Enteric methane emissions within Irish dairy systems

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Summary

- There is a seasonal nature to enteric methane output by grazing dairy cows which is related to differences in grass quality across the grazing season.
- Measured enteric methane output is less than what current models assume for dairy cows in Ireland.
- New emission factors for enteric methane will allow for more accurate accounting of methane output at a national level.

Introduction

Methane emissions from enteric fermentation are a by-product of feed digestion within the animal's rumen. Within the agriculture sector, methane emissions from enteric fermentation account for 63.1% of total greenhouse gas emissions. Given that the agricultural sector needs to reduce its greenhouse gas emissions by 25% by the year 2030 relative to 2018 levels, developing strategies to better measure and ultimately mitigate enteric methane will be crucial to meeting Ireland's agricultural sector's climate targets. Teagasc, in collaboration with VistaMilk, has acquired pasture-based GreenFeed units to measure methane at grass (See Figure 1). Cows are enticed to visit these units 2-3 times per day by offering a small portion of concentrate feed. When the cows enter the machine air is sampled from their breath which is then measured for methane output. These units are being used to profile the methane output of Irish dairy cows at grass as well as to evaluate strategies to reduce methane output relating to grazing management, feed additives and animal breeding.

Figure 1. *Cow being measured for methane emissions using a GreenFeed unit*

Methane profile

Results show that there is a seasonal nature to methane output from dairy cows at grass with lower enteric methane emissions observed in the spring period when cows are at peak milk production (Figure 2). The lower methane emissions in the spring are related to high quality pasture with low levels of neutral detergent fibre during this period. Lower levels of fibre can result in a reduction in the residency time of material in the rumen which means there will be less time for methane to be formed. Spring pasture can also lead to reduced pH levels in the rumen, which can inhibit the growth of methane producing micro-organisms. As the grazing season progresses, methane output increases while milk solids production decreases, in line with a deterioration in sward quality and an increase in the lactation stage of the herd. When compared to methane values calculated using international default methane emission factors there can be a considerable difference between calculated and measured methane output. When all data from grazing dairy cows collected to date is accumulated, the methane conversion factor for Irish dairy cows is ~9% lower than currently used within the national greenhouse gas inventory. This research can allow for more accurate accounting of methane on a national level, enabling policy makers to make better and more informed decisions when implementing mitigation strategies for methane emissions under Irish grazing conditions.

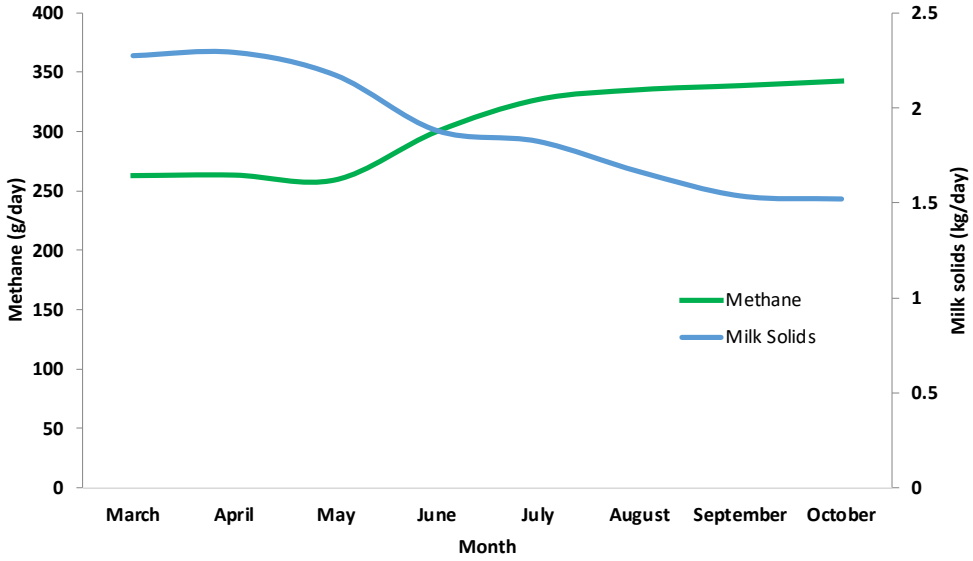

Figure 2. *Seasonal profile of methane emissions and milk solids production in grazing dairy cows*

Conclusion

Research has shown that there is a seasonal nature to methane output in grazing dairy cows. Additionally, models used to generate enteric methane output in Irish dairy cows currently overestimate enteric methane emissions. New emission factors for Irish grazing dairy cows will allow for more accurate accounting of methane output nationally.

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