METHANE INDEX FOR GRASS SILAGES: A STANDARDIZED TOOL FOR BENCHMARKNG METHANE EMISSIONS GLOBALLY

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INTRODUCTION

Methane is a significant environmental concern in agriculture worldwide, contributing to climate change. Governments globally are addressing this issue; for instance, in 2022, the Dutch Government introduced a National Methane Strategy to reduce methane emissions by 30% by 2030 compared to 2020 levels.1 The agricultural sector, responsible for a large share of methane (CH_4) emissions, up to 78%.2

Measures like feed additives, optimized livestock diets, and advancements in breeding are being implemented to create a more sustainable sector.

This study observed significant differences in methane emissions between years and seasons, prompting the creation of a Methane Index by Eurofins Agro. This Index benchmarks methane emissions in grass silages worldwide. This innovative tool supports promotes environmental sustainability in agriculture.

MATERIAL AND METHODS

Based on research conducted by Wageningen University, two unpublished models developed by Sebek *et al.*, based on chemical parameters of silages, were utilized to predict potential methane emissions from grass silages. These models were applied to calculate the potential methane emissions for 47,422 grass silages harvested across Europe in 2022 and 2023. Additionally, to examine yearly fluctuations in methane excretion, we analyzed a dataset involving 347,185 production samples from grass silages harvested between 2015 and 2024 in the Netherlands.

In the analysis of the production samples submitted to the Eurofins Agro laboratory in the Netherlands, the ADF model was preferred; however, when ADF was not available, the Crude Fiber model was used. The results were processed using Excel, and statistical methods, including regression analysis, were employed to ensure accuracy and consistency.

RESULTS

The analysis revealed significant differences in methane emissions across various dimensions, including countries, seasons, and years. These findings underscore the complexity of methane emissions and the need for a comprehensive approach to benchmarking and reduction strategies.

The analysis of average potential methane emissions across the Netherlands, Belgium, Germany, and Denmark reveals significant variations, as shown in Figure 1. The Netherlands exhibits the lowest average emissions, while Belgium shows the highest. Additionally, Belgium's interquartile range (IQR) is the largest, indicating greater variability in methane emissions. Denmark has the lowest IQR, suggesting that methane emissions are more consistent.

The seasonal variation in potential methane excretion was analyzed, revealing distinct patterns throughout the year. As illustrated in Figure 2, methane excretion peaks during the spring season and reaches its lowest levels in autumn. This

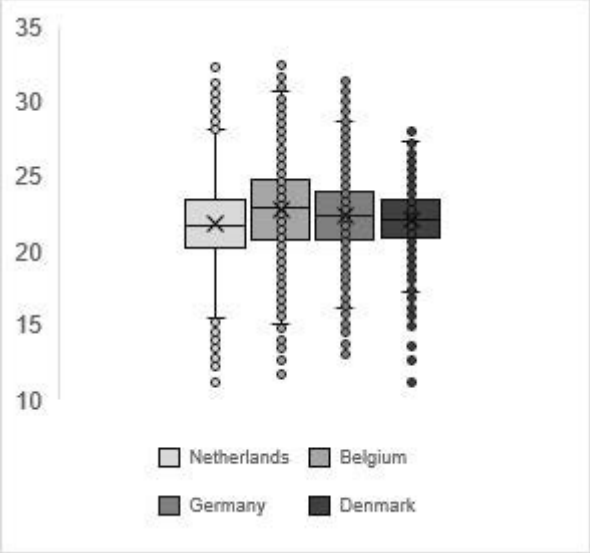

Fig. 1: Potential methane emissions in grass silages in the Netherlands, Belgium, Germany and Denmark

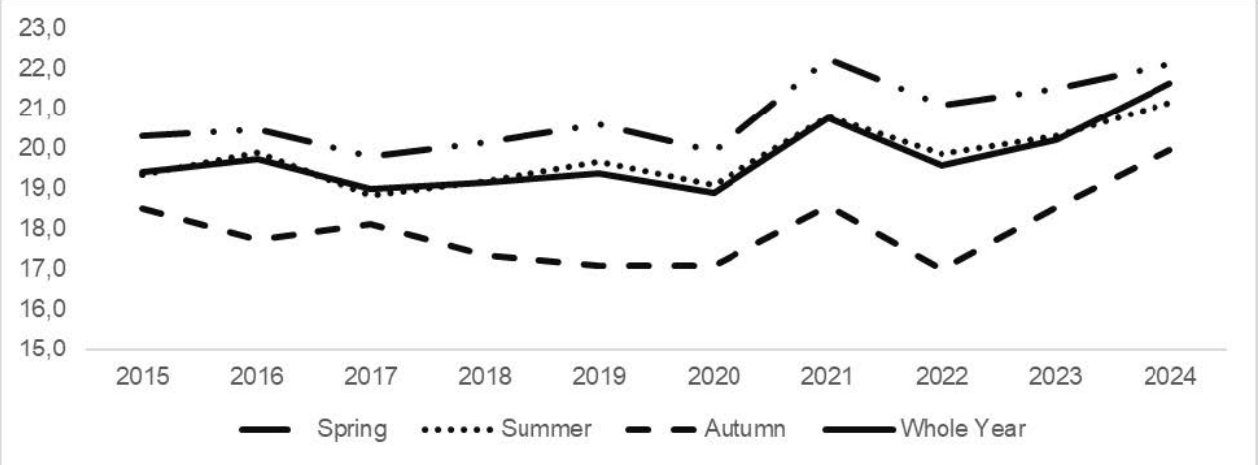

Fig. 2: Seasonal Variation of Potential Methane Emissions in the Netherlands (2015-2024)

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seasonal trend suggests that environmental or biological factors influencing methane production are more active in spring compared to autumn.

During the analysis, it became evident that benchmarking methane emissions based on country averages was not feasible due to the varying number of samples from different countries. To address this, an index was created to correct for seasonality and yearly fluctuations. This index allows for a more accurate comparison of methane emissions across different regions and time periods. The index evaluates whether the potential methane emissions of the silage, based on the Wageningen University models, are high or low.

CONCLUSIONS

The analysis of potential methane emissions across different seasons and countries revealed significant variations. The Netherlands exhibited the lowest average emissions, while Belgium showed the highest and most variable emissions. Denmark had the most consistent emissions profile. Additionally, the seasonal analysis indicated that methane emissions peaked in spring and were lowest in autumn.

The proprietary index, developed during the results analysis, proved essential for benchmarking methane emissions globally. This index corrects for seasonality and yearly fluctuations, enabling farmers to understand that high absolute methane emissions may be due to environmental conditions rather than poor management practices.

More research on a wider scale is needed to identify effective management practices that can lower methane emissions and, consequently, reduce the methane index.

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