

Which model feeds best ?

Predicting metabolizable energy of herbage for ruminants

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Introduction

- Swiss nutritional requirements for dairy cows will be aligned to GfE (2023) recommendations in the next years
- Feed and ration evaluation for ruminants need to be updated accordingly
- Metabolizable energy (ME) of herbages is currently predicted based on organic matter digestibility (OMD) and crude ash (CA) and crude protein (CP) according to Agroscope (2017)
- In GfE (2023), ME is predicted according to a **3-step approach** as a function of gross energy (GE), OMD, CP and CA

Aim: Compare the 3-step approach for ME prediction of GfE (2023) and current Swiss approach, based on *in vivo* OMD values and chemical composition of dried, ensiled and fresh/frozen herbages

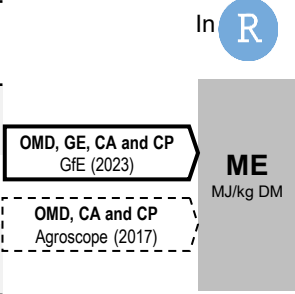
Material & Methods

Table 1 Summary (Mean ± SD, [min - max]) of the input parameters for predicting the ME value of herbages. Data were obtained from the SUPER.DIG database of Agroscope.

Item	n	DM %	CA g/kg DM	CP g/kg DM	GE MJ/kg DM	OMD %
Hay	106	88 [73-93]	105 ± 44 [55 - 281]	137 ± 41 [66 - 245]	17.4 ± 1.1 [14.1 - 19.5]	73 ± 6.8 [53 - 83]
Grass silage	23	32 [25 - 77]	91 ± 16 [62 - 127]	146 ± 35 [83-217]	18.0 ± 1.3 [13.6-19.6]	70 ± 7.2 [61 - 82]
Fresh/frozen herbage	35	21 [12 - 26]	112 ± 38 [70 - 220]	165 ± 50 [83-276]	17.1 ± 1.2 [13.2 - 19.2]	77 ± 5.1 [66 - 83]



n = 164 *in vivo* OMD determinations of herbages with wethers fed at energy maintenance level
Timeframe: 1996-2023



Results

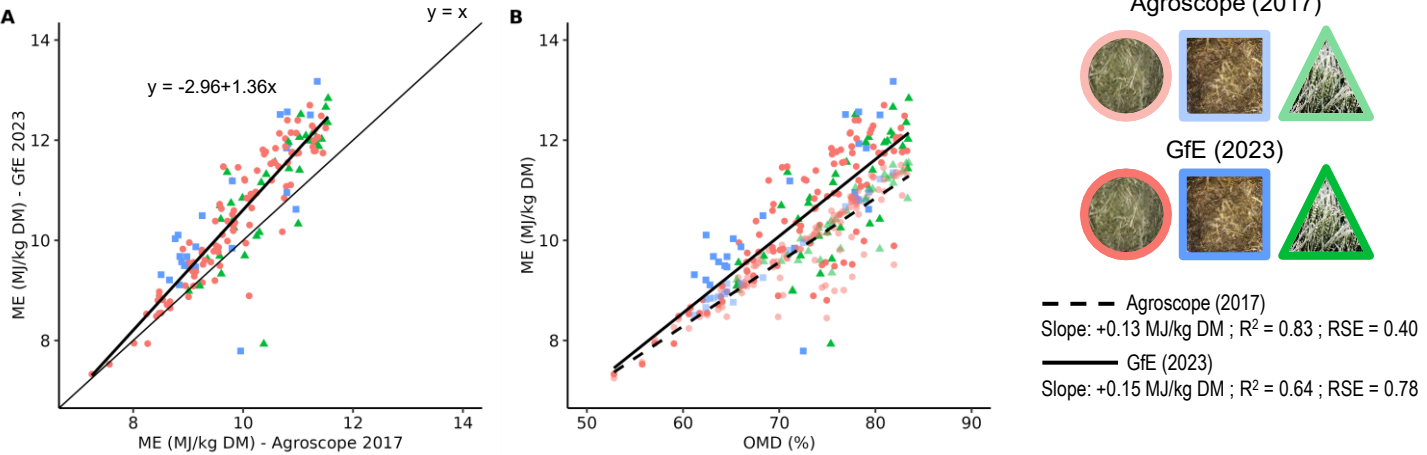


Figure 1 **A)** General relationship between metabolizable energy (MJ/kg DM) of herbages (n = 164) predicted according to GfE (2023) or Agroscope (2017) ; **B)** Metabolizable energy (MJ/kg DM) of herbages predicted according to Agroscope 2017 (---) and GfE 2023 (—) as a function of OMD (%).

Table 2 Summary (Mean ± SD, [min - max]) of predicted metabolizable energy values

Item	Hay	Grass silage	Fresh/Frozen herbage
ME _{Agroscope} MJ/kg MS	9.9 ± 0.96 [7.3 - 11.5]	9.7 ± 0.97 [8.5 - 11.3]	10.4 ± 0.80 [9.0 - 11.5]
ME _{GfE} MJ/kg MS	10.5 ± 1.3 [7.3 - 12.7]	10.5 ± 1.4 [7.8 - 13.2]	10.9 ± 1.2 [7.9 - 12.8]

Conclusions & Implications

Compared to Agroscope (2017), GfE (2023) overestimates the ME of herbages by 0.60 MJ/kg DM (mean bias error). This difference is more pronounced at higher OMD levels, such as early growth stages, where GfE (2023) predicts higher ME values. Regular determination of GE (calorimetry) and OMD (via enzymatic or *in vitro* methods) are required for precise evaluation of herbage energy value according to GfE (2023).

We acknowledge current and former colleagues at Agroscope, in particular Yves Arrigo, for conducting the digestibility experiments and updating the SUPER.DIG database.

References

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[2] Daccord, R., Arrigo, Y., and Chaubert, C. (2017): Formeln und Regressionsgleichungen. Fütterungsempfehlungen für Wiederkäuer (Grünes Buch), Chapter 15, Agroscope, Posieux.