

# Beyond milk: food conversion as farm efficiency indicator

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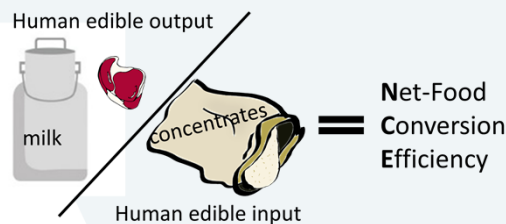
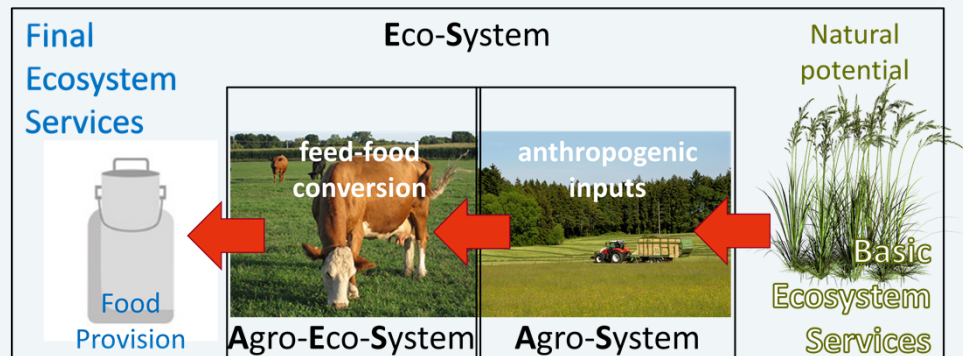
**Introduction:** Final Ecosystem services (ES, eg. food provision) reflect basic ES (e.g. plant growth).<sup>a</sup> External anthropogenic inputs should be deducted.<sup>b</sup> Only few on-farm indicators for ES are available.<sup>c</sup>

**Problem:** Often anthropogenic contributions are neglected and externalities shifted elsewhere (e.g. concentrates).<sup>c</sup>

**Hypothesis:** Mountain Farming optimizes the natural potential within the Agro-Eco-System and optimizes Net-Food Conversion Efficiency (NCE).<sup>d</sup>

**Method and data:** On 29 farms in the Austrian National Park „Kalkalpen“ NCE was calculated using the FarmLife LCA tool. NCE-ratio for energy (MJ) and protein (g) of the 29 trial farms is compared with FarmLife dairy- and suckler farms.

**Results:** In comparison with the Austrian sample, the median NCE of the 29 farms in the study region is 1.3 times higher.



$$\text{NCE} = \frac{m * DIAAS + c_e * DIAAS}{\sum_{i=1}^n f_i(p * q * DIAAS_i) + j_e}$$

m, c ... milk, carcass f ... feedstuffs  
e ... edible fraction p ... share of protein, energy  
j ... juvenile livestock q ... quantity of protein, energy  
DIAAS ... digestible indispensable amino acid score

**Conclusions:** We suggest to exclude AS-services (e.g. feed) from the list of ES, if they are incorporated into the end product (e.g. milk) and would otherwise result in double counting.

Results confirmed the contribution of Alpine grassland farming to an efficient conversion of natural resources into human digestible energy and protein.

**Sources:**

- <sup>a</sup> Schwaiger et al. (2011) Ökosystemeleistungen und Landwirtschaft. Erstellung eines Inventars für Österreich. Umweltbundesamt REP-0355.
- <sup>b</sup> Bethwell et al. (2021) Towards an enhanced indication of provisioning ecosystem services in agro-ecosystems. *Env. Mon. and Ass.* 193 (1), 269.
- <sup>c</sup> Huber et al. (2022) Economic value of three grassland ecosystem services when managed at the regional and farm scale. *Sci. Rep.* 12, 4194.
- <sup>d</sup> Ertl et al. (2015) The net contribution of dairy production to human food supply: The case of Austrian dairy farms. *Agr. Sys.* 137, 119–125.

50%  
of 29 farms  
produce the 4.8-fold  
of MJ input

| Unit         | Number of farms | NCE Energy MJ, -fold | NCE Protein g, -fold |
|--------------|-----------------|----------------------|----------------------|
| FL-dairy     | 478             | 3.6                  | 4.5                  |
| FL-suckler   | 32              | 3.6                  | 6.6                  |
| <b>FL-29</b> | <b>29</b>       | <b>4.8</b>           | <b>8.1</b>           |

Bottom 25% of 29 farms produce the 2-fold of MJ-input

Top 25% of 29 farms produce the 7-fold of MJ-input

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