

Optimal concentrate supplementation for growing-finishing cattle

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Summary

- Comparisons of feedstuffs should be based on their net energy (and protein) values.
- Increasing the level of concentrates in the diet reduces forage intake and increases live weight and carcass weight gains, although at a progressively diminishing rate.
- Subsequent compensatory growth diminishes the advantage of concentrate supplementation of young cattle.
- High digestibility grass silage with moderate concentrate supplementation can sustain a large proportion of the cattle performance achieved on high concentrate diets.
- Feeding management is especially important when feeding concentrates *ad libitum*.

Introduction

The comparatively lower cost of efficiently produced grazed grass, and to a lesser extent grass silage, as feedstuffs dictates that maximising their proportion in the annual feed budget is central to sustainable beef production systems. Although grass-based animal nutrition is fundamental, feeding concentrates is a key component of beef production systems, especially during the indoor winter period and with finishing systems, but also at pasture, mainly in autumn. The role of concentrates is to make up the deficit in nutrient supply from forages in order for cattle to reach performance targets. Indeed, in situations where there is a shortage in winter supplies of forage, it may be better to buy concentrates and feed less forage than to purchase expensive low-quality forage. Comparisons of feedstuffs should always be based on their net energy (and protein) values on a dry matter (DM) basis. It is important to ensure that adequate levels of an appropriate mineral/vitamin mix are included in the ration.

Feeding concentrates: key principles

Dry matter digestibility (DMD) is the primary factor influencing the nutritive value of forage and, consequently, the performance of cattle. Low DMD forage means higher levels of concentrate supplementation have to be used to achieve the same growth rates or performance (Table 1). Increasing the level of concentrates in the diet reduces forage intake (substitution rate) and increases live weight and carcass weight gains, although at a diminishing rate. Production response to concentrate supplementation is higher with forages of lower DMD and greater in high growth potential animals. Animal response to concentrate supplementation at pasture primarily depends on the availability and quality of pasture and level of supplemented concentrate. Increasing concentrate supplementation reduces the importance of forage nutritional value, especially so when feeding concentrates *ad libitum* (to appetite). The optimal level of concentrate supplementation primarily depends on animal production response (kg gain/kg concentrate), forage substituted and the relative prices of animal product and feed stuffs.

Weanling cattle

To minimise feed costs and exploit subsequent compensatory ("catch-up") growth at pasture during the following grazing season, live weight gains of 0.5-0.6 kg/day through the first winter are acceptable. Due to compensatory growth, there is little point in over-

feeding weanlings during the first winter. However, cattle growing too slowly during winter will not reach target weights. Target animal performance level can be achieved on grass silage supplemented with concentrates as outlined in Table 1.

Finishing cattle

Efficiency of feed utilisation by finishing cattle primarily depends on the weight of animal (decreases as live weight increases), potential for carcass growth (e.g. breed type, gender, compensatory growth potential) and duration (decreases as length increases) of finishing period. Even high quality grass silage is incapable of sustaining adequate growth rates to exploit the growth potential of most cattle so concentrate supplementation is required. Each 1 percentage unit decline in DMD of grass silage requires an additional ~0.33 kg concentrate daily to sustain performance in finishing cattle. Concentrate supplementation rates for finishing steers to achieve ~1.0 kg live weight/day with grass silage varying in DMD are shown in Table 1. For finishing heifers (lower growth potential) daily supplementation is reduced by about 1.5 to 2.0 kg and for finishing bulls (higher growth potential) rates should be increased by 1.5 to 2.0 kg. Where silage DMD is poor (e.g. 60%) and/or in short supply, and animal growth potential is high, feeding concentrates *ad libitum* should be considered. However, when feeding concentrates *ad libitum*, particularly cereals, there is a risk of acidosis. Therefore, it is critical to ensure; (i) gradual adaptation to concentrates, (ii) minimum roughage inclusion (~10% of total DM intake) for rumen function, (iii) meal supply never runs out, and (iv) a constant supply of fresh water is provided.

Table 1 — Concentrate supplementation (kg/day) necessary for weanlings to grow at ~0.5 kg and for finishing steers (600 kg) to grow at ~1.0 kg, live weight/day when offered grass silage of varying dry matter digestibility (DMD) to appetite

Grass silage DMD (%)	60	65	70	75
Weanlings	2.0-3.0	1.5-2.0	1.0-1.5	0-1.0
Finishing steers	–	7.0-8.0	5.5-6.5	4.0-5.0

Concentrate type

Cereals are a primary component of cattle rations. Studies at Grange showed that carcass weight gains and feed conversion efficiency to carcass gain were similar between rolled barley and wheat offered as supplements to grass silage. In addition to cereals, a wide variety of other feed ingredients are available. Grange research has shown that cattle offered concentrates formulated to have similar energy and protein levels but contrasting feed ingredients had similar intake, growth, feed efficiency and carcass traits. Ingredients ranged from rapidly fermented starch (barley-based), to slowly fermented starch (maize-based), to rapidly fermented starch + fibre or fibre only (pulp-based) and, were offered either as a 5 kg/day supplement to grass silage or *ad libitum* (plus 5 kg fresh weight grass silage daily). Comparable findings were also obtained with grazing cattle. This means that net energy (and protein) levels of beef rations are more important than ingredient content *per se*.

Protein supplementation

Weanling and finishing, steers and heifers generally do not require protein supplementation when fed barley-based concentrates and high DMD grass silage but, for suckler bull weanlings, recent research at Grange showed a significant, but small, response to protein supplementation. However, all cattle are likely to respond to supplementary protein in barley-based concentrates when grass silage has moderate to low DMD and/or low protein content, especially weanlings and young bulls.