



Maximizing forage performance to reduce concentrate feed – grass silage

Topic	Topic
Technical efficiency 	Economic resilience 

Background

Ruminants have a unique ability to convert fibrous feed materials into high quality milk and meat products thanks to the genius evolutionary development – the rumen. The rumen harbours fibrolytic microbes that allow utilization of e.g., grass that is not directly human edible. Grass cultivation provides many ecosystem services such as carbon sequestration, improved biodiversity, less erosion, capture of nutrients, better soil structure etc. Fibrous forages are natural feeds for ruminants and support the health of their digestive system. Typically grass based feeds are also cheaper than concentrate feeds. All these factors support high use of grass in the diets of ruminants, but it requires production of good quality grass-based feeds.



Silage quality is a function of raw material nutritional quality and ability to preserve that for animals

The chemical composition [ash, crude protein, water soluble carbohydrates and neutral detergent fibre (NDF)] and digestibility change dynamically during the growth of grass. The upper limit of the feeds is set by the timing of cutting the grass. At that point, preservation losses start, but with proper preservation techniques used, should be kept at minimum.

- 1. Raw material factors:**
- Grass species and variety
 - Age of the ley – winter damage, reseeding
 - Fertilisation and irrigation – more effect on yield than quality
 - Timing of harvest

- 2. Preservation factors:**
- Wilting – dry matter (DM) content varies widely and has huge impact of silage fermentation. Low water activity restricts fermentation, while high moisture may result in effluent production.
 - Machinery: chop length, maceration
 - Storage type: silos, towers, clamps, big bales...
 - Additive use: biological, chemical, none...

- 3. Silo management and feed-out**
- At ensiling: High hygiene, good compaction, no delays, prompt and proper covering of the silo
 - At feed-out: low aerobic microbes and air penetration to the silo, quick removal, even silo face

Substitution rate (SR) helps maximize grass silage use

SR tells how much voluntary forage intake reduces (in kg DM), when one kg of concentrate DM is added to the diet. On average the substitution rate is 0.5 meaning that increasing one kg DM concentrate decreases forage intake by 0.5 kg DM. But SR is not constant! It increases with increasing concentrate use and with improving silage intake potential. Both digestibility and fermentation quality contribute to silage intake potential – see the SDMI index box on the right. In practice, higher response is achieved to addition of concentrate, when the amounts used are small and silage intake potential is low. On the other hand:

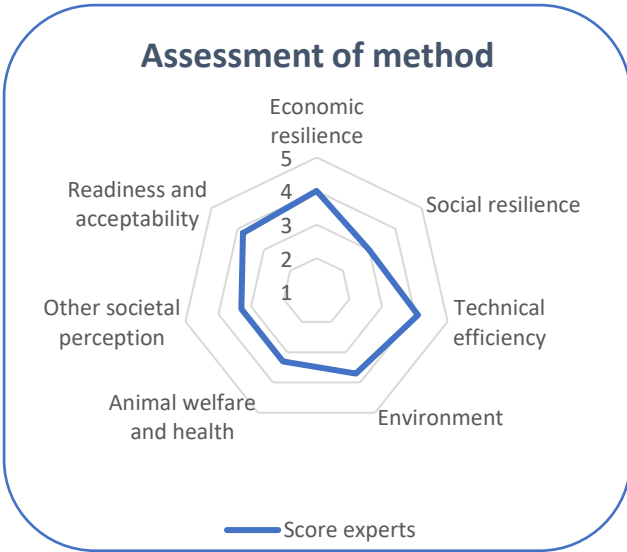
When grass silage is of high quality, good intake and production can be achieved with minimal concentrate input 😊

Silage DM intake index describes silage quality with a single number

The factors positively correlated with intake are: digestibility, DM concentration, inclusion of legumes or whole crop cereal silages. The factors negatively correlated with intake are fermentation acids, NDF, regrowth grass material. The result describes the relative intake potential of the silage compared to a “standard silage”. The standard silage has an index value of 100. One point difference indicates 1 % change in intake compared to the standard silage.

The index is based on a large literature data set and published: Huhtanen, P., Rinne, M. & Nousiainen, J. 2007. Evaluation of the factors affecting silage intake of dairy cows: a revision of the relative silage dry-matter intake index. *Animal* 1: 758-770. DOI: /10.1017/S175173110773673X

- In silage, look for:**
- Low pH relative to DM
 - Low proportion of ammonia N in total N
 - Low VFA's (volatile fatty acids), particularly propionic and butyric acids
 - High lactic acid : acetic acid
 - High energy = digestibility
 - Suitable CP content depends on context



Quote of the farmer:
“Set a target for grass silage quality, do everything possible to reach it, evaluate the results, adjust the ration, and learn lessons for next summer”