Oberhasli Cluster Analysis Summary
September, 2014

Data was obtained from the ADGA for 8 dairy breeds. All results were limited to those animals reported as Purebred (PB) or American (AM); however, all animals were included in the pedigree analysis to establish ties between animals, including cases where the ancestors are from another breed. Cluster analysis is a procedure that groups related animals based on pedigree relationship. This is a technique used by NAGP to assess where repository animals are grouping with the currently available genetic pool for each breed. It also establishes a practical approach for obtaining animals for the repository in a way that maximizes genetic diversity. Animals that were included in the cluster analysis included sires of PB and AM offspring born 2010 to present that are also PB or AM themselves. Repository bucks are also included in the clusters.

Table 1 shows the summary statistics based on the pedigree and cluster analyses.

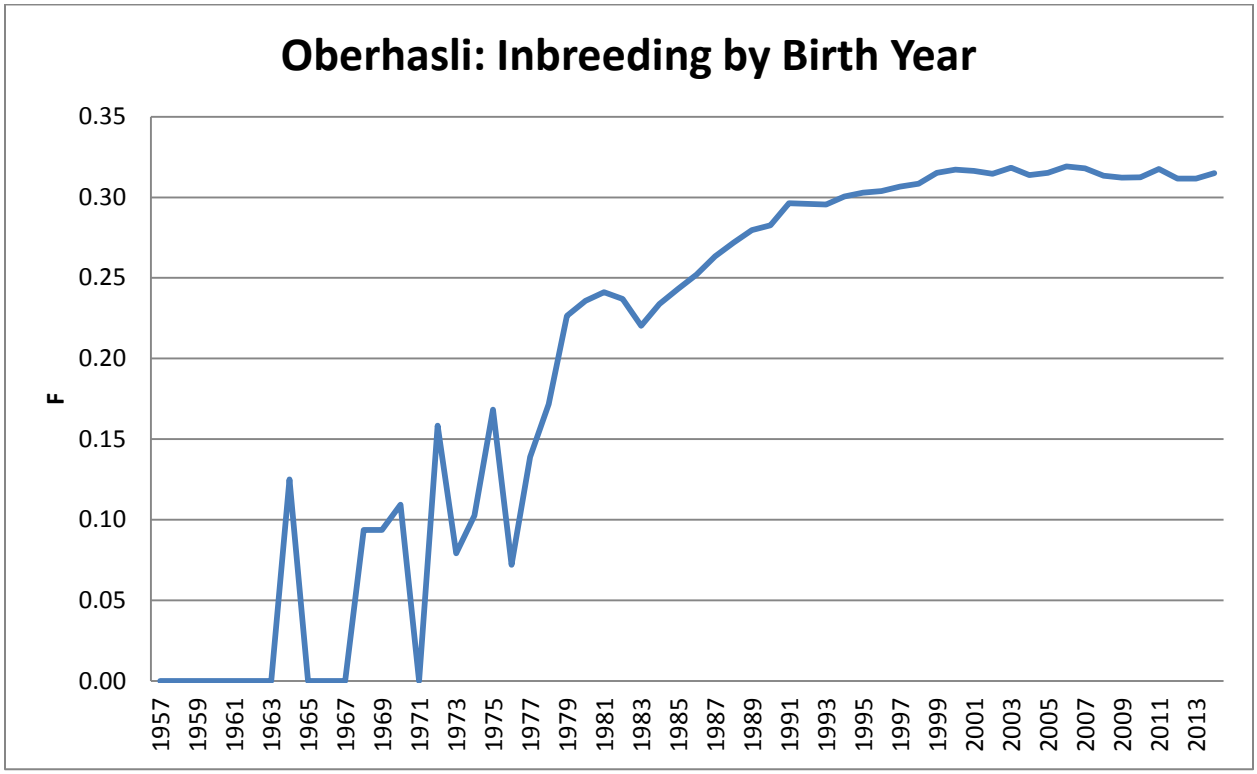
Table 1. Summary statistics for Oberhasli

	Oberhasli
Animals that are PB or AM	40,219
Full pedigree file (until all ancestors are unknown)	55,246
Unique sires	4,813
Unique dams	15,628
Mean inbreeding (F)	0.306
F range	0 – 0.71
Repository bucks	17
Clustered bucks	1,186

Pedigree & Inbreeding Analysis

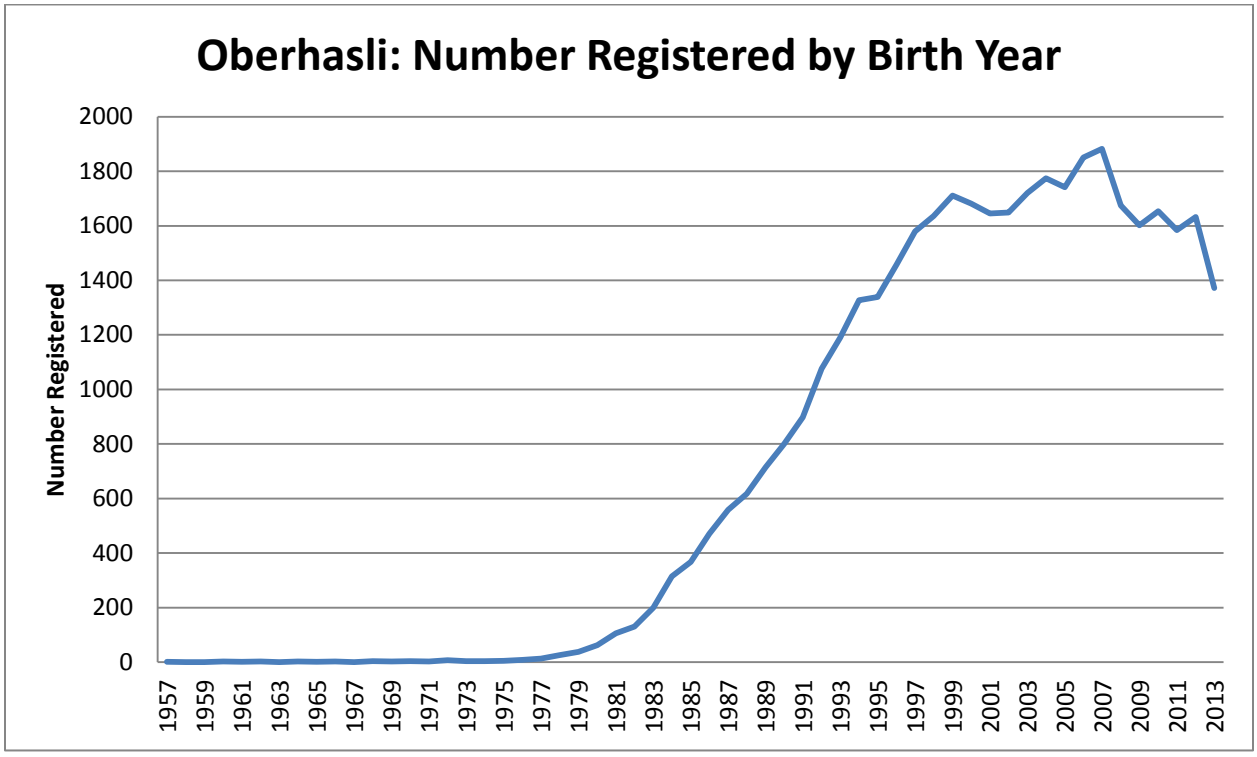
The inbreeding level for the Oberhasli breed has been over 30% for almost 20 years. This inbreeding level means that the average relationship among all animals within the breed is greater than half-sibs. This is a remarkably high level of inbreeding, and has remained steady for the past 20 years. The inbreeding trend over time is plotted in Figure 1.

Figure 1. Oberhasli inbreeding trend by birth year



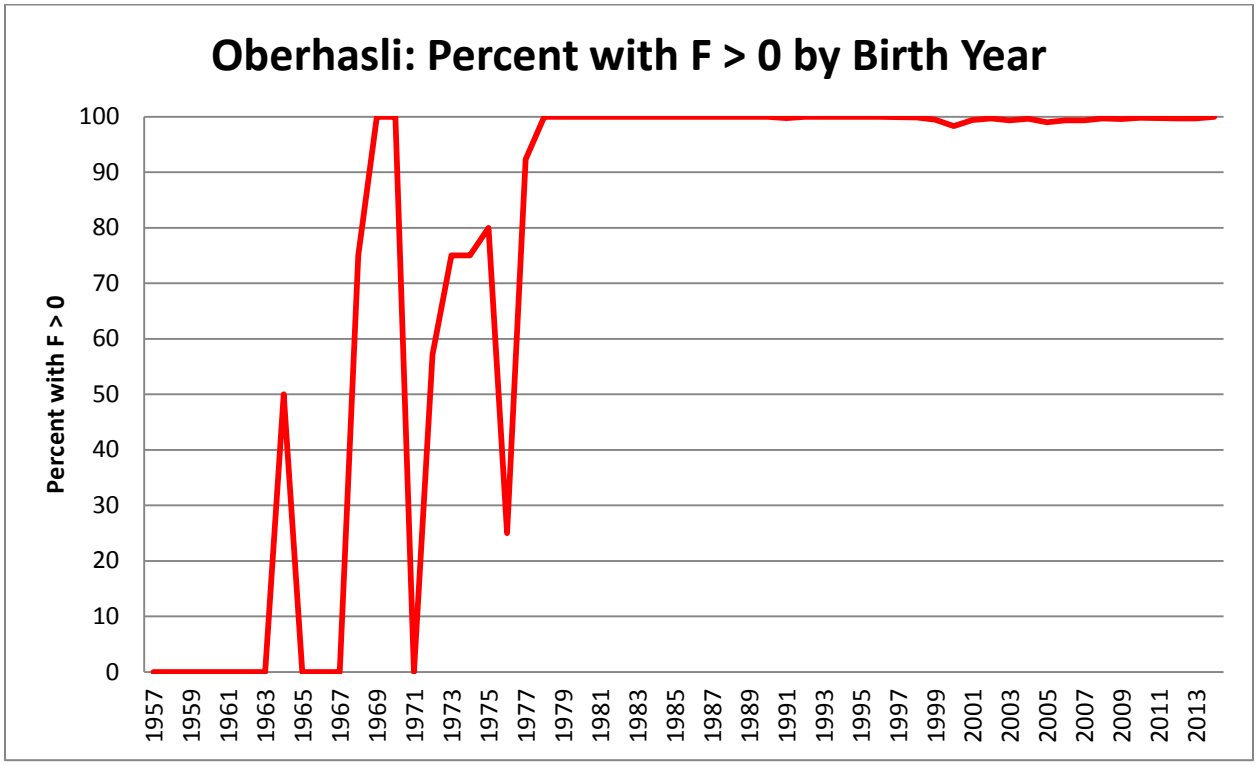
The number of registrations for Oberhasli has been fairly steady since the late 1990's. The trend is depicted in Figure 2.

Figure 2. Oberhasli goats registered by birth year



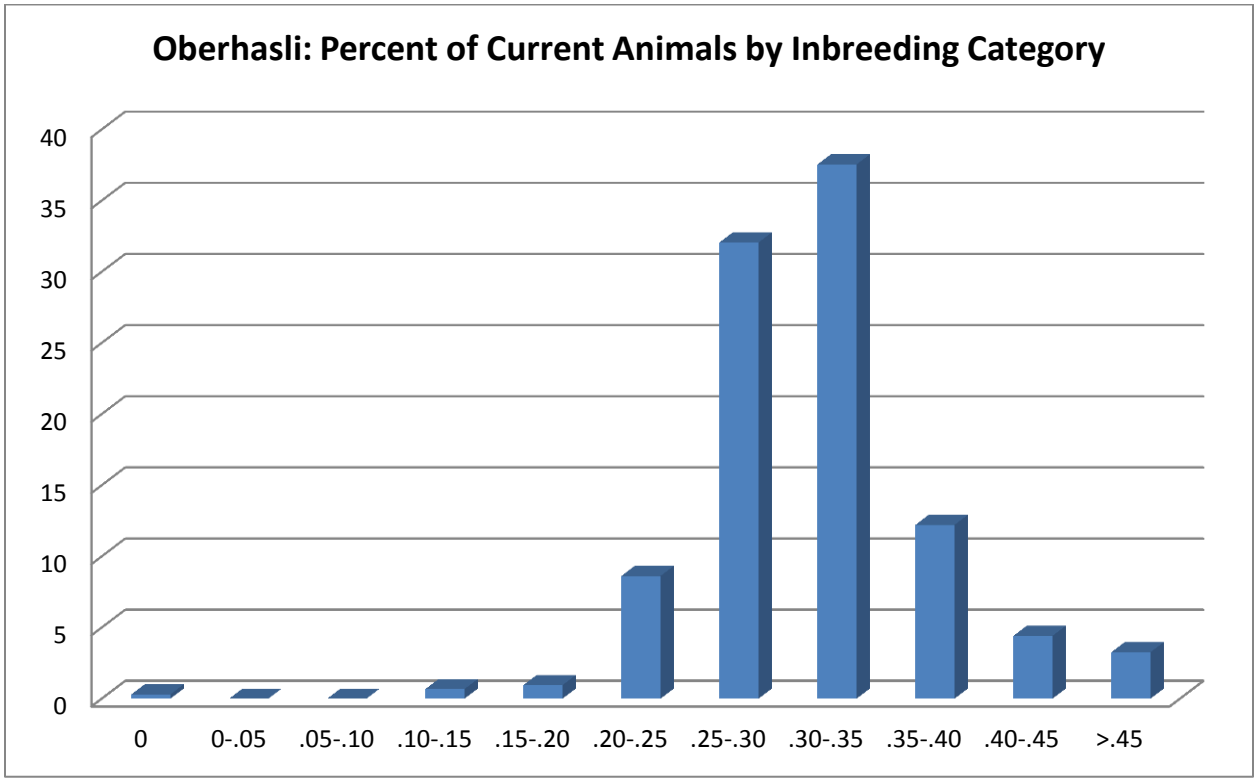
With such a high average inbreeding level, it is easy to understand that few animals would be non-inbred. In fact, almost no Oberhasli have been non-inbred since 1980. This trend can be seen in Figure 3.

Figure 3. Percent of Oberhasli with an inbreeding coefficient greater than zero by birth year



Also as expected, the inbreeding categories of the current population show the majority of Oberhasli are in the 0.25-0.30 and 0.30-0.35 range (Figure 4). There are very few lowly related animals that can be used to reduce the inbreeding level within the breed.

Figure 4. Percent of Oberhasli born 2009 and later by inbreeding category



Eleven clusters were selected from the cluster analysis. The overall average relationship of bucks in the cluster analysis was 0.434, and the within cluster relationships ranged from 0.376 to 0.589. Considering 0.50 is a full sibling or parent-offspring relationship, these are extremely high relationships. Little genetic variation would be expected across the breed; however this would not be known for certain without molecular analysis. The tree diagram showing the 11 clusters is shown in Figure 5.

Figure 5. Tree diagram for Oberhasli cluster analysis of sires of PB and AM offspring born 2010 and later that are PB or AM themselves (gold line depicts cluster level)

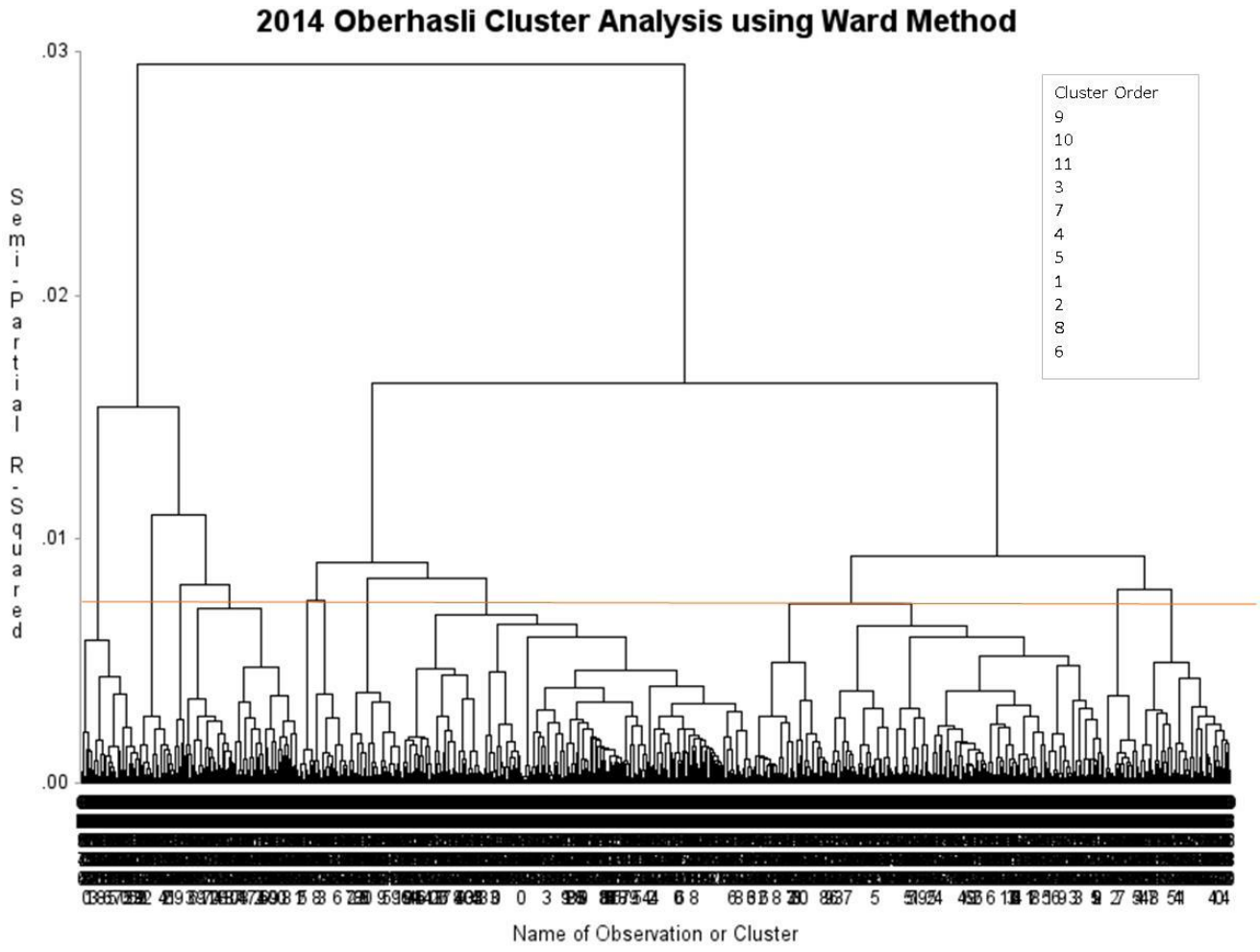


Table 2 shows the high within cluster relationships, and also that five clusters are represented in the repository.

Table 2. Oberhasli cluster results showing the number, mean, and variance for between and within cluster relationships in addition to repository bucks

Between Clusters			
	n	Mean	Variance
	1186	0.434	0.003

Within Cluster				
	n	Mean	Variance	Bucks in Repository
Cluster 1	362	0.453	0.002	11
Cluster 2	362	0.482	0.002	1
Cluster 3	118	0.418	0.003	3
Cluster 4	35	0.517	0.006	1
Cluster 5	56	0.521	0.004	
Cluster 6	93	0.450	0.003	
Cluster 7	16	0.589	0.007	
Cluster 8	37	0.547	0.005	
Cluster 9	60	0.448	0.006	1
Cluster 10	37	0.526	0.005	
Cluster 11	10	0.376	0.015	

The within and between cluster relationship matrix is shown in Figure 6; only cluster 11 contains some lower relationship levels, but these are all still above the half-sib level.

Figure 6. Within and between cluster relationship matrix for Oberhasli

	1	2	3	4	5	6	7	8	9	10	11
1	0.453	0.455	0.399	0.438	0.455	0.422	0.427	0.454	0.387	0.430	0.284
2		0.482	0.406	0.436	0.467	0.444	0.428	0.468	0.393	0.440	0.282
3			0.418	0.390	0.405	0.391	0.378	0.402	0.372	0.407	0.284
4				0.517	0.433	0.405	0.426	0.437	0.376	0.415	0.291
5					0.521	0.434	0.429	0.460	0.391	0.448	0.285
6						0.450	0.399	0.443	0.371	0.417	0.263
7							0.589	0.426	0.361	0.408	0.302
8								0.547	0.388	0.432	0.280
9									0.448	0.388	0.276
10										0.526	0.275
11											0.376

Milk, Fat, and Protein PTA graphs are plotted in Figures 7, 8, and 9, respectively. Repository bucks show a range of PTA above and below the breed average for all three traits.

Figure 7. Oberhasli genetic trend for Milk PTA compared to repository bucks

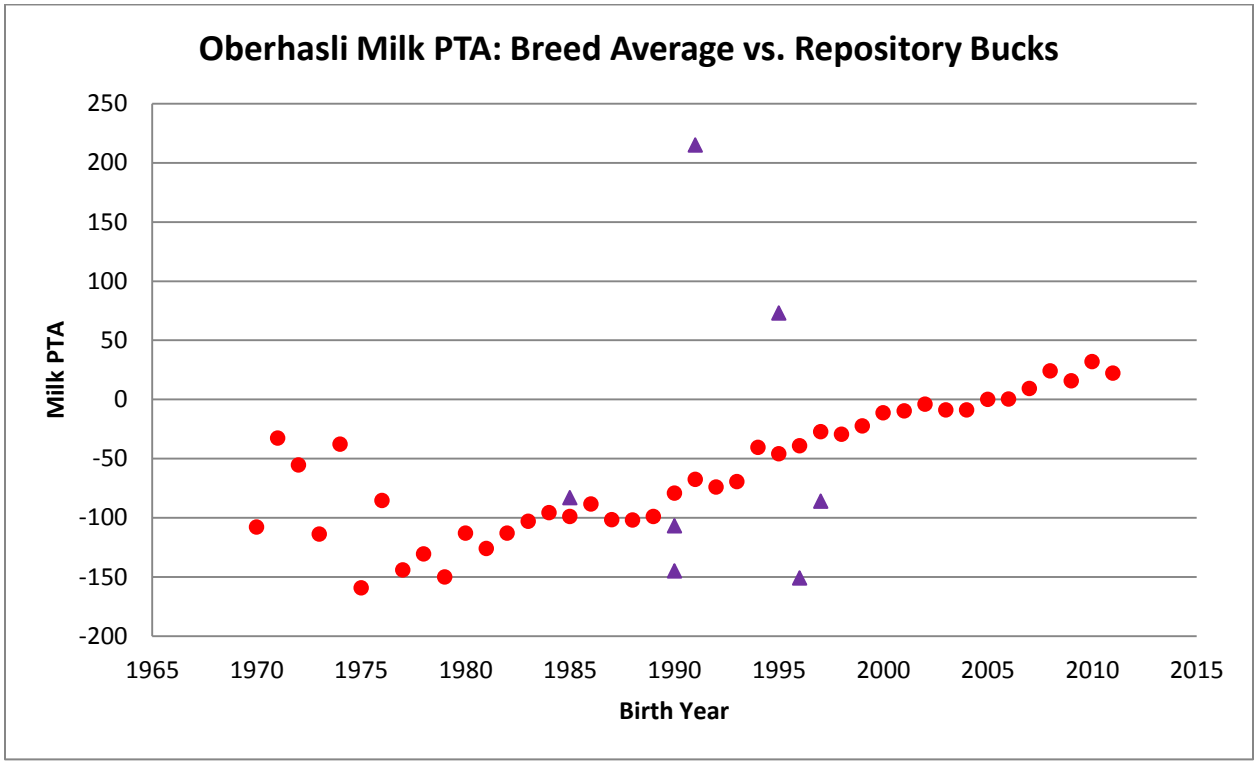


Figure 8. Oberhasli genetic trend for Fat PTA compared to repository bucks

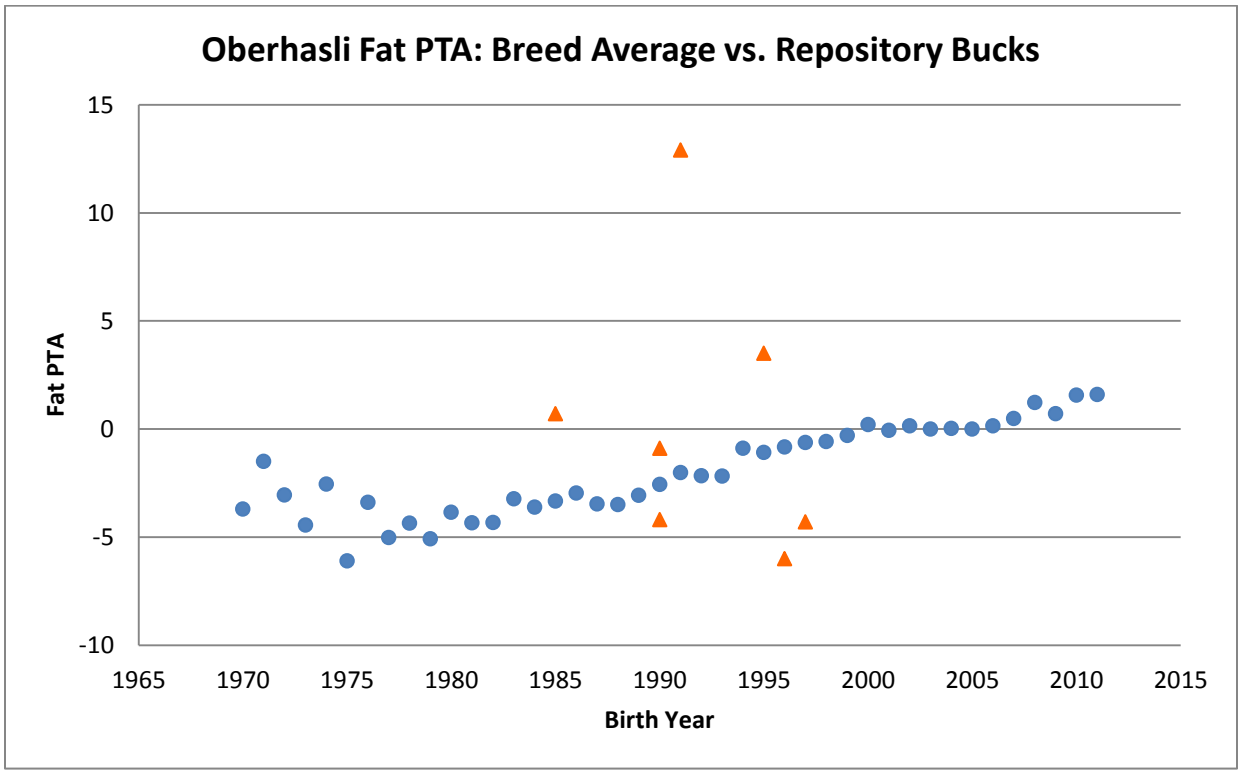


Figure 9. Oberhasli genetic trend for Protein PTA compared to repository bucks