Are we presenting our best lines for a good yarn? - A critique of the current standards governing Australian alpaca fleece classing.

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1 The move from 'single desk' fleece marketing to competitive fleece supply chains

Since about 2008, the Australian alpaca fleece market has moved from a single desk marketing system dominated by the Australian Alpaca Fleece Ltd, to competitive supply networks incorporating a number of fleece collection and buying entities. The entities range from producer based collectives to commercial businesses. Further, these entities are able to adopt any one, or a combination of fleece collection protocols or standards that have been developed over recent years to provide guidance on how to class alpaca fleeces into commercially driven consignment lines.

These supply collectives and businesses jostle for their share of the national alpaca clip, offering breeders the opportunity for increased price premiums for their fleeces, or at least elevated recognition for the type of fibre they are producing.

In order to achieve an increase in prices paid or recognition for alpaca fibre, supply networks must become more responsive to the demands of the different markets that currently or potentially use alpaca, with particular focus on the types of markets they wish to supply. These markets include the high-volume household product ranges such as carpets that normally source broader micron fibre with less stringent specifications that generally pay lower prices per kilo, to the luxury 'next to skin wear' garments that offer higher prices per kilo, but with more stringent specifications for finer micron fibre.

Crucial to meeting the demands of their respective markets is the need for fibre supply entities to adopt fleece collection protocols or standards appropriate to the expectations and operating environment of producers as well as the demand drivers for their customers.

This paper will consider the two main sets of fleece collection and classing standards currently in existence and will make observations on their ability to guide fleece classing so as to effectively respond to respective market requirements.

2 Industry feedback – what's important to the mills and manufacturers

Seven businesses involved in alpaca fibre processing and/or manufacturing were interviewed as part of this critique. Some of their responses give evidence of the range of specifications for the differing product ranges.

Two Australian mills processing huacaya alpaca for carpet manufacturing, throws and blankets (mill 1 and 4) stated the main raw fibre specification was evenness of desired length. For these mills, fibre diameter was of little consequence on price paid. The price paid to the grower for these consignments were in the vicinity of AUD2.00 to AUD10.00 per kilo and normally consisted of 25 microns and above. These mills preferred not to be named.

On the other hand, Frank and Anya Walkington from Shamarra Alpacas, New Zealand who buy alpaca fibre for luxury knitwear retailing stated "Uniformity of fibre diameter was crucial for processing performance and consistent handle of the end product", while Emma Taylor of UK's East Anglia Alpaca Mill stated that based on their experience, mills aiming for the top end market should be seeing a superior product if batching is correct and SD of fibre diameter is low

Further, Adagio Alpaca Mills in NSW stated uniformity of fibre diameter is critical for their processing performance towards high quality end product, while Great Ocean Road Woollen Mill in Victoria stated "From a processing perspective, we are more concerned with consistency of fibre including micron, SD, length and cleanliness" and "…that a large variation of individual fibres …will lead to an uneven yarn and therefore, an inferior product".

Fibre Naturally in Victoria stated they look for evenness in length and micron, and little or preferably no medullated fibres. They also look for narrowing of type between secondary and primary fibres. Fibre Naturally pursues 'next to skin' wear products.

Prices paid for consignments of fibre aimed towards these 'high end' product ranges have regularly fetched around AUD20.00 per kilo for finer micron lines. It should also be noted that the world record price paid for an alpaca bale was AUD80.00 per kilo, where very strict criteria on micron parameters and SD were maintained.

In essence therefore, those alpaca fleece collection schemes or businesses that aim to exert upward pressure on price paid for kilo are likely to strive towards consignments that consistently exhibit high levels of uniformity with fibre diameter, colour and length in order to attract and retain business from 'high end' markets.

3 The two main sets of standards for alpaca fleece collection in Australia

Currently, there are two main sets of standards guiding fleece collection and classing for the alpaca community in Australia. One set of standards were established by the Australian Alpaca Association (AAA) in consultation with the Australian Wool Exchange Ltd (AWEX) and a range of industry experts. The standards are referred to as the 'Code of Practice for Alpaca Fleece Classing (COP).

The other set of standards are referred to as Objective Measurement assisted Alpaca Fleece Classing (OM). OM finds its origins with the Premium Alpaca scheme initiated about 10 years ago. Today, there are a number of fleece collection schemes operating around Australia that have incorporated the fundamental principles of OM.

3a AAA's 'Code of Practice for Alpaca Fleece Classing' (Industry Standard for the Preparation of Australian Alpaca, AAA. 2012)

The preface in the Code of Practice (COP) booklet indicates the COP was produced to enable standardised and quality assured alpaca fleece clips to be offered to both Australian and overseas buyers.

The COP covers classing of fleeces, branding of bales, description of fleece lines, documentation and registration of classers. As it is the classing of fleeces that offers the greatest impact on standardisation and quality assurance of product to buyers, it is this aspect of the COP that will be singled out for consideration.

Alpaca fleece-classers under the COP fall into three categories.

'Professional classers' may class alpaca fleeces from any herd or farm, and can aggregate fleeces from multiple herds in order to form volume consignments.

'Owner classers' may class only alpacas under their ownership and/or under their direct control

‘Corporate or Commercial classers’ are companies or businesses that compile fleeces into volume consignments. In such cases, a registered Professional Classer must be available to uphold classing standards.

COP prescribes classing line standards and parameters based on gradients of average fibre diameter, fibre length and colour, with respective branding descriptions that are placed on consignment bales.

With regard to subjective classing for the above parameters, colour and fibre length are non-contentious given each are easily distinguishable by sight or the use of a ruler or colour chart. With regard to average fibre diameter, it is understood that during training, it is suggested classers use fibre templates for the various micron bands until sufficient levels of competency are achieved.

It is also noted the COP provides parameters for crimp style (crimp frequency, amplitude and uniformity). While this paper will not consider these particular classing parameters, it is suggested this aspect for COP is problematic. The main reason for this is the lack of tangible evidence that crimp style features as a demand driver for alpaca fibre.

Further, the COP links crimp style with fibre diameter, which is a theory that has largely been discounted across all fibre industries for many years now (Menkart, J. Relations Between Crimp Fineness in Australian Merino, Journal of Agricultural Research 1957 and Kondinan Group, ‘Correlations for phenotype and genotype traits in Merino Sheep, 1997).

It is acknowledged, however, crimp definition can be an indicator of variation in fibre diameter within a fibre staple and over any one fleece.

For suri fleeces, there is reference to ‘lock type’.

While the COP provides guidelines for alpaca fleece classing and subsequent procedures such as bale branding and consignment documentation, it appears to be silent on the issue of fleece harvesting including fleece skirting, apart from a recommendation that fleece producers refer to the ‘AAAL Shearing Shed and Pre-Classing Code of Practice. This is noteworthy as explained later in this paper.

3b Objective Measurement assisted Fleece Classing

The concept referred to as Objective Measurement assisted Fleece Classing (OM) was initiated in 2006. OM is in fact one aspect of a comprehensive approach to alpaca fleece production that covers genetic improvement, husbandry, fibre harvesting, marketing and market feedback. The standards relevant to fleece harvesting were developed in consultation with alpaca breeders and a range of people regarded as experts in relevant fields including a large number of mill operators, manufacturers and retailers.

In terms of fleece harvesting, OM requires all breeders who participate in the scheme to have successfully passed a training course that covers shearing shed management, fleece skirting and an introduction to fleece classing.

Participating breeders contribute fleeces at group collection days where skirting standards of fleeces are re-checked before a subjective appraisal of the fleece is made for traits such as colour, length and tensile strength. Importantly, three samples are taken from each fleece that meet minimum standards. These three samples, referred to as grid samples, are tested either on-site or sent to a fibre testing laboratory for subsequent advice on average fibre diameter

and SD. The fleece is then allocated to the appropriate classing line (or rejected) based on the fibre test report.

The current price for grid testing is about AU$1.65 per fleece (AAFT Nov 2016).

4 Can the 'Code of Practice' deliver uniformity of fibre diameter?

As previously evidenced, fibre markets that appear to offer maximum opportunity for price premiums are those that require high levels of consistency and uniformity with fibre diameter as well as length and colour. Given the COP is heavily based on the Australian wool-classing system of subjective appraisal, there is the obvious question as to whether the COP can deliver fleece consignments that meet buyer specifications, particularly with regard to consistency and uniformity of fibre diameter.

A snapshot of wool harvesting in Australia is therefore relevant when considering this point.

According to Australian Bureau Statistics, in 2014, the average flock size was just under 3000 sheep for specialist wool producers. Based on testing data for Countrywide Wool Testing and DPI, NSW 2009, about 66% of the adults in a merino sheep flock have average fleece diameter within a 2 micron range. Further, almost all sheep are very similar in type and obviously colour and possess little variation within fleeces as well as between fleeces.

Due to the uniformity of fibre type within a merino enterprise, it was very common to see the adult fleece clip, often weighing between 8 to 12 tonnes, being classed into 2 to 4 main fleece lines, with say, one line each for off-type wool (cast line), tender wool and short line as well as about 5 'oddment' lines such as 'Bellies' and 'Broken' (skirtings). For superfine wool producers catering for the Italian fabric trade, however, more than 4 main fleece lines for adult sheep is not uncommon.

For wool classers, the emphasis is not so much towards identifying the fibre diameter of fleeces, but to differentiate between the finer fleeces and the broader fleeces. In other words, wool classing is based on where a fleece fits relative to the flock's overall clip rather than identifying a fleece's respective micron count. It is the job of the eventual core test results for the fleece lines to identify their respective average fibre diameter (and other objective traits).

It might also be worth noting that it is not uncommon for a professional wool (sheep) classer to class 20,000 to 60,000 fleeces a year.

On the other hand, most alpaca farms have less than 50 alpacas. Even if fleeces are combined from a number of alpaca farms, there is a typical range in average fleece diameter of 10 microns or more. In addition to this, there is often a significant range in colours, fibre length and style of fleece.

In cases of large scale alpaca farms with over 1000 alpacas, or with fleece collection schemes involving similar numbers, AAFT have witnessed up to 25 fleece lines being used to grade all the fleeces. It is understood that some alpaca fleece classers are attempting to class into about 70 different lines.

While figures are unavailable, it is not unreasonable to suggest a relatively experienced alpaca fleece classer might class no more than, say, 2,000 alpaca fleeces in one year.

Considering the two quite distinct scenarios of merino wool classing against alpaca fleece classing, a valid deduction might be that the two demand quite different grading systems to take account of their peculiarities. A wool classer maintains a constant exposure to the

relative grading of high volume wool clips that possess significant degrees of uniformity. On the other hand, an alpaca fleece classer must deal with the constraints of lower overall volume of fleeces classed, while needing to grade an extremely varied range of fleeces into a very large number of fleece lines.

The evidence of whether such constraints impact on eventual classing outcomes can be drawn from consignment line 'core test' data.

5 Core test data – a window into fleece classing outcomes

Almost all wool consigned in Australia and New Zealand is sold subject to a certified core test. The core test is carried out on a collection of fibre samples taken from pressed bales that form the respective classing or consignment line. The core samples are obtained using hollow metal rods penetrating each bale in order to take wool samples throughout each bale.

The cored samples are tested for traits such as average fibre diameter, variation in fibre diameter, staple (fibre) length and strength and yield. Given the thoroughness of the sampling method, these core test results are accepted by the industry as providing a true indication of the wool traits within the bales or consignment lines.

As Standard Deviation (SD) is the statistic that indicates the true level of variation (of fibre diameter), we look at the core test SD to reveal the extent of variation that exists throughout the respective consignment.

It should be remembered there are three levels of fibre diameter variation that impact the SD displayed on a core test result (fibre variation within a bale/consignment). There is the variation between fibres within fibre bundles (as reflected in normal midside fibre tests for SD) which is mainly influenced by genetics and environment. Then there is the variation across each fleece which is influenced by skirting technique as well as genetics. Finally, there is the variation between the fleeces within the consignment which is influenced by fleece classing technique.

A review of the core test results for indicative fleece lines from each of the two standards for alpaca fleece classing is a suitable window with which to evaluate the degree of uniformity of fibre diameter.

For effective comparison, only white huacaya fleece lines were considered. The core test for these fleece lines (and two indicative merino lines) are contained in table 1.

Table 1 showing core test results for various alpaca and wool consignments.

Serial	AFD (microns)	Consignment SD	Brand	* Classing method
1	22.8	6.8	HWTDFFLC	Sub
2	23.7	6.3	HWTBSFLC	Sub
3	22.1	5.9	HWTBMFLC	Sub
4	19.5	4.9	HWTBSFLC	Sub
	Variation avg's	**6.0**		**Sub**
5	20.2	5.0	PAWT XXXX	OM
6	23.6	5.4	PAWT XXX	OM
7	23.5	5.2	AFFN	OM
8	17.8	4.1	PAWT ULTRAFINE	OM with adv skt
9	17.9	4.4	PAWT ULTRAFINE	OM with adv skt
	Variation avg's	**4.8**		**OM**
10	26.7	6.1	PAWT X	OM Pre trg
11	22.2	5.5	PAWT XXX	OM Pre trg
	Variation avg's	**5.8**		**OM Pre trg**
12	19.0	3.5	various	Merino S14 avg
13	16.1	2.8	AUSFINE BEST	Merino superfine

* Classing method:

Sub = Classing using subjective appraisal (COP).
OM = Objective measurement with subjective appraisal
OM with adv skt = Objective measurement with subjective appraisal and advanced skirting
OM Pre trg = Objective measurement with subjective appraisal prior to fleece preparation training
Merino S14 avg = Average taken merino wool core test data from sale 13, Sept 2016
Merino superfine = Average for 1.7 tonne consignment using objective measurement of fleeces with advanced skirting and SD focused breeding (sold Oct 2014)

Note: all core test information is derived from AWTA certified test data as presented in AWEX or Australian Wool Handlers catalogue sheets

6. Discussion of core test results

While the focus of this paper is directed towards classing standards, the above core test results reveal information relevant to producing 'high value' fleeces that cannot be ignored.

One of the main sources of concern with processing alpaca fibre is the high degree of variation in diameter found between fibres within a fleece. Alpaca fleece SD's average at about 4.5 microns, with many above 5 microns. Merino sheep SD's average at about 3.3 microns, with many fine wool merinos now having SD's lower than 3.0 microns. This difference between wool and alpaca fibre is evident when comparing the bale SD's for merino bales of wool (serials 12 & 13) compared to bale SD's containing alpaca fibre (serials 1 to 11).

When compiling the Ultrafine Alpaca Bales (serials 9 & 8), only fleeces that exhibited SD's of lower than 3.5 microns where considered for inclusion. This minimum standard for low 'within fleece' SD is part of the reason these bales had core test SD's of only 4.1 and 4.4.

Clearly, this illustrates the need for alpaca breeders to prioritise SD and 'across fleece variation' in their breeding objectives in order to reduce overall fibre diameter variation and to improve the general processing performance of the fibre (Vallely, P 'Should alpaca breeders use SD or CV when evaluating fibre traits'. AAFT, 2016).

I am not suggesting for one minute the alpaca community simply replicate merino fleece production, however, I think this is one case where it can provide some guidance on how we can improve the relative value of alpaca fleeces.

Returning to the theme of fleece classing standards, the first point to note is the difference between consignments compiled by breeders who have completed 'fleece preparation' training, against those consignments compiled by breeders who have not.

The core test results for OM classed bales compiled by breeders who have completed training (serials 5 to 9) against bales compiled prior to the training (serials 10 & 11) appear to suggest that bale SD's could be reduced if breeders developed proficiencies in fleece handling and skirting, particularly with regard to reducing fibre contamination.

It should be stressed however, further analysis of comparative core testing would need to be undertaken in order to make substantiated findings. In saying that, the distinct possibility that enhanced skirting procedures help achieve the remarkably low SD's for the ultrafine alpaca bales tends to give some weight to the suggestion that training breeders in fleece harvesting and preparation standards does have considerable merit.

The crucial point drawn from the table is how the respective classing method impacted on fibre diameter variation throughout consignment lots.

The above table tends to suggest the subjectively appraised (COP) bales (serials 1 to 4) had significantly higher degree of fibre diameter variation than the OM consignments (serials 5 to 9), although it is understood the COP bales were compiled by breeders who had not benefited from fleece preparation training. Given the above observations, it is reasonable to suggest that much of the increase in fibre diameter variation with the COP consignments could be attributable to this lack of training. None-the-less, the table does indicate subjective appraisal accounts for an increase in fibre diameter variation with consignment lots compared to classing fleeces with the support of objective measurement.

This observation is reinforced by the following comment from luxury knitwear retailers, Frank and Anya Walkington.

"We have commercially processed 5 batches of alpaca over the past 5 years. The first 3 batches were classed by eye and hand. The last 2 batches were classed based on fleece test results (3 samples taken from each fleece) and then classed into lines of 2 micron bandwidths. We did experience a higher degree of fluffing, pilling and a lower level of durability from the first 3 batches using eye/hand classing.

By classing fleeces using micron testing, the most noticeable improvement is the increased comfort factor and reduced SD. This gives us an assurance and confidence that the quality of our yarn/knitwear will be consistent which translates into customer satisfaction.

To further reinforce this point, the following comment from Andrew Hulme of Adagio Alpaca Mill should be noted. "Based on my technical experience, I struggle to see how anyone can class fleeces to effectively reduce micron variation without the use of a fibre testing computer".

Furthermore, Fibre Naturally stated they preferred consignments that had been classed with the support of objective measurement, preferably classed to within 2 micron bands.

If one considers the challenges on classing alpaca fleeces without the aid of objective measurement as detailed in paragraph 4, combined with the outcomes from table 1, the above comments from mills should come as no surprise.

While further analysis is recommended, it is reasonable to suggest at this stage that OM classing places processors at an advantage due to the consistency of reduced fibre variation in consignment lines, which should in turn result in increased price premiums to breeders combined with elevated recognition for alpaca fibre in the global market place.

7 Bringing it all together

This paper found strong evidence that end users of alpaca fibre who pursued top-end markets emphasised specifications for consistency and uniformity of key fibre traits, particularly with regard to fibre diameter. Further, observations drawn from a limited and initial set of core test data suggest OM classing standards were more likely to achieve top-end consignment specifications compared to COP standards.

Fleece classing standards, however, need to dove tail with the variable dynamics of alpaca fibre production.

Clearly, not all alpaca owners will be comfortable with the increased demands and grid testing costs associated with the more centralised and prescriptive nature of OM compared to COP classing, and therefore, COP will be more attractive and perhaps more appropriate for these breeders. In turn, those fleece collection entities not targeting the premium end market should find COP more appropriate.

On the other hand, those breeders who are comfortable with the increased efforts and costs required to meet the more demanding, and potentially more lucrative premium end of the fibre market where more exact fleece specifications are required, should find OM classing and fleece collection standards more appropriate.

The challenge for fleece collection schemes using OM standards, is to achieve price premiums, or at least increased recognition of alpaca as a premium fibre, in return for evidently more consistent and uniform consignments to justify the increased costs and effort.

Based on the information and evidence to date, it appears that neither set of alpaca fleece classing/collection standards are considered intrinsically problematic. Rather, it is a case of matching the set of standards that are appropriate to the markets targeted by the respective fleece buying/collection entity.

While this paper is limited by the narrow scope of enquiry and admittedly, the possibility of some bias towards OM by the writer, it provides a case for reconciling the two classing systems, and to introduce fleece harvesting and breeding awareness training into a single national alpaca fleece production scheme.

Disclosure of commercial interest:

As owner of AAFT Fibre Testing Laboratories in Australia and UK, the writer declares a commercial interest in the topic of the paper.