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**Animal Science Research Centre - Beef Unit Trial Results – 2015 (a)**

**Evaluation of 12% and 14% crude protein rations for 300kg intensively finished  
Continental dairy-bred bulls**

**Introduction and Objective:**

There is increasing concern that the stated energy and protein requirements for beef cattle (AFRC, 1993) are now underestimated for today's modern high genetic merit beef cattle, especially for young fast growing intensively fed bulls. The current recommendation for the crude protein (CP) content of cereal based rations for young bulls from 3 to 7 months old is 140g CP/kg (14%) which can then be reduced to 12% through to slaughter for Holstein bulls (EBLEX, 2012, Marsh *et al.*, 2009). In the study by Marsh *et al.*, (2009) 285kg Holstein bulls were intensively finished on cereal based rations containing 12%, 14% or 16% CP. There was no response to feeding elevated levels of CP. However genetic improvement and sire selection for higher productivity and lean tissue deposition may have substantially increased the protein requirement with Continental bred cattle.

With the increased costs of protein feedstuffs relative to cereals and the requirement to determine the optimum protein content of finishing rations for continental bred beef cattle the objective of this experiment was to evaluate different protein levels for intensively finished Continental cross Holstein bulls from 7 months old to slaughter.

**Animals & Timing:**

36 Sept-Oct 2014 born British Blue x Holstein bulls weighing approximately 320kg at 7 months old randomized according to live weight to the following treatments:

**Comparison:**

12% CP

*Ad libitum* 12% CP (140g CP/kg DM) concentrates based on 75% rolled barley, 7.5% soyabean meal, 10% molassed sugar beet feed, 5% molasses and 2.5% minerals.

14% CP

*Ad libitum* 14% CP (163g CP/kg DM) concentrates based on 70% rolled barley, 12.5% soyabean meal, 10% molassed sugar beet feed, 5% molasses and 2.5% minerals. Straw was offered *ad lib* to both groups of bulls from racks.

The 12% and 14% rations were analysed to contain 35.8 and 37.6% starch (as fed).

**Results:**

Table 1: Animal performance (kg)

(Kg/bull)	12%	14%	s.e.d	P Value	Sig
Start wt	320	320	3.1	0.807	NS
Slaughter wt	587	596	8.1	0.265	NS
Days to slaughter	202	196	5.4	0.269	NS
DLWG	1.33	1.42	0.042	0.049	*
Age at slaughter (days)	418	413	4.8	0.72	NS

NS = not significant, \* = P<0.05, \*\* = P<0.01, \*\*\* = P<0.001

Table 2: Carcase characteristics

	12%	14%	s.e.d	P Value	Sig
Carcase wt (kg)	320.7	328.2	4.75	0.134	NS
Kill out (%)	54.7	55.1	0.34	0.266	NS
Carcase DG (kg)	0.85	0.92	0.034	0.043	*
Conformation <sup>1</sup> (1-7)	4.19	4.29	0.176	0.332	NS
Fat class <sup>1</sup> (1-7)	3.06	3.23	0.196	0.382	NS
Liver score <sup>2</sup> (1-5)	1.53	1.06	0.273	0.104	NS

<sup>1</sup> EUROP carcase classification: Conformation: P+=1 and E=7, Fat class: 1=1 and 5H=7.

<sup>2</sup> Liver assessment: 1= Healthy liver and 5 = Severe abscesses (due to acidosis)

Table 3: Feed intakes (kg/bull) and feed conversion ratio (FCR)

	12%	14%
Total concentrate intake (kg)	1666	1605
Daily concentrate intake (kg)	8.24	8.18
FCR (kg feed: kg lwt gain)	6.24	5.82
FCR (kg feed: kg carcase gain)	9.69	8.90

The FCRs (kg feed: kg liveweight gain) appear relatively high compared to the target of 5.0:1 for cereal fed Continental x Holstein bulls but it must be taken into consideration that the experiment did not include the period of growth from 110kg to 320kg. During this rearing phase Continental x Holstein bulls at Harper Adams University typically record an FCR of 3.8:1 with a DLWG of 1.66kg having consumed 765kg of concentrates. Overall feed intakes from 12 weeks old to slaughter were approximately 2.37t (fresh weight) per head for the 14% CP bulls.

Table 4: Financial performance (£)

	12%	14%	s.e.d	P Value	Sig
Carcase price (£/kg)	3.46	3.48	0.018	0.332	NS
Carcase value (£)	1,099	1,142	18.7	0.034	*
Feed cost (£/t)	167	180			
Feed cost (£/bull)	278	289			
Margin over Feed (£/bull)	821	853			
Feed cost/kg live wt gain (£/kg)	1.03	1.04			
Feed cost/kg carcase gain (£/kg)	1.62	1.60			

Overall the 12% and 14% CP fed bulls returned a gross margin of £296 and £335 per head when calculated from being reared from calves through to slaughter.

## **Discussion & Conclusions:**

- Overall performance of the bulls was good with the 14% CP fed bulls being slaughtered at 13.5-13.7 months old with carcass weights of 328kg exceeding the EBLEX (2012) targets for intensive cereal beef production.
- There was a significant improvement in DLWG and daily carcass gain with bulls fed the 14% CP ration.
- The bulls fed the 14% CP ration were sold 6 days earlier. Feed intakes were reduced by 60kg compared to the 12% fed bulls and with an increased DLWG this resulted in an improvement in FCR (kg feed: kg live weight gain) from 6.24 to 5.82.
- There were no significant differences in carcass characteristics or liver damage scores. However the bulls fed the 14% CP ration recorded numerically lower liver damage scores. Liver abscesses are associated with acidosis and it must be noted that the 14% CP ration had a relatively lower starch content.
- Based on the costs prevailing at the time of the study increasing the CP of the ration to 14% with Continental x dairy-bred bulls increased the carcass value by £43. There was an increase in ration cost of £13/t with the 14% CP ration so the margin over feed was increased by £32 per bull.

## **Acknowledgement:**

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The above work was presented as a conference paper at the British Society of Animal Science annual meeting in 2017. The reference is as follows:

Marsh, S.P. and Leeming, J. 2017. Effect of dietary crude protein level on the performance of cereal fed Continental cross Holstein bulls. *Advances in Animal Biosciences*: 8. Paper 8.

## **References:**

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Marsh, S.P., Briggs, P. and Ferguson, D.M.R. 2009 Effect of dietary crude protein level on the performance of cereal fed Holstein bulls. *Proceedings of the British Society of Animal Science*. Paper 147

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