Analysis of test day yield data in dairy cattle of Costa Rica

B.Vargas[1,2]; J.A.M. van Arendonk[1] and E. Perez[2]

[1]**Breeding and Genetic Unit**
WIAS
Wageningen
The Netherlands

[2]**Escuela de Medicina Veterinaria**
 UNA
Heredia
Costa Rica

General characteristics of milk production in Costa Rica

- **Breeding schemes not fully established**

- **Large variation in**
    - **Size of Herds**
    - **Management practices**
    - **Frequency of sampling**
    - **Breed types**
    - **Breeding schemes not established**

Objectives

1.   To determine the degree of heterogeneity of variances across the lactation

2.   To demonstrate the effect of standardisation on variance component estimates

Costa Rica

NICARAGUA

Lake Nicaragua

San Juan R.

11° N — La Cruz   Los Chiles

Golfo del Papagayo

Liberia

Cañas

Filadelfia

Santa Cruz

Nicoya

10° N — Puntarenas   Alajuela   Heredia   San José

Lepanto

Península de Nicoya

Santiago   Cartago   Moravia

Golfo de Nicoya

Parrita   San Pablo

Quepos   San Isidro

General R.

Buenos Aires

9° N

Bahía de Coronado   Puerto Cortés

North Pacific Ocean

Península de Osa

Golfo Dulce

Colfito

PANAMA

Bahía de Charco Azul

Muelle

Chirripó R.

Caribbean Sea

Ciudad Quesada

Guápiles

Siquirres

Limón

0   40 Miles
0   40 Kilometers

N

8° N — 86° W   85° W   84° W   83° W

Material and methods

Database

Farms	222
Breed types	6
Cows	28417
Lactations	57891
Samples	423336
Lactations/cow	2.03
Samples/lactation	7.34
Milk yield 305 days (kg)	4427 ± 1685
AI Sires	1161
Genetic groups	208

U N A

Model analysed for later parity traits

$$Y_{ijklm} = HYS_i + b_1(AGE)_j + b_2(AGE)_j + b_3(DAY)_k + A_l + PE_m + E_{ijklm}$$

Y_{ijklm} = Test day records.

HYS_i = Fixed effect of Herd-year-season i.

AGE_j = Linear and quadratic effects of age at calving j.

DAY_k = Linear effect of day of sampling k within period.

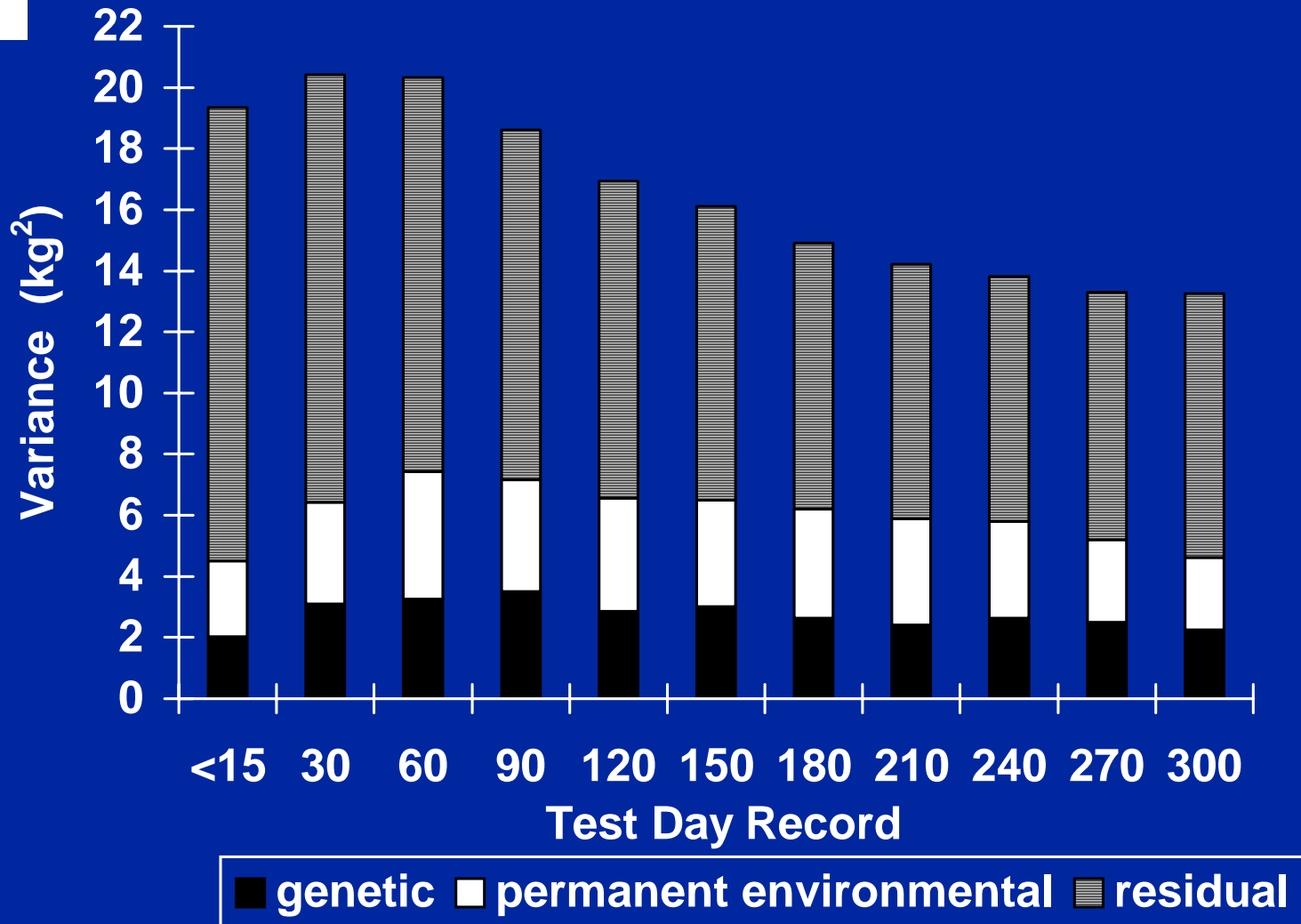A_l = Random animal effect.

PE_m = Permanent environmental effect.

E_{ijklm} = Random residual.

Results

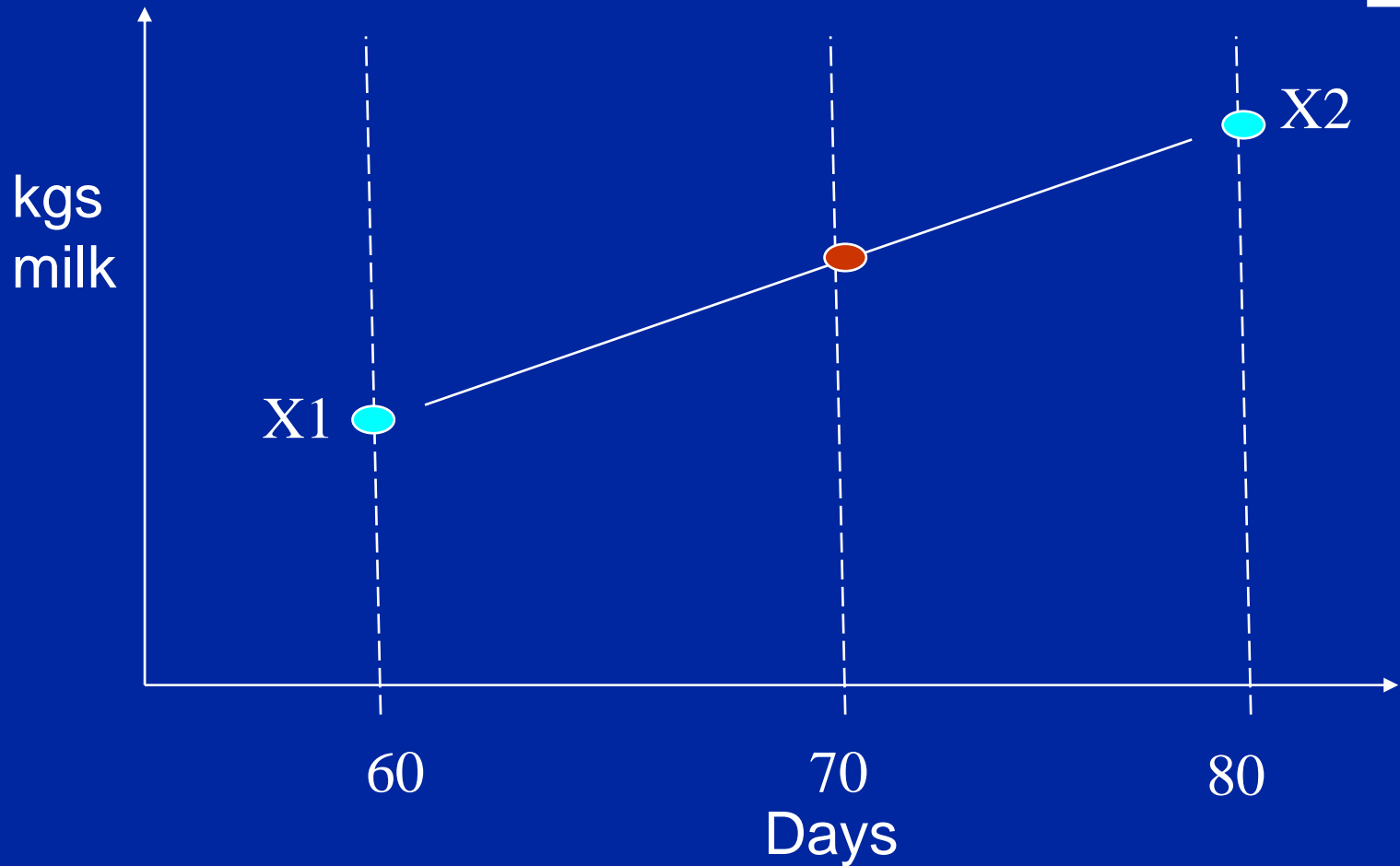## Heterogeneity of variances across the lactation

Results

Heritabilities and genetic correlations

	30	60	90	120	150	180	210	240	270	300
30	.16	.90	.87	.84	.81	.79	.77	.72	.66	.60
60		.21	.90	.87	.85	.82	.80	.75	.70	.63
90			.20	.91	.88	.85	.82	.78	.72	.65
120				.22	.91	.88	.84	.80	.74	.66
150					.22	.90	.87	.82	.76	.69
180						.24	.90	.85	.79	.71
210							.24	.88	.82	.73
240								.23	.87	.78
270									.20	.84
300										.18

Results

Effect of standardisation on estimates of variance components and heritability

	σ^2_e		σ^2_a		σ^2_p		h^2	
	act	std	act	std	act	std	act	std
90	8.02	6.52	1.96	2.11	9.98	8.63	0.20	0.24
120	8.04	6.40	1.18	1.94	9.22	8.34	0.13	0.23
150	7.74	6.23	1.20	1.87	8.94	8.10	0.13	0.23
180	7.44	6.09	1.41	1.84	8.85	7.93	0.16	0.23

Results

Effect of standardisation on estimates of genetic correlations

	actual	standard
90 and 120	0.89	0.99
90 and 150	0.81	0.88
90 and 180	0.78	0.87
120 and 150	0.91	0.94
120 and 180	0.89	0.90
150 and 180	0.94	0.94

Conclusions

There is clear heterogeneity of variances across lactation.

Standardisation results in overestimation of heritability and genetic correlations.

Analysis of milk yield with a test day model is more appropriate.

Thank you!