

Genotype environment interaction between organic and conventional dairy farming in the Netherlands

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Introduction

- Organic dairy farming developed to ~3% of total dairy production
- Considerable differences exists between organic and conventional dairy farms
 - ➔ the restrictions on using chemical fertiliser, concentrates and antibiotics
- Many organic dairy farmers use HF cows and select breeding bulls on the same EBVs as “conventional” colleges
- Does genotype by environment interaction exist between organic and conventional dairy farming?

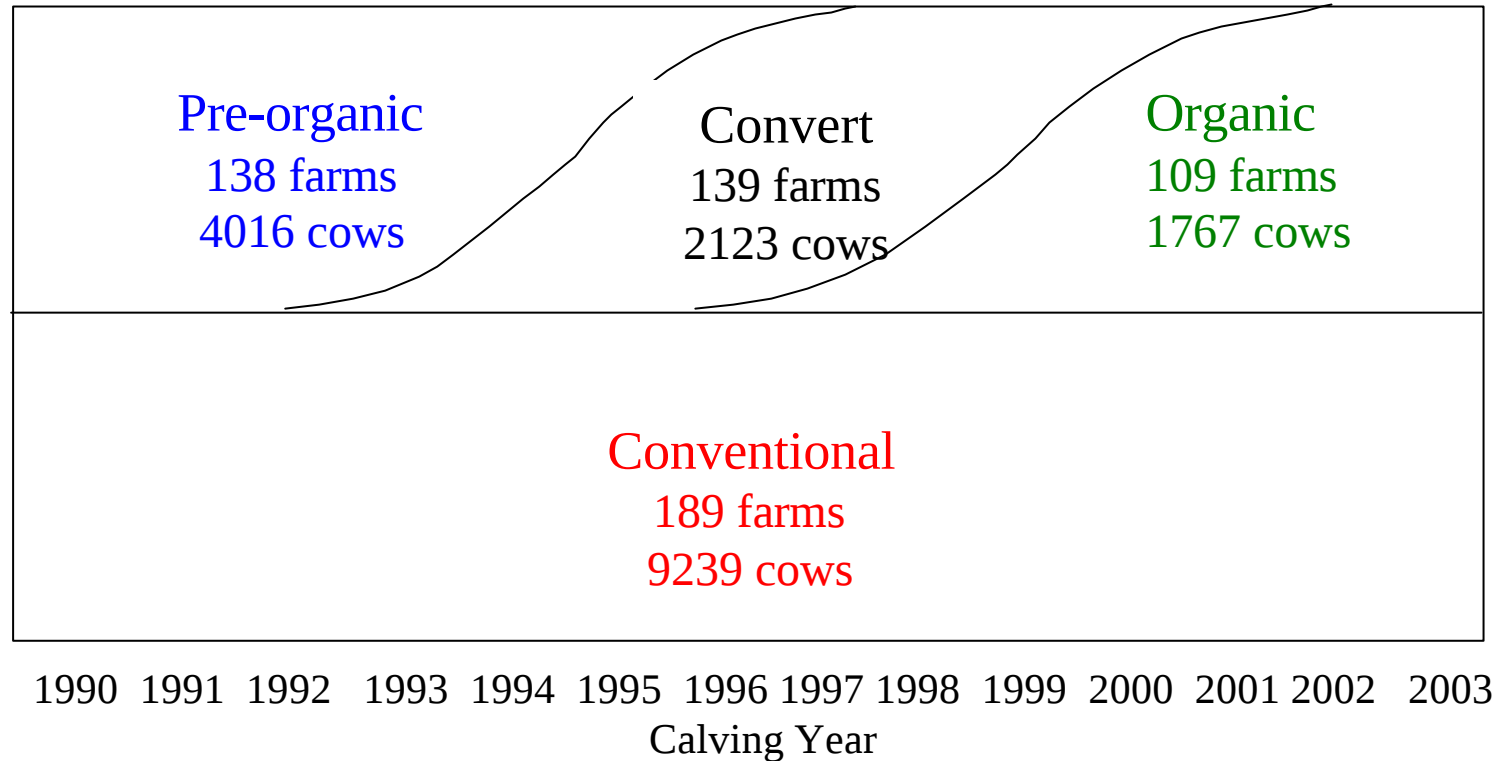
Goal of the study:

- Estimate the heritability of milk production traits under organic production circumstances.
- Determine the magnitude of G x E for milk production traits between organic and conventional dairy production

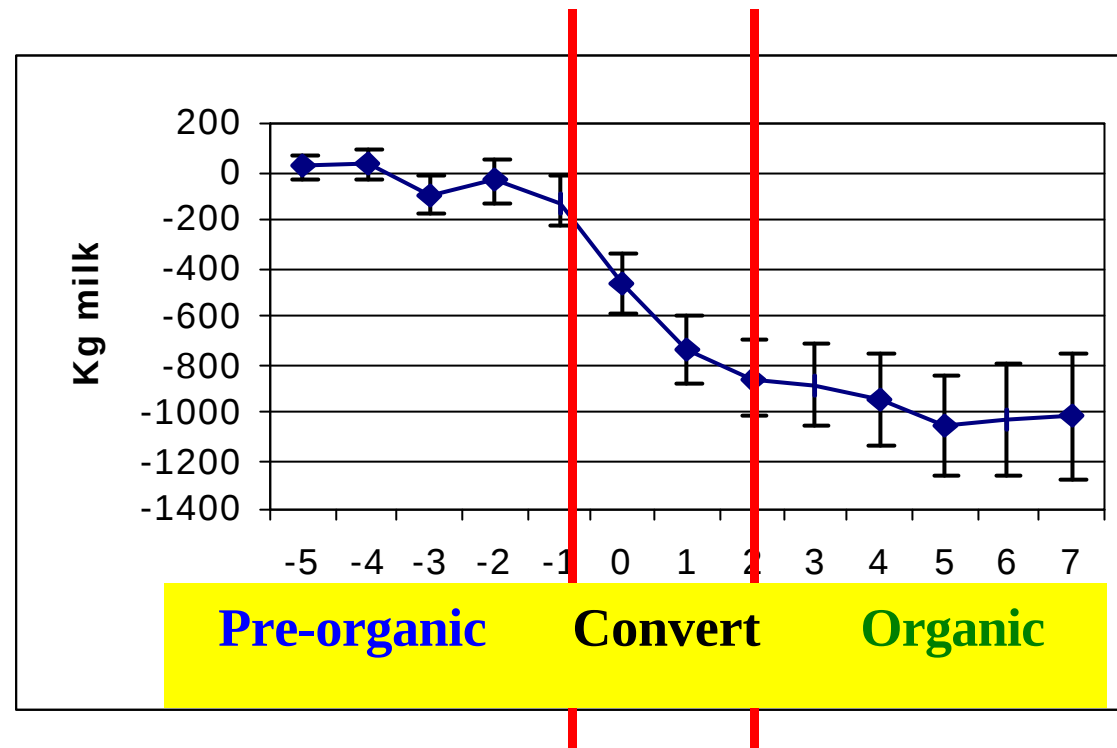
Material and Methods

- Holstein Friesian (HF) cows
- 305-day first lactation records 1990-2003
- > 180 days in lactation
- animals that changed between farms were excluded
- ≥ 4 daughters/sire
- ≥ 4 records per HYS class
- Herds:
 - Organic: all farms registered in 2002.
 - Conventional: random selection

Material and Methods



Material and Methods



Effect of conversion to organic farming (BIO) on first lactation milk production. BIO indicates the number of years since conversion (BIO = 0 is date of conversion to organic farming)

Source: (Nauta et al, 2005)

Material and Methods

Estimating heritabilities and genetic correlations:

$$\textbf{Model: } Y_{ijkl} = \mu + HYS_j + \beta_0 * AFC_{ijkl} + \beta_1 * (AFC_{ijkl})^2 + \beta_3 * DO_{ijkl} + \beta_4 * (DO_{ijkl})^2 + Animal_l + e_{ijkl}$$

Y_{ijkl}	milk production record
μ	mean
HYS_j	fixed effect of herd-year-season of calving j ,
AFC_{ijkl}	covariable age at first calving,
DO_{ijkl}	covariable days open,
$Animal_l$	random additive genetic effect l ,
e_{ijkl}	residual

Material and Methods

Multivariate (quatro) analysis – treating milk production in the four different groups as different traits:

- Conventional
- Pre-organic
- Converting
- Organic

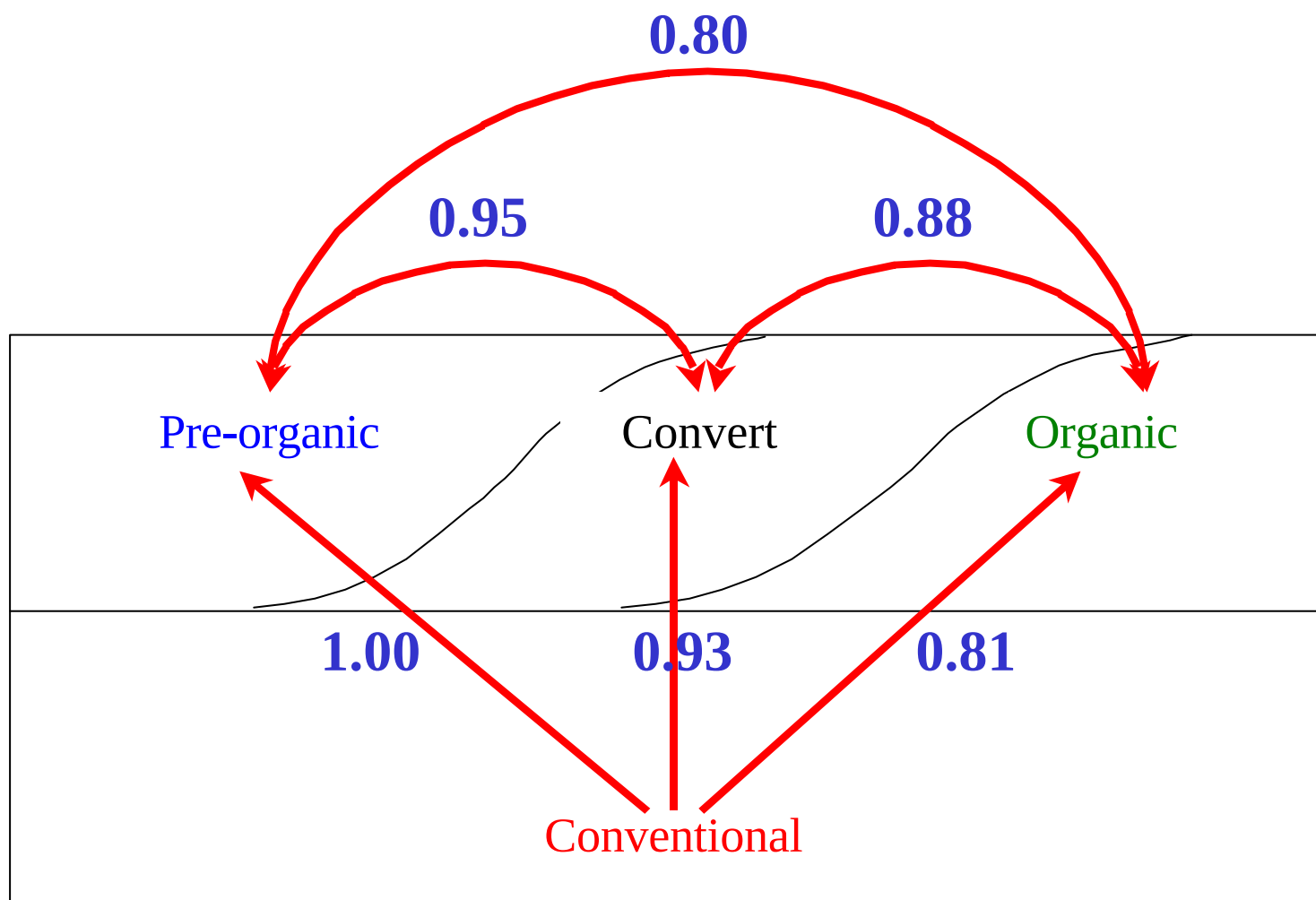
Descriptive statistics:

	conventional	pre-organic	converting	organic
Kg Milk (sd)	7156 (1203)	6991 (1219)	6622 (1145)	6440 (1158)
% fat (sd)	4.36 (0.46)	4.32 (0.45)	4.31 (0.45)	4.29 (0.46)
% protein (sd)	3.45 (0.19)	3.44 (0.20)	3.37 (0.20)	3.34 (0.19)

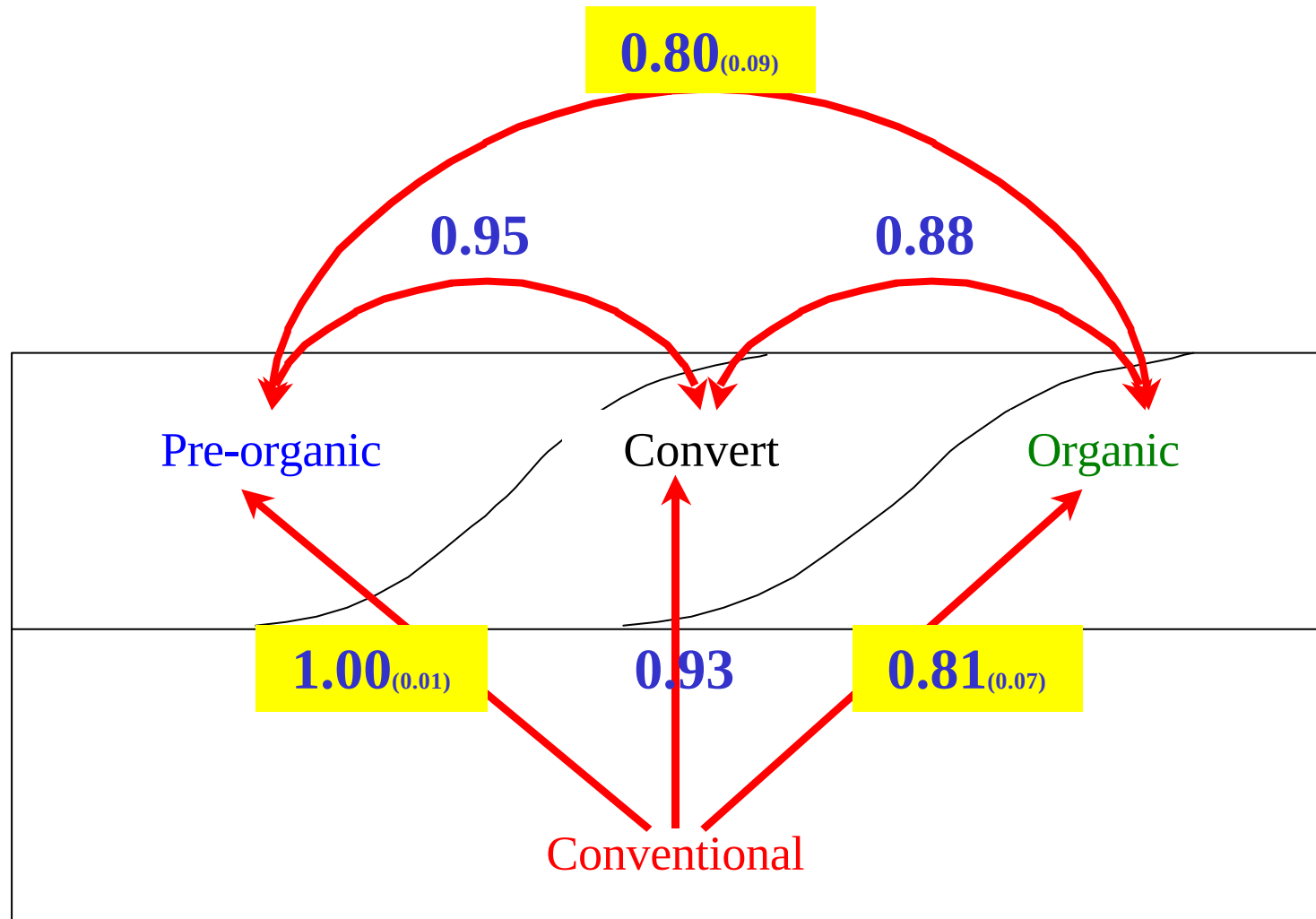
Heritabilities

	Conventional	Pre-organic	Converting	Organic
Kg milk	0.48	0.39	0.59	0.70
Fat %	0.79	0.83	0.87	0.84
Protein %	0.72	0.76	0.77	0.68

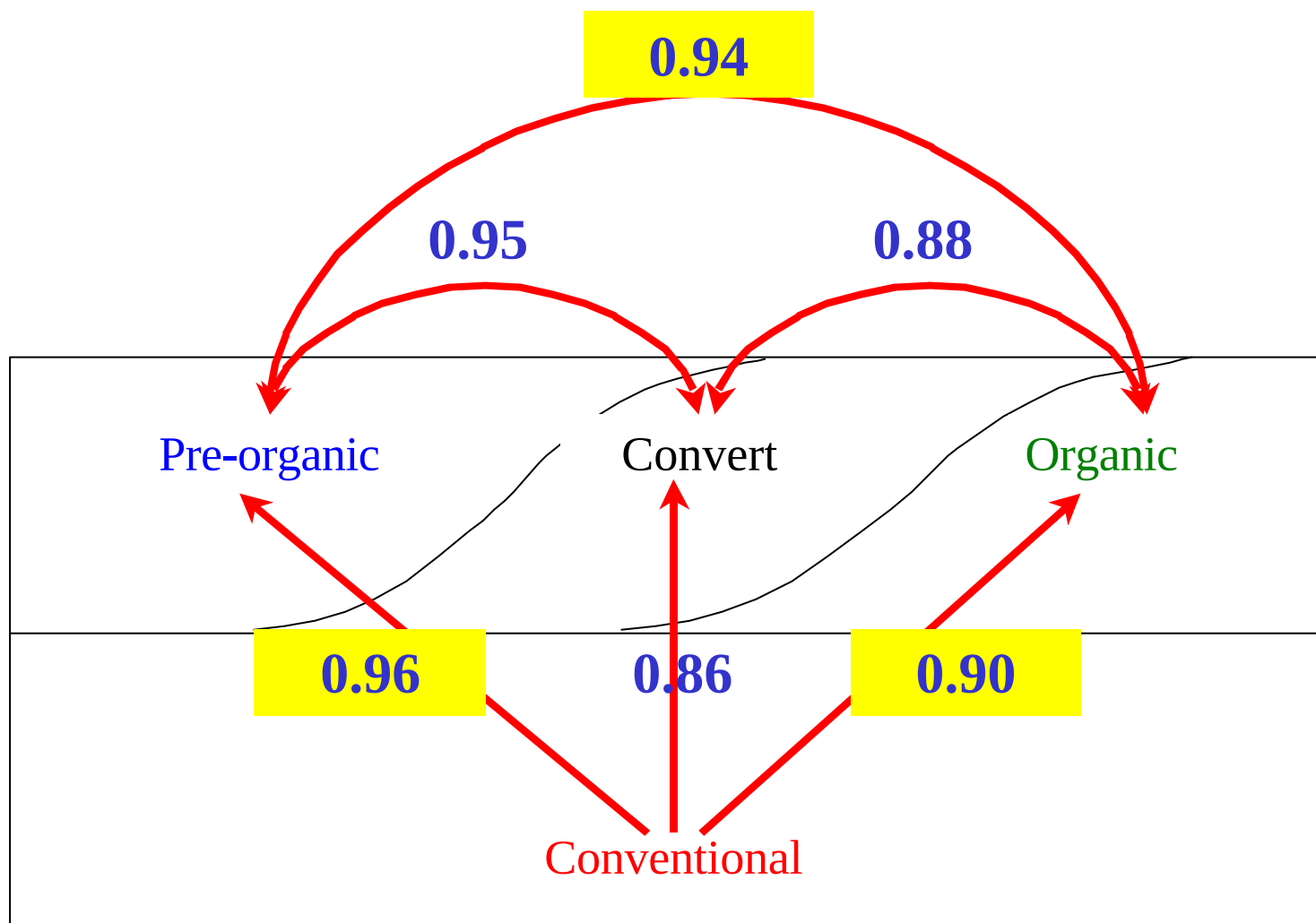
Milk Yield – Genetic correlations



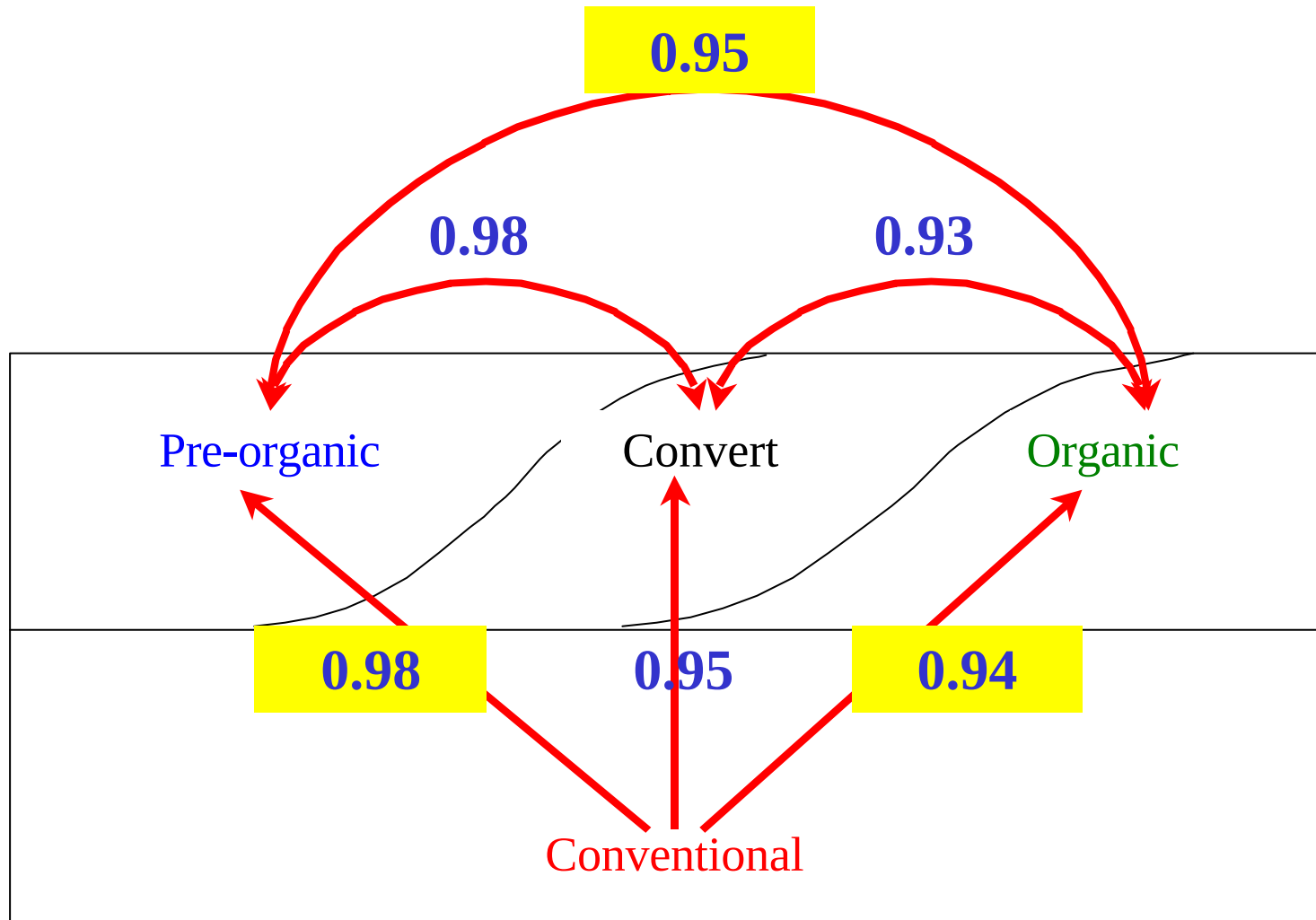
Milk Yield – Genetic correlations (SE)



% Fat – Genetic correlations



% Protein – Genetic correlations



Conclusions (1):

- The genetic correlation between milk yield under conventional and organic production circumstances is about 0.8
- The genetic correlation between fat and protein content under conventional and organic production circumstances is about between 0.9 and 1

Conclusions (2):

- Heritability for milk yield tends to be higher for organic production circumstances as compared to conventional for milk yield tends to be higher for organic production circumstances as compared to conventional
- Heritabilities for fat% and protein% are very similar.

Thank you for your attention,
any questions?