End of Project Report

PRODUCTION OF RED VEAL FOR THE EU MARKET

Authors

Richard J. Fallon and Michael J. Drennan

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Teagasc
Agriculture and Food Development Authority

GRANGE RESEARCH CENTRE,
Dunsany,
Co. Meath

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SUMMARY

- A summary of four experiments which used Holstein/Friesian bulls and a fifth which used continental cross bulls to determine the effect of feeding *ad libitum* concentrates on animal prefomance.

- The Barley soyabean meal ration provided consistent liveweight gain (1.25 kg/day) and similar cold carcass weight (237 kg) in all four experiments using Holstein and Friesian Bulls.

- The Low energy treatment group (Experiment 1) had a liveweight gain of 1.14 kg/day and a cold carcass of 220 kg, i.e. 21 kg lower than that achieved on the High energy treatment group which had a liveweight gain of 1.26 kg/day and a cold carcass of 241 kg.

- Providing animals with a summer period outdoors at pasture compared with a continuous period indoors, in general had the effect of improving daily liveweight gain and feed conversion efficiency when animals were offered *ad libitum* concentrate diet. The effect was greatest when autumn-born calves spent the final 180 days prior to slaughter at pasture.

- Restricting the concentrate allowance at pasture brought about a 1.5 unit improvement in FCR carcass, however, at a similar slaughter age this treatment group produced carcasses that were 22 and 21 kg lighter than the control in two respective experiments.

- The current economic climate for beef production does not permit the production of red veal in Ireland. However, when markets develop in the Mediterranean countries there will be opportunities to produce red veal carcasses for those markets using male bulls from the Holstein/Friesian herds.

- Weaned continental cross suckler bulls slaughtered off an *ad libitum* concentrate diet at 550 kg liveweight had a feed conversion efficiency of 8.2 kg concentrate DM per kg carcass produced. The corresponding value at 650 kg slaughter, liveweight was 9.5 kg.

INTRODUCTION

The red veal markets in Spain, Portugal and Italy require a carcass weight of 250 kg from Holstein or Friesian bulls at 11 months of age. An increase in the availability of Holstein calves in Ireland provide an opportunity to access the production potential of such a system. The production targets are very similar to those outlined for cereal beef production in England by the Meat and Livestock Commission (MLC) which involves feeding concentrates *ad libitum* from 12/14 weeks of age to slaughter with a daily allowance of long roughage such as straw at approximately 5% of total diet.

Table 1. Meat and Livestock Commission standard for cereal beef starting with 3 month old Friesian Holstein calves

Daily liveweight gain	**1.3 kg**
Slaughter weight	**440 kg**
Carcass weight	**235 kg**
Concentrates	**1.76 tonnes**

The MLC feeding programme for cereal beef

Age	**Diet**
to 3 months	**milk replacer 25 kg** **concentrate 125 kg**
3 mths to 11 mths	**85% rolled barley** **15% high protein supplement, mineral and vitamins plus straw**
Feed conversion rate (3 to 11 months)	**5.5 to 6.0**

At Grange Research Centre, a series of four experiments were undertaken to determine the effect of diet type and different feeding programmes on the performance of Holstein/Friesian bulls within the red veal production system. A fifth experiment was undertaken to determine the suitability of a suckler production system for continental cross bulls commencing at 8/9 months of age and finished over the following 4 or 7 months on all concentrate diets

MATERIALS AND METHODS

Diets

The Barley Soyabean meal ration (kg/tonne) consisted of rolled barley (850), soyabean meal (130) and vitamins (20). The main ingredients of the High energy pellet (kg/tonne) with a calculated ME value of 12.5 MJ/kg dry matter were barley (290), maize gluten (200), soya hulls (170), cotton extract (80), palm kernel expeller (100), copra extract (60) plus minerals and vitamins (20). The mean ingredients of the Low energy pellet (kg/tonne) with a calculated ME value of 11.5 MJ/kg dry matter were barley (200), maize gluten (90), pollard (100), palm kernel expeller (100) plus minerals and vitamins (20). Details of the mineral/ vitamin supplement which was similar for all rations are presented in Appendix Table 1.

Unless otherwise stated, the rations were offered *ad libitum* throughout the experimental period. Concentrate feed intakes were recorded weekly and fresh water was available at all times. All indoor animals received a daily allowance of straw (50 g/kg of concentrate intake). The grass allowance of the outdoor treatment groups on limited or restricted access to concentrates was 3-fold that of the group offered *ad libitum* concentrates. In Experiment 1 through 4, there was a minimum pre-experimental periods of 84 days on the barley soyabean meal ration. In Experiment 5, there was a 28-day pre-expreimental period when the animals were generally introduced to their respective rations such that they had *ad libitum* access at the start of the experimental period.

EXPERIMENTAL

Experiment 1. Effect of dietary energy density

The objective of the experiment was to determine the effect of feeding concentrate diets with different energy density on the performance of young bulls.

A control treatment of barley soyabean meal offered *ad libitum* was used throughout the 277 day experimental period. Seventy-two 12 week old Holstein/Friesian bulls with an initial weight of 110 kg were allocated on a liveweight basis to the following treatments:

BS - Barley soyabean meal ration
LL - Low energy pellet ration
HH - High energy pellet ration
LH - Low energy pellet for 140 days, high energy thereafter

A similar mineral and vitamin supplement was used in all diets (Appendix 1). Throughout the experimental period animals were accommodated in a naturally ventilated slatted floor house with 4 or 5 animals/pen. Each animal had a pen area allowance of 2.5 m^2 throughout.

Experiment 2. Effect of period at pasture on the spring-born calf

The objective of the experiment was to determine the effect of an 112-day period at pasture on the performance of spring born calves with *ad libitum* or restricted access to concentrates on performance.

A control treatment of barley soyabean meal offered ad libitum, indoors, was used throughout the 250-day experimental period. Fifty-four 14-week old Holstein/Friesian bulls with an initial weight of 125 kg were allocated on a liveweight basis to the following treatments:

BS - Barley soyabean meal ration indoors
OI - Barley soya outdoors for 112 days, indoors thereafter
OIR - Initially grass only, introduced to barley soyabean meal after 84 days outdoors and indoors from 112 days

The mineral vitamin supplement was similar for all treatments. The supplement was similar to that used in Experiment 1 except that the copper inclusion rate was reduced from 27 mg/kg to 10 mg/kg. Throughout the indoor period the animals were accommodated on concrete slats in a naturally ventilated house with 9 animals/pen. Each animal had a pen area allowance of 2.5m^2.

Experiment 3. Effect of period at grass on spring-born animals

The objective of the experiment was to determine the effect of an initial 140-day period at pasture on the performance of spring born calves with *ad libitum* or limited access to concentrates.

A control treatment of barley soyabean meal offered *ad libitum* indoors, was used throughout the 266 experimental period. Fifty-four 12-week old spring-born Holstein/Friesian bull calves with an initial weight of 114 kg were allocated on a liveweight basis to the following treatments:

- BS - Barley soyabean meal ration indoors
- OI - Barley soya outdoors for 140 days, indoors thereafter
- OIR - Limited to 2 kg barley soyabean meal ration/head/day for initial 112-days at pasture, then increased allowance, indoors from 140 days with ad libitum access to concentrate

All experimental groups were offered the barley soyabean meal ration similar to that used in Experiment 2. Throughout the indoors period the animals were accommodated on concrete slats in a naturally ventilated house with 6 animals/pen. Each animal had a pen area allowance of 2.5m^2.

Experiment 4. Effect of period at grass on autumn-born animals

The objective of the experiment was to determine the effect of different periods at pasture during the summer on the performance of autumn-born calves with ad libitum access to concentrates.

A control treatment of barley soyabean meal offered *ad libitum* indoors, was used throughout the 180-day experimental period. Fifty-four 24-week old autumn-born Holstein/Friesian bulls calves with an initial weight of 233 kg were allocated on a liveweight basis to the following treatments:

- BS - Barley soyabean meal ration indoors
- OI - Barley soyabean meal ration offered outdoors for 77 days, then indoors
- OO - Barley soyabean meal ration offered outdoors throughout

All experimental groups were offered the barley soyabean meal diet described in Experiment 2. Indoor housing was similar to that described in experiment 2 with 6 animals/pen.

Experiment 5. Effect of diet on weaned continental cross bulls

The objective of the experiment using weaned continental cross bulls was to determine the effect of concentrate type and weight at slaughter on growth and the efficiency of feed usage.

Forty-eight continental cross bulls were used in the experiment. The animals were fed concentrates *ad libitum* from weaning at 8 months of age through to slaughter at 550 or 650 kg liveweight.

Animals were allocated on a liveweight and breed basis to the following experimental dietary treatments:

- BS - Barley soyabean meal ration
- HH - High Energy pellet ration

Both rations were supplemented with the same mineral/vitamin supplement. Throughout the experimental period the animals were accommodated with 6 animals per pen in either straw bedded or slatted floor pens. Each animal had minimum pen area allowance approximating to 2.5 m^2 for 450 kg animal. In addition to concentrates, the animals were offered a fixed daily allowance of straw (50 g/kg of daily DM intake) as a roughage source.

RESULTS

Experiment 1

The barley soyabean meal (BS) and High-Energy (HH) rations gave similar liveweight gains and feed conversion rates (Table 2). In contrast, the Low-Energy (LL) ration resulted in a 28 kg lower liveweight gain compared to the high energy ration. All four treatment groups had a similar feed DM conversion ratio for carcass of 9 to 1.

Table 2. Effect of ration type on animal performance

	Treatment					
	BS	LL	HH	LH	SED	Sign
Initial weight (kg)	110	110	110	109	2.78	NS
Concentrate intake (kg DM)						
1 - 140 d	747	717	744	734		
141 - 277 d	878	813	878	864		
1 - 277 d	1625	1530	1622	1598		
Liveweight gain (g/day)						
1 - 140 d	1280	1260	1340	1330	27	NS
141 - 277 d	1140	1010	1140	1120	54	NS
1 - 277 d	1200	1140	1240	1220	33	NS
FCR (kg conc.DM/kg gain)						
1 - 140 d	4.17	4.06	3.97	3.94		
141 - 277 d	5.62	5.88	5.62	5.30		
1 - 277 d	4.89	4.85	4.72	4.53		
Final weight (kg)	445	424	452	447	9.76	NS
Carcass weight (kg)	237	222	241	235	5.27	NS
FCR carcass[1] (kg conc. DM/kg carcass gain)	9.1	9.3	8.9	9.1		
Kidney and channel fat (kg)	6.4	4.5	6.1	6.4	0.56	NS
Conformation[2]	2.1	2.1	2.2	2.0	0.049	NS
Fat score[3]	3.3	2.6	2.9	3.0	0.177	NS

[1]Calculated by assuming an initial killing-out rate of 520 g/kg
[2]Based on E = 5; U = 4; R = 3; O = 2
[3]Based on fat score 1 (leanest) to 5 (fattest)

The results showed that three of the four dietary treatments had similar liveweight, feed conversion efficiency(FCR), carcass weight, kidney and channel fat weight and fat score, but low energy (LL) treatment had numerically lower values though not significantly, for all of the above measurements. The low energy ration produces a 28 kg lighter carcass compared with the high energy ration.

Experiment 2

Restricting concentrate feeding outdoors significantly reduced liveweight in this treatment group during the 112-day period at pasture when the total concentrate consumed was 112 kg compared to *ad libitum* treatment group of 511 kg (Table 3). This group (OIR) had significantly higher growth during the final 138-day indoor period. The indoor (BS) and outdoor (OI) *ad libitum* groups had similar performance characteristics during both periods of the experiment. A 4 month period outdoor (June/September) for spring-born calves on ad libitum concentrates gave similar liveweight gain and carcass weight to calves retained indoors over the 8 month feeding period (Table 3).

Table 3. Effect of outdoor period on the performance of bulls fed *ad libitum* or restricted amounts of concentrate.

	BS	OI	OIR	SED	Sig
Initial weight (kg)	125	126	128	1.7	NS
Concentrate intake (kg DM)					
1-112 d	559	511	112		
113-250 d	1019	1051	1030		
1-250 d	1578	1562	1142		
Liveweight gain (g/d)					
1-112 d	1390	1420	800	35	***
113-250 d	1180	1220	1410	122	***
1-250 d	1270	1310	1130	93	***
FCR (kg concentrate DM/kg gain)					
1-112 d	3.61	3.22	1.26		
113-250 d	6.31	6.26	5.33		
1-250 d	4.98	4.78	4.05		
Final liveweight (kg)	442	452	411	9.85	***
Carcass weight (kg)	237	237	215	5.48	***
KO %	53.6	52.4	52.4	0.71	***
Kidney and channel fat (kg)	8.47	8.49	8.46	1.17	***
Conformation score[1]	1.89	1.97	1.94	0.042	NS
Fat score[2]	3.08	3.47	3.22	0.197	*

[1]Based on E=5, U=4, R=3 and O=2
[2]Based on fat score 1 (leanest) to 5 (fattest)

Experiment 3

The indoor (BS) and outdoor for 140 days (OI) treatments which were offered *ad libitum* concentrate had similar liveweight gain and carcass weight (Table 4). The outdoor treatments (OIL) with limited access to concentrate had significantly reduced liveweight gain during the 140-day period at pasture and did not show any compensatory growth in the final period indoors (141 to 266 days).

Offering concentrates *ad libitum* for 144 days to animals at pasture resulted in an improvement in feed conversion efficiency compared to offering concentrate ad libitum to the indoor group. This would also have the effect of reducing housing costs.

Table 4. Effect on outdoor period at pasture on the performance of spring-born bulls fed concentrates *ad libitum*

	BS	OI	OIL	SED 1	Sign
Initial weight (kg)	114	114	114	1.6	NS
Concentrate intake (kg DM)					
1 - 140 d	711	640	384		
141 - 266 d	872	919	914		
1 - 266 d	1583	1559	1298		
Liveweight gain (g/d)					
1 - 140 d	1260	1340	1070	35	***
141 - 266 d	1240	1300	1240	50	NS
1 - 266 d	1250	1320	1150	31	***
FCR (kg concentrate DM/kg gain)					
1 - 140 d	4.04	3.40	2.56		
141 - 266 d	5.59	5.60	5.86		
1 - 266 d	4.76	4.44	4.24		
Final liveweight (kg)	447	464	419	9.38	***
Carcass weight (kg)	237	244	216	5.22	***
KO %	53.1	52.5	51.6	0.32	***
Kidney and channel fat (kg)	6.88	6.76	5.10	0.45	**
Conformation score[1]	1.85	1.79	1.67	0.68	*
Fat score[2]	3.18	2.94	2.85	0.18	NS

[1]Based on E=5, U=4, R=3 and O=2
[2]Based on fat score 1 (leanest) to 5 (fattest)

Experiment 4

There was no overall effects on liveweight gain or carcass weight in offering concentrates ad libitum indoors or outdoors at pasture during the final finishing period (Table 5). During the first 77 days of the experiment, the indoor group (BS) had a significant liveweight advantage over the outdoor groups (OI and OO). This trend was reversed in the second period of the experiment.

Overall, autumn-born calves reared on a similar *ad libitum* programme, the final 6 month period outdoors had similar growth rate and carcass characteristics to those reared indoors. Concentrate intake per kg of gain was 5 to 1 for outdoor group (OO) and 5.7 to 1 for indoor group (BS). However, having animals outdoors resulted in a saving in the cost of housing and in the total amount of concentrates consumed.

Table 5. Effect of outdoor period at pasture of the performance of autumn-born bulls fed concentrates *ad libitum*.

	BS	OI	OO	SED	Sign
Initial weight (kg)	233	235	232	1.6	NS
Concentrate intake (kg DM)					
1-77 d	601	405	410		
77-180 d	667	737	756		
1 - 180 d	1268	1141	1165		
Liveweight gain (g/d)					
1-77 d	1490	1130	1160	187	***
77-180 d	1050	1300	1410	184	***
1 - 180 d	1240	1230	1310	143	NS
FCR (kg concentrate DM/kg gain)					
1-77 d	5.31	4.70	4.63		
77-180 d	6.14	5.49	5.18		
1 - 180 d	5.72	5.8	4.97		
Final liveweight (kg)	454	454	470	9.21	NS
Carcass weight (kg)	236	234	243	4.94	NS
KO %	52.0	51.5	51.8	0.23	NS
Kidney and channel fat (kg)	4.45	3.03	3.43	0.74	**
Conformation score[1]	1.81	1.74	1.75	0.037	NS
Fat score[2]	3.07	3.22	2.78	0.229	**

[1]Based on E=5, U=4, R=3 and O=2
[2]Based on fat score 1 (leanest) to 5 (fattest)

Holstein/Friesian bulls on *ad libitum* concentrates

Experiment 5

At the 550 kg slaughter target, a feed conversion efficiency of 8.2 kg concentrates DM per kg carcass was obtained (Table 6). The corresponding value for the 650 kg slaughter target was 9.5 kg. In all treatment groups, liveweight gains in excess of 1.30 kg/day were achieved during the experimental period. The 100 kg liveweight difference between the two slaughter times produced an additional 54 kg of carcass for an additional input of 674 kg of concentrate DM, i.e. a feed conversion efficiency of 12.5. Average daily gain was significantly increased with the barley soyabean meal ration and this was reflected with a significant increase in carcass gain, kidney and channel fat, and fat score.

The economics of offering an all concentrate diet to continental cross weaned suckler bulls will be dictated by price of the weaned bull, the cost of the concentrates and the value of the final carcass.

Liveweight gain and feed conversion efficiency was satisfactory for both ration types. Animals offered the barley/soyabean ration had greater feed intakes which was reflected in an average improvement in carcass weight gain of 19 kg. Concentrate DM required per kg carcass gain increased from 8.2 to 9.5 as a result of increasing carcass weight from 314 to 368 kg.

Table 6. Effect of ration type and age at slaughter on the performance of continental cross bulls from the suckler herd							
	Treatment						
	550 kg slaughter		650 kg slaughter				
	BS	HH	BS	HH	SE	Significance	
						Ration	Slaughter
No. of animals	12	12	12	12			
Initial weight (kg)	320	315	318	328	13.8	0.87	0.69
Days to slaughter	160	160	237	237			
Concentrate intake (kg DM)	1293	1174	2026	1789			
Final weight (kg)	569	528	646	630	15.7	NS	***
Carcass weight (kg)	325	303	375	361	9.7	NS	***
Average daily gain (kg/d)	1.55	1.33	1.38	1.32	0.05	*	NS
Average daily carcass (kg/d)[1]	0.99	0.87	0.88	0.80	0.04	**	*
FCR (kg conc. DM/kg gain)	5.2	5.6	6.2	5.9			
FCR (kg conc. DM/kg carcass gain)	8.2	8.3	9.7	9.4			
Lifetime liveweight gain (kg/d)	1.43	1.32	1.34	1.31	0.03	*	NS
Lifetime carcass gain (kg/d)[2]	0.82	0.77	0.78	0.76	0.02	*	NS
Age at slaughter (days)	369	368	441	436			
KO (%)	57.1	57.4	58.0	57.4	0.57	NS	NS
Kidney and channel fat (kg)	9.3	7.7	12.2	9.6	0.86	*	**
Conformation score[3]	3.9	3.8	4.3	4.0	0.13	NS	NS
Fat score[4]	3.6	3.0	3.6	3.5	0.21	NS	NS

[1]Assumed an initial killing out rate of 540 g/kg
[2]Assumed a birth weight of killing out rate of 520 g/kg
[3]Based on E=5, U=4, R=3 and O=2
[4]Based on fat score 1 (leanest) to 5 (fattest)

Continental cross weaned suckled bulls on *ad libitum* concentrates

ECONOMIC CONSIDERATIONS

The economics of red veal production is very dependent on price of the calf, concentrate price and the price paid for the carcass at slaughter. Based on a calf costing £125, concentrate ration at £140 per tonne and carcass at a 198 p/kg (90 p/lb) the following costing can be applied to the production system:

	Cost/animal £
Variable costs	366.00
Interest (10%)	30.80
Fixed costs	40.00
Calf cost	125.00
	561.80
Net sale value	495.00
Margin	-66.80

It was concluded that profitability would be very dependent on obtaining a substantial subsidy for each animal produced within the system.

Sensitivity Analysis

- **Calf Price.** A £25 increase in calf price increases costs by £27.50.
- **Concentrate Ration.** A £20 increase in the cost per tonne of the concentrate ration increases costs by £39.90.
- **Carcass Value.** A 22 p increase in the price paid for each kg of carcass increases the value of the carcass by £55 for a 250 kg carcass.
- **Carcass weight.** A 10 kg reduction in the final weight of carcass would reduce the value of the carcass by £30 based on a value of 198 p/kg carcass.

CONCLUSIONS

The series of experiments showed that consistent animal performance was achieved in the four experiments using Holstein/Friesian bulls. The uptake of such a system in Ireland will depend on the development of market opportunities for red veal together with a direct payment on each animal unit. In respect to finishing continental cross bulls from weaning to slaughter the results indicate the potential for such a production system provided the market will reward such an approach. In view of the current economic climate for beef in the EU it is unlikely that a red veal production system would be successful in Ireland unless links are established between the producers, processors and retailers.

PUBLICATIONS

Fallon, R.J. and Drennan, M.J. (1998). Effect of concentrate diets and slaughter weight on the performance of weaned continental x suckler bulls. Proceedings of the British Society of Animal Science.

Fallon, R.J. and Earley, B. (1998). Effect of summer period at pasture on the performance of young bulls offered concentrates ad libitum. Proceedings of Irish Grassland and Animal Production Association, 24th meeting.

Fallon, R.J. and Drennan, M.J. (1997). Effects of two different concentrate diets offered ad libitum on the performance of weaned continental x suckler bulls slaughtered at two different liveweights. Proceedings of Irish Grassland and Animal Production Association, 23rd meeting.

Fallon, R.J. and Drennan, M.J. (1997). Effect of dietary energy density on the performance of young bulls offered all concentrate diets. Proceedings of Irish Grassland and Animal Production Association, 23rd meeting.

APPENDIX

TABLE 1. Trace mineral and vitamin supplementation per kg of ration

Copper	27 mg
Iodine	6 mg
Selenium	0.3 mg
Vitamin A	400 iu
Vitamin D3	1200 iu
Alpha-tocopherol	6 iu