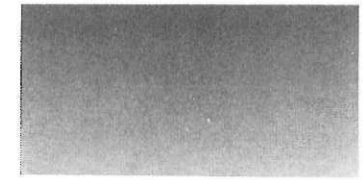

End of Project Report

QUALITY SUCKLER BEEF FROM LOW AND HIGH INPUT GRASSLAND MANAGEMENT SYSTEMS

Authors

M. J. Drennan, R.J. Fallon and B. Davis

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Contents

1. Summary

Spring calving cows were used in the years 1997 to 2003 in the development of planned low and high input systems of suckler beef production. The main objective of the study was to compare a semi-intensive Grange (standard) system of suckler beef production with a more extensive REPS (Rural Environment Protection Scheme) compatible system. In the standard system the stocking rate was 0.80 ha per cow unit (cow plus heifer and steer progeny to slaughter at 20 and 23/24 months of age, respectively, plus replacements or its equivalent), a nitrogenous fertiliser application rate of 210 kg per ha and two silage harvests each year amounting to the equivalent of 87% of the total area harvested. The REPS system involved a 25% lower stocking rate, an annual nitrogen fertiliser application rate of 90 to 100 kg per ha and one silage harvest (portion in late May to provide good silage for the progeny and the remainder in June to provide lower quality silage for cows) amounting to 58% of the total area harvested.

Between 1997 and 2000 the cow herd were Limousin x Friesians (LF) and Simmental x (Limousin x Friesians) (SLF). A herd of first calvers were introduced in 2001 and 2002 which in addition to LF and SLF included Limousin x (Limousin x Friesians), purebred Limousin and purebred Charolais. Charolais (or Simmental) sires were used on mature cows. Replacement heifers were bred to calve at 2 years of age using an easy calving Limousin bull. Concentrate inputs per animal were the same in the two systems.

The main findings of the study were:

- The mean nitrogenous application rates were 210 and 98 kg per ha in the standard and REPS systems, respectively.
- Mean dry matter digestibility of the first-cut silages harvested early (May 19 to May 29), late (June 5 to June 13) and the second cut silage in the standard system (harvested in July/early August) were 716, 690 and 674 g/kg, respectively.
- When averaged throughout two grazing seasons there was

no difference between the standard and REPS systems in pre-grazing or post-grazing sward heights.

- When examined over one grazing season the only major difference between the grazing areas was that the pasture crude protein content was higher in the standard system in both the pre-grazed (205 and 159 g/kg) and post-grazed (172 v 141 g/kg) swards.
- Cow liveweight and body condition score gains at pasture and calf gains from birth to weaning were the same for both systems.
- Carcass weights of the progeny were the same for the standard and REPS systems.

2. Introduction

There are now 1.17 million suckler cows in Ireland and they account for half of the total cow herd (CSO 2003). The suckler herd is predominantly spring calving with half of calvings in March/April, three-quarters in the four month period February to May and 87% in the first six months of the year (Burke 1998). Estimates show that the use of continental breeds in the herd has gradually increased and two thirds of suckler cows are now continental breeds and crosses while 87% are bred to continental sire breeds (ICBF 2002).

Irish suckler beef production systems are based mainly on grass either grazed *in situ* or conserved as silage (or hay). Systems vary in intensity but many operate to low input criteria and currently participate in REPS (Rural Environment Protection Scheme). The aim of the project is to provide blue-prints for low and high input grass based spring calving suckler beef production systems and to determine if a similar animal performance level can be achieved in the REPS system to that obtained in the standard system.

3. Production Systems

Two grassland based spring calving single-suckling systems were operated at Grange between 1997 and 2003. A semi-intensive Grange (standard) system involved a moderately high stocking rate, up to 225 kg of fertiliser nitrogen per ha annually with two silage harvests required to provide adequate winter feed (Table 1).

Table 1. Details of planned standard and REPS suckling systems

	Standard	REPS
Stocking rate	High	Low
Nitrogen: kg/ha	225	90 to 100
Number of silage harvests	2	1
Age of animals when finished (months):		
Heifers	20	20
Steers or (Bulls)	23 (16)	23 (16)
Heifers finished with concentrates on	Silage	Grass

The second system was REPS compatible and involved a 25% lower stocking rate, 90 to 100 kg of fertiliser nitrogen per ha and only one silage harvest yearly, 50% of which was in May to provide good quality silage for the progeny with the remainder in June providing moderate quality silage for the cows. Between 1997 and 2000 the spring calving cow herd were Limousin x Friesian (LF) and Simmental x (Limousin x Friesian) (SLF). A herd of first calvers were introduced in 2001 and 2002 which in addition to the LF and SLF included Limousin x (Limousin x Friesian), purebred Limousin and purebred Charolais. The heifer progeny remained in the system until 20 months of age while the males were either slaughtered as steers at 23 months of age (progeny born in 1996, 1997 and 1998) or as young bulls at 15/16 months of age (born from 1999 onwards). In the standard system because of the high stocking density, grass supply would be limited in Autumn and thus the conservation system included a silage allowance for heifers over a 2 month finishing period.

In contrast, in the REPS system because of the lower stocking density and the absence of a second harvest, grass supplies would be greater in Autumn thus providing the opportunity to finish the heifers at pasture (with a concentrate supplement).

Breeding commenced in early May and was mainly by artificial insemination (AI). Charolais sires selected for high growth rate (or occasionally Simmentals to provide replacements) were used on the mature cows. Easy calving Limousin bulls (AI) were used on replacement heifers which were bred to calve at two years of age.

3.1 Fertilisers and Slurry

The planned nitrogenous fertiliser programme and the quantities actually applied each year are shown in Tables 2 and 3, respectively. In both systems, the quantities applied in both systems for the first silage cut and for early grass were 114 and 57 kg/ha, respectively. In the standard system the quantities of nitrogen applied for the second silage cut and to areas for grazing after the first silage harvest were 80 and 57 kg, respectively. Subsequent nitrogen applications were minimal in the REPS system while in the standard system these were flexible and dependent on grass supplies (if adequate grass was available then a particular nitrogen applications was omitted). Urea was generally used as the nitrogen source except in dry conditions when calcium ammonium nitrate was applied. The average annual nitrogen application rates on the standard and REPS systems were 210 and 98 kg, respectively. Phosphorus and potash application rates were based on soil analysis. Slurry produced by the herds in winter was returned to the silage ground.

Table 2. Planned nitrogenous fertiliser programme (kg/ha)

	Standard system	REPS system
For first silage cut	114	114
For second silage cut	80	-
Early grass	57	57
After silage/after 1st grazing	57	0 to 25
Further applications (if needed)	34	0
Total planned application	225	90 - 100

Table 3. Actual nitrogen application rates (kg/ha)

Year	Standard system	REPS system
1997	198	101
1998	210	102
1999	212	104
2000	208	99
2001	193	92
2002	232	88
2003	217	97
Mean	210	98

3.2 Grazing and Conservation

Cattle grazing commenced each year in April. In the standard system two silage harvests were taken yearly, the first in late May and the second in late July/early August. In the REPS system, only one silage harvest was taken with half of the area cut in late May and the remainder two weeks later in early June. The objective was to provide high quality silage for the progeny and thus, grass was conserved at a leafy stage of growth in May and an effective additive used when necessary to ensure good preservation. The second silage cut in the standard system and the late first cut in the REPS system was intended for the cows and thus the same emphasis on quality was not necessary. The planned grass conservation programmes for the standard and REPS systems producing either steers or young bulls are shown in Tables 4 and 5 respectively.

Table 4. Total grassland areas and planned grass conservation areas per cow unit[1] producing steers at 2 years and heifers at 20 months of age

		Standard system		REPS system	
		Ha	% of total	Ha	% of total
Total		0.80		0.99	
1st silage cut:	Early	0.43	54	0.29	29
	Late			0.29	29
2nd Silage cut		0.26	33	-	-
Overall % harvested			87		58

[1]Cow unit = cow and progeny to slaughter and 25% replacements.

Table 5. Total grassland area and planned grass conservation areas per cow unit producing bulls at 15/16 months and heifers at 20 months of age

		Standard system		REPS system	
		Ha	% of total	Ha	% of total
Total		0.65		0.82	
1st silage cut:	Early	0.36	56	0.24	29
	Late	-	-	0.24	29
2nd Silage cut		0.23	35	-	-
Overall % harvested			91		58

While such planned programmes are essential, it is necessary to have flexibility in order to allow for variation in weather conditions and grass growth rates. Thus, if grass availability on the grazing area was greater than requirements an additional area was conserved while if there was insufficient grass in the grazing area as a result of poor growth or poor utilisation in wet weather conditions then a part of the silage area would be grazed. No second silage harvest was planned for the REPS system and grass supplies exceeded demand particularly in the July period in all years. This necessitated harvesting some paddocks in July/early August so as to control grass quality as the aim in both systems was to provide adequate supplies of leafy grass throughout the season. First silage harvests were taken between May 19 and May 29 and silage dry matter digestibility (DMD) values averaged 716 g/kg (Table 6). DMD values for the late first harvests in the REPS system (harvest date varied between June 5 and June 13) and the second harvests taken in late July/August in the standard system averaged 689 and 674 g/kg respectively. The difference in DMD values between the early and late first cuts do not reflect the expected differences in digestibility for these cutting dates as varying proportions of silage areas were grazed in spring prior to closing for silage. The entire area was grazed in autumn and animals were housed as grass supplies declined. Commencement of housing was usually in early September for finishing heifers (in the standard system), early to mid October for steers while the cow

herds remained at pasture up to mid November in most years. However, due to inclement weather resulting in poor ground conditions all animals were housed in mid to late October in 2001 and 2002.

Table 6. Silage cutting dates and in-vitro dry matter digestibility (DMD) values (g/kg)

Year	First Cut				Second Cut	
	Early (Standard and REPS)		Late (REPS)		Standard	
	Cutting date	DMD	Cutting date	DMD	Cutting date	DMD
1997	May 19	691	June 5	681	July 29	668
1998	May 25/26	701	June 11	640	August 13	701
1999	May 19/21	712	June 8	727	August 5	625
2000	May 22/24	774	June 7/8	726	July 27	735
2001	May 23/25	760	June 10/12	696	July 30	693
2002	May 27/29	710	June 13	712	August 14	676
2003	May 26/28	661	June 12	640	August 6	618
Mean		716		689		674

3.3 Concentrate Feeding Levels

The planned mean concentrate feeding levels per head daily was 1 kg for weanlings in winter, 3 kg during the final 2/3 month finishing period for heifers in Autumn and 4 to 5 kg with silage for finishing steers and bulls. Concentrate inputs to replacement heifers (calf stage, first grazing season and first winter), cull cows, suckled calves (indoors as calves) and first calvers (1.5 kg per day from calving until grazing commenced) represented a relatively small proportion of the total. Cows and in-calf heifers (pre-calving) received silage plus a mineral/vitamin supplement. Concentrate inputs per animal and disposal dates were the same for the two production systems.

3.4 Herbage Yield and Quality

In two years, herbage height pre-grazing and post-grazing was recorded throughout the grazing season. In addition, in the second year, herbage yield was also estimated by mowing strips from each paddock pre- and post-grazing. Representative samples of the herbage were subsequently analysed for dry matter digestibility (DMD), crude protein (CP) and ash contents. In the area grazed by cows and calves there was no difference between the standard and REPS systems in pasture heights pre- or post-grazing in year 1 (Table 7). In year 2, pasture height pre-grazing was greater in the standard system than in the REPS system but there was no difference between the two systems in post-grazing heights (Table 8). The main difference between the two production systems was in herbage crude protein contents which was considerably higher both pre- and post-grazing in the standard than in the REPS system. Both swards had high DMD values (~760 g/kg) pre-grazing which was marginally greater for the herbage in the standard systems. Post-grazing DMD values (640 g/kg) were considerably lower than the pre-grazing values with no difference between the two systems. The average number of days spent grazing a paddock was greater in the REPS system (3.7 days) than in the standard system (3.3 days). This was clearly evident during the early part of the grazing season and resulted from similar paddock sizes in both systems but about 25 percent more animals in the standard than the REPS system. Similar results were obtained in the areas grazed by yearlings in that the main difference between the two swards was the higher crude protein content in the standard than in the REPS system.

Table 7. Pre- and post-grazing sward heights, in the cow grazing areas, for the overall grazing season of year 1

	Production System		s.e.	Significance
	Semi-intensive	REPS		
Sward height (cm)				
Pre-grazing	11.4	11.4	0.22	NS
Post-grazing	5.6	5.8	0.10	NS

Table 8. Sward heights (cm), yields (kg DM/ha) and quality (g/kg) on cow grazing areas over the entire grazing season in year 2

	Production System		s.e.	Significance
	Semi-intensive	REPS		
Pre-grazing				
Height	11.6	10.9	0.24	*
Plate yield	2015	1844	57.3	*
Mower yield	2325	2541	140.0	NS
CP	205	159	4.5	***
DMD	761	747	5.7	NS
Ash	106	105	2.3	NS
DOMD	677	665	6.1	NS
Post-grazing				
Height	6.3	6.2	0.11	NS
Plate yield	712	694	25.8	NS
Mower yield	1005	1003	72.7	NS
CP	172	141	4.1	***
DMD	640	641	7.3	NS
Ash	153	140	5.5	NS
DOMD	560	561	7.8	NS
Days grazing per paddock	3.3	3.7	0.14	*

3.5 Animal Performance

Cows

The mean liveweight gains of the cows during the grazing season in the standard and REPS systems were 78 and 74 kg respectively (Table 9). Corresponding average body condition score changes over the grazing season were 0.20 and 0.16. Thus, cow performance was similar for the two systems. It is however noticeable that cow body condition score gains at pasture averaged about 0.5 when the herds were predominately mature cows while there was no improvement when the herd was mainly first calvers. This result emphasises the need for a higher winter feeding level for first calvers due to their inability to recover body condition at pasture when compared to that of a mature cow.

Table 9. Liveweight gains (kg) and body condition score changes of cows at pasture in Standard and REPS systems

	Liveweight gain		Body condition score changes	
Year	Standard	REPS	Standard	REPS
1997	58	65	-0.10	-0.20
1998	84	86	0.44	0.47
1999	83	84	0.41	0.59
2000	80	62	0.52	0.26
2001	84	74	-0.10	-0.09
2002	65	67	-0.09	0.00
2003	91	79	0.33	0.17
Mean	78	74	0.20	0.16

Daily liveweight gains of the calves from birth to weaning in the standard and REPS systems were also similar (Table 10). Likewise there was no difference between the standard and REPS systems in final carcass weights (Table 11). It can thus be concluded that similar animal performance levels can be expected in a REPS compatible system as that attained in the conventional Grange system involving moderately high stocking rates and nitrogen inputs.

Table 10. Liveweight gains (g/day) of calves from birth to weaning in the Standard and REPS systems

	System	
Year	Standard	REPS
1997	1114	1142
1998	1210	1175
1999	1204	1206
2000	1205	1152
2001	987	955
2002	964	955
2003	055	1073
Mean	1106	1094

Table 11. Relative carcass weights of animals from the Standard and REPS systems

	Steers (Bulls)		Heifers	
Year	Standard	REPS	Standard	REPS
1997	100	101	100	102
1998	100	99	100	99
1999	100	99	100	102
2000	(100)	(101)	-	-
2001	(100)	(95)	-	-
2002	(100)	(102)	100	101
2003	(100)	(98)	100	101
	100	99	100	101

3.6 Animal Health

Parasite control

The calves were treated 2 or 3 times during the grazing season and always at housing for the control of lung and gastronintestinal worms. The anthelmintic used at housing was one that is effective against Ostertagia Type II. In addition, yearlings were treated for lung worms and stomach worms during their second grazing season when deemed necessary.

Vaccines

Cows and heifer replacements were vaccinated in April each year for Leptospirosis and with Rotavec K (for the control of E. coli and Rotavirus in calves) in January.

Minerals

In spring each year pastures were dusted with calcined magnesite (32 kg/ha) to control grass tetany in the cows. In Autumn, tetany control measures involved providing a 50:50 calcined magnesite/molasses mixture in containers. Cows and in-calf heifers were fed 60 g daily of a mineral/vitamin supplement (high copper content) in winter to supply trace elements. Weanlings on a low level of concentrates were also offered 20 g daily of this mineral/vitamin supplement in their first winter.

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