Session 04

Genotype x Environment Interaction in the Greek Holstein Population

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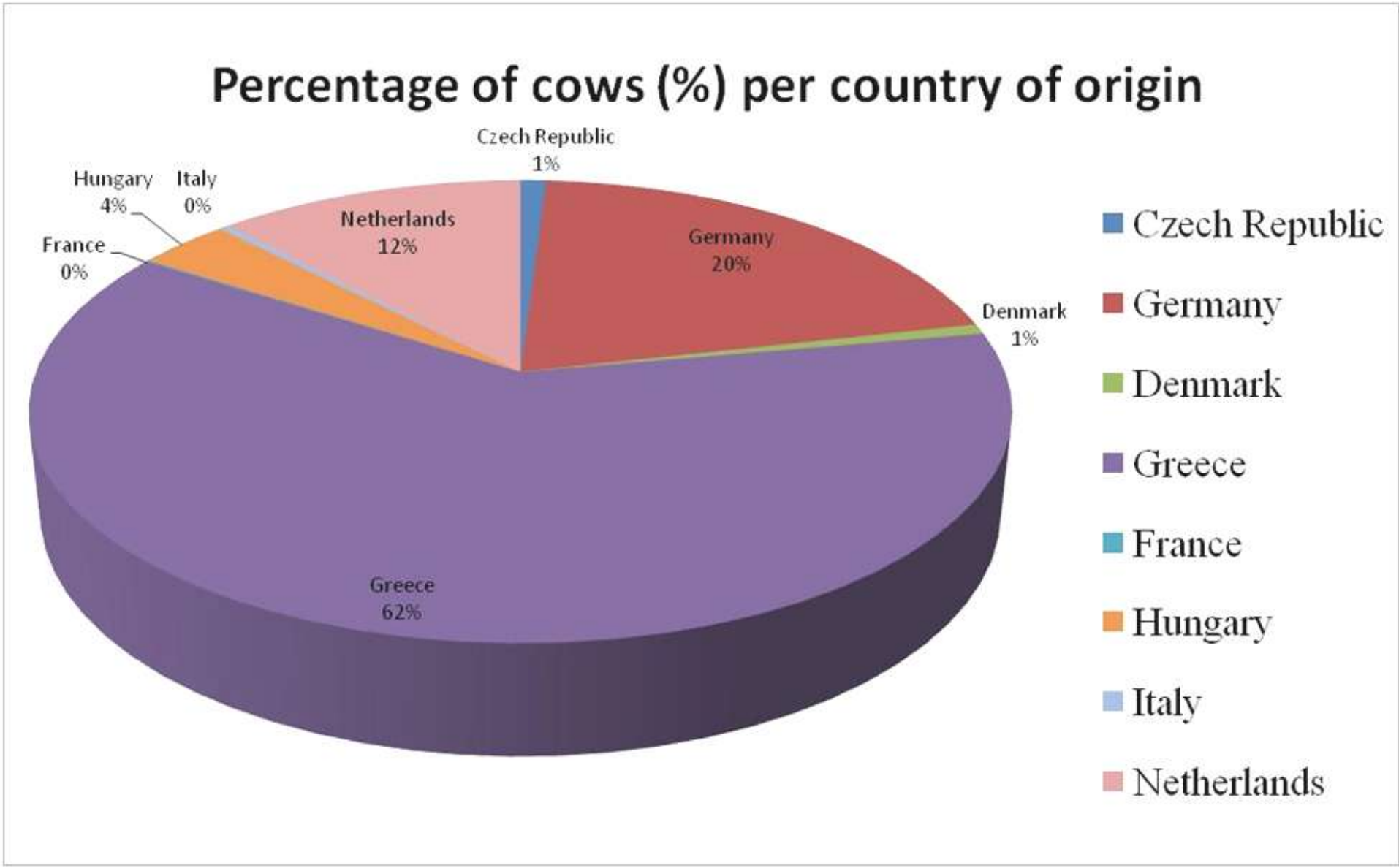
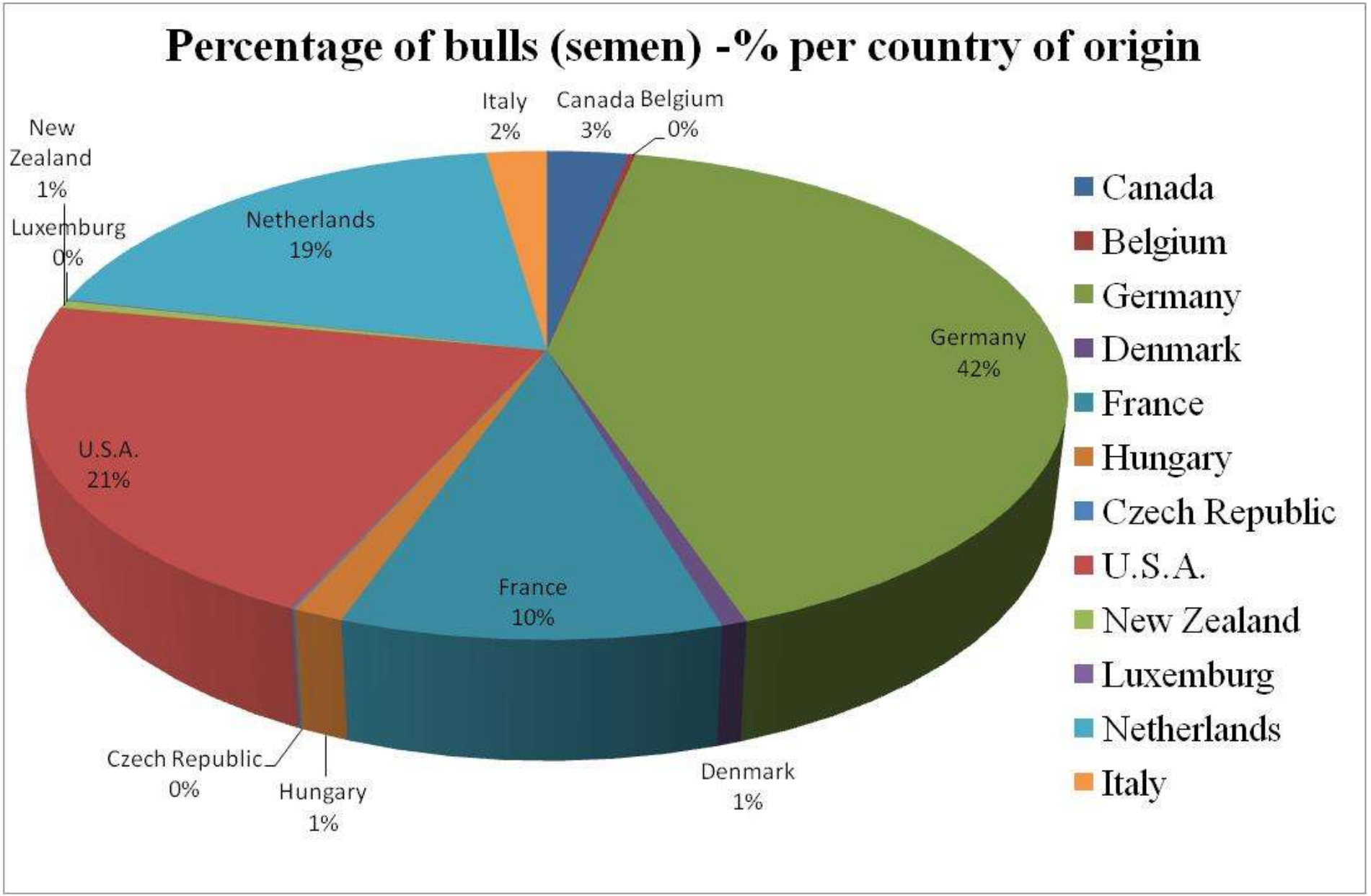
Introduction

- Use of imported semen of progeny tested bulls or direct importation of 7 month pregnant heifers
- Investigate the existence of genotype x environment interaction
- Investigate the factors involved


Percentage of cows (%) per country of origin
Czech Republic
1%
Germany
20%
Denmark
1%
Greece
62%
France
0%
Hungary
4%
Italy
0%
Netherlands
12%
Czech Republic
Germany
Denmark
Greece
France
Hungary
Italy
Netherlands


Percentage of bulls (semen) -% per country of origin
Italy 2%
Canada 3%
Belgium 0%
New Zealand 1%
Luxemburg 0%
Netherlands 19%
Germany 42%
U.S.A. 21%
France 10%
Czech Republic 0%
Hungary 1%
Denmark 1%
Canada
Belgium
Germany
Denmark
France
Hungary
Czech Republic
U.S.A.
New Zealand
Luxemburg
Netherlands
Italy

Material and methods (1)

- 7079 Holstein cows.
- 45 dairy herds.
- 11459 completed lactations
- Northern part of the country– Members of the Holstein Association of Greece.
- January 2000 – December 2008.
- 305 D. lactation: 8742 kg

Material and methods (2)

$$Y_{klmnopq} = \mu + ys_k + age_l + par_m + herd_n + G_o + PE_p + e_{klmnopq}$$

Where:

$Y_{klmnopq}$: 305 days lactation ,
μ : mean value of the population
ys_k : year-season of the calving,
age_l : the age at calving,
par_m :parity number,
$herd_n$: production class of the herd,
G_o : random additive genetic effect,
PE_p :random effect of the permanent environment,
$e_{klmnopq}$: residual effects.

Variance Components and heritability for 305 days lactation

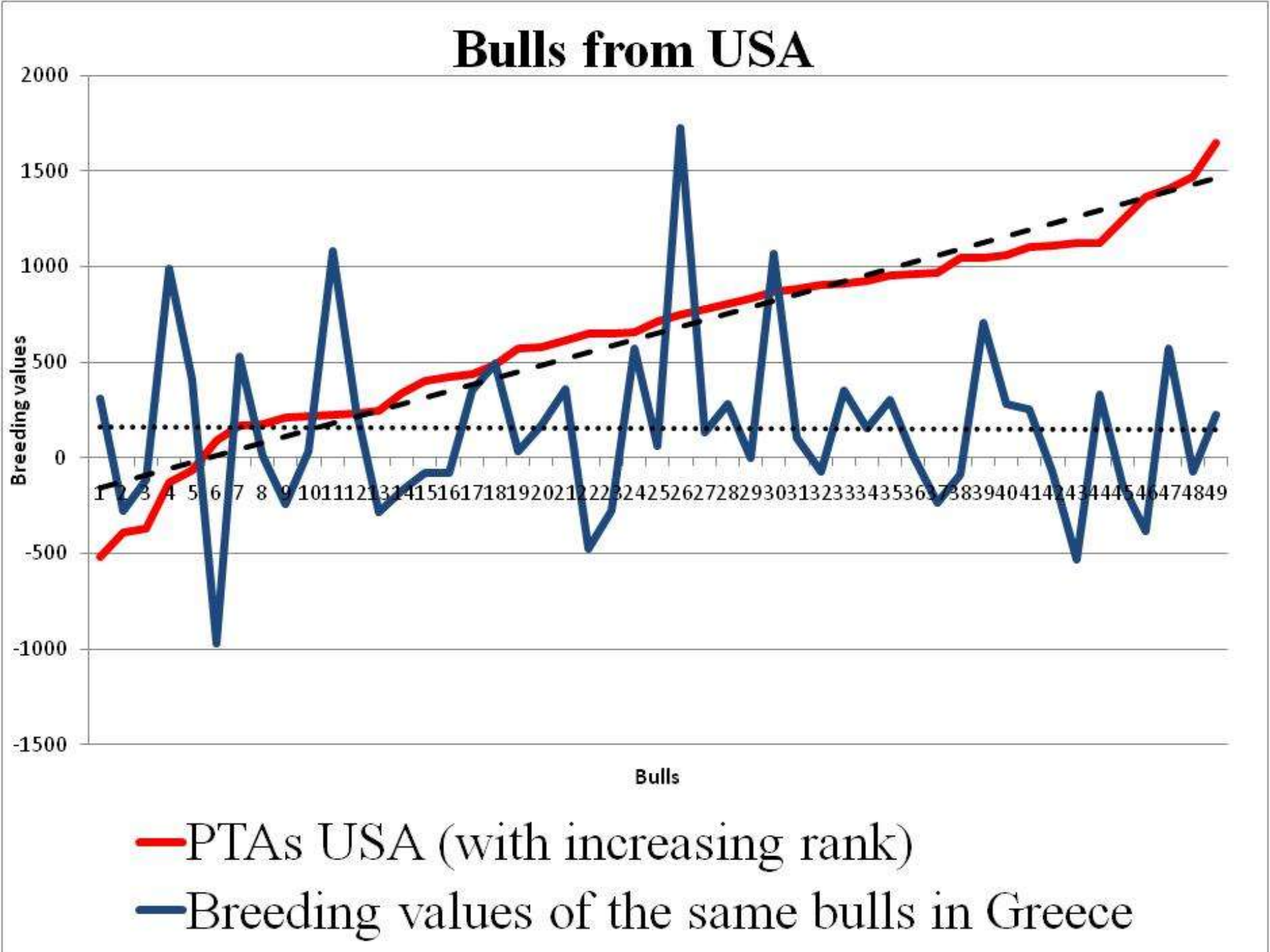
Trait	h^2	Variance ratio			
		Animal	Permanent Environment	Error	
305 days milk production (kg)	0,23	0,23	0,17	0,606	
		Variance components (kg)			
		Animal	Permanent Environment	Error	Total phenotypic variation
		580270	421980	1538900	2541100

Correlation Coefficients

Country of bulls' origin	**Correlation Coefficient (Greece)**	**Significance**
Canada	0,45	0,261 ns
France	-0,32	0,367 ns
Germany	0,32	0,069 ns
Netherlands	-0,23	0,370 ns
USA	0,01	0,991 ns

	Correlation Coefficient	
Country of bulls' origin	**Herds with 305 D. lactation below population average (Greece).**	**Significance**
Canada	0,07	0,915 ns
France	0,39	0,392 ns
Germany	0,59(**)	0,000
Netherlands	0,25	0,484 ns
USA	0,01	0,959 ns

	Correlation Coefficient	
Country of bulls' origin	**Herds with 305 D. lactation above population average (Greece).**	**Significance**
Canada	0,90(*)	0,038
France	-0,41	0,423 ns
Germany	0,43	0,066 ns
Netherlands	-0,37	0,190 ns
USA	0,00	0,980 ns


Bulls from USA
2000
1500
1000
500
0
-500
-1000
-1500
Breeding values
Bulls
PTAs USA (with increasing rank)
Breeding values of the same bulls in Greece

Comparison of the mean values of the production traits in Greece and the bulls' countries of origin.

Production trait	Greece	Canada	France	Germany	Netherlands	USA
305 days milk production (kg)	8742	9343	7662	8722	8790	10311
Season of calving	6,71	6,82	-	6,72	7,4	6,61
Age at first calving	28,0	25,2	29,2	26,4	26,4	24,1
Calving interval	14,5	13,2	-	13,1	13,3	13,3
Age at culling	62	67	-	66	71	73
Fat/Protein ratio	1,15	1,15	1,31	1,31	1,3	1,15
Som. Cell Count	353	167	125	-	226	60
Size of farm	136	62	37	71	70	773

Discussion

•The variance components and heritability for 305 D. milk production estimated close to similar studies

•Genotype by environment interaction is present in the Holstein population in Greece as indicated by the changes in rank and scale of the bulls used as semen in the population

•The traits with the highest differences between Greece and the countries of the bulls' origin were:

- Age at first calving
- Calving interval
- Age at culling
- Som. Cell Count

Thank you very much for your attention!