Clonakilty update: the effect of sward type and varying levels of nitrogen application on a spring calving dairy grazing system

Megan Bock[1], Eoin McCormack[1,2] and Brian McCarthy[1]
[1]*Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork;*
[2]*Teagasc, Clonakilty Agricultural College, Darrara, Clonakilty, Co. Cork*

Summary

- Sward type and nitrogen (N) fertiliser rate had an effect on grass DM production.
- The grass-clover 150kg N/ha treatment produced a similar amount of grass as the grass-only 225 kg N/ha treatment.
- The grass-clover 150kg N/ha treatment cows produced 29 kg per cow of milk solids (5.5%) more than the grass-only 225kg N/ha treatment cows for the full lactation in 2022.

Introduction

Irish grazing systems have been predominantly perennial-ryegrass (PRG) based swards that required relatively large amounts of nitrogen (N) fertiliser to produce high grass DM yields. Increased pressure to reduce the environmental impact of agriculture, particularly greenhouse gas emissions and water pollution, will necessitate a reduction in the amount of chemical N fertiliser that farmers can use. White-clover has become a focus for more sustainable farming due to its capability to biologically fix N from the atmosphere into the soil. Other added benefits such as increased grass production and improved animal performance have also been observed from past research. The previous experiment in Clonakilty found higher milk solids yield per cow for cows grazing PRG-white clover swards compared to cows grazing PRG-only swards. This paper will present results of the most recent Clonakilty Agricultural College research experiment from 2022. The experiment entitled "Nitrogen sustainability in Irish dairy systems" investigated how utilising biological N fixation and varying nitrogen fertiliser inputs on different sward types effected grass growth and milk production.

Clonakilty experiment 2022

The experiment utilised the Clonakilty systems experiment and contained four treatments; a PRG-only sward receiving 150 kg N/ha (GO-150), a PRG-only sward receiving 225 kg N/ha (GO-225), a PRG-white clover sward receiving 150 kg N/ha (GC-150) and a PRG-white clover sward receiving 75 kg N/ha (GC-75). Each treatment had a separate farmlet of 20 paddocks for grazing. The treatment herds each contained 28 cows which gave a stocking rate of 2.57 cows/ha. The previous experiment conducted at Clonakilty from 2019-2021 was focused on improving sward white clover content on the farm. A systematic programme of reseeding and over-sowing was undertaken to increase white clover content. The current experiment follows from the previous experiment by continuing to look at white clover and how varying N fertiliser application rates impact overall farm production. By looking at varying levels of N fertiliser on different sward types, data can be collected to determine the feasibility of utilising biological N from clover as a more sustainable source to maintain grass production while maintaining high levels of milk production.

Results 2022

The average sward white clover content in 2022 was 15.5% with the GC-150 having a lower sward white clover content (14.0%) than the GC-75 treatment (16.9%). Sward type and N fertiliser rate had an effect on grass DM production. Comparing the sward types, PRG-only

swards produced 14.1 t DM/ha while the PRG-white clover swards produced 13.5 t DM/ha. Within sward type, there was a difference of 0.7 t DM/ha between the GO-225 and the GO-150 swards and a difference of 1.6 t DM/ha between the GC-150 and GC-75 swards. There was no difference in grass DM production between the GO-225 and GC-150. The GC-75 treatment having the lowest grass DM produced led to a higher amount of silage fed during lactation compared to the other treatments. None of the treatments were able to reach their winter feed production requirement and when silage fed during lactation was accounted for, the GO-225 treatment had the highest winter feed made (68%) versus the GC-75 treatment with the lowest winter feed made (38%). Grass production was reduced in 2022 due to drought at different times of the year. Sward type was found to have an effect on total milk production while N fertiliser rate had no effect. The GO-150 treatment produced 348 kg of milk per cow less than the GC-150 treatment while there was no difference between the GO-225 and the GC-75 treatments. Fat and protein contents were similar across treatments but a difference of 29 kg of milk solids per cow (5.5%) between the GO-150 and GC-150 treatments was found. Bodyweight and body condition score (BCS) were similar across all treatments.

Table 1. *Production parameters of white-clover in a dairy grazing system at varying levels of nitrogen application rates from 2022*

	GO-150[1]	GO-225	GC-150	GC-75
Nitrogen fertiliser spread (kg/ha)	151	224	151	85
Grass production (t DM/ha)	13.7	14.4	14.3	12.7
Concentrate (kg/cow)	783	780	776	792
Silage made (kg DM/cow)	996	1,025	1,004	880
Silage fed – lactation (kg DM/cow)	287	214	251	422
Winter feed made (%)	59	68	63	38
Milk yield (kg/cow)	5,843	6,086	6,191	6,086
Fat content (%)	4.85	4.78	4.76	4.80
Protein content (%)	3.76	3.80	3.86	3.75
Milk solids yield (kg/cow)	492	509	521	509
Bodyweight (kg)	506	515	515	518
Body condition score	2.90	2.95	2.96	2.99

[1]*GO-150 = perennial ryegrass (PRG)-only sward receiving 150 kg N/ha, GO-225 = PRG-only sward receiving 225 kg N/ha, GC-150 = PRG-white clover sward receiving 150 kg N/ha, GC-75 = PRG-white clover sward receiving 75 kg N/ha*

Conclusions

The results from year one of this study show that white clover inclusion in PRG swards continues to have positive effects on grass DM and milk production. Although 2022 was a poor year for grass growth, due to the dry conditions for much of the summer, and none of the treatments produced enough winter feed, the results show the potential of white clover and the capabilities of reducing reliance on N inputs while being able to maintain production.