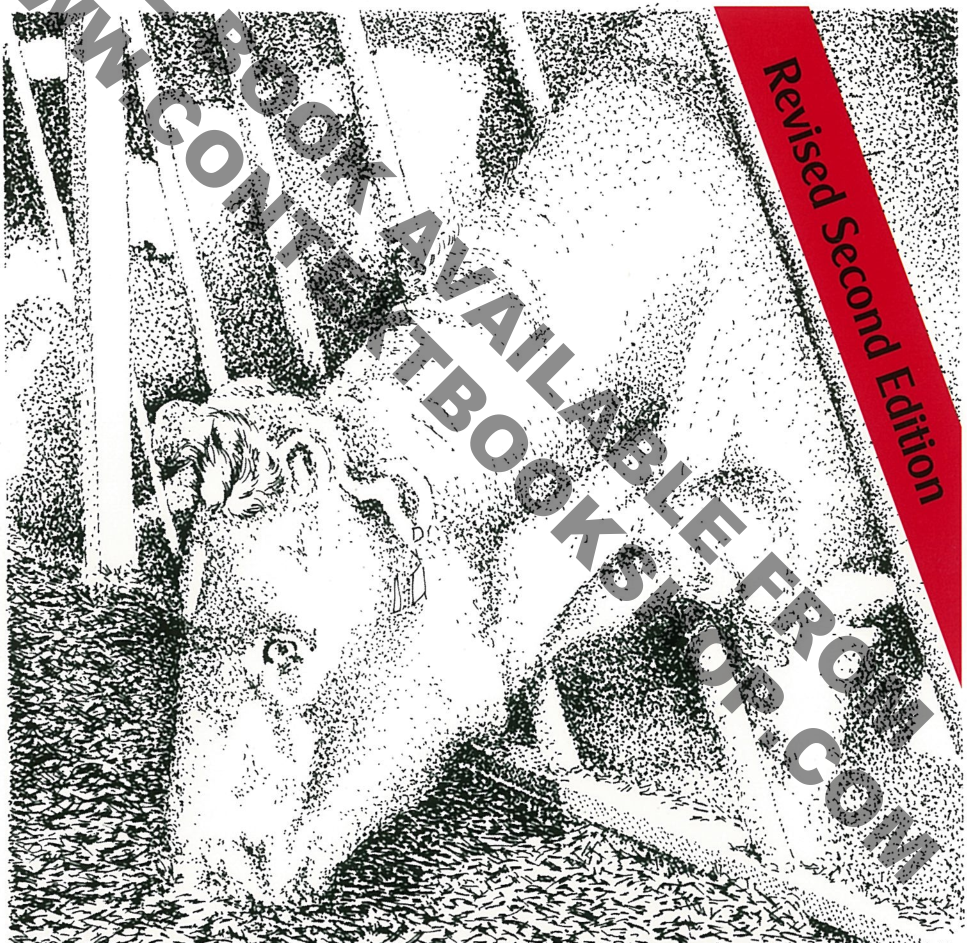
RATIONING BEEF CATTLE



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Chapter 1

Cattle Performance

Narrow profit margins and increasingly demanding market specifications make it imperative to set performance targets for the various categories of cattle. Only then can rations be designed that allow production, marketing and financial targets to be met. This chapter presents performance standards for growing and finishing cattle, replacement heifers and beef suckler cows.

FINISHING CATTLE

The objectives in setting performance targets for finishing cattle are to decide on the slaughter date and weight, the consequent level of daily gain required and the duration of the feeding period. These pieces of information are a pre-requisite of rationing and feed budgeting.

The best information on which to base performance targets is previous experience with the same category of cattle on the farm. Look through sale returns to find out what liveweights and carcase weights at sale were achieved and whether the EU fat classes[1] were within the buyer's specification. If possible, from a known start weight calculate the daily gain achieved and the average duration of the feeding period. This information can then be used to help set targets for the present batch of cattle.

In the absence of previous experience of the type of cattle, use as an approximate working guide the slaughter weight/slaughter age graphs in Figure 1.1 to set performance targets. It is much easier to work with age as a reference now that all cattle in the UK have official passports stating date of birth.

1 In the EU scheme carcases are classified on a scale 1 (leanest), 2, 3, 4L, 4H, 5L, 5H (fattest). Most buyers prefer fat classes 3 and 4L which correspond to a back fat thickness of about 3 mm and 4 - 5 mm, respectively.

Chapter 2

Feed Intake

The pieces of information needed to devise a ration are the dry matter (DM), metabolisable energy (ME), and crude protein (CP) values of the ration ingredients, ME and protein requirements and feed intake. Feed intake is afforded less attention than it needs and accurate rationing is undermined more by poor predictions of intake than anything else.

AFRC (1993) presented a series of equations for the prediction of dry matter intake (D MI) in lactating, pregnant and growing cattle. Those for rations based on grass silage and fed to growing cattle are not very accurate. Equations for milking cows are not really applicable to suckler cows fed very different rations.

Through the 1990s a good deal of research has been carried out on factors affecting silage intake, notably at the Scottish Agricultural College (SAC) and the Agricultural Research Institute for Northern Ireland (ARINI). Some silage analyses use this research to give an indication of intake potential. At ARINI intakes were recorded in growing cattle for a large variety of grass silage samples collected from commercial farms. The results have been used as a basis for the guidelines on grass silage intakes in Table 2.1 (personal communication from Dr Raymond Steen). Liveweight, breed type, sex category, body condition, forage quality and the amount of concentrate fed interact to determine feed intake.

GROWING CATTLE

As cattle grow heavier they eat more feed but there is a decline in intake as a percentage of liveweight. On mixed rations of forage and concentrate the traditional guideline is a daily DMI of about 3 per cent of liveweight at 100 kg, falling to 2.5 per cent at 300 kg and 2 per cent or less at 600 kg. It is very unreliable as a predictor of feed intake.

Chapter 3

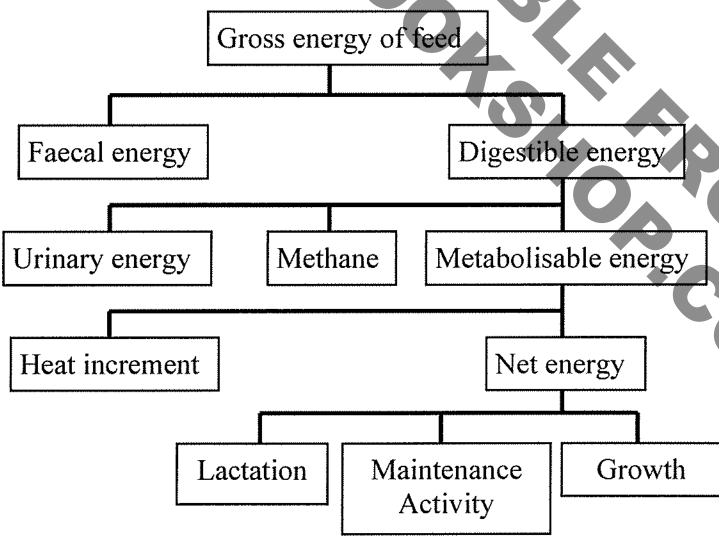
ME Requirements

METABOLISABLE ENERGY

Metabolisable energy (ME) is the unit of energy used in the UK ruminant rationing system and many others world wide. It is the energy circulating in the bloodstream after losses from the gross energy of the feed from indigestible faecal energy, methane gas from the rumen and energy in the urine (Figure 3.1). Work done on the ME preparing it for use in body functions results in a further loss of energy called the heat increment. The net energy that is left is available for body maintenance, physical activity, growth and milk production.

Using ME as the basis of a rationing system for cattle depends on evaluating the ME contents of feed ingredients, expressed as megajoules (MJ) of ME per kg DM, and establishing daily ME requirements to support target levels of performance.

Figure 3.1 Partition of feed energy



Chapter 4

Protein Requirements

Energy rightly holds centre stage in rationing because it is the driving force for growth. Yet it is dietary protein that provides the building blocks for lean meat production. Moreover, unless the energy in the diet is correctly balanced with protein, minerals and vitamins, utilisation of the whole ration is impaired.

PROTEIN DEGRADABILITY

Protein nutrition is more complicated in beef cattle than in simple-stomached animals such as the pig because of the part played by the rumen in protein utilisation. The microorganisms in the rumen have a protein requirement of their own which must be met by effective rumen degradable protein (ERDP) which replaces the former term rumen degradable protein (RDP). The dietary protein is first degraded to ammonia and then built into microbial protein. It follows that the microorganisms also have the important capacity to turn non-protein nitrogen (NPN) sources such as urea into microbial protein. To do this they need to be provided with an energy source to fuel their metabolism and a small quantity of sulphur which is incorporated into some of the amino acids of microbial protein.

Not all feed components are fermented in the rumen and some of those that are do not supply energy to the microorganisms, though they provide nutrients to the host animal when digested in the lower gut. In particular, fats and protein itself yield negligible energy to the microorganisms and the organic acids in silage and ensiled brewers grains yield none at all.

The most important sources of fermentable energy for the rumen microorganisms are starches, sugars, celluloses and hemicelluloses.

Chapter 5

Vitamins and Minerals

Adequate levels of essential vitamins and minerals are just as important to cattle performance as the energy and protein of the diet. Indeed in cases of deficiency performance may be completely disrupted or the cattle may die. Allowances presented here are based on the recommendations of MAFF *et al* (1984).

VITAMINS

Once rumen function is established cattle become largely independent of B vitamins, though rumen synthesis may be impaired unless the cobalt level of the diet is at least 11 mg per kg DM (parts per million – ppm).

Cattle fed green feeds and exposed to sunlight are usually well supplied with the major vitamins A and D. However, the requirements of housed cattle must be met and allowances for growing cattle and suckler cows are presented in Table 5.1.

The vitamin A allowances are lower than former estimates which were considered by MAFF *et al* (1984) to be over-generous.

Further, to guard against the remote possibility of pregnant women ingesting toxic levels of vitamin A, a voluntary code has been agreed which limits inclusion rates to not more than 12000 international units (iu) per kg in concentrates for growing cattle and 10000 iu in concentrates for milking cows.

For home mixing of concentrates it is only necessary to include a vitamin supplement for calves or where housed cattle are fed high concentrate mixes, *eg* in cereal beef production.

1 kg concentrate DM supplies	13.3	MJ ME
Less reduced forage DMI	0.5	kg
@ 11.0 MJ ME/kg DM =	5.5	MJ ME
Net value of 1 kg concentrate DM	7.8	MJ ME/kg

(i) Daily concentrate requirement

Work out the daily concentrate DM requirement simply by dividing the ME shortfall from forage alone (g) by the net value of 1 kg concentrate DM. Then the ME provided by the concentrate allowance is DM multiplied by its actual ME content from (b).

Shortfall(g) 10 MJ ME ÷ Net value (h) 7.8 MJ ME/kg DM
= 1.3 kg concentrate DM x 13.3 MJ ME/kg DM(b)
= 17 MJ ME/day

(j) Actual forage intake

Calculate the ME that needs to be supplied by the forage and the resulting DMI.

ME requirement (d)	97	MJ ME/day
Less concentrate ME (i)	17	MJ ME
= Forage ME required	80	MJ ME/day
÷ Forage ME/kg DM (b)	7.3	kg DM/day

(k) Check actual M/D

Check that the predicted M/D (c) is within 0.5 of the actual value. If not, go back to step (c) and use the value calculated here to look up a new ME requirement and recalculate steps (d), (g), (i) and (j).

Feed ingredient	DMI(kg DM/day)	ME(MJ/day)
Silage	7.3	80
Rolled Barley	1.3	17
Totals	8.6	97

Actual M/D is total ME intake ÷ total DMI
= 11.3 MJ ME/kg DM
Predicted M/D (c) 11.0 MJ ME/kg DM OK?

acid or effective inoculant additive is an aid to good fermentation and suppresses undesirable fermentation that spoils silage. Many farmers routinely as an insurance policy.

Some well made silages have very low pH values (3.5 to 4.0) which cattle may find unattractive and which can cause acidosis. It may be necessary to supplement acid silage with a buffer such as sodium bicarbonate.

A problem with grass and maize silage is spoilage at the face due to aerobic secondary fermentation. It is worst in warm weather. It helps if silage clamps are narrow and a block cutter is used to remove silage so that the face stays compacted.

It is notoriously difficult to make good quality hay over 80% DM unless there is a prolonged hot, dry spell of weather. Heavy first cuts are a particular problem. With damp hay moulding is a problem which reduces intake and may cause health problems in cattle and stockworkers alike. Many farmers who used to make hay have switched to big bale silage.

Straw for feeding should be baled and carted while it is dry and bright in colour so that it does not become musty. If the straw is to be treated in a stack with ammonia, it is best carted soon after harvest when the weather is still warm and the reaction works well. Feed grain stored at 85% DM is likely to shatter when rolled, producing an undesirable dusty feed. Rolling works best with moist grain stored in a tower or treated with propionic acid.

It is sensible with purchased concentrates to take advantage of cheaper bulk delivery. The feed might be stored in a grain trailer not needed for transport over the winter. If the feed has to be stored on the floor, it is wise to take the smallest discounted delivery. The concentrate needs to be kept dry and spoilage by birds and rodents prevented.

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