Ability to digest explains part of between cows feed efficiency variability

A. Fischer, R. Delagarde, L. Denouel & P. Faverdin
Improving feed efficiency
More/equal production with less inputs... How?

Improving feed efficiency

Understanding underlying biological mechanisms involved in between cows feed efficiency differences
More/equal production with less inputs... How?

Improving feed efficiency

Understanding underlying biological mechanisms involved in between cows feed efficiency differences

Thermogenesis

Maintenance

Gestation

Digestion

Maintain Body Reserves

Lactation

Activity

Intake
Asked Questions…

Why do inefficient (efficient) cows need to eat more (less) than the efficient ones, for similar energy requirements?

**Hypothesis:**

*Within same diet*, cows are inefficient (efficient) because they digest less (more)

→ inefficients (efficients) need to eat more (less) for similar energy requirements
Are between cows feed efficiency differences determined by digestibility differences?
Methodology:
- Assessing individual DM digestibility
- Assessing feed efficiency with REI

Results: explaining REI with DM digestibility?

Conclusion
Assessing DM digestibility

Dry Matter Digestibility (DMd) = GP #qwdnh#

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Measuring feed efficiency

- Maintenance
- Maintain Body Reserves
- Lactation

Intake

Measured net energy intake

Expected net energy intake

Residual Energy Intake

Positive Difference

- Cow eats more than expected
- = less efficient than expected

Negative difference

- Cow eats less than expected
- = more efficient than expected
Measuring feed efficiency

- Maintenance
- Maintain Body Reserves
- Lactation

Intake

Measured net energy intake - Expected net energy intake = Residual Energy Intake

BW^{0.75} + Lactation requir. + EBWgain + EBWloss
Methodology:
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Results: explaining REI with DM digestibility?

Conclusion
Results: explaining REI with DM digestibility?

Method NOT accurate enough to assess real between cows DMd differences!

R² = 0.12
RSE = 0.62

Relevant with literature:
0.12 for Nkromah et al. (2006)
McDonnell et al. (2016)
Results: explaining REI with DM digestibility?

Identification
6% lowest digestibility (=4/60) 6% highest (=4/60)

3 cows probably inefficient because low DM digestibility

REI group
- a medium
- the_least_efficient
- the_most_efficient
Results: explaining REI with DM digestibility?

Lower digestion because of too high intake level?
Results: explaining REI with DM digestibility?

Lower digestion because of too high intake level?

3 cows with low DMd + high intake level

REI group
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CONCLUSION

- Difficulty to measure accurately between cows DMd differences for numerous cows
  - potential to combine several methods (NIRs, Yb): need for a huge calibration database
CONCLUSION

• **Difficulty to measure accurately between cows DMd differences for numerous cows**
  
  ➔ potential to combine several methods (NIRs, Yb): need for a huge calibration database

• **Some Inefficient COWS = low digestibility + high intake level**
CONCLUSION

• **Difficulty to measure accurately between cows DMd differences for numerous cows**
  
  → potential to combine several methods (NIRs, Yb): need for a huge calibration database

• **Some Inefficient cows = low digestibility + high intake level**

  ![Diagram](High intakes level ? Low DMd)

  **Coming soon:**
  **Effect of imposed intake level on feed efficiency?**
CONCLUSION

• Difficulty to measure accurately between cows DMd differences for numerous cows
  ➔ potential to combine several methods (NIRs, Yb): need for a huge calibration database

• Some Inefficient cows = low digestibility + high intake level

High intake level  ➔  Low DMd

Coming soon: Effect of imposed intake level on feed efficiency?