Maize in beef systems

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Summary

- Good quality maize silage is ideal for finishing beef cattle and rations need to be supplemented with adequate levels of ERDP. Bulls and steers can be successfully finished on *ad lib* maize silage and just 2.5-3kg of 20% CP concentrates.
- Continental heifers can be successfully finished on just maize silage with 1-1.5kg of a 35% CP supplement. Native breed types will benefit from mixing maize silage with some lower ME forages.
- Trials replacing grass silage and whole crop with maize showed improved performance, however most of these studies involved feeding medium quality grass silage.
- Some cereals in barley beef rations can be replaced with good quality maize silage. Only replace cereals in these systems once the bulls are 6-8 months old.
- Give serious consideration to feeding grain maize to finishing beef cattle - if it can be successfully grown. It is 'rocket fuel for bulls'!
- It is hard to justify feeding maize silage to store cattle and dry sucklers. It can have a place in rations for lactating sucklers.

Maize silage for beef cattle

Maize silage is a proven forage across most of Europe, either to complement grass, wholecrop silage, or fed exclusively. Good quality maize silage with dry matter and starch contents of 30-32% offers the opportunity to maximise performance and improve margins. Such high starch contents results in a forage with an ME of 11.0+ MJ/kg DM and with 30-35% of the starch being slowly degraded this minimises issues with acidosis. However, maize has a low protein (8-9% in the DM) content and therefore needs supplementing with a protein source to supply high levels of effective rumen degradable protein (ERDP). Suitable sources of ERDP include rapeseed meal, pot ale syrup, distillers grains or feed grade urea. The latter should be accurately fed and mixed into the ration, ideally in a TMR, and fed in relatively small quantities i.e. up to 100g/h/d. Seek professional nutritional advice.

Maize silage for finishing cattle

Maize silage is widely regarded as an ideal forage for finishing beef cattle. Maize silage is commonly used in Northern Europe to fatten young bulls and the simple 'recipe for success' is feeding 3-4kg/h/d of an 18% CP compound with good quality maize silage. Old rationing text books used to recommend feeding just 1.5kg/h/d of a 35% CP concentrate with maize. This ration however would have similar feed costs to the former, due to the high price of protein straights compared to cereals. Feeding a small quantity of a high protein concentrate would however work well with finishing continental bred heifers resulting in DLWGs of approximately 1.0kg. With the majority

of native breeds, especially heifers, mixing maize with a lower quality forage will prevent early fat deposition.

Finishing steers and heifers require a diet containing 12-14% CP (in the DM). Young bulls from 3 to 6 months old require 16-19% CP. Heaver/older bulls have a reduced requirement for protein and the CP of the diet can be lowered to 14% and 17% in the DM for Holsteins and Continentals respectively.

A study was recently conducted at Harper Adams University with diets containing either 75% maize:25% concentrates or 50% maize silage:50% concentrates on a dry matter basis fed to 225kg Holstein bulls (Marsh, 2011). The bulls on the 75% maize ration were fed the equivalent of 2.5kg/h/d of a 22% CP concentrate. The bulls on the 50% maize ration were fed the equivalent of 5.4kg/h/d of a 15% CP concentrate. The maize silage contained 34% DM and 31% starch. As shown in table 1 there were no significant differences in performance. The bulls were approximately 1.5 months older at slaughter compared to Harper Adams intensive cereal fed bulls with a 10kg heavier carcase weight. With an average age of 15.2 months some bulls in a batch/pen may therefore be over 16 months old which would be penalized by most abattoirs.

Table 1 Effect of concentrate feed level on the performance of maize silage fed bulls

	75:25	**50:50**
Slaughter wt (kg)	587	585
DLWG (kg)	1.32	1.33
Carcase wt (kg)	295	296
Age at slaughter (months)	15.3	15.2

(Source: Marsh, 2011)

Replacing alternative forages with maize silage

Work by Browne *et al.,* (2000), Keady and Kilpatrick (2004), Walsh *et al.,* (2005), Keady and Gordon (2006) and Keady *et al.,* (2007) found that the replacement of grass silage and/or whole crop with maize silage with finishing beef cattle significantly improved performance. However when looking closely at the results consideration needs to be given to the actual qualities of the forages used in the experiments. In most cases medium quality grass silage was replaced with good quality silage so the improvement in performance with maize was not unexpected. The study by Keady and Gordon (2006) also looked at replacing grass silage with low dry matter/starch maize silage (22% DM & 8% starch) and unsurprisingly there was no improvement in performance!

Replacement of cereals with maize silage

There has been some work carried out in the UK on the replacement of cereals with maize silage on barley beef systems. Work by Chapple *et al.,* (1999) at ADAS Rosemaund with British Blue cross bred bulls evaluated cereal based diets containing 20%, 40% or 60% good quality maize silage on a dry matter basis and found no significant difference in DLWG, slaughter weight, carcase weight or dressing proportion. The results in table 2 clearly highlight the benefits of feeding some good quality maize.

Table 2 Replacement of cereals with good quality maize silage

	100% Cereal	80% Cereal 20% Maize	60% Cereal 40% Maize	40% Cereal 60% Maize
DLWG (kg)	1.66	1.54	1.52	1.53
Carcase wt (kg)	301	296	295	304

(Source: Chapple *et al.,* 1999)

If the decision is taken to feed some good quality maize silage to young bulls, still continue to feed *ad lib* cereals to cattle up to 6-8 months of age. Bulls from 3 to 8 months old will typically record a DLWG of 1.5-1.7kg with an FCR of 3.5:1 which is very cost effective, even at times of high cereal prices, and will get them to a size to utilise and cope with a forage based diet.

Growing cattle and dry suckler cows

The ME levels in good quality maize silage are too high to be fed *ad lib* or as the sole forage to store and growing cattle. However if it is available and has to be fed then it will need to be incorporated in a mixed forage diet or straw based ration formulated to provide sufficient crude protein (15-16% CP for growing cattle, 8-10% CP for dry suckler cows).

Lactating suckler cows

Maize can form a substantial part of a diet for autumn and late winter calved suckler cows with calves at foot, in early-mid lactation. During this phase, nutritional demand is high, virtually double that of a dry cow, and maize can provide a useful source of energy. A 650kg suckler cow that is 6 week calved requires approximately 140MJ ME in a diet containing at least 12% CP.

Grain Maize for finishing beef cattle

In areas of the country where grain maize (not maize silage) can be successfully grown it should be given ‘serious consideration’ by beef finishers. In 2010 at Harper Adams University we finished some bulls on grain maize and recorded our best ever finishing performance. Grain maize is ‘rocket fuel’ for bulls!

The study at Harper Adams involved finishing 360kg dairy-bred bulls, replacing a home mix based on on rolled barley with grain maize (Marsh *et al.,* 2011). Both rations contained 14%CP in the DM. Finishing bulls on grain maize resulted in increased daily live weight gains (1.51 v 1.34kg) with bulls sold 13 days sooner with an improved FCR (4.98 v 6.59:1). The bulls fed grain maize recorded lower liver damage scores. Liver abscesses are associated with mild acidosis from feeding high starch based diets. It could be assumed that the reduced incidence of liver abscesses was due the higher proportion of by-pass starch in grain maize. It is suggested that the improved performance with the grain maize fed bulls could be due to improved efficiency of energy utilisation together with a reduced incidence of rumen acidosis.

The bulls fed grain maize recorded an increased margin over feed costs worth £32 per head with a 10.4% reduction in feed costs per kg gain based on the costs

prevailing at the time of the study. If grain maize had been grown without the use of plastic mulch the margin over feed would have increased to £57 per bull.

Grain maize offers significant potential to improve cattle performance, reduce feed costs and increase margins **provided good** (10t/ha @ 65%DM) crops can be grown. If grain maize cannot be grown it could be assumed that similar effects would be seen by including maize meal (dried) in cereal beef diets to improve DLWGs and help put flesh (fat cover) on Holstein and Continental x bulls.

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