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Strategies to increase dairy cow performance at pasture

Key external stakeholders:
Dairy farmers, advisors, agricultural consultants, researchers, grassland industry.

Practical implications for stakeholders:
The research investigated the effect of different pre-grazing herbage mass swards and their impacts on animal, sward and system performance. Key results found:

- Maintaining a medium pre-grazing yield of between 1300 to 1600 kg DM/ha can achieve high cow performance at pasture
- Grazing swards with low pre-grazing herbage mass will reduce overall annual farm growth rate by >1t DM/ha
- Grazing heavy pre-grazing yields (>1800 kg) during the main grazing season will reduce cow performance and grass utilisation
- Optimising pre-grazing herbage mass provides the opportunity to increase the profitability of the farm system by adjusting grassland management practices

Main results:

Maintaining pre-grazing herbage masses in the range of 1300 to 1600 kg DM/ha (8-9cm) can maintain high levels of milk production performance and grass utilisation during the main grazing season.
Maintaining lower herbage masses (<1000 kg DM/ha) will result in reduced grass production, lower grass dry matter intakes and more frequent intervention with supplementary feed. While increasing the herbage mass (> 2200 kg DM/ha) will reduce sward quality and grass utilisation and hence lower animal performance.

Opportunity / Benefit:

The results of this project provide clear guidelines as to the optimum level of pre-grazing yield for rotational grazing systems which will optimize the quality of the grass available and the dry matter intake and milk performance of grazing dairy cows. In addition grazing management can be simplified as results suggest that maintaining low pre-grazing yields (900 kg DM/ha) can result in insufficient grass production at farm level and therefore require a greater amount of supplementary inputs in the system.

Collaborating Institutions:

UCD
INRA (France)

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1. Project background:

With the upcoming removal of quotas, the future expectations of the Irish dairy industry are to increase milk production with greater focus on increased grass utilisation. In order to remain competitive at an international level maximising milk production from a grass-based system is a key objective on many Irish dairy farms. Results of previous research projects have highlighted the benefits of early turnout to grass in spring in terms of improved animal performance and subsequent sward quality. Information on the optimum level of pre-grazing herbage mass which should be offered is limited. Previous research has shown that as pre-grazing yield increases the proportion of stem in the sward will also increase and this will reduce sward nutritive value. Low herbage mass swards have been shown to limit the intake of the animal as the cow must spend a larger proportion of the time grazing to meet their energy requirements, as a result animals offered high pre-grazing yield swards tend to have greater intakes than those offered low pre-grazing yield swards. As feed intake and nutritive value are key drivers of milk production, factors influencing milk performance in swards of different herbage masses must be fully investigated.

The objective of this project was to investigate the effect of different levels of pre-grazing yield on grass supply and quantify the effect on cow performance and sward structural changes. In the first grazing rotation, grass supply is generally limited, however in mid-April, grass supply begins to exceed herd demand. This project aimed to impose different levels of pre-grazing yields from the beginning of the second rotation through to the end of the grazing season to quantify the resulting effect on farm output throughout the grazing season.

2. Questions addressed by the project:

- What is the optimum pre-grazing yield to offer grazing dairy cows in rotational grazing systems?
- Will very low or high pre-grazing yield swards affect nutritive quality and animal performance?
- What key sward structural factors influence the performance of the grazing dairy cow?
- Does sward quality affect methane emissions from grazing dairy cows?

3. The experimental studies:

In order to answer the research questions posed a number of experimental studies were completed. All experiments examined the performance of grazing spring calving dairy cows. The first study investigated the effect of grazing a medium (1600) and high (2200) kg DM/ha pre-grazing yields on grass dry matter intake and performance from April, through to the end of the grazing season at two levels of daily herbage allowance (DHA). The second study compared the dry matter intake, performance and sward characteristics of 900 (low), 1400 (medium) or 2400 (high) kg DM/ha for the entire grazing season. Each study monitored sward structural changes and attempted to relate these to differences in intake, milk yield and milk composition.

4. Main results:

Results from the first study showed that grazing swards at a medium pre-grazing yields resulted in increased milk solids output (+ 6%/ ha) and grazing days (+40 days/ ha) compared to high pre-grazing yield swards. Adapting the concept of grazing medium pre-grazing mass swards resulted in increased pasture quality after the reproductive growth phase this in turn resulted in increased dry matter intake and as a result milk yield was improved compared to the high pre-grazing yield swards. Leaf proportion in the medium pre-grazing yield sward was greater than that in the high mass swards. In the second study, cows grazing the low mass swards required substantially more supplement during the grazing season to overcome grass deficits. Within the high mass treatment,

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sward quality and grass utilization was lower than the other treatments and milk production performance tended to decline from July onwards. A reduction in grass DM production (-1.15 t DM/ha) and grass silage conserved for winter feeding (- 180 kg DM/cow) was recorded on the low mass treatment. It was concluded that maintaining low pre-grazing yields results in reduced grass DM production and a reduced level of grass silage conserved for winter feeding while offering no benefit in terms of animal performance.

Within this study methane emissions were measured on two occasions (June and July), it was found that grazing high pre-grazing yield swards increased methane production per cow/day (+42g), per kilogram of milk yield (+3.5g/kg of milk), per kilogram of milk solids (+47g/kg of milk solids) and per kilogram of grass dry matter intake (+3.1g/kg of GDMI) in the July period. In summary cows grazing high pre-grazing yield swards lost a greater proportion of their gross energy intake as methane during both measurement periods (+0.9% and +1%). This indicates that grazing swards of high grass quality (high leaf content) can reduce methane emissions from grazing dairy cows.

Targeting pre-grazing yields in the range of 1300 – 1600 kg DM/ha is a suitable criterion for determining when a pasture is ready to graze as it considers both pasture and animal performance related factors. Maintaining pre-grazing yields in the range of 1300 – 1600 kg DM/ha will ensure high pasture growth rates coupled with high levels of herbage utilization with no adverse affect on pasture quality or animal performance.

5. Opportunity/Benefit:

This project has highlighted the optimum level of pre-grazing yield which should be maintained within rotational grazing systems. This will result in increased milk solids output per ha and a greater number of grazing days per ha in comparison to very low or high levels of pre-grazing DM yields. It provides grassland farmers with an understanding of the benefits to be achieved through targeting specific pre-grazing herbage masses. This information will also benefit advisors as it provides them with the knowledge of what is the optimum level of pre-grazing DM yield and what drives animal performance as a result of this. It also provides an understanding as to why animal performance may be suffering on particular pastures or through particular grazing management practises.

6. Dissemination:

This information has already been widely disseminated to grassland farmers via discussion groups, open days, farm walks, popular press and Teagasc publications. It will continue to be disseminated through Teagasc advisors at discussion groups. Results have also been published in a number of peer reviewed international journals.

Main publications:

McEvoy, M., Delaby, L., Murphy, J.P., Boland, T.M. and O'Donovan, M. (2010). Effect of herbage mass and allowance on sward characteristics, milk production, intake and rumen volatile fatty acid concentration. Grass and Forage Science 65 : 335-347

McEvoy, M., O'Donovan, M., Murphy, J.P., O'Mara, F., Rath, M. and Delaby, L. (2009). Effect of pre-grazing herbage mass and daily herbage allowance on the lactation performance of Holstein-Friesian dairy cows. Journal of Dairy Science 92:414-422

Palladino, R.A., O'Donovan, M., McEvoy, M. , Callan, J., Boland, T.M. and Kenny, D.A. (2009). Fatty acid intake and milk fatty acid composition of Holstein dairy cows under different grazing strategies: herbage mass and daily herbage allowance. Journal of Dairy Science 92 :

Curran, J., Delaby, L., Kennedy, E., Murphy, J.P., Boland, T.M. and O'Donovan, M. (2010). Sward characteristics, grass dry matter intake and milk production performance are affected by pre-grazing herbage mass and pasture allowance. Livestock Science 127 : 144-154

Wims, C., Deighton, M., Lewis, E., O'Loughlin, B., Delaby, L., Boland, T. and O'Donovan, M. (2010). Effect of pregrazing herbage mass on methane production, dry matter intake, and milk

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production of grazing dairy cows during the mid-season period. Journal of Dairy Science 93: 4976-4985.

2 PhD and 1 Masters Thesis

Popular publications:
Farmers Journal
Farming Independent
New Thinking in Challenging Times booklet distributed at Teagasc Moorepark open day 2009
Winning on a World Stage, booklet distributed at Teagasc Moorepark open day 2007

Several discussion groups visited the research campus
Moorepark open days (2007, 2008, 2009, 2010,2011)
Farm walks (2006 to 2011 and ongoing)

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