How to deal with feed efficiency in NTM?

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• Feed efficiency is an important trait in relation to
  • Economic importance
  • Carbon footprint

Why consider feed efficiency?

• Feed costs accounts for approximately 88 % of variable farm costs
• Considered in breeding goals for broilers and slaughter pigs
• Genetic variation is well documented
The overall aim – save feed

Opportunities:
1. Consider maintenance costs
2. Improve metabolic efficiency

Saved Feed

Saved Feed = Maintenance + Metabolic Efficiency
Maintenance

• Smaller cows have less maintenance requirements than big cows
  
  • ~1 kg dry matter per 100 kg body weight
    • Corresponds to ~30 % of energy requirement
    • 0.18 €/kg DM

Maintenance in relation to NTM

• 3.2 €/ kg MBW
  
  • Genetic SD 5.3 kg MBW (Manzanilla Pech et al., 2016)
    • Reliability = 0.90
  
  • NTM value ≈ 1.6 €/index unit
Maintenance requirements

Require knowledge and data from:

- Body weight (heritability ~0.5)
- Correlated traits (genetic correlation >0.45)
  - Stature (heritability ~0.5)
  - Chest width (heritability ~0.3)
  - Body depth (heritability ~0.25)

Residual Feed Intake ~ Metabolic Efficiency (ME)

- The difference between observed and predicted energy requirement

Adapted from VandeHaar et al., 2016
Implications of Metabolic Efficiency

- Easy to identify efficient animals
- Independent of performance
  - No need for adjustment of economic values of other NTM traits
- Complicated trait to evaluate genetically
  - Caused by mobilization
Genetic evaluation of ME

- ME models often assume constant energy requirements per kg ECM across lactation
  - However, energy requirements per kg ECM change across lactation (Li et al., 2017)

Mobilization and ME

- Assuming energy equality is problematic, because:
  - Fat is the most energy efficient body reserve
  - Body reserves mobilized in different periods
  - Water is mobilized together with body protein (4:1)
Simulation study of metabolic efficiency

Results from simulation study

- The economic value of ME is approximately
  - 55.3 €/kg DM (per annual cow)
  - 0.17 €/SFU
  - Corresponds to applied average feed price (0.18 €/SFU)
Metabolic Efficiency in relation to NTM

- 0.18 €/ kg DM

- Genetic SD 206 kg DM in a lactation (Li et al., 2017)
  - Reliability = 0.60

- NTM value ≈ 2.9 €/index unit

Metabolic Efficiency requirements

- Accurate and high amount of feed intake records
  - Most likely from commercial farms – currently difficult to get!

- Energy requirement observations
  - Milk production, maintenance, mobilization, etc.
Conclusion

Saved Feed = Maintenance + Metabolic Efficiency

\[ 4.5 \text{ €/index unit} = 1.6 \text{ (37\%)} + 2.9 \text{ (63\%)} \]

≈ 40% of economic value for yield