Producer Report

Fall 2013
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The fall 2013 analysis of the Huacaya and Suri databases is now complete with the expected progeny differences (EPD) and accuracies calculated for each trait. The database continues to grow with over 17,900 Huacaya and 4,200 Suri animals having an observation on at least one trait.

Several significant changes were made during this analysis. First, given the continued growth in the amount of performance data, the heritability of each trait was re-estimated before EPD were calculated. Heritabilities were originally estimated when the EPD program was initiated in 2010 and since that time there has been over a 450% increase in Huacaya performance data, and over a 510% increase in Suri data. The additional data allowed for more precise estimates of heritability and genetic correlations. The second significant change in this analysis was a prototype analysis of birth weight, which included estimating heritability for both Huacaya and Suri with the subsequent calculation of EPD and accuracy for birth weight.

The following report summarizes the data used in the latest analysis, outlines the results of the new heritability analysis of all traits, summarizes the process and the data for development of birth weight EPD, and presents the results of the EPD and accuracy calculations for each trait for both Huacaya and Suri.

We have added additional information on the population so that you are now able to determine the exact rank of each animal for each trait within the Huacaya and Suri populations. These rankings are also split into that for males and females. This provides a more precise percentile ranking for each individual (although percentile tables are still available in this report). These much be interpreted in context remembering that males typically have many more progeny than females and therefore have different accuracies.

The combination of another large increase in data as compared to the last evaluation and the re-estimation of heritabilities and genetic correlations has led to reranking of some animals for EPD in various traits although generally animals rank similarly to previous analyses.

Data Summary

The number of observations used in the calculations is presented in Table 1 by trait for both Huacaya and Suri along with the average level of performance in each. In comparison to the Fall 2012 analysis, data once again increased at a rate not normally seen in more traditional livestock species' genetic evaluations. In Huacaya, observations for percent fibers greater than 30 microns, curvature, standard deviation of curvature and medullation had the largest increase with over 36% growth. In Suri, the staple length, curvature, standard deviation of curvature, and medullation had the largest increase in observations with over 35% growth.

The counts in Table 1 include the numbers of **usable** observations. As in previous analyses, some historical observations are outside of the range of allowable age at measure (age in days must be greater than 270 days), or there is not sufficient information to determine the age of the animal when the measurement was taken. To be usable for calculating EPD, the age at which an animal is measured must be known. For the few animals where calculation of an age is not possible, the animal will still get an EPD for the trait, but that EPD will not be based on the animal's observation for that trait. Instead that EPD is based primarily off of performance of relatives. In some other cases observations are outside the allowable range for a trait and accordingly these are not used for the calculation of EPD.

Table 1. Summary of observations for Huacaya and Suri by trait.

	Huacaya		Suri	
Trait Name	Count	Average	Count	Average
Average Fiber Diameter (microns-μ)	15397	23.7	2561	26.8
Standard Deviation (AFD; μ)	15395	5.1	2555	6.3
Spin Fineness (μ)	15396	23.2	2560	26.7
Percent of Fibers larger than 30 microns	15397	13.9	2535	26.6
Fleece Weight	15334	6.0	2752	5.4
Mean Curvature (deg/mm)	14513	37.6	2493	11.0
Standard Deviation of Curvature	14511	23.3	2493	14.2
Percent Medullation	6885	18.1	1187	17.4
Mean Staple Length (mm)	13692	92.3	2403	149.9
Birth Weight	7394	16.7	1902	17.4

To achieve the greatest accuracy possible for EPD, performance data on all related individuals is used. In this process the degree of relatedness must be determined to properly "weight" relatives' performance information. In the ARI genetic evaluation, this process begins with a list of animals with performance information on any trait (e.g. fleece weight, fiber diameter, etc). In previous analyses, the list was based on animals with fleece weight and fiber characteristic observations, but for the current analysis animals with birth weight observations were also included. For each of the animals having performance information on at least one trait, a pedigree is traced back 4 generations and these "ancestors" are then included in the analysis. For those animals that do not have a 4-generation pedigree in the ARI registry (i.e. original importations and animals that are within 3 generations of an original import), pedigrees are constructed back to the original imports. Progeny of animals with an observation are not included in the analysis unless those progeny have their own observation. In the case where progeny do not have an observation those progeny do not add information to the overall genetic evaluation, and their EPD would simply be an average of their parents' EPD. The same would be true of collateral relatives—without an observation or descendants with an observation they are not included in the evaluation as they add no additional information on genetic merit.

The constructed pedigree for Huacaya included 44,476 animals and for Suri included 10,280 animals. These animals and their relationships form the basis for the EPD calculations.

Analysis Procedures

The degree of genetic influence on animal performance for any specific trait must be quantified before EPD can be calculated. Put another way, of the differences we observe in animal performance how much is due to genetic differences as opposed to management/environmental effects. This degree of genetic control is termed heritability and is expressed as a decimal ranging from 0 to 1 (or as a percentage ranging from 0 to 100%). As previously stated, the heritabilities used in the current analysis were re-estimated for each trait (for birth weight this was the first time heritability was estimated) based on data from the entire population of individuals. These estimates were then used directly or combined with previous estimates to arrive at heritabilities for the current evaluation. The heritability estimates used in the current evaluation are shown in Table 2.

Table 2. Heritabilities used in the latest EPD calculations for Huacaya and Suri.

Trait	Huacaya	Suri
Average Fiber Diameter (AFD)	.52	.52
Standard Deviation of AFD	.52	.52
Spin Fineness	.52	.52
Percent of Fibers larger than 30 microns	.55	.52
Fleece Weight	.35	.32
Mean Curvature	.52	.51
Standard Deviation of Curvature	.55	.20
Percent Medullation	.54	.55
Mean Staple Length	.39	.15
Birth Weight	.50	.55

For most genetic evaluations, heritabilities are typically re-estimated every 10 to 15 years. However, most livestock performance databases have not experienced the growth seen in the ARI database and as such, an earlier re-estimation process was implemented for this program. Moving forward database growth and parameters will be monitored over time to determine if there is a need to re-estimate on a shorter timetable than 10 years.

As stated in previous producer reports, the magnitude of the heritability influences two practical aspects of the EPDs and their calculation. First, the heritability determines the spread (i.e. minimum and maximum) of EPD for each trait—the greater the heritability, the greater the spread in EPD across all alpacas given the **same** data (i.e. additional performance data also influences the spread of EPD in a population). Second, heritability also influences the accuracy of the EPD—as heritability of a trait increases, the accuracy of the EPD increases as well given the same available data. At higher heritabilities, each observation is more closely related the underlying genetics controlling expression of that trait and therefore, a single observation reveals much about the individual's genetic merit. When heritability of a trait is low, a single observation on an individual reveals less about that animal's genetic merit. For instance, the value of a single observation on fleece weight would result in a less accurate fleece weight EPD than a single fiber diameter observation would for a fiber diameter EPD. The heritability of fleece weight is .35 (Huacaya) and the heritability of fiber diameter is .52.

All of the EPD are calculated in multiple trait models to leverage information on genetically related traits to increase EPD accuracy. These genetic relationships enable the EPD system to use information on one trait to predict genetic merit in another. The strength of that relationship is reflected in the genetic correlations. The magnitude of a genetic correlation indicates the degree to which genes in an individual influencing one trait also contribute to performance in the other traits of interest. For instance, the genetic correlation between fiber diameter and standard deviation of fiber diameter is .66 in Huacaya. A .66 genetic correlation indicates a strong tie between the two traits and that many genes influencing fiber diameter also influence standard deviation of fiber diameter. This provides an opportunity to use fiber diameter to predict the genetic merit of the individual for standard deviation of fiber diameter and vice versa. For sake of example, a .10 correlation would indicate little genetic relationship between two traits. Leveraging information in a multiple trait analysis results in more accurate EPD. The EPD from this analysis result from the analysis of 3-trait combinations with fleece weight included in all analyses as it has the greatest number of observations reported in both Huacaya and Suri.

This is the first analysis in which a birth weight EPD was calculated. The first step in this process is to appropriately define contemporaries—that is to group animals that have had the same opportunity to express their genetic differences. Differences in performance of animals in the same contemporary group are then a better indicator of their genetic merit. Contemporary group for birth weight is defined as the farm and year of birth. This then accounts for climatic variation from year to year on the same farm and for managerial differences between farms. The heritability of birth weight was in line with the heritability of birth weight in livestock species at .50 and .55 for Huacaya and Suri respectively. The birth weight EPD are produced using only birth weight information in a single trait analysis.

EPD Summary

Averages and ranges of EPD for each trait in both Huacaya and Suri are shown in Tables 3 through 6. For an animal to have received EPD, it must have been within 4 generations of an animal with an observation and have an accuracy greater than 0 for fiber diameter. New for this analysis, we have split the summary statistics into different tables for males and females.

Table 3. Expected progeny differences and associated accuracies for all Huacaya males in the analysis.

	Expected Progeny Differences			Accuracy	
Trait	Average	Minimum	Maximum	Average	Maximum
Fiber Diameter (FD; μ)	-.2	-3.4	4.6	.15	.72
Standard Deviation of FD (μ)	-.1	-.9	1.7	.15	.71
Spin Fineness (μ)	-.3	-3.4	4.6	.16	.72
Percent of Fibers > 30 microns	-1.0	-13.2	22.2	.16	.73
Mean Curvature (CURV)	.5	-6.5	9.3	.15	.71
Standard Deviation of CURV	.2	-3.6	4.1	.15	.72
Percent Medullation	-.1	-11.0	14.8	.08	.67
Staple Length (SL)	.0	-10.3	10.0	.13	.68
Fleece Weight	.1	-1.1	2.1	.10	.65
Birth Weight	.0	-2.0	2.0	.09	.51

Table 4. Expected progeny differences and associated accuracies for all Huacaya females in the analysis.

	Expected Progeny Differences			Accuracy	
Trait	Average	Minimum	Maximum	Average	Maximum
Fiber Diameter (FD; μ)	-.1	-3.2	5.6	.13	.57
Standard Deviation of FD (μ)	.0	-.9	1.8	.13	.57
Spin Fineness (μ)	-.1	-3.2	5.7	.14	.64
Percent of Fibers > 30 microns	-.6	-13.0	26.3	.14	.64
Mean Curvature (CURV)	.3	-7.1	10.2	.13	.56
Standard Deviation of CURV	.1	-3.3	4.6	.13	.59
Percent Medullation	.0	-10.9	18.6	.07	.49
Staple Length (SL)	.0	-11.1	13.1	.11	.49
Fleece Weight	.1	-.9	1.6	.08	.45
Birth Weight	.0	-2.4	2.0	.1	.35

*Accuracies represent animals with an accuracy for fiber diameter greater than 0. As such, some animals may have an accuracy of 0 for other traits.

Table 5. Expected progeny differences and associated accuracies for all Suri males in the analysis.

	Expected Progeny Differences			Accuracy	
Trait	Average	Minimum	Maximum	Average	Maximum
Fiber Diameter (FD)	-.1	-2.8	4.5	.13	.67
Standard Deviation of FD	-.1	-1.0	1.4	.13	.67
Spin Fineness (μ)	-.1	-2.9	3.7	.13	.68
Percent of Fibers > 30 microns	-.3	-12.3	17.3	.13	.68
Mean Curvature (CURV)	.0	-2.4	3.1	.12	.67
Standard Deviation of CURV	.0	-1.4	1.6	.07	.52
Percent Medullation[1]	-.5	-9.7	13.4	.07	.65
Staple Length	.3	-9.2	16.3	.06	.47
Fleece Weight	.1	-.7	1.2	.08	.57
Birth Weight	.0	-2.5	2.2	.10	.52

*Accuracies represent animals with an accuracy for fiber diameter greater than 0. As such, some animals may have an accuracy of 0 for other traits.

Table 6. Expected progeny differences and associated accuracies for all Suri females in the analysis.

	Expected Progeny Differences			Accuracy	
Trait	Average	Minimum	Maximum	Average	Maximum
Fiber Diameter (FD)	-.1	-3.0	6.6	.12	.54
Standard Deviation of FD	.0	-1.0	1.7	.12	.52
Spin Fineness (μ)	-.1	-2.8	6.3	.12	.58
Percent of Fibers > 30 microns	-.2	-13.7	25.0	.13	.57
Mean Curvature (CURV)	-.0	-3.0	6.9	.12	.58
Standard Deviation of CURV	.0	-1.4	2.0	.06	.38
Percent Medullation[1]	-.4	-9.0	20.9	.07	.55
Staple Length	.2	-9.4	20.4	.06	.30
Fleece Weight	.1	-.9	1.5	.07	.38
Birth Weight	.0	-2.1	2.3	.07	.34

*Accuracies represent animals with an accuracy for fiber diameter greater than 0. As such, some animals may have an accuracy of 0 for other traits.

Accuracy values provided with each EPD offer an easy method for evaluating confidence in that prediction (i.e. EPD) with accuracies closer to 1 yielding more confidence than EPD with lower accuracies. No matter the accuracy, however, the EPD for a trait is a consistently better prediction of an animal's genetic merit than its own performance alone because EPD are based on considerably more data than that from just the individual. EPD take into account data from ancestors, collateral relatives (e.g. half sibs, full sibs, etc), the individual itself, and progeny (if available). EPD also account for differences in age of the animal at measure, and in nutritional and climatic differences across herds provided contemporary groups are appropriately designated.

As data accumulates on an individual and its relatives, the accuracy of the EPD for that individual increases. As an example, for a trait that is 50% heritable, with only a single observation per individual, no inbreeding, no other information on relatives, and an **infinitely** large contemporary group, the accuracy of the EPD should be just over .28. An advantage of the statistical methodology used to calculate these EPD is that animals do not need to compete in infinitely large contemporary groups. The system adjusts accuracies up or down accordingly based on the number of animals in the contemporary group with larger contemporary groups having greater influence on the EPD. Given the same number of animals in a contemporary group, traits with lower heritability than .5 will result in a lower accuracy associated with a single observation.

Another perspective on accuracy is available through the use of possible change values for each trait (Tables 7 and 8). The possible change values can be used to construct a confidence interval around an EPD and within that confidence range we are confident (within a given probability) that the animal's true genetic merit resides. To illustrate, let's assume a particular Huacaya animal's fiber diameter EPD is -1.2 with an accuracy of .4. That EPD (-1.2) plus/minus possible change will produce a range within which we are 68% confident the animal's true merit for fiber diameter lies. With a .4 accuracy, the possible change value for fiber diameter in this example is .70 (Table 7) and -1.2 minus .70 and -1.2 plus .70 results in a confidence range of -1.9 (-1.2-.70) to -.40 (-1.2+.70). We are 68% confident the animal's true genetic merit lies in that range. As is apparent from the tables and from intuition, as we gather more data on an animal and its relatives, we become more confident in our EPD—accuracy increases and possible change values decrease (Tables 7 and 8). Accordingly, the confidence range would be narrower as our estimate is more precise.

Table 7. Possible change values for various accuracy levels by trait in the Huacaya population.

Accuracy	FD	SD of FD	SPIN	Percent of Fibers > 30μ	CURV	SD of CURV	MED	SL	FW	BW
0.0	1.17	0.35	1.17	5.37	2.48	1.27	5.24	4.21	0.47	0.95
0.1	1.06	0.32	1.05	4.83	2.23	1.14	4.72	3.79	0.42	0.86
0.2	0.94	0.28	0.93	4.30	1.98	1.02	4.19	3.37	0.38	0.76
0.3	0.82	0.25	0.82	3.76	1.74	0.89	3.67	2.95	0.33	0.67
0.4	0.70	0.21	0.70	3.22	1.49	0.76	3.14	2.53	0.28	0.57
0.5	0.59	0.18	0.58	2.69	1.24	0.63	2.62	2.10	0.23	0.48
0.6	0.47	0.14	0.47	2.15	0.99	0.51	2.10	1.68	0.19	0.38
0.7	0.35	0.11	0.35	1.61	0.74	0.38	1.57	1.26	0.14	0.29
0.8	0.23	0.07	0.23	1.07	0.50	0.25	1.05	0.84	0.09	0.19
0.9	0.12	0.04	0.12	0.54	0.25	0.13	0.52	0.42	0.05	0.10
1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

[A]FD=Fiber Diameter, SPIN=Spin Fineness, CURV=Mean Curvature, MED=Percent medullation, SL=Staple length, FW=Fleece weight, SD = standard deviation, BW=Birth weight.

Table 8. Possible change values for various accuracy levels by trait in the Suri population.

Accuracy	FD	SD of FD	SPIN	Percent of Fibers > 30μ	CURV	SD of CURV	MED	SL	FW	BW
0.0	1.45	0.49	1.48	6.81	0.99	0.82	5.54	6.64	0.45	0.95
0.1	1.30	0.44	1.33	6.13	0.89	0.74	4.99	5.98	0.40	0.86
0.2	1.16	0.39	1.19	5.44	0.79	0.66	4.43	5.31	0.36	0.76
0.3	1.01	0.34	1.04	4.76	0.69	0.57	3.88	4.65	0.31	0.67
0.4	0.87	0.29	0.89	4.08	0.59	0.49	3.33	3.99	0.27	0.57
0.5	0.72	0.25	0.74	3.40	0.49	0.41	2.77	3.32	0.22	0.48
0.6	0.58	0.20	0.59	2.72	0.40	0.33	2.22	2.66	0.18	0.38
0.7	0.43	0.15	0.44	2.04	0.30	0.25	1.66	1.99	0.13	0.29
0.8	0.29	0.10	0.30	1.36	0.20	0.16	1.11	1.33	0.09	0.19
0.9	0.14	0.05	0.15	0.68	0.10	0.08	0.55	0.66	0.04	0.10
1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

[A]FD=Fiber Diameter, SPIN=Spin Fineness, CURV=Mean Curvature, MED=Percent medullation, SL=Staple length, FW=Fleece weight, SD = standard deviation, BW=Birth weight.

To make it easier for breeders to determine how their animals rank relative to the overall alpaca population, percentile tables for Huacaya and Suri are shown in Tables 9 through 12. New for this analysis, are percentiles by sex—tables split into male and female percentiles for Huacaya and Suri. These show the relative ranking of an individual in comparison to the population of animals of the same sex (those with published EPD). For instance, if a Huacaya male had a fiber diameter EPD of -1.5 it would be in the top 5% of all Huacaya males for fiber diameter.

Given that birth weight EPD have just been released with this analysis and that birth weight likely has an intermediate optimum (best animal is not too light nor too heavy at birth), no percentiles are included.

Table 9. Percentile rankings in Huacaya males for each trait*.

Percentile	FD	SDFD	SPIN	PERC	CURV	SDCURV	MED	SL	FW
1	-2.01	-0.55	-2.05	-7.55	5.29	-1.52	-5.24	5.11	1.01
2	-1.80	-0.50	-1.83	-6.81	4.47	-1.26	-4.34	4.30	0.86
3	-1.66	-0.46	-1.70	-6.31	4.07	-1.09	-3.83	3.77	0.75
4	-1.56	-0.43	-1.60	-5.95	3.75	-1.00	-3.48	3.42	0.70
5	-1.47	-0.41	-1.51	-5.67	3.52	-0.91	-3.16	3.07	0.66
10	-1.17	-0.32	-1.20	-4.69	2.60	-0.62	-2.28	2.19	0.51
15	-0.96	-0.27	-0.99	-4.00	2.04	-0.46	-1.76	1.67	0.42
20	-0.81	-0.22	-0.83	-3.45	1.62	-0.34	-1.38	1.28	0.35
25	-0.68	-0.19	-0.70	-2.99	1.30	-0.24	-1.07	0.99	0.30
30	-0.56	-0.16	-0.57	-2.58	1.02	-0.16	-0.83	0.75	0.25
35	-0.45	-0.13	-0.47	-2.16	0.78	-0.09	-0.61	0.53	0.21
40	-0.36	-0.10	-0.38	-1.79	0.58	-0.02	-0.41	0.33	0.17
45	-0.27	-0.08	-0.28	-1.44	0.39	0.05	-0.23	0.15	0.13
50	-0.19	-0.06	-0.21	-1.08	0.23	0.12	-0.08	-0.02	0.09
60	-0.05	-0.01	-0.06	-0.43	-0.06	0.29	0.22	-0.38	0.04
70	0.10	0.03	0.09	0.24	-0.34	0.49	0.61	-0.81	-0.02
80	0.28	0.08	0.28	1.09	-0.68	0.76	1.12	-1.37	-0.07
90	0.58	0.17	0.57	2.55	-1.27	1.19	2.10	-2.32	-0.16

*Where FD=Fiber diameter; SDFD=Standard deviation of fiber diameter; SPIN=Spin fineness; PERC=Percent of Fibers >30 microns; CURV=Mean curvature; SDCURV=Standard deviation of curvature; MED=Percent medullation; SL=Staple length; FW=Fleece weight.

Table 10. Percentile rankings in Huacaya females for each trait*.

Percentile	FD	SDFD	SPIN	PERC	CURV	SDCURV	MED	SL	FW
1	-1.91	-0.52	-1.94	-7.35	4.73	-1.49	-4.74	4.84	0.85
2	-1.67	-0.46	-1.71	-6.43	3.95	-1.24	-3.95	3.93	0.72
3	-1.52	-0.42	-1.55	-5.93	3.56	-1.08	-3.49	3.43	0.65
4	-1.40	-0.39	-1.43	-5.54	3.22	-0.98	-3.12	3.06	0.60
5	-1.31	-0.36	-1.34	-5.26	2.95	-0.89	-2.82	2.79	0.56
10	-0.99	-0.28	-1.02	-4.15	2.09	-0.62	-1.93	1.97	0.43
15	-0.79	-0.22	-0.80	-3.42	1.59	-0.47	-1.43	1.47	0.34
20	-0.63	-0.18	-0.64	-2.82	1.20	-0.36	-1.09	1.14	0.27
25	-0.50	-0.14	-0.51	-2.33	0.90	-0.27	-0.82	0.89	0.22
30	-0.39	-0.11	-0.40	-1.90	0.67	-0.20	-0.60	0.66	0.17
35	-0.30	-0.09	-0.31	-1.52	0.48	-0.13	-0.41	0.47	0.13
40	-0.22	-0.07	-0.23	-1.17	0.32	-0.07	-0.26	0.30	0.09
45	-0.15	-0.05	-0.15	-0.85	0.18	-0.02	-0.12	0.15	0.06
50	-0.08	-0.03	-0.09	-0.54	0.06	0.03	-0.02	0.01	0.04
60	0.03	0.01	0.03	-0.01	-0.15	0.16	0.20	-0.28	0.00
70	0.16	0.04	0.15	0.58	-0.41	0.33	0.54	-0.64	-0.04
80	0.33	0.10	0.33	1.43	-0.74	0.58	1.02	-1.13	-0.08
90	0.61	0.18	0.61	2.84	-1.29	0.98	1.99	-1.95	-0.15

*Where FD=Fiber diameter; SDFD=Standard deviation of fiber diameter; SPIN=Spin fineness; PERC=Percent of Fibers >30 microns; CURV=Mean curvature; SDCURV=Standard deviation of curvature; MED=Percent medullation; SL=Staple length; FW=Fleece weight.

Table 11. Percentile rankings in Suri males for each trait*.

Percentile	FD	SDFD	SPIN	PERC	CURV	SDCURV	MED	SL	FW
1	-1.87	-0.67	-1.79	-8.08	1.03	-0.73	-5.59	7.36	0.67
2	-1.62	-0.59	-1.54	-6.83	0.86	-0.63	-4.90	6.13	0.58
3	-1.47	-0.54	-1.37	-6.11	0.74	-0.56	-4.30	5.25	0.51
4	-1.37	-0.50	-1.25	-5.56	0.64	-0.49	-3.83	4.71	0.46
5	-1.26	-0.47	-1.18	-5.22	0.58	-0.44	-3.57	4.24	0.43
10	-0.97	-0.37	-0.88	-4.02	0.38	-0.33	-2.73	2.85	0.33
15	-0.76	-0.29	-0.70	-3.06	0.27	-0.26	-2.24	2.11	0.27
20	-0.62	-0.23	-0.57	-2.51	0.21	-0.20	-1.83	1.62	0.21
25	-0.51	-0.19	-0.46	-1.96	0.15	-0.15	-1.52	1.20	0.17
30	-0.40	-0.15	-0.35	-1.53	0.11	-0.11	-1.25	0.91	0.14
35	-0.30	-0.12	-0.28	-1.14	0.07	-0.08	-0.98	0.63	0.10
40	-0.22	-0.10	-0.20	-0.75	0.04	-0.05	-0.71	0.38	0.08
45	-0.15	-0.07	-0.13	-0.47	0.01	-0.03	-0.47	0.17	0.06
50	-0.08	-0.04	-0.06	-0.18	-0.03	-0.01	-0.27	0.00	0.03
60	0.05	0.00	0.04	0.34	-0.09	0.04	0.04	-0.33	0.00
70	0.20	0.05	0.17	0.90	-0.17	0.10	0.36	-0.71	-0.03
80	0.39	0.12	0.34	1.68	-0.28	0.17	0.72	-1.18	-0.07
90	0.75	0.22	0.65	3.17	-0.46	0.28	1.45	-1.92	-0.13

*Where FD=Fiber diameter; SDFD=Standard deviation of fiber diameter; SPIN=Spin fineness; PERC=Percent of Fibers >30 microns; CURV=Mean curvature; SDCURV=Standard deviation of curvature; MED=Percent medullation; SL=Staple length; FW=Fleece weight.

Table 12. Percentile rankings in Suri females for each trait*.

Percentile	FD	SDFD	SPIN	PERC	CURV	SDCURV	MED	SL	FW
1	-1.92	-0.66	-1.79	-7.96	1.26	-0.72	-5.73	7.00	0.61
2	-1.65	-0.57	-1.57	-6.97	0.91	-0.59	-4.75	5.73	0.53
3	-1.49	-0.52	-1.38	-6.16	0.78	-0.53	-4.26	4.84	0.46
4	-1.37	-0.48	-1.25	-5.49	0.67	-0.48	-3.85	4.26	0.42
5	-1.24	-0.45	-1.13	-5.05	0.60	-0.45	-3.56	3.89	0.39
10	-0.91	-0.35	-0.85	-3.94	0.38	-0.32	-2.62	2.60	0.29
15	-0.71	-0.27	-0.66	-2.95	0.26	-0.24	-2.06	1.89	0.23
20	-0.58	-0.21	-0.52	-2.30	0.19	-0.18	-1.63	1.45	0.19
25	-0.45	-0.17	-0.40	-1.75	0.14	-0.15	-1.30	1.04	0.15
30	-0.34	-0.13	-0.30	-1.29	0.09	-0.11	-1.01	0.76	0.11
35	-0.25	-0.10	-0.22	-0.91	0.06	-0.08	-0.73	0.52	0.09
40	-0.18	-0.07	-0.14	-0.56	0.03	-0.06	-0.51	0.33	0.06
45	-0.11	-0.05	-0.08	-0.28	0.00	-0.03	-0.31	0.15	0.04
50	-0.04	-0.03	-0.02	-0.03	-0.03	-0.01	-0.13	0.02	0.02
60	0.07	0.01	0.06	0.33	-0.10	0.03	0.06	-0.26	0.00
70	0.21	0.06	0.17	0.89	-0.17	0.08	0.34	-0.61	-0.03
80	0.40	0.12	0.34	1.72	-0.28	0.15	0.71	-1.08	-0.07
90	0.75	0.22	0.65	3.16	-0.47	0.27	1.44	-1.86	-0.13

*Where FD=Fiber diameter; SDFD=Standard deviation of fiber diameter; SPIN=Spin fineness; PERC=Percent of Fibers >30 microns; CURV=Mean curvature; SDCURV=Standard deviation of curvature; MED=Percent medullation; SL=Staple length; FW=Fleece weight.

After each EPD analysis, diagnostic tests are performed to identify any unusual changes in EPD and/or any potential data integrity issues. One of these tests is to calculate a rank correlation between EPD of animals in the previous analysis with new EPD on those same animals in the latest analysis. The rank correlation evaluates reranking of animals in the latest analysis with a rank correlation of 1.0 indicating no reranking of animals while a rank correlation of 0 indicating no relationship between EPD from the last and current analyses. Both extremes, a zero and a 1.0 correlation, are undesirable. The former would indicate that data in the previous analysis was completely overwhelmed by new data—a situation that should never occur. The latter, a 1.0 correlation, would indicate the additional data did not add any new information to animals in the analysis. Obviously this is undesirable as well. As such, correlations closer to 1 but not 1 are desired. Because heritabilities and genetic correlations were re-estimated and the amount of data grew by well over 25%, we expect lower correlations between the last and the current evaluation in this instance. For Huacayas the lowest correlation for all animals between EPD from the previous 2012 evaluation and the current analysis was a .92 for standard deviation of curvature and staple length. The highest were above .96 for fiber diameter, standard deviation of fiber diameter, spin fineness, and percent fibers greater than 30 microns. In Suris, the lowest correlation was for standard deviation of curvature at .83. The highest correlations (above. 94) were for fiber diameter and standard deviation of fiber diameter.

For several traits there has been a shift in the magnitude of EPD. This is the result of a floating base in the current and previous analyses. The term "base" refers to a group of animals from which all genetic comparisons begin. In the current analysis, the base population is comprised of all animals for which there is no pedigree information. Likely these are the animals from which the US population began (imports) and for which (grand/great) progeny with data have been submitted. As historical information has been added to the database more animals from the original importations have been included in the EPD calculations resulting in an unstable base population from one analysis to the next. To overcome this issue in future evaluations, this evaluation will now serve as the base evaluation. Data on any original import animals will not influence the base population. Moving forward, this should remove the potential for shifts in magnitude of EPD due to changes in the base population and allow better tracking of genetic progress over time in Huacaya and Suri populations. Changes in magnitude of EPD in future evaluations could occur but would not be due to changes in base population but rather to changes in heritability or to additional data submitted.

Conclusions

The performance database continues to experience dramatic growth with EPD becoming more reliable. Improvement in reliability will continue as additional information is submitted. To facilitate tracking of genetic change over time (i.e. genetic trend), this analysis will serve at the base and to which future EPD runs will be compared.