



*Effects of silage type and dietary proportion on the growth and carcass characteristics of finishing lambs*

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# Introduction

- Lambs are often housed late in the season when grass supply and/or nutritive value is inadequate to sustain high levels of performance
- Intensive all-grain diets have become uneconomical:
  - ◆ High feed costs (+£200/t)
  - ◆ High Feed Conversion Ratio - 8.1 to 12.7 kg DM per kg lamb carcass  
(Annett *et al.*, 2008; Speijers *et al.*, 2009)
- Good quality grass silage plus concentrates can sustain lamb growth rates >200 g/d  
(Chestnutt, 1989)
- Maize silage can be cost competitive with grass silage on mixed beef/sheep farms

## *Relative forage costs on NI dairy farms (2008)*

	<i>Utilised DM yield (t/ha)</i>	<i>Cash cost (£/t DM)</i>
Grazed grass	5-10	85-42
3-cut grass silage	8-13	107-66
Maize silage (under plastic)	10-15	79-52
Fermented WCW	8-13	106-65
18% Dairy mix	-	236

*(Source: Kilpatrick et al. (2001), updated with 2008 input costs)*

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(Annett *et al.*, 2008; Speijers *et al.*, 2009)
- Good quality grass silage plus concentrates can sustain lamb growth rates >200 g/d  
(Chestnutt, 1989)
- Maize silage can be cost competitive with grass silage on mixed beef/sheep farms
- Limited information on performance and concentrate feeding strategies for lambs offered maize silage-based diet



## *Aims of study*

To investigate the effects of silage type and dietary forage:concentrate ratio on:

1. Lamb performance
2. Lamb carcass characteristics

## *Materials and Methods (1)*

- 60 crossbred lambs:
  - ❖ 12 males & 48 females
  - ❖ Mean ( $\pm$ SD) live weight:  $35 \pm 0.5$  kg
  - ❖ Mean ( $\pm$ SD) age:  $217 \pm 9.3$  days
  - ❖ Sire breeds - Texel, Suffolk, Charollais, Belclare, Lleyn
- 4 treatment diets (2 x 2 factorial design):
  - ❖ *Ad lib* precision chop grass silage (**GS**) or maize silage (**MS**)
  - ❖ 80/20 (**HIGH**) or 50/50 (**LOW**) forage/conc (on a DM basis)
- Concentrates offered twice daily
- Concentrate CP level varied (167-214 g/kg DM) to balance total dietary intake of metabolizable protein
- Housed in groups of 4 to 6 until slaughter

## *Forage quality*

	<i>Grass silage</i>	<i>Maize silage</i>
<b>VCODM (g/kg)</b>	<b>291</b>	<b>346</b>
<b>DOMD (g/kg)</b>	<b>655</b>	<b>-</b>
<b>NCGD (g/kg DM)</b>	<b>-</b>	<b>700</b>
<b>ME (MJ/kg DM)</b>	<b>10.5</b>	<b>11.3</b>
<b>CP (g/kg DM)</b>	<b>140</b>	<b>87</b>
<b>NDF (g/kg DM)</b>	<b>600</b>	<b>400</b>
<b>pH</b>	<b>3.9</b>	<b>-</b>
<b>NH<sub>3</sub>-N (g/kg total N)</b>	<b>83</b>	<b>-</b>
<b>Starch (g/kg DM)</b>	<b>-</b>	<b>293</b>

*(Predicted by NIRS)*

## *Materials and Methods (2)*

### Measurements:

- Dry-matter intake determined daily
- Lambs weighed fortnightly and immediately prior to slaughter at  $44 \pm 1$  kg
- Live weight gain determined by linear regression
- Cold carcass weight recorded after 48 h chill at  $4^{\circ}\text{C}$
- Carcass conformation scored on a 5 point scale based on the EUROP system (E=5, P=1)
- Carcass fat class scored on a 6 point scale (1=1, 2=2, 3=3, 4L=4, 4H=4.5, 5=5)
- Carcass fat depth measured to the nearest 0.01mm using a digital vernier calliper

## *Materials and Methods (3)*

### Statistical analysis

- Data analysed using Regression Analysis to adjust means to a 20kg carcass weight
- Feed intake data:
  - ❖ Fixed model: Forage type X Proportion
  - ❖ Random model: Pen
  - ❖ Covariates: Carcass weight, sire breed, sex
- Animal performance data:
  - ❖ Fixed model: Forage type X Proportion
  - ❖ Covariates: Carcass weight, sire breed, sex

# 1. Effects of silage type and proportion in the diet on feed intake and lamb performance

<i>Silage type</i>	Grass silage		Maize silage		s.e.d	Significance		
	HIGH	LOW	HIGH	LOW		Type	Prop.	T x P
Silage DMI (kg/d)	0.65 <sup>b</sup>	0.55 <sup>a</sup>	0.76 <sup>c</sup>	0.63 <sup>b</sup>	0.010	***	***	*
Conc. DMI (kg/d)	0.16 <sup>a</sup>	0.52 <sup>c</sup>	0.18 <sup>b</sup>	0.59 <sup>d</sup>	0.008	*	***	***
Total DMI (kg/d)	0.81 <sup>a</sup>	1.07 <sup>c</sup>	0.94 <sup>b</sup>	1.22 <sup>d</sup>	0.018	***	***	NS
Daily LWG (g/d)	75 <sup>a</sup>	145 <sup>b</sup>	126 <sup>b</sup>	162 <sup>b</sup>	20.1	***	**	NS
FCR (kg DM/kg LWG)	10.3	8.1	10.0	7.8	1.62	NS	P=0.06	NS
Days to slaughter	68 <sup>c</sup>	52 <sup>ab</sup>	60 <sup>bc</sup>	49 <sup>a</sup>	5.1	NS	***	NS
Dressing proportion	0.492	0.472	0.472	0.472	0.0088	NS	NS	P=0.12

## 2. Effects of silage type and proportion in the diet on lamb carcass characteristics

<i>Silage type</i>	Grass silage		Maize silage		s.e.d	Significance			
	<i>Silage proportion</i>	HIGH	LOW	HIGH		LOW	Type	Prop.	T x P
Conformation score		3.20 <sup>b</sup>	2.86 <sup>a</sup>	3.02 <sup>ab</sup>	3.12 <sup>ab</sup>	0.154	NS	NS	*
Fat score		3.08	3.10	3.14	3.11	0.232	NS	NS	NS
Carcass length (mm)		641	630	633	634	7.9	NS	NS	NS
Barrel width (mm)		246	246	248	246	3.3	NS	NS	NS
Depth of side (mm)		378 <sup>b</sup>	365 <sup>a</sup>	373 <sup>ab</sup>	369 <sup>ab</sup>	4.8	NS	*	NS
Shoulder width (mm)		203	198	197	198	3.9	NS	NS	NS
Buttocks width (mm)		230	225	227	226	2.3	NS	NS	NS

### 3. Effects of silage type and proportion in the diet on carcass fat depth (mm)

<i>Silage type</i>	Grass silage		Maize silage		s.e.d	Significance		
	HIGH	LOW	HIGH	LOW		Type	Prop.	T x P
KKCF (g)	431	532	445	447	57.2	NS	NS	NS
<i>Longissimus dorsi</i>	3.1	3.6	3.8	3.2	0.48	NS	NS	NS
<i>Illiocostalis</i>								
Internal	1.3	1.6	1.3	1.4	0.27	NS	NS	NS
External	8.6	9.3	9.5	9.3	1.05	NS	NS	NS
<i>Gluteus medius</i>	4.8	4.4	5.4	4.3	0.67	NS	NS	NS
<i>Obliquus internus</i>	11.3	11.4	11.5	11.2	0.98	NS	NS	NS

## Conclusions

- High quality maize silage is ideal for finishing lambs indoors:
  - ❖ Higher intake characteristics (+0.10 kg DM/day) and similar feed conversion efficiency to grass silage-based systems
  - ❖ Increased daily live weight gain of lambs (+40 g/day) which has potential to shorten the finishing period
  
- Increasing the forage proportion of the diet from 0.50 to 0.80:
  - ❖ Reduced total DM intake (-0.28 kg/day) and reduced overall feed conversion efficiency (+2.2 kg feed DM per kg LWG)
  - ❖ Reduced daily LWG (-52 g/day) and extended the feeding period by 13 days
  
- For lambs offered silage-based diets, neither the silage type nor the forage:concentrate ratio have any effects on carcass fatness or conformation when diets contain  $\geq 50\%$  forage (DM basis) and the forage is of medium-high nutritive value

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