2022 Genetic Evaluation Producer Report
Alpaca Owners Association, Inc.

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The 2022 genetic evaluation for the participating Huacaya and Suri populations in the AOA, Inc database are complete. Also completed are the coefficient of inbreeding values for all animals in the registry. Expected progeny differences (EPD) and accuracies are now available for each trait with this year's analysis including observations for at least one trait on 44,112 Huacaya and 9,684 Suri animals. Including pedigree information resulted in analysis of and EPD for 84,752 Huacaya and 18,222 Suri animals. An inbreeding coefficient was also calculated for all animals in the registry at 283,222 total animals.

The following report summarizes the data used in the evaluation and the results of the EPD and accuracy calculations for each trait in both Huacaya and Suri populations. Also included is a summary of the inbreeding coefficients. Percentile rankings by sex and possible change tables are presented below. Animal rankings for each trait within the Huacaya and Suri populations can be determined from those tables presented below. Rankings are split by sex (males and females) to give breeders a more precise idea of where their animals rank in the overall population in comparison to others of the same sex. The percentile rankings for animals should be interpreted with care and in the context of the overall goals of the breeding program—a leader in one trait may be deficient in others and the overall merit must be judged in that context. Two primary considerations include:

1. Breeding males typically have many more progeny than females and therefore, on average, have higher accuracies and a corresponding greater range in EPD for each trait.
2. The economic value of fiber and of the whole animal, for that matter, is a function of many traits and an animal excelling in one trait may not be superior in others—EPD and population rankings <u>must</u> be used in the context of the <u>overall</u> production system and in the context of each breeder's goals for their farm. Single trait selection is never recommended.

Data Summary

The number of observations for each trait used in the calculations is presented in Table 1 for both Huacaya and Suri. The counts in Table 1 include the numbers of observations in the Alpaca Owners Association, Inc database that were submitted and then available for use in the EPD calculations. As in previous analyses, some 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 (i.e., missing birth or measurement/sample date). To be usable for calculating EPD, the age at which an animal is measured must be known and then the animal must meet age restrictions. For the few animals where calculation of an age is not possible, the animal still received an EPD for the trait, but the EPD is based on the performance of relatives and does not include the animal's own observation.

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

	Huacaya		Suri	
Trait Name	Count	Average	Count	Average
Average Fiber Diameter (AFD; microns-μ)	51,416	22.4	9,658	25.8
Standard Deviation of AFD (SDAFD; μ)	51,416	4.7	9,652	6.0
Spin Fineness (μ)	51,415	21.8	9,657	25.7
Percent of Fibers larger than 30 microns	51,387	9.9	9,484	22.6
Fleece Weight	43,273	6.2	9,243	5.6
Mean Curvature (deg/mm)	50,071	41.8	9,474	13.3
Standard Deviation of Curvature	50,068	23.8	9,474	14.0
Percent Medullation	24,272	13.1	4,208	14.5
Mean Staple Length (mm)	47,910	90.1	9,270	149.1
Birth Weight	25,334	16.5	5,550	17.3

To achieve the most accurate EPD possible, available performance data on all related individuals is used after being weighted by the animals' genetic relationship to all others in the EPD program. This is done separately for Huacaya and Suri. The calculation of the relationships amongst all animals in the evaluation population begins with a list of animals with performance information on any trait (e.g., fleece weight, fiber diameter). Animals on this list then have their pedigree traced back 4 generations and these ancestors are then included in the EPD analysis. For those animals that do not have a 4-generation pedigree in the AOA registry (i.e., original importations and animals that are within 3 generations of an original import), pedigrees are constructed back to the original imports.

Other than for ancestors of an animal with an observation, animals are not included in the evaluation unless they have their own observation. For instance, progeny of animals with an observation are not included in the analysis **unless** those progeny have their own observation. Those "un-observed" progeny do not add information to the overall genetic evaluation and are therefore left out. However, a breeder could estimate an EPD for those "un-observed" progeny by simply taking the average of that animal's parents' EPD. This is known commonly as a "pedigree estimate EPD". Collateral relatives (e.g., half-sibs, full-sibs, cousins) without an observation or without descendants with an observation, also add no additional information to the genetic evaluation and are therefore not included in the analysis.

The constructed pedigree for Huacaya included 84,752 animals and for Suri included 18,222 animals. These animals and their relationships formed the basis for the EPD calculations and these animals all received EPD for all traits.

In the 2022 analysis, all animals in the AOA database were included for the inbreeding calculations with a total of 283,222 animals receiving the inbreeding coefficient values.

Analysis Procedures

EPD and accuracy are both influenced by the degree of genetic influence on animals' expression of each trait or put another way, the genetic influence on each trait. This degree of genetic control is expressed as a decimal ranging from 0 to 1 (or as a percentage ranging from 0 to 100%) known as heritability, with each trait having a different heritability value. The heritability estimates used in this evaluation are shown in Table 2. As is clear, there is considerable genetic influence on the traits of interest in alpaca indicating there is sizable opportunity for genetic improvement in these traits.

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

The magnitude of the heritability influences two practical aspects of EPDs and their calculation. First, the heritability helps to determine 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 amount of data (i.e., additional performance data also influences the spread of EPD in a population). Second, heritability influences the accuracy of the EPD—as heritability of a trait increases, the accuracy of the EPD increases given the same amount of performance information. At higher heritabilities, each observation (e.g., fiber diameter measure) is more closely related to 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 because environment has a larger influence on performance. For instance, the value of a single observation on fleece weight would result in a less accurate fleece weight EPD than would a single fiber diameter observation for the fiber diameter EPD. (The heritability of fleece weight is .35 in Huacaya and the heritability of fiber diameter is .52.)

With the exception of birth weight, these EPD are calculated with multiple trait models that leverage information on genetically related traits in order to increase EPD accuracy. These genetic relationships enable the EPD system to use information on one trait to predict genetic merit in another because genes influencing one trait can also influence performance in the other traits of interest. The strength of that influence is reflected in the genetic correlation between two traits. 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 with many genes influencing fiber diameter also influencing standard deviation of fiber diameter. Leveraging this information in a multiple trait analysis results in more accurate EPD. For the AOA genetic evaluation, the EPD result from the analysis of 3-trait combinations with fleece weight. Fleece weight was originally chosen as that trait had the greatest number of observations reported in both Huacaya and Suri in the original, developmental data set.

The birth weight analysis takes a slightly different approach with the birth weight EPD produced using only birth weight information in a single trait analysis. The birth weight evaluation is similar to the other evaluations in that accounting for environmental (i.e., nongenetic) factors influencing performance is essential to producing more accurate EPD. For birth weight this is accomplished through "contemporary groups", where a contemporary group is defined as all animals born on the same farm and in the same year. This combination is designed to account for climatic and nutritional variation from year to year on the same farm and for managerial differences between farms.

The EPD for Huacaya and for Suri are calculated independently as genetic linkages (i.e., animals producing progeny in both) between the population are small.

Inbreeding Summary

For inbreeding calculations the pedigree information from both the Huacaya and Suri populations was combined, as historically there have been some limited matings between animals in the different populations. Combining the complete populations resulted in a total pedigree of 283,222 animals. Inbreeding coefficients were then calculated for all animals. The average inbreeding across all animals was 0.4% with the highest inbreeding coefficient 43.75%.

EPD Summary

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

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

Trait	Expected Progeny Differences			Accuracy	
	Average	Minimum	Maximum	Average	Maximum
Fiber Diameter (FD; μ)	-.5	-3.4	4.5	.22	.85
Standard Deviation of FD (μ)	-.1	-.9	1.7	.21	.84
Spin Fineness (μ)	-.5	-3.5	4.5	.24	.86
Percent of Fibers > 30 microns	-2.1	-13.2	26.2	.24	.86
Mean Curvature (CURV)	1.0	-6.7	11.6	.21	.84
Standard Deviation of CURV	.4	-3.8	5.5	.21	.84
Percent Medullation	-.8	-10.9	16.1	.11	.81
Staple Length (SL)	-.4	-11.0	14.6	.18	.81
Fleece Weight	.2	-1.2	1.9	.14	.76
Birth Weight	-.1	-2.4	2.3	.16	.74

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

Trait	Expected Progeny Differences			Accuracy	
	Average	Minimum	Maximum	Average	Maximum
Fiber Diameter (FD; μ)	-.4	-3.7	5.6	.21	.65
Standard Deviation of FD (μ)	-.1	-1.0	1.8	.19	.64
Spin Fineness (μ)	-.4	-3.7	5.8	.22	.74
Percent of Fibers > 30 microns	-1.6	-13.6	26.5	.22	.74
Mean Curvature (CURV)	.7	-7.9	11.8	.19	.62
Standard Deviation of CURV	.3	-3.9	5.4	.19	.65
Percent Medullation	-.6	-11.4	21.8	.10	.58
Staple Length (SL)	-.3	-10.2	16.6	.16	.57
Fleece Weight	.2	-1.0	1.9	.13	.54
Birth Weight	-.1	-2.5	2.6	.13	.44

*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.

Trait	Expected Progeny Differences			Accuracy	
	Average	Minimum	Maximum	Average	Maximum
Fiber Diameter (FD)	-.2	-3.3	4.6	.20	.77
Standard Deviation of FD	-.1	-1.3	1.4	.19	.77
Spin Fineness (μ)	-.3	-3.6	3.4	.20	.78
Percent of Fibers > 30 microns	-1.3	-14.4	15.7	.20	.78
Mean Curvature (CURV)	-.1	-2.4	4.2	.19	.77
Standard Deviation of CURV	-.1	-1.6	1.8	.12	.68
Percent Medullation[1]	-.8	-9.7	15.3	.11	.75
Staple Length	1.0	-8.6	28.0	.11	.63
Fleece Weight	.2	-.9	2.0	.14	.70
Birth Weight	.0	-2.3	2.1	.16	.63

*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.

Trait	Expected Progeny Differences			Accuracy	
	Average	Minimum	Maximum	Average	Maximum
Fiber Diameter (FD)	-.1	-3.7	5.8	.18	.62
Standard Deviation of FD	-.1	-1.3	1.6	.18	.59
Spin Fineness (μ)	-.2	-3.5	5.8	.18	.70
Percent of Fibers > 30 microns	-.8	-15.5	22.6	.18	.67
Mean Curvature (CURV)	-.1	-3.3	6.9	.18	.69
Standard Deviation of CURV	-.1	-1.5	2.0	.11	.50
Percent Medullation[1]	-.6	-9.8	20.8	.09	.68
Staple Length	.7	-9.2	25.5	.10	.39
Fleece Weight	.1	-1.0	1.7	.12	.48
Birth Weight	.0	-2.1	2.7	.12	.43

*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 with accuracies closer to 1 yielding more confidence than EPD with lower accuracies. No matter the accuracy, however, the EPD for a trait is consistently a better prediction of an animal's genetic merit than its own performance alone. The EPD are based on considerably more data than just that of an observation on the individual. EPD take into account data and performance from ancestors, collateral relatives (e.g., half sibs, full sibs), the individual itself, and progeny (if available); adjust for differences in age of the animal at measure; and account for nutritional and climatic differences across herds through appropriately designated contemporary groups. In total these characteristics result in a better prediction of genetic merit than individual performance alone.

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 (this does not occur other than theoretically), 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 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 50% 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 have a probability (68%) 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 (the animal's EPD) 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 from -1.9 to -.40. 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) and accordingly, the confidence range grows more narrow.

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. Percentiles are determined 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. For instance, if a Huacaya male had a fiber diameter EPD of -1.60 it would be in the top 10% of all Huacaya males for fiber diameter. If it were -1.88, then that animal would be in the top 5% of all Huacaya males for genetics of fiber diameter.

No percentile rankings are provided for traits for which there are no clear superior performance endpoints (high or low) or for which there are likely intermediate optimums. In the case of traits with an intermediate optimum, the best animal is not at either extreme, high or low. A good example is birth weight where the best animal is neither too light nor too heavy at birth but rather has an intermediate birth weight. In the AOA analysis, these traits include mean curvature, standard deviation of mean curvature, and birth weight for Suri; and standard deviation of mean curvature and birth weight for Huacaya.

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

Percentile	FD	SDFD	SPIN	PERC	CURV	MED	SL	FW
1	-2.37	-0.68	-2.43	-8.09	6.58	-5.78	5.38	1.05
2	-2.18	-0.62	-2.23	-7.47	5.84	-5.15	4.41	0.93
3	-2.05	-0.59	-2.10	-7.07	5.40	-4.76	3.79	0.86
4	-1.95	-0.56	-2.01	-6.79	5.06	-4.51	3.44	0.81
5	-1.87	-0.53	-1.92	-6.59	4.77	-4.27	3.11	0.76
10	-1.59	-0.45	-1.62	-5.87	3.83	-3.50	2.17	0.62
15	-1.37	-0.38	-1.40	-5.35	3.14	-2.94	1.60	0.54
20	-1.20	-0.33	-1.23	-4.88	2.62	-2.50	1.20	0.47
25	-1.05	-0.29	-1.07	-4.44	2.18	-2.11	0.89	0.41
30	-0.91	-0.25	-0.92	-4.03	1.81	-1.78	0.61	0.36
35	-0.79	-0.22	-0.80	-3.61	1.49	-1.49	0.37	0.32
40	-0.68	-0.18	-0.68	-3.21	1.20	-1.22	0.17	0.28
45	-0.57	-0.15	-0.57	-2.81	0.93	-0.96	-0.05	0.23
50	-0.46	-0.12	-0.47	-2.40	0.69	-0.72	-0.26	0.20
60	-0.27	-0.07	-0.26	-1.57	0.27	-0.28	-0.71	0.12
70	-0.08	-0.01	-0.07	-0.72	-0.12	0.13	-1.25	0.05
80	0.13	0.05	0.14	0.24	-0.53	0.68	-1.97	-0.02
90	0.44	0.15	0.46	1.77	-1.16	1.60	-3.13	-0.12

*Where FD=Fiber diameter; SDFD=Standard deviation of fiber diameter; SPIN=Spin fineness; PERC=Percent of Fibers >30 microns; CURV=Mean 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	MED	SL	FW
1	-2.32	-0.66	-2.39	-7.93	6.22	-5.53	5.07	0.98
2	-2.11	-0.60	-2.16	-7.28	5.49	-4.92	4.13	0.86
3	-1.96	-0.56	-2.01	-6.89	4.99	-4.51	3.64	0.79
4	-1.85	-0.52	-1.90	-6.59	4.66	-4.22	3.25	0.74
5	-1.76	-0.50	-1.81	-6.36	4.37	-3.99	2.97	0.70
10	-1.45	-0.40	-1.48	-5.58	3.36	-3.17	2.06	0.57
15	-1.23	-0.34	-1.25	-4.99	2.69	-2.60	1.54	0.48
20	-1.04	-0.29	-1.06	-4.44	2.16	-2.15	1.17	0.41
25	-0.88	-0.24	-0.89	-3.95	1.74	-1.77	0.88	0.35
30	-0.75	-0.20	-0.75	-3.46	1.38	-1.42	0.62	0.30
35	-0.62	-0.17	-0.62	-2.99	1.08	-1.14	0.40	0.25
40	-0.50	-0.14	-0.50	-2.53	0.82	-0.89	0.21	0.21
45	-0.40	-0.11	-0.39	-2.09	0.59	-0.66	0.04	0.16
50	-0.30	-0.08	-0.29	-1.65	0.38	-0.44	-0.13	0.12
60	-0.11	-0.03	-0.11	-0.84	0.05	-0.08	-0.52	0.05
70	0.04	0.02	0.04	-0.08	-0.26	0.24	-1.00	0.00
80	0.23	0.07	0.24	0.82	-0.64	0.76	-1.67	-0.05
90	0.54	0.17	0.56	2.34	-1.25	1.66	-2.81	-0.14

*Where FD=Fiber diameter; SDFD=Standard deviation of fiber diameter; SPIN=Spin fineness; PERC=Percent of Fibers >30 microns; CURV=Mean 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	MED	SL	FW
1	-2.25	-0.75	-2.29	-10.16	-5.85	11.54	0.93
2	-1.98	-0.67	-2.04	-9.15	-5.31	9.18	0.81
3	-1.83	-0.62	-1.91	-8.51	-4.87	7.90	0.75
4	-1.74	-0.59	-1.80	-8.14	-4.55	7.31	0.69
5	-1.65	-0.56	-1.72	-7.77	-4.27	6.67	0.65
10	-1.32	-0.45	-1.39	-6.49	-3.48	4.91	0.51
15	-1.10	-0.38	-1.16	-5.43	-2.92	3.83	0.43
20	-0.91	-0.32	-0.97	-4.55	-2.50	3.02	0.37
25	-0.76	-0.26	-0.81	-3.85	-2.13	2.43	0.32
30	-0.62	-0.22	-0.68	-3.27	-1.79	1.89	0.28
35	-0.51	-0.18	-0.55	-2.72	-1.50	1.46	0.23
40	-0.41	-0.14	-0.44	-2.14	-1.23	1.07	0.20
45	-0.31	-0.11	-0.34	-1.66	-0.97	0.74	0.16
50	-0.20	-0.07	-0.23	-1.14	-0.73	0.42	0.13
60	-0.02	-0.01	-0.04	-0.25	-0.26	-0.08	0.06
70	0.18	0.05	0.15	0.68	0.16	-0.59	0.01
80	0.43	0.12	0.38	1.79	0.70	-1.19	-0.05
90	0.83	0.24	0.73	3.52	1.54	-2.10	-0.12

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

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

Percentile	FD	SDFD	SPIN	PERC	MED	SL	FW
1	-2.16	-0.73	-2.25	-10.04	-5.94	9.62	0.82
2	-1.91	-0.65	-1.95	-8.83	-5.23	7.72	0.70
3	-1.76	-0.59	-1.80	-8.09	-4.74	6.77	0.64
4	-1.62	-0.56	-1.69	-7.70	-4.44	6.14	0.60
5	-1.52	-0.52	-1.58	-7.29	-4.15	5.62	0.56
10	-1.19	-0.41	-1.24	-5.74	-3.22	4.08	0.44
15	-0.97	-0.33	-1.01	-4.76	-2.62	3.12	0.37
20	-0.79	-0.27	-0.83	-3.98	-2.17	2.44	0.31
25	-0.63	-0.22	-0.67	-3.22	-1.80	1.87	0.26
30	-0.50	-0.18	-0.53	-2.54	-1.46	1.39	0.22
35	-0.39	-0.14	-0.41	-1.97	-1.14	1.03	0.17
40	-0.29	-0.10	-0.31	-1.49	-0.85	0.71	0.14
45	-0.19	-0.07	-0.21	-1.02	-0.58	0.44	0.10
50	-0.11	-0.05	-0.12	-0.59	-0.34	0.22	0.07
60	0.05	0.00	0.02	0.08	-0.02	-0.17	0.02
70	0.23	0.06	0.18	0.89	0.31	-0.63	-0.01
80	0.46	0.13	0.40	1.92	0.79	-1.22	-0.06
90	0.85	0.25	0.76	3.71	1.58	-2.14	-0.13

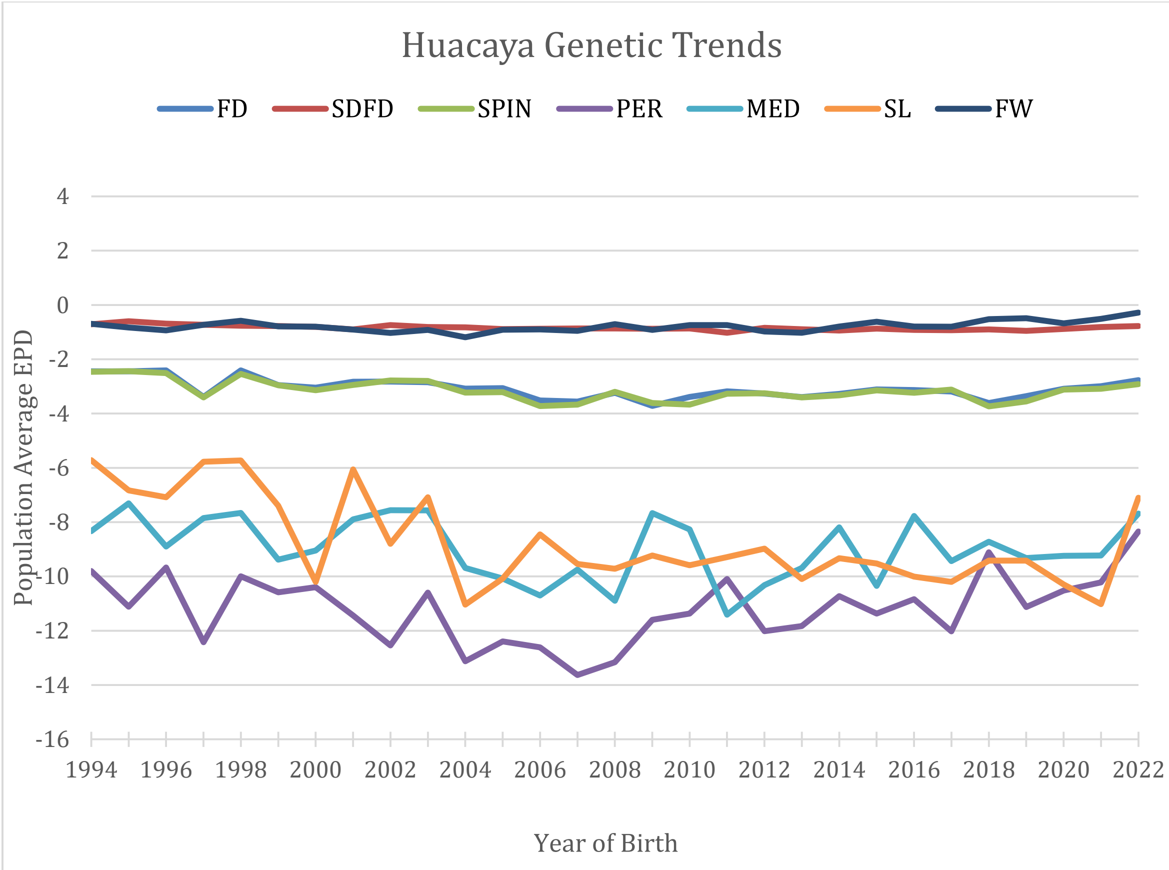
*Where FD=Fiber diameter; SDFD=Standard deviation of fiber diameter; SPIN=Spin fineness; PERC=Percent of Fibers >30 microns; MED=Percent medullation; SL=Staple length; FW=Fleece weight.

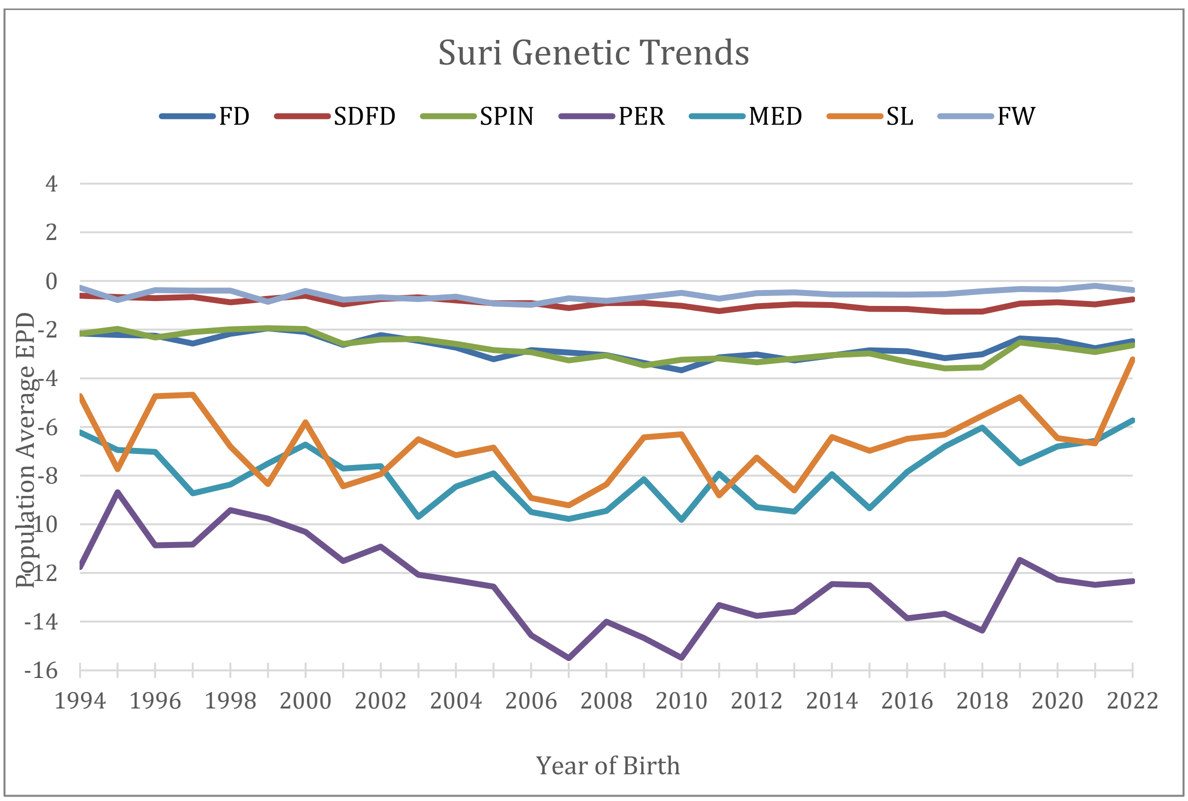
After each EPD analysis, diagnostic tests are performed to identify any unusual changes in EPD and/or any potential data integrity issues. One of these tests is to calculate a rank correlation between EPD of animals in the previous analysis with new EPD on those same animals in the latest analysis. The rank correlation evaluates reranking of animals in the latest analysis. A rank correlation of 1.0 would indicate no reranking of animals while a rank correlation of 0 would indicate 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 or accuracy to animals in the previous analysis. Obviously this is undesirable as well. As such, correlations closer to 1 but not 1 are desired. For Huacayas the lowest correlation for all animals between EPD from the previous 2021 evaluation and the current analysis was a .986 for staple length. All other trait correlations were greater than .986. In Suris, the lowest correlation was for curvature (.984) with the remaining trait correlations all higher than that level.

The base for the genetic evaluation has been fixed. The term “base” refers to a group of animals from which all genetic comparisons begin. The base population is set as all animals with no parentage information in the 2014 analysis. Likely these are the animals from which the US population arose (i.e., original imports). As historical information has been added to the database more animals from the original importations have been included in the EPD calculations resulting in a scenario where this group of animals has become more consistent from one analysis to the next with the list finalized in the 2014 analysis. By setting a permanent base, genetic trend over time more accurately reflects the genetic progress breeders have made through selection.

Genetic Trends

From a larger, breed-wide view, the genetic trends of animal populations often provide perspective on changes within a breeding population. These trends can provide useful information and a means to identify traits that are experiencing unfavorable change and to identify other traits where further change may not be desired. In this instance, given the relatively separate nature of the Huacaya and Suri breeding programs, those trends are presented below by group (i.e., Huacaya and Suri). These trends must be interpreted with care, as not all breeders and not all animals are involved in the EPD program (some animals are included through pedigree alone). Besides the addition of young animals, older, existing animals are introduced to the program annually adding more information to the analysis but as time has passed, there are fewer and fewer of these older, historical animals being added each year. These new animals are often added with little performance information and therefore their EPD are low accuracy and can dampen overall genetic trend.


Huacaya Genetic Trends
FD
SDFD
SPIN
PER
MED
SL
FW
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
Population Average EPD
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
Year of Birth


Suri Genetic Trends
FD
SDFD
SPIN
PER
MED
SL
FW
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
Population Average EPD
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
Year of Birth

Conclusions

The performance database continues to expand with additional data. Accordingly, the EPD are becoming more reliable with maximum accuracies in the population continuing to increase. With the increase in data, evaluations have also become more stable with the correlations of EPD from one analysis to the next continuing to increase.