

Beef Finishing Nutrition

Simon Marsh, Beef Cattle Specialist, Harper Adams University

Once having grown adequate frame on a beast, the finishing period should last 90-120 days with target DLWG's of 1.1-1.5kg to produce the maximum fleshing possible, with a good finish (fat class 3-4L) to maximise carcass weight, grade and kill out percent. The exception to this short finishing phase are of course dairy bred bulls and weaned suckled calves that are intensively finished post weaning.

Finishing cattle are invariably heavier than growing cattle, with a reduced appetite in relation to body weight. Rapid live weight gain requires feeding high cereal based rations since high starch levels can promote fast weight gains, fat cover and more efficient FCR particularly in the larger framed, more difficult to flesh cattle. Typical ration guidelines are shown in table 1.

Table 1. Ration guidelines for finishing cattle

Nutrients in total ration DM		Comments
DMI (% live wt)	1.7-2.0%	Influenced by access, freshness and palatability
DLWG	>1.1kg	Can be over 2kg with compensatory growth
ME (MJ/Kg DM)	>12.2	Starch drives high DLWGs
Starch & Sugar	> 33%	Manage carefully to avoid acidosis
Crude Protein	12-14%	Higher levels required for continental bulls and heifers
Long fibre	>10%	Don't rely on bedding to supply this
Oil	<6%	Can depress intakes. High in distillery products

(Source: Adapted from AHDB BRP Manual 7)

Management

The basic principle to optimize profitability with finishing cattle is to maximize the inclusion of home grown feeds whether this is cereals and/or high quality forage, or cheap high energy co-product feeds. I have always been a proponent of 'feed what you grow'. The transition phase from a growing to finishing ration is one that should be very carefully managed and in the early phases *ad lib* long fibre ideally from silage should be provided. Cattle coming off grass into a finishing unit need very careful management. Always make any ration changes gradually over a 7-14 day period. Having a feeder wagon is not a prerequisite to maximize performance. Below I will draw on a lot of research work carried out at Harper Adams University on finishing rations for beef cattle. Most of the trial reports from these studies are available on the NBA website (go to Resources>Technical Information>Beef Nutrition).

Energy

Starch is the key driver of DLWG since this promotes the production of propionic acid (a volatile fatty acid) in the rumen which is more effective for growth and fat deposition compared to energy sources from digestible fibre which result in higher acetic acid production. Processing of the cereal is a major consideration which influences target starch content of the diet. Ideally

the cereal grain should just be lightly cracked. With compounded feeds when cereals are milled, starch content is usually capped at about 30% whereas we have looked at home mix blends based on rolled barley containing 45% starch without any issues. Too much readily available starch causes acidosis which will cause abscessed livers. Ask your abattoir for some feedback on the status of your cattle livers which is an easy way to know if you have acidosis or sub-acute rumen acidosis (SARA).

At Harper when we replaced barley with oats we recorded a deterioration in performance and the inclusion of oats could only be justified if it was £50/t cheaper than barley. However the inclusion of a small quantity (10-15%) of oats can be justified with very high starch rations to 'take the heat out of the ration'. Alternatives to oats are beet pulp, citrus pulp, soya hulls and Nutritionally Improved Straw (NIS).

We have fed 100% wheat to bulls and despite its very high starch content (69% v 59% for barley) found no improvement in performance when in theory cattle should have performed better. In fact performance was slightly worse since wheat goes 'glutenous' in the rumen and causes more issues with acidosis. We have however fed cattle with 100% wheat as the cereal source with 10% NIS in the ration and cattle have performed well.

The best performance we have ever had is with crimped maize grain. This is 'rocket fuel' for finishing cattle. Maize grain has a higher level of starch than barley (71% v 59%) but more importantly a higher proportion of the starch is by-pass starch (35% v 15%) which minimises acidosis problems. Disappointingly in a recent study when we replaced 20% of barley with dried maize meal we didn't see any significant effect on performance.

Protein

Crude protein requirements are determined by the animal's genetic potential. Intensively fed continental bulls will require more CP than steers and heifers. Theoretical protein requirements are based on AFRC 1993 which determined protein requirements from feeding studies carried out in the 1970's and 80's. As you are aware the genetics of our cattle have significantly improved over the last 30-40 decades and there are concerns that the theoretical protein requirements are too low, especially with young fast growing cattle.

With regards to protein quality in a ration the first requirement is of course to satisfy the rumen degradable protein requirements of the beast. I always like to see at least 2 different protein rich feedstuffs in a ration in case there is an issue of protein quality with one of the feeds. Soya is the 'gold star' protein source (47-52% CP in DM) and its inclusion in a ration would allow maximum inclusion of home grown cereals. It also has the highest level of by-pass protein but this is less critical for finishing cattle with the exception of high genetic merit intensively finished weaned suckled bulls. Some cost effective protein rich feeds are distillers (26-32%CP) and rape (39%CP). Linseed meal (35%CP) contains high quality protein and is renowned for putting a bloom on

the coats. Peas (24%CP) and beans (29%CP) can be home grown to follow the mantra of 'feed what you grow'. The issue with lower protein feeds is that you have to include a relatively high quantity to get a decent lift in protein percent. Beans at up to 30% of the diet have been fed. Do not discount a small inclusion of feed grade urea (280% CP) but its inclusion must be limited to a maximum of 1% in a barley based home mix fed *ad libitum* and introduced gradually. We have also evaluated protected protein sources at Harper and only found benefits in performance with young (3-6 month old) continental bulls.

We have recently compared feeding 12.5% versus 16% CP (in the DM) rations for 300kg maize silage fed continental heifers and found a significant response in performance. When we compared 14% versus 16%CP (in the DM) with barley fed continental dairy bred bulls we again recorded a significant response in performance. However when we compared 14% versus 16% versus 18% CP (in the DM) with Holstein bulls the performance deteriorated with increasing protein. It was assumed that surplus protein was supplied for this breed type and that cattle were using energy getting rid of this excess protein. Please note that 14% in the DM is equivalent to feeding a 12% 'as fed' beef ration on a barley beef system.

What does need to be urgently investigated is the protein requirements for weaned high genetic merit suckler bred bulls growing at 1-6-2.0kg per day from weaning to slaughter. The 'text book' is way out of date for these cattle!

Forage

High quality forage can replace some concentrates and this forage can be maize, grass, whole crop or red clover and producers should focus on growing the crop with the highest dry matter and ME yield on their farm. I've heard numerous anecdotal comments on the performance of cattle on red clover silage and this needs investigating. The key is that the forage must be well made and high in ME, ideally above 11.5ME. An article in the autumn 2018 edition of the Beef Magazine details the results of our recent trial intensively finishing weaned South Devon steers and highlights the major financial benefits that can accrue with replacing concentrates with top quality forage. Poorer quality forage can of course be fed with systems with high cereal feed rates to provide that scratch factor. Ad lib cereal diets will need at least 10% of the DMI as forage and finishing rations with above 25% forage will be a lot healthier for the cattle and minimise acidosis.

Will a TMR fed via an expensive feeder wagon give improved performance? There is a lot of anecdotal evidence with some supporting evidence from research work that it can. However there are a number of producers that achieve very good performance without a feeder wagon. Also in a study with 540kg continental grass silage fed bullocks carried out by Teagasc 7kg of concentrates were fed either as in a TMR or trough fed as one feed. The latter goes totally 'against the text book' of a maximum of 0.5kg of concs per 100kg live weight in one feed. There were no significant differences in performance! I

am a firm believer that producers must minimise investment in machinery. All it does is burn fuel, rusts and depreciates.

Moist/Co-product Feeds

There are a number of very good co-product feeds on the market with high energy values and some also with decent protein levels as well. Some also have very high starch levels such as potato and bread waste but since they have been processed need to be fed with care to avoid acidosis. We have evaluated co-product blends of Traffodgold/bread/beet pulp and Pressed pulp/distillers and the studies showed either similar or improved performance compared to an *ad lib* barley based ration. Full details are on the NBA website. One of the main issues of co-product feeds is storage and potential waste. In a study carried out a number of years ago by the SAC it was found that losses can be as high as 20% with draff that wasn't correctly ensiled. You must also take into consideration the cost per tonne of dry matter and also per unit of energy and protein. Co-products will always be cheaper per tonne on a fresh weight basis since they can contain 50-75% water! Unfortunately some co-products are short in supply due to the growth of AD plants and continuity of supply is crucial for consistent rations. I would also advise consulting an experienced nutritionist who should be able to formulate a balanced ration.

Feed additives

There is a lot of published work on feed additives, especially yeast cultures. We have carried out 5 trials with yeasts, 2 worked and 3 didn't. The 2 that worked were with a live yeast (Yea-Sacc¹⁰²⁶) and a dead yeast (Diamond V XP_Ls) and both were fed in a home mix. The 3 trials that didn't work involved a live yeast included in a compound feed. I would suggest that the heat process involved in making the compound feed denatured the yeast i.e. killed it! Some yeast manufacturers now claim that their yeast will survive the heat of processing. With regards to yeasts make sure you check the strength (cfu's/g), inclusion rate and subsequent feed rate per head per day and that the yeast has not been 'pepper potted' into the ration. We have also evaluated essential oils (CRINA) and a buffer (Acid Buf) and both improved DLWG and reduced days to slaughter in barley beef rations. Be aware that the inclusion of an additive (at its appropriate rate) can increase ration costs by £5-7/t. It would be great if we could bring back Romensin. It was 'as cheap as chips', worked virtually every time by shifting VFA production to propionic and reduced methane production which would help reduce global warming by the cattle industry, but sadly I can't see it coming back. Romensin is still of course widely used in other parts of the world, especially the USA so giving us a marketing edge over American beef as British beef is additive (and hormone) free.

For further information on the results from the Harper Adams beef unit as well as other beef research centres go to the NBA website (go to Resources>Technical Information>Beef Nutrition).



Picture above left: Simon Marsh



Picture above right: Healthy liver (score 1) on the LHS. Badly abscessed liver (score 5) due to acidosis on the RHS