

MM21: High Sugar Grasses

Description of the measure

The incorporation of high sugar grasses (HSG) into swards is a management option for pasture-based dairy systems. HSGs are perennial ryegrass diploids that have been bred to express with elevated concentrations of water-soluble carbohydrate. HSG have the potential to increase the efficiency of the use of N released from the digested forage (Parsons *et al.* 2011). Consequently, HSGs have the potential to reduce the proportion of ingested N lost in the form of urine (Parsons *et al.* 2011), which results in a reduction in N lost through leaching and N₂O emissions (Foskolos and Moorby, 2017; Parsons *et al.* 2004). However, the water soluble carbohydrate (WSC) : crude protein (CP) ratio of the grass is critical in controlling the N excreted (Parsons *et al.* 2011).

There is also evidence to suggest that HSGs can increase milk production and animal growth rates (Parsons *et al.*, 2011). HSGs also have the potential to reduce the emissions of enteric methane; however, the evidence for this effect is uncertain (Parsons *et al.* 2011, Staerfl *et al.* 2012; Ellis *et al.* 2012), and therefore the impact of HSGs on methane production have been omitted from this assessment.

Applicability

Sowing HSG is applicable to all livestock holdings with temporary swards. In low N input system, cultivars are available with suitable WSC:CP ratio that have the potential to achieve the benefits in ruminant nitrogen use efficiency and thus reduce the N losses from the grazing animal (Parsons *et al.* 2011). However, this is not the case in high N systems.

The potential applicability for HSGs is assumed to be related to the proportion of temporary grassland to the total of the temporary and permanent pastures. It is therefore assumed to be 29% of the dairy herd.

Abatement rate

To estimate the GHG effects of this measure, based on the abatement data in Table 1 the milk yield of the cows were increased by 6.8%. Furthermore, it was assumed that digestible energy content of the roughage increased to 75% from the original 71.8%. This resulted in a 9% decrease in the N excretion relative to energy corrected milk (ECM).

Table 1 Data from literature on abatement by HSGs

Abatement	Value	Country	Reference
Milk yield	+6.8%	UK/NL/NZ	In LCA study (Soteriades <i>et al.</i> 2018)
ECMY ^a	+2%	UK/NL/NZ	In LCA study (Soteriades <i>et al.</i> 2018)
Fat (%)	-1.5%	UK/NL/NZ	In LCA study (Soteriades <i>et al.</i> 2018)
Protein (%)	-1.5%	UK/NL/NZ	In LCA study (Soteriades <i>et al.</i> 2018)

Abatement	Value	Country	Reference
Dry matter intake	+3.8%	UK/NL/NZ	In LCA study (Soteriades <i>et al.</i> 2018)
N excretion	-12% per kg ECMY	UK/NL/NZ	In LCA study (Soteriades <i>et al.</i> 2018)
Fertiliser N	+3%	UK/NL/NZ	In LCA study (Soteriades <i>et al.</i> 2018)

^a Energy corrected milk yield

Current and additional future uptake

Currently, 62% of livestock holdings with temporary grasslands have sown HSGs (Defra, 2018a). However, in 2018, only 30% had sown HSG in more than 60% of the swards. It has been assumed that 30% of the temporary grassland is sown with HSGs. Based on the June Census for England (Defra, 2018b) and the relative areas of temporary and permanent grassland, it has been assumed that the current uptake of the measure is 9% of dairy farm grassland area, and this it is assumed that 9% of the cows are getting diet which include HSGs.

Cost

Cost data from the literature is presented in Table 2 (assuming 1.8 LU stocking density).

Table 2 Costs and benefits of precision farming

Costs/savings	Value ('-' sign for savings)	Country	Year	Reference
Cost of HSG	Italian ryegrass £47 acre ⁻¹ , HSG varieties £68-80 acre ⁻¹ ; price difference is £67 ha ⁻¹	UK	2018	Boston Seeds (2019)

Assumptions used in the MACC

Parameter	Change in value	Notes
Roughage digestibility content	Increased to 75%	
Milk yield	+6.8%	
Seed cost difference	£7.97 head ⁻¹ year ⁻¹ (£67 ha ⁻¹ for every 5 years, assuming 1.8 livestock unit stocking density)	
Maintenance cost	£32 head ⁻¹ year ⁻¹	

References

Boston Seeds (2019) <https://www.bostonseeds.com/products/1/Grass-Seeds/> (accessed on 4/2/2019)

Defra (2018a) Greenhouse gas mitigation practices - England Farm Practices Survey 2018 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/710413/fps-ghg2017-statsnotice-24may18.pdf (accessed on 4/2/2019)

Defra (2018b) June Census - results by type of farm

<https://www.gov.uk/government/statistical-data-sets/structure-of-the-agricultural-industry-in-england-and-the-uk-at-june>

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