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Milk and dual purpose basis for the publication of breeding values estimated with the animal model in Belgian dairybreeds.

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Introduction

In Belgium, since January 1994, sire and cow evaluations are based routinely on quantitative and qualitative first three lactation records using an animal model.

The animals belong to four main breeds : Black and White Holstein(HO), Red and White(RW), East Flemish Red Pied (FP) and West Flemish Red (WF).

Since they are two main groups (Black and White and Red and White dairy breeds, dual purpose or sometimes called mixed red breeds) with good genetic connections, people in charge of the genetic evaluation and the selection programs have decided to evaluate the animals globally (all breeds in the same run) and to establish a milk and a dual purpose basis for the publication of breeding values. The purpose of this presentation is to illustrate the differences between the two objectives, to illustrate the evolution regarding yields and percentages in Belgium, to explain how the bases were established and how the two bases system is used in Belgium.

Data

First, second and third lactations of cows with parents known or unknown belonging to Black and White Holstein(HO), Red and White(RW), East Flemish Red Pied (FP) and West Flemish Red (WF) breeds were obtained from the

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Vlaamse Rundveeteelt Vereniging (VRV-North Belgium) and Elinfo (South Belgium). Birth dates of the animals are from 1977 to 1992.

Extrapolated 305-d productions from partial lactations ≥ 100 days and 305-d complete records were obtained for milk, fat and protein quantitative productions. The data were not preadjusted for non genetic factors.

The pedigrees were traced as far as the information was available starting with the informations obtained from the different exporting countries present in Belgium. Genetic groups for unknown parents were created.

The distribution of the data corresponding to the different breeds and regions (9 provinces) are given in tables 1, 2 and figures 1 and 2. Means, standard deviations of the quantitative and qualitative traits and frequencies are given by lactation number for the four Belgian dairy breeds in table 3.

Model

The data were analyzed with the linear model described earlier by Leroy et al. (1993):

$$y_{ijklmn} = m_{gi} + a_{gej} + c_{ck} + m_l + u_m + p_m + e_{mn}$$

where

y_{ijklmn}	=	milk, fat, protein (Kg) 1st, 2nd, 3rd lactation 305-d record.
m_{gi}	=	fixed management group effect
a_{gej}	=	fixed age effect (all lactations)
c_{ck}	=	fixed current calving interval effect
m_l	=	fixed month of calving effect
u_m	=	random additive genetic effect (a) + group (g)
p_m	=	random permanent environment effect
e_{ijkmn}	=	random residual effect

Results and discussion

The averages of the animal model solutions obtained at the end of the iteration process and grouped by breed and year of birth are presented in the figures 3,4 and 5 for Milk yield (kg), Fat percentage and Protein percentage.

The figures illustrate the estimated genetic trends for the three traits and indicate also that the objectives in the West Flemish Red (WF) breed have been modified since some years giving an important positive trend. Since it was decided that cows born in 1985 would be considered as the zero value

basis for the country and that two "goals" (a dairy and a dual purpose one) would be established, differences (for each trait) were computed from the averages of the genetic estimations of cows (zero basis 1985) belonging to the two "goals" (Figures 6,7,8)

The differences used to express the data from one goal to another were obtained from the 1985 differences for each trait (table 4). The results of table 4 are used officially to translate breeding value estimations from the dairy to the dual purpose goal (and reverse). For international exchange, the data are published according to the dairy basis.

The results indicate also that, in Belgium, the selection programs allow to maintain the protein percentage together with the increase of Milk yield and the decrease of fat percentage due to EEC quota system.

Conclusions

In Belgium, large breed differences exist between the specialized and the dual purpose breeds. The estimated genetic trend of Protein percentage has been maintained in all breeds even in the presence of a corresponding trend positive in Milk yield and negative in Fat percentage.

When good genetic connections in different dairy breeds exist in one country, a genetic evaluation system could be established in order to estimate the breeding values globally.

If the breeding values estimated by the global evaluation system handicap some breeds, especially not yet specialized dairy breeds, then a two genetic bases system solves the every day problem herd management problem of dealing with negative breeding values.

References

Leroy P.L., Farnir F., Volckaert D. 1993.
Proceedings of the open session of the Interbull Annual Meeting, Aarhus, Denmark, August 19-20, 1993.

Table 1. Distribution of the data corresponding to the Belgian dairy breeds: HO - Black and White Holstein, RW - Red and White, WF - West Flemish Red and FP - East Flemish Red Pied (milk recorded cows only, birth year from 1977 to 1992).

Province	Breed				Total
	HO Black and White Holstein	RW Red and White	WF West Flemish Red	FP East Flemish Red Pied	
Antwerp	47441	72275	15	141	119872
Brabant	6173	8719	77	408	15377
West Flanders	77405	1286	30964	561	110216
East Flanders	39901	3287	19	125516	168723
Hainaut	6621	1675	0	0	8296
Liege	70564	26854	0	0	97418
Limburg	8186	38874	15	7	47082
Luxemburg	5067	3006	0	0	8073
Namur	2192	2249	0	0	4441
Total	263550	158225	31090	126633	579498

Table 2. Distribution (%) by Province of the data corresponding to the different Belgian dairy breeds: HO - Black and White Holstein, RW - Red and White, WF - West Flemish Red and FP - East Flemish Red Pied (milk recorded cows only, birth year from 1977 to 1992).

Province	Breed				Total
	HO Black and White Holstein	RW Red and White	WF West Flemish Red	FP East Flemish Red Pied	
Antwerp	18.001	45.679	0.048	0.111	
Brabant	2.342	5.511	0.248	0.322	
West Flanders	29.370	0.813	99.595	0.443	
East Flanders	15.140	2.077	0.061	99.118	
Hainaut	2.512	1.059			
Liege	26.774	16.972			
Limburg	3.106	24.569	0.048	0.006	
Luxemburg	1.923	1.900			
Namur	0.832	1.421			
Total	100	100	100	100	

Table 3. Frequencies, means, standard deviations of quantitative and qualitative traits corresponding to the three first lactations of the different Belgian dairy breeds (milk recorded cows only, birth year from 1977 to 1992).

Breed / Trait		Parity 1	Parity 2	Parity 3	Total Lactations
HO Black and White Holstein	n	265577	180755	125138	571470
	Milk Kg	$\bar{x}$ 5444.5	6134.6	6522.7	
		S 1238.0	1454.8	1483.8	
	Fat Kg	$\bar{x}$ 222.7	251.5	266.3	
		S 56.4	65.7	68.1	
	Prot Kg	$\bar{x}$ 178.6	205.6	216.0	
		S 41.2	48.1	49.2	
	Fat %	$\bar{x}$ 4.08	4.10	4.08	
		S 0.46	0.48	0.49	
	Prot %	$\bar{x}$ 3.28	3.36	3.32	
		S 0.21	0.23	0.23	
RW Red and White	n	158233	109218	75504	342955
	Milk Kg	$\bar{x}$ 4813.4	5327.9	5730.0	
		S 1077.1	1270.0	1288.6	
	Fat Kg	$\bar{x}$ 194.0	214.7	228.4	
		S 49.9	57.6	59.3	
	Prot Kg	$\bar{x}$ 162.6	183.0	194.2	
		S 37.2	43.1	44.1	
	Fat %	$\bar{x}$ 4.02	4.02	3.97	
		S 0.42	0.43	0.43	
	Prot %	$\bar{x}$ 3.78	3.44	3.39	
		S 0.21	0.22	0.21	
FP East Flemish Red Pied	n	126634	84780	54605	266019
	Milk Kg	$\bar{x}$ 4255.5	4687.1	5162.8	
		S 944.4	1100.4	1134.8	
	Fat Kg	$\bar{x}$ 163.3	180.1	197.0	
		S 41.8	48.7	50.7	
	Prot Kg	$\bar{x}$ 140.6	157.9	170.9	
		S 31.5	36.7	37.8	
	Fat %	$\bar{x}$ 3.83	3.84	3.81	
		S 0.43	0.46	0.44	
	Prot %	$\bar{x}$ 3.31	3.38	3.31	
		S 0.21	0.23	0.21	
WF West Flemish Red	n	31090	20250	12758	64098
	Milk Kg	$\bar{x}$ 4271.3	4819.9	5300.5	
		S 1084.1	1250.3	1319.9	
	Fat Kg	$\bar{x}$ 168.6	189.9	208.6	
		S 49.6	56.9	60.9	
	Prot Kg	$\bar{x}$ 144.0	164.5	179.2	
		S 36.2	42.1	44.5	
	Fat %	$\bar{x}$ 3.93	3.92	3.92	
		S 0.43	0.46	0.45	
	Prot %	$\bar{x}$ 3.38	3.42	3.39	
		S 0.20	0.21	0.21	

Table 4. Averages of breeding value estimations (zero basis 1985) for cows belonging to the dairy and the dual purpose goal. Difference between the two bases (milk recorded cows only, birth year from 1977 to 1992) .

	Milk (kg)	Fat(kg)	Protein (kg)	Fat (%)	Protein(%)
Dairy	404.451	23.147	12.361	0.13375	-0.01139
Dual purpose	-338.558	-16.978	-10.146	-0.07829	0.0195
Difference	743.009	40.125	22.507	0.21204	-0.03089

Figure 1. Relative importance of the milk recorded Black and White and Red and White breeds in the Provinces of Belgium (birth year from 1977 to 1992)

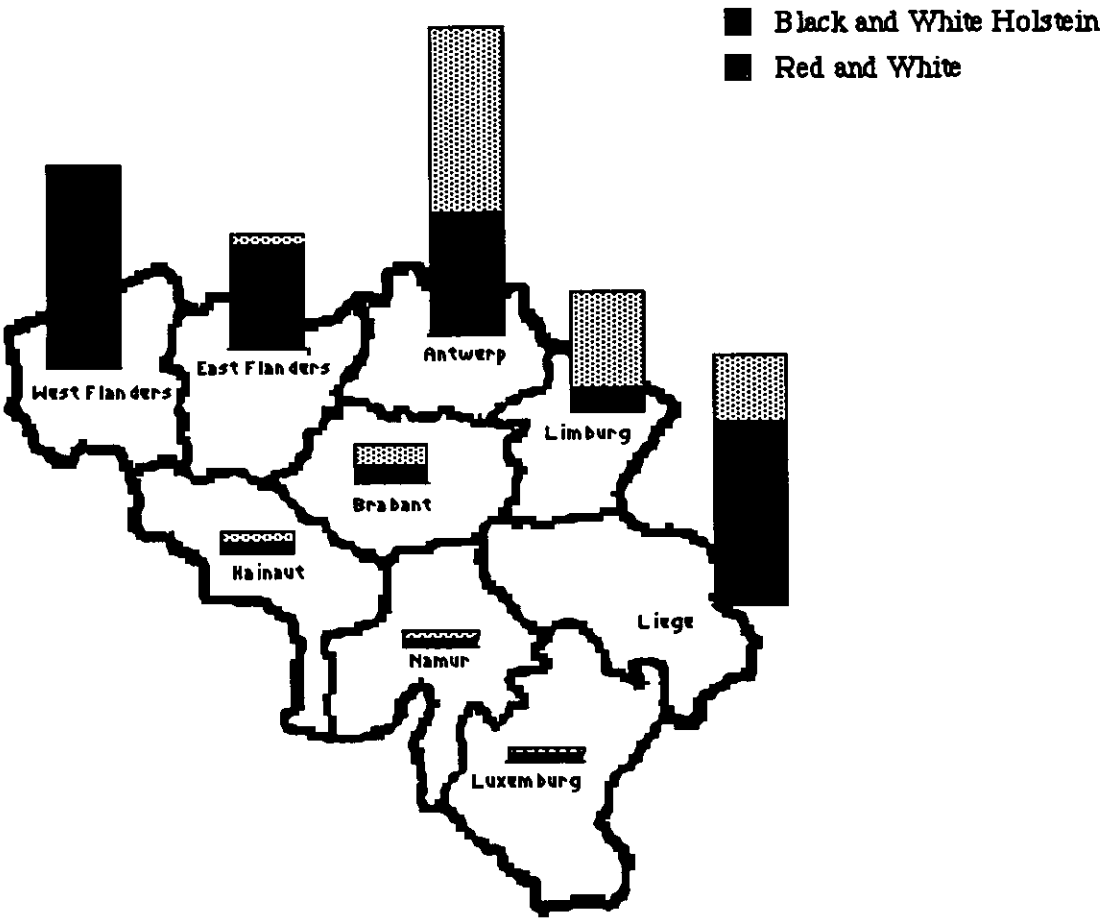


Figure 2. Distribution of the milk recorded White Red and Red breeds in the Provinces of Flanders (birth year from 1977 to 1992)

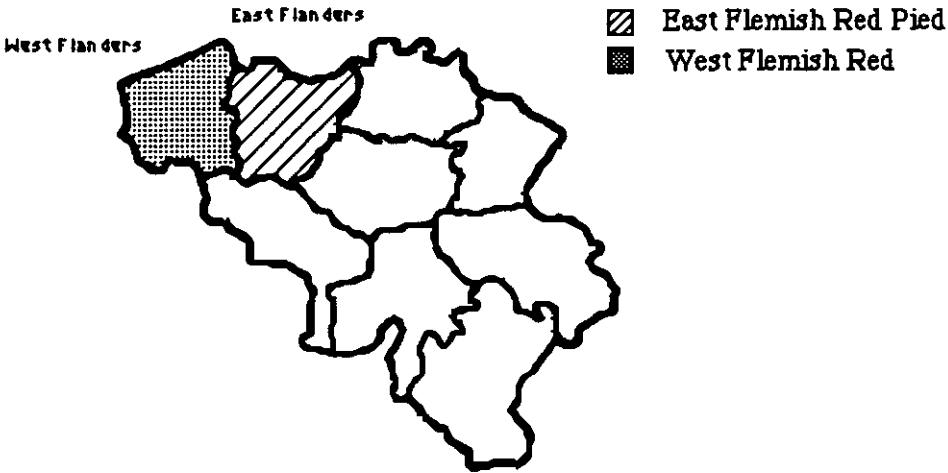


Figure 3. Estimated genetic trend of Milk yield for the different Belgian dairy breeds (birth year from 1977 to 1992)

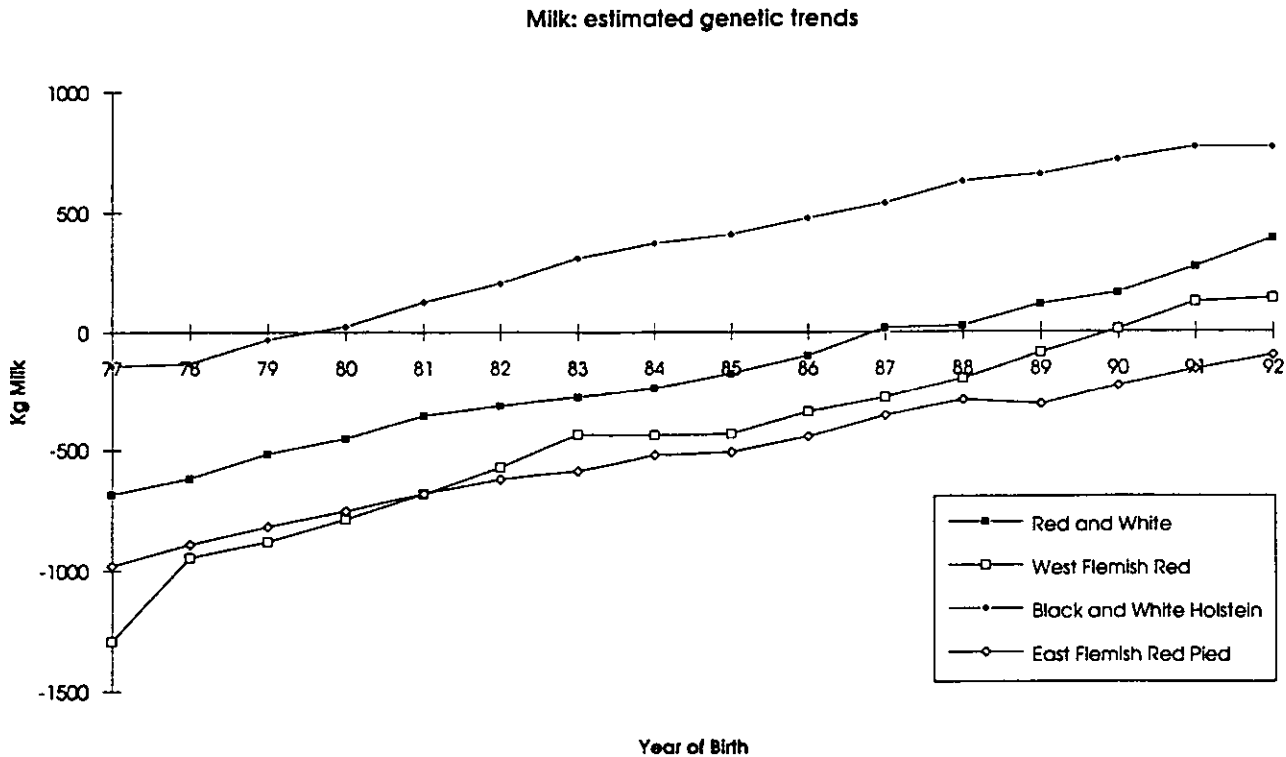


Figure 4. Estimated genetic trend of Fat percentage for the different Belgian dairy breeds (birth year from 1977 to 1992)

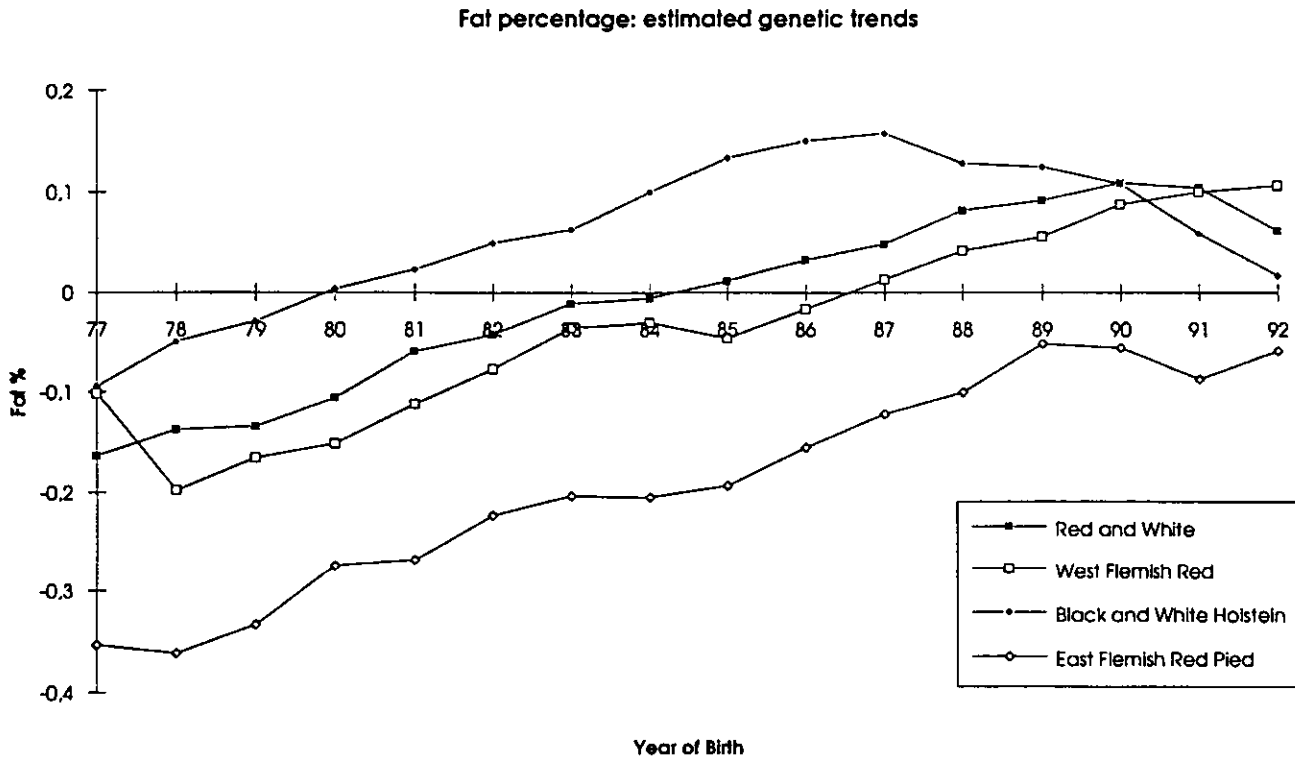


Figure 5. Estimated genetic trend of Protein percentage for the different Belgian dairy breeds (birth year from 1977 to 1992)

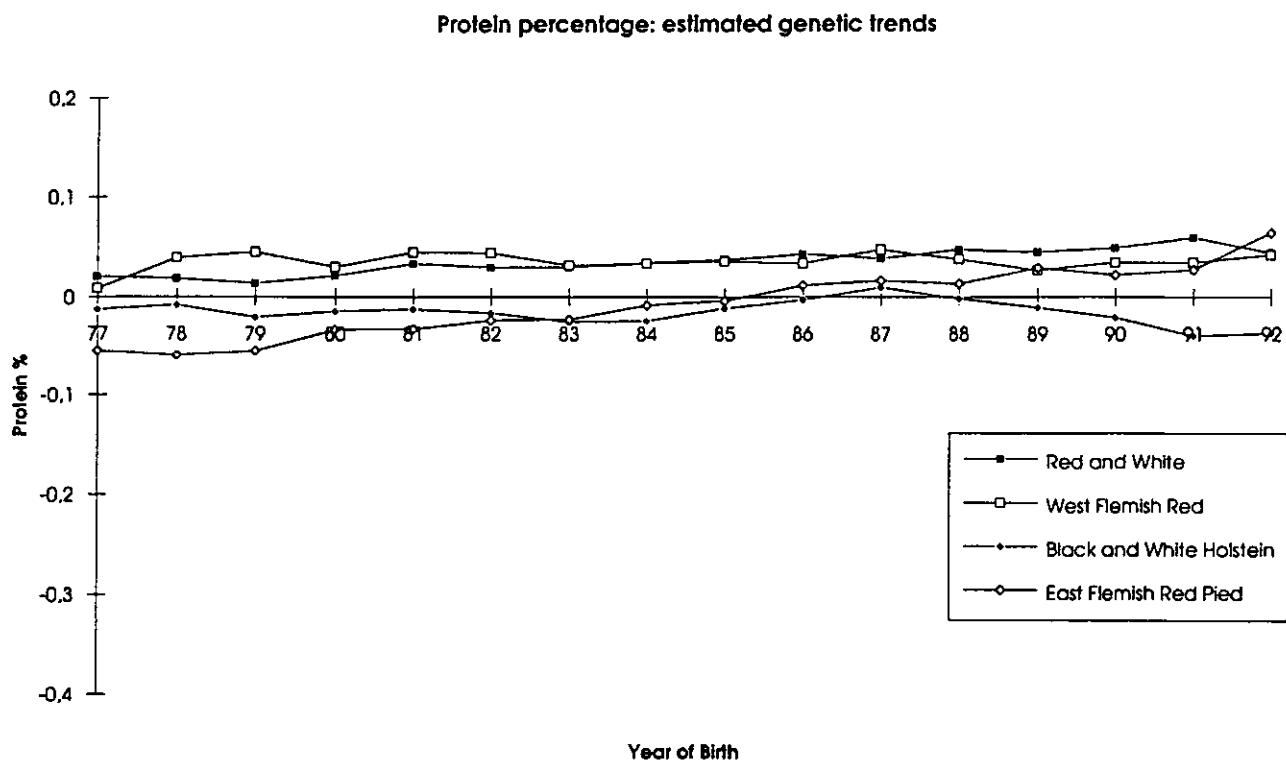


Figure 6. Estimated genetic trend of Milk yield for the two dairy objectives (birth year from 1977 to 1992)

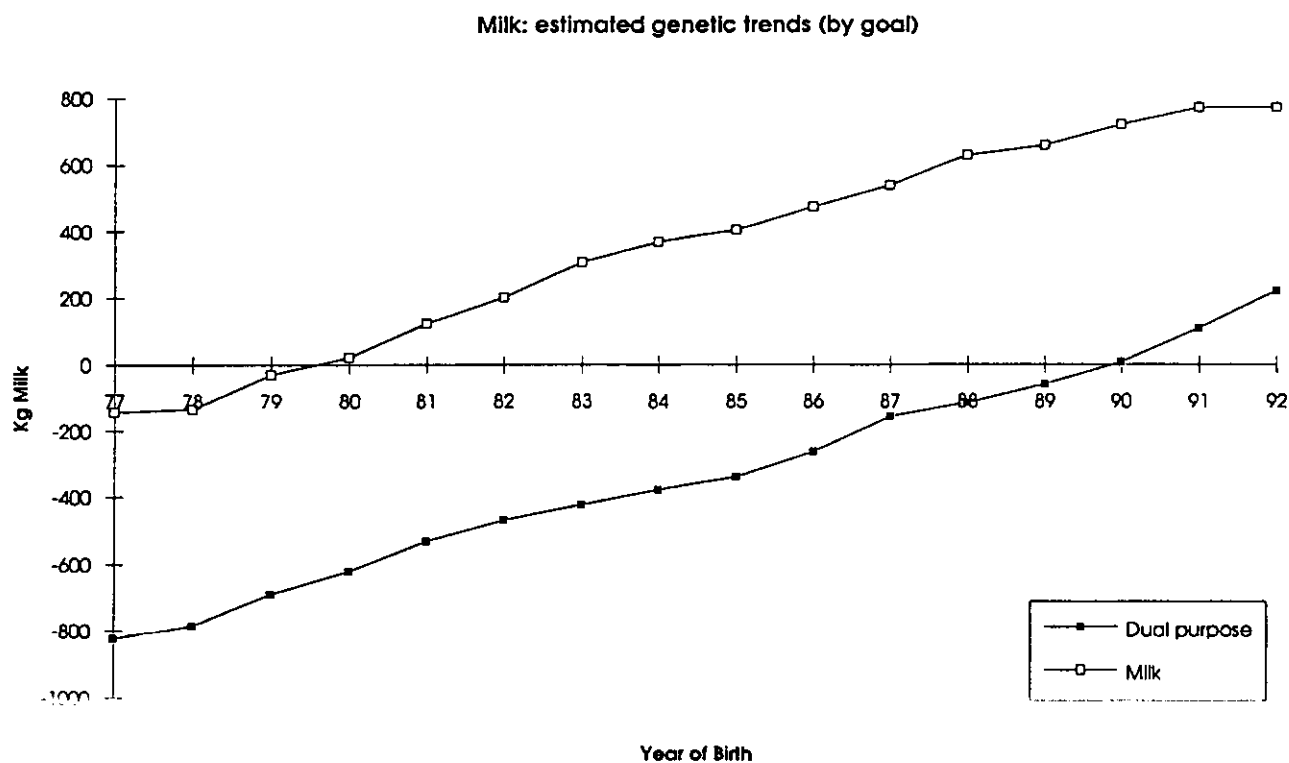


Figure 7. Estimated genetic trend of Fat percentage for the two dairy objectives (birth year from 1977 to 1992)

Fat percentage: estimated genetic trends (by goal)

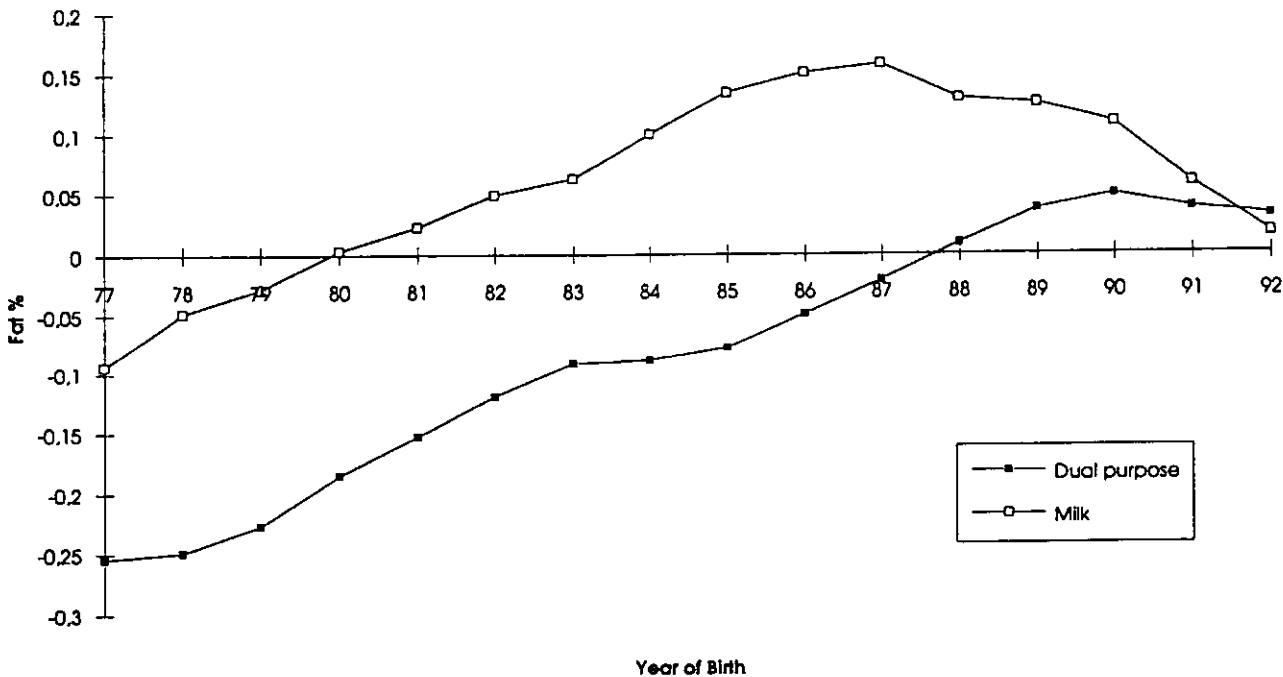


Figure 8. Estimated genetic trend of Protein percentage for the two dairy objectives (birth year from 1977 to 1992)

Protein percentage: estimated genetic trends (by goal)

