Composite traits and International genetic evaluation

F. Canavesi, J. Pena, G. De Jong,
G. Pedersen Aamand, S. Mattalia

Composite traits: a challenging definition

- Composite trait:
  - A trait that is composed by other traits in its computation
- Not to be confused when speaking of Conformation with:
  - General characteristics
  - Overall or Final Score
  - Overall type traits

Problems related with overall type traits in International evaluation

Country	Overall conformation	Overall Udder	Overall Feet &Legs
AUS	General appearance	Mammary system	Side view foot diagonal
BEL	Overall conformation score	Overall udder score	Overall F&L score
CAN	Final score (individual trait)	Mammary system	F&L (individual trait)
CHE	Final score (composite trait)	Overall udder (composite)	Overall F&L (composite)
CHR	Overall score (composite)	Composite score for udder	Composite score for F&L
CZE	Overall conformation score	Overall udder score	Overall F&L score
DEU	Relative breeding value conformation(RZE)	Overall udder (composite)	Overall F&L (composite)
DFS	Overall conformation(composite)	Mammary (composite)	F&L (composite)
DNK	Overall conformation(composite)	Mammary (composite)	F&L (composite)
ESP	Overall conformation (composite trait)	Overall udder (composite trait)	F&L (individual trait)
FRA	Overall score (composite)	Udder score (composite)	Locomotion
GBR	Overall conformation (composite)	Overall udder (composite)	Overall F&L (composite)
HUN	Overall conformation	Overall udder	Overall F&L
ITA	Final score (individual trait)	Overall udder (composite)	Functionality of F&L (individual trait)
JPN	Overall conformation (composite)	Overall udder score (individual trait)	Overall F&L (individual trait)
NLD	Overall conformation(composite)	Qualification of total udder(individual trait)	Functionality of F&L (individual trait)
NOR	Overall conformation	Udder index	Leg index
NZL	Overall conformation (composite)	All traits of the udder	-
POL	Overall conformation score	Overall udder score	Overall F&L score
USA	Overall conformation (individual trait)	Overall udder (composite)	F&L (composite)

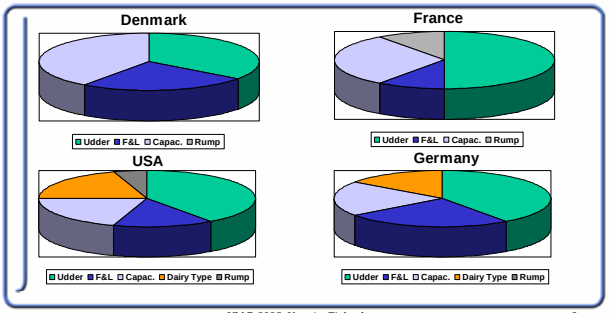
In principle

- MACE international evaluation system was set up to help breeders convert bull proofs from other countries into the most probable proof in their country based on:
  - Genetic correlations (genetic links among countries)
  - Sire variances (scale of national proofs).
- It was developed for single linear traits

Some examples

- Milk, fat and protein:
  - The same trait is measured in the different countries;
- Linear conformation traits:
  - Work si ongoing to harmonize trait definitition and allow for better comparison
  - As a result of this work genetic correlationa among countries have increased over time
- What happen with overall conformation?

Relative weights within Total Conformation



Some facts

- Mattalia, 1998
  - Her study showed that:
    - ✓Overall traits have lower correlation compared to linear traits
    - ✓Domestic bulls (with daughters in the country) are always favourite when correlations are low
    - ✓It is advisable to derive composites from individual linear traits.

Trait	Rg
Teat lenght	0.97
Udder depth	0.96
Teat placement	0.94
Udder support	0.89
Rear udder	0.88
Fore udder	0.87
Overall udder	0.83

The "international" predictor

- A composite derived nationally in order to maximize genetic correlation with the other countries for overall score
- This is submitted to Interbull instead of the official proofs that has lower correlation in order to avoid unfavourable effects on bulls converted proofs

All traits

- Ø udder (6)	0,92	
- Ø F&L (3)	0,82	
- Rump angle	0,97	Ø 0,892
- Stature	0,95	
- Rump width	0,91	
- Strength	0,88	
- Body depth	0,86	
- Angularity	0,85	
- Overall confor.	0,81	

Interbull recommendation

- For all overall traits that can be derived by single linear traits Interbull recommend to apply the procedure suggested by Miglior in 2004:
  - Derive a composite from linear traits assigning the most appropriate weight for the Country;
  - Combine this derived composite with the overall trait estimated by MACE;
  - This give the best correlation with the future values of the bull in the country once its proofs will be based on real daughters.

The current situation

- Most countries do apply Interbull recommendation
- Some do not and continue to discriminate some bulls because of the use of an inappropriate tool
- Discussion has been ongoing but those countries do not seem to be willing to move to a more reliable and fair system

What do to next

- As Interbull continues to compute overall type traits because they may be the only available tools for some countries, recommendation at all levels to always use linear derived traits that guarantee the best correlations across countries may speed up the process of harmonization:
  - Interbull has defined a clear best practice procedure
  - Breed Association may as well endorse this recommended procedure
  - ICAR guidelines ?