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One of the largest methane anthropogenic sources worldwide is livestock production. In Denmark, this contribution reached 81.1% of total anthropogenic methane, divided into both enteric fermentation and manure management emissions (Nielsen et al., 2019). Numerous factors can influence methane emissions from livestock production. The development of strategies to measure and monitor this anthropogenic activity allows the identification of efficient mitigation actions. The dynamic tracer gas dispersion method (TDM) is a ground-based remote sensing method, which combines a controlled release of tracer gas from the target source with concentration measurements downwind of the same source. TDM has been compared to other remote sensing techniques and widely applied for methane quantification from many facilities (Samuelsson et al., 2018). Previous studies found that this method is very likely to reached up to only 20% of error (Fredenslund et al., 2019). For livestock methane quantification, TDM has been used before releasing a strong greenhouse gas (SF_6) with mostly stationary point sampling setup. The aim is to verify the suitability of the method for these facilities and identify the differences between farming approaches. Furthermore, the comparison of the measured emissions with inventory estimation could show the accuracy of the later.

This study uses acetylene as tracer gas and measurements performed with a fast responding and highly sensitive gas analyzer by Picarro. On this project, emissions from six livestock facilities (dairy cows and swine production) were investigated along one year.

Dairy farms were the largest methane emitters per head (Around 40 gCH_4/head/h). Results show that management practices might cause different methane emissions from dairy farms. Similar result was observed analyzing emissions from pig facilities (Around 6 gCH_4/head/h), with an influence of animal life stage. The sow's farm had the highest methane emission factor when compared to fattening pigs, while manure acidification treatment might have a positive impact on reducing methane emission.

The successful application in this study of the TDM showed that this method is a valuable tool to support Danish farming strategies to meet ambitious GHG emission reduction targets.

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Samuelsson, J., Delre, A., Tumlin, S., Hadi, S., Offerle, B., & Scheutz, C. (2018). Optical technologies applied alongside on-site and remote approaches for climate gas emission quantification at a wastewater treatment plant. Water Research, 131, 299–309.