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Optimal Management Practices for Replacement Dairy Heifers



Key external stakeholders:

Dairy farmers, replacement heifer rearers, animal nutrition companies and consultants

Practical implications for stakeholders:

Replacement heifers are the building blocks of the future dairy herd. Reduced levels of management will result in a lesser profit, as heifers may calve later than 24 months, be underweight and produce less milk compared to more well managed heifers. This project investigated different over winter feeding regimes and their effect on the attainment of target weight at mating start date (MSD).

Main results:

- Winter diet offered to heifers significantly impacts the weight gain achieved and their realisation of target weight at MSD.
- Offering heifers an energy rich diet (e.g. grass silage + concentrate or a forage crop based diet) increased over-winter weight gain and tends to improve fertility performance (as heifers are more likely to achieve target weight)
- Heifers can be fed a 100% kale diet for a 90-day period with similar performance to a 70% kale and 30% grass silage diet (it should be noted that forage crops are only suitable on drier soil types)
- Similar weight gains were achieved from all forage crops investigated (kale, rape, kale x rape hybrid)
- Higher weight gains were achieved from grass (after early spring turnout) than from a winter diet thus heifers should be turned out to grass as soon as possible in the spring
- Forage crops can be offered during the second winter but a fibre source (e.g. baled silage) should be offered in conjunction with the crop
- Over winter diet during the second winter has no effect on milk yield or milk solids yield during the first lactation

Opportunity / Benefit:

These results provide data on the weight gains that can be expected from different diets offered to replacement dairy heifers during the winter period. This knowledge will allow dairy farmers, heifer rearers and animal nutrition companies and consultants to formulate diets for these heifers to ensure optimum growth over the winter and increase the likelihood of attainment of target weights at MSD.

Collaborating Institutions:

University College Dublin

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1. Project background:

Ensuring the best possible development of replacement heifers is critical and, although it needs to be accomplished at low cost, heifer performance must not be compromised. Optimum performance from the dairy herd is influenced by realising target weights at key points, such as at mating start date at 15 months of age (MSD) and pre-calving. In practice, heifer rearing receives low priority on Irish dairy farms and achieving target weights is neglected by many. Reduced levels of management will result in a lesser profit, as heifers may calve later than 24 months, be underweight and produce less milk compared to more well managed heifers.

Feed costs account for approximately 80% of the total variable costs associated with costs of production. One of the methods of reducing feed costs in particular, is by sourcing lower cost feeds. Kale grazed in-situ ranked as the cheapest alternative to grazed grass and was considerably cheaper than grass silage in a recent Teagasc study. Kale tends to have a low neutral-detergent fibre (NDF) concentration, suggesting that feeds with a higher NDF concentration (>500 g/kg DM) - such as grass silage - may need to be offered in order to avoid acidosis. A short-term (20-day) indoor feeding experiment conducted at Teagasc Moorepark examined the effect of feeding a 100% kale diet in comparison to varying combinations of a kale and silage diet. The results of the experiment reported that feeding a 100% kale diet did not reduce rumen pH below 6.0 nor did it induce acidosis. Diets which examined more conventional type feeding systems (i.e. grass silage + concentrate) were also investigated to ascertain the rate of weight gain that could be expected over the winter period.

2. Questions addressed by the project:

- What weight gains can be expected from a range of diets offered to replacement heifers over the winter period?
- Can a 100% kale diet be offered to replacement heifers for a continuous 90-day period?
- Does winter diet influence weight gain post-turnout, after the first winter?
- Offering forage crops during the second winter – do they affect milk production during the first lactation?

3. The experimental studies:

Several experiments were undertaken to investigate the effect of diet over the winter on replacement heifer weight gain.

The diets investigated included:

- indoors offered ad libitum grass silage and 1 kg DM concentrate/day (S1);
- indoors offered ad libitum grass silage and 2 kg DM concentrate/day (S2);
- indoors offered ad libitum grass silage only (SO);
- outdoors on an out-wintering pad offered ad libitum grass silage and 1.5 kg DM conc/day (OWP);
- outdoors offered 70% kale and 30% grass silage bales (70K);
- outdoors offered 100% kale (100K)

Table 1. Effect of diet on weight gain at different periods (kg/heifer/day).

(kg/heifer/day)	SO	S1	S2	70K	100K
Winter weight gain	0.30	0.44	0.65	0.47	0.48
Weight gain from turnout to breeding	0.86	0.68	-	0.89	0.88

The Moorepark experiments have shown that considerable variation exists in the weight gain achieved from different diets offered over the winter (Table 1). Kale has a high feeding value (1.05 UFL – similar to early spring grass; one UFL is defined as the energy contained in one kg of air dry standard barley); consequently heifers can achieve high levels of weight gain at a relatively low cost. Similar levels of weight gain can be achieved with grass silage and concentrate diets. Silage only diets support weight gains of approximately

0.30 kg/heifer/day. Therefore, heifers should be well ahead of target at housing if silage only is being used during the winter as 0.30 kg/day is insufficient weight gain to achieve target weight at MSD for heifers that commence the winter period at or below target weight.

Which forage crop to use?

Another experiment was completed to establish if there were differences in weight gains achieved from three different forage crops and more conventional diets. The diets investigated were:

- indoors offered grass silage and 1 kg DM concentrate/day (**S1**),
- indoors offered grass silage and 2 kg DM concentrate/day (**S2**),
- outdoors grazing forage kale (cv. Maris Kestral) in conjunction with grass silage bales which were offered as 30% of the diet (**K**),
- outdoors grazing forage rape (cv. Stego) in conjunction with grass silage bales which were offered as 30% of the diet (**R**),
- outdoors grazing a rape x kale hybrid (cv. Red Start) forage in conjunction with grass silage bales which were offered as 30% of the diet (**H**).

At turnout there was no weight difference between heifers from the S2, K, R and H treatments (279 kg) but all treatments were heavier than the S1 heifers (261 kg). Thus, over-winter weight gain was least for the S1 heifers (0.38 kg/heifer/day) when compared to all other treatments which were similar (0.53 kg/heifer/day). There was no difference in the turnout body condition score (BCS) for the five winter feeding treatments.

Early turnout

Regardless of diet offered over the winter, similar weight gains are achieved when heifers are turned out to grass in spring. Weight gains achieved post-turnout are higher than that achieved during the winter. This clearly indicates that heifers should be turned out to grass as soon as possible, as they can gain up to 1 kg/heifer/day at grass compared to <0.70 kg/heifer/day while on their winter diet (Table 1). Consequently, heifers have a greater chance of attaining their target weight with early turnout.

Diet during the second winter

Many studies have shown a positive relationship between body weight at calving and first lactation milk yield. An experiment was undertaken to: investigate the effect of winter diet on pre-partum weight gain of replacement dairy heifers, and, establish the effect of pre-partum feeding treatment on post-partum milk production performance.

The treatments were:

- indoors offered a silage only diet for the duration of the experiment (**SO**),
- indoors offered silage and 2kg concentrate/day for 46 days followed by a silage only diet (**SC**),
- outdoors grazing forage kale in conjunction with grass silage bales at an inclusion rate of 30% in the diet (**70K**),
- outdoors grazing a 100% forage kale diet (**100K**).

Daily weight gain was similar for the SC and 70K treatments (1.10 kg/heifer/day) over the winter period, weight gain was lower for the SO treatment (0.96 kg/heifer/day), and weight gain was further reduced on the 100K treatment (0.78 kg/heifer/day). At the end of the winter period BCS was greatest for the SO and SC animals (3.47), significantly lower for the 70K animals (3.25) and lowest for the 100K animals (3.09). There was no difference between treatments in cumulative milk yield (3656 kg) or milk solids yield (273 kg) for the first 29 weeks of lactation. Milk composition was also between similar treatments; average lactation fat, protein and lactose concentrations were 4.10, 3.38 and 4.70%, respectively.

Average body weight throughout the first 29 weeks of lactation was also similar between treatments (439 kg). Average BCS of animals from the 100K treatment was lower (2.86) than that of the SC and SO animals (3.00) but was not different to the 70K animals (2.93). There was no difference in average BCS between the SC, SO and 70K treatments (2.98).

4. Main results:

- Winter diet offered to heifers significantly impacts the weight gain achieved and their realisation of target weight at MSD.
- Offering heifers an energy rich diet (e.g. grass silage + concentrate or a forage crop based diet) increased over-winter weight gain and tends to improve fertility performance (as heifers are more likely to achieve target weight)

- Heifers can be fed a 100% kale diet for a 90-day period with similar performance to a 70% kale and 30% grass silage diet (it should be noted that forage crops are only suitable on drier soil types)
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5. Opportunity/Benefit:

These results provide data on the weight gains that can be expected from different diets offered to replacement dairy heifers during the winter period. This knowledge will allow dairy farmers, heifer rearers and animal nutrition companies and consultants to formulate diets for these heifers to ensure optimum growth over the winter and increase the likelihood of attainment of target weights at MSD.

6. Dissemination:

The primary stakeholders for this research are Irish dairy farmers, heifer rearers, animal nutrition companies and consultants. The results of this project have been disseminated through the popular press and at the Teagasc Moorepark Open Days, as well as at scientific conferences and in scientific peer-reviewed publications.

During the project an open day showcasing this project was held on the Dairygold Research Farm in Kilworth where the kale crops were grown.

Main publications:

Deighton, M., O'Loughlin, B., Williams, S.R.O., Moate, P.J., Kennedy, E., Boland, T.M. and Eckard, R.J. (2013). Declining sulphur hexafluoride permeability of polytetrafluoroethylene membranes causes overestimation of calculated ruminant methane emissions using the tracer technique. *Animal Feed Science and Technology* 183 : 86-95 29777 A1

Kennedy, E., Coughlan, F., Murphy, J.P. and Fitzgerald, S. (2013). Comparison of feeds offered during the winter on replacement dairy heifer bodyweight and weight gain. In: *Agricultural Research Forum*, Tullamore Court Hotel, 12-Mar-2013, 108 29391 B2

Kennedy, E., Shalloo, L. and Buckley, F. (2011). Optimising replacement heifer performance. In: *everyday farm practices*. In: *Positive Farmers Dairy Conference*, Co. Limerick, 20-Jan-2011, p. 34

Popular publications:

- In 2008 there was a weekly column in the *Irish Farmers Journal* documenting the progress of the experiment

7. Compiled by: Dr. Emer Kennedy