

A Static Balance Model Quantifying Nutrients in Feces, Urine and Gasses of Cattle and Pigs

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Objective of the study

To develop a model for dairy cattle and pigs to quantify greenhouse gas emissions from animal and barn level – only pig example presented here

Introduction

✓ It is expected that in the future Danish farmers, besides the mandatory accounts for nitrogen and phosphorus, should have an account for greenhouse gasses emissions from the farm

Materials and methods

- Typical Danish diet for pigs shown in Table 1
- Chemical composition and digestibilities for each feedstuff from standard feed tables
- Digested feed fractions calculated from chemical composition, digestibilities and **actual** feedstuff composition
- Methane emission modelled using the anaerobic biodegradation model (**ABM**) with a standard barn scenario including washing in between batches of growing-finishing pigs

Table 1 shows the two diets used for modelling and modelled methane emission at barn level

Feed components	Typical diet (% of DM)	Typical diet + 5% soybean oil (% of DM)
Wheat	41.28	39.22
Barley	27.00	25.65
Rye	10.00	9.50
Soybean meal, toasted	15.93	15.13
Sunflower meal	2.00	1.90
Soybean oil	0.80	5.80
Amino acids	0.60	0.57
Calcium monophosphate	2.37	2.25
CH ₄ barn emission from slurry modelled by ABM (kg animal place ⁻¹ year ⁻¹)	1.31	1.35

Results

Figure 2. Digested feed fractions, g/kg of DM

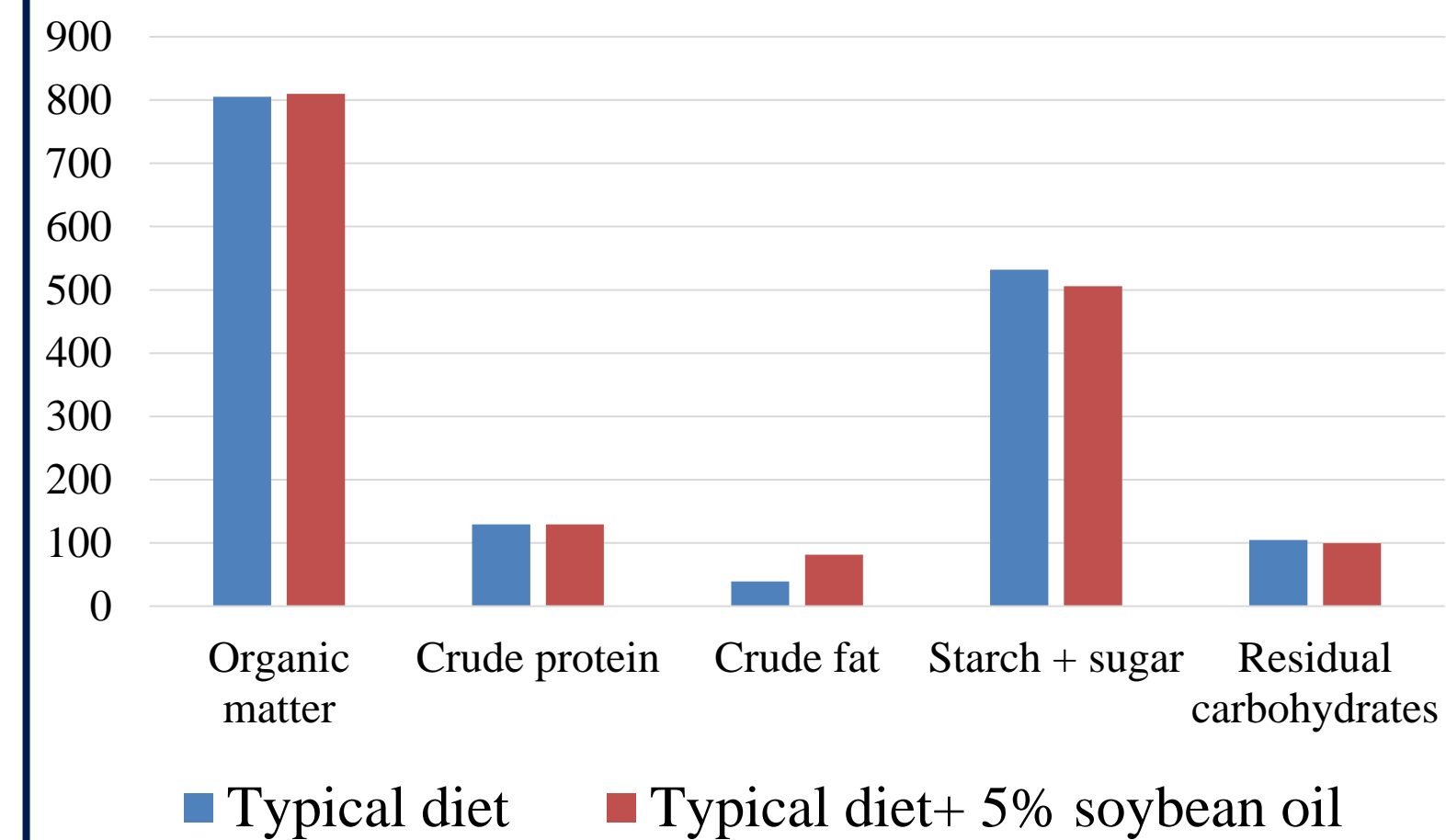


Figure 3. Slurry composition, g/kg fresh slurry

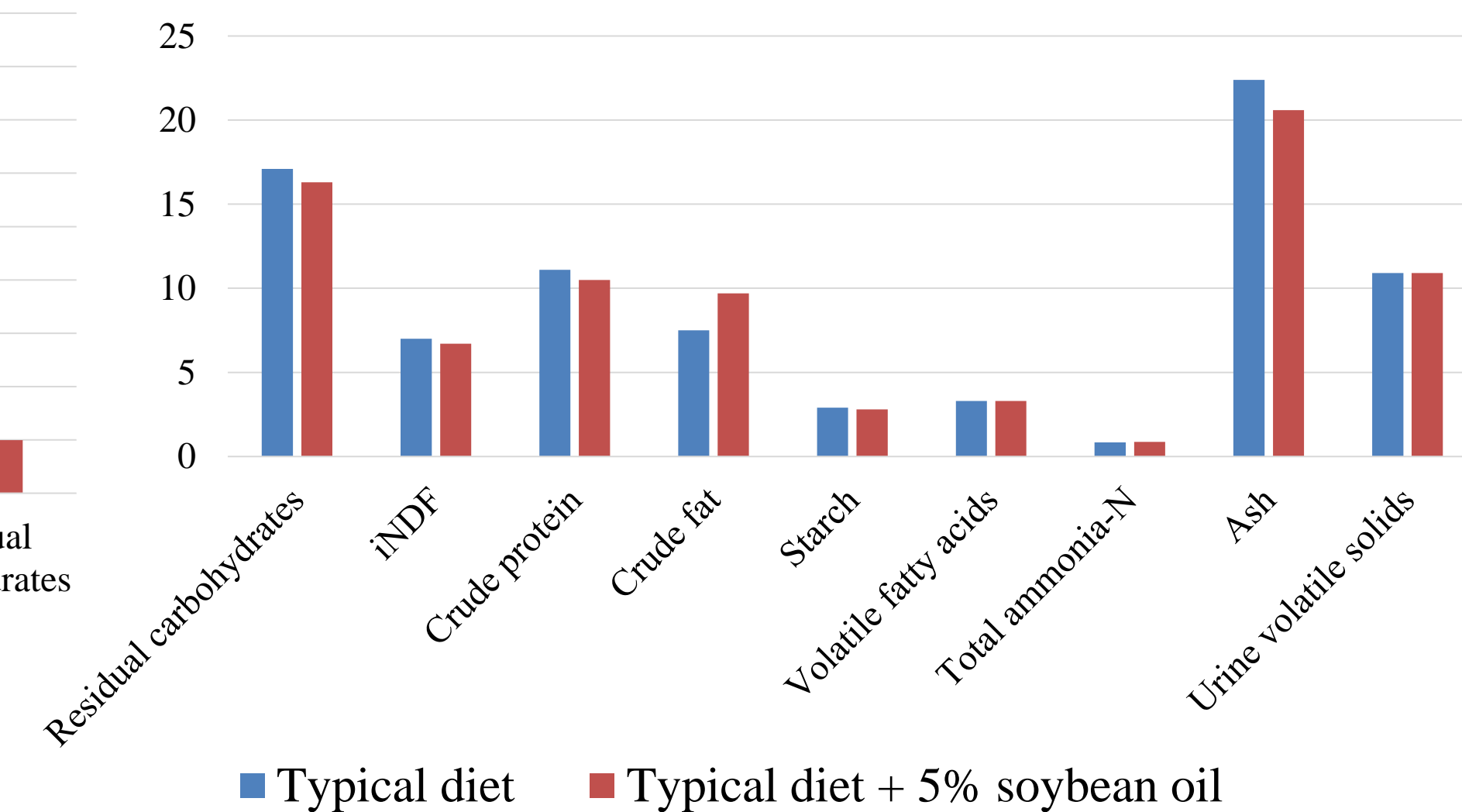
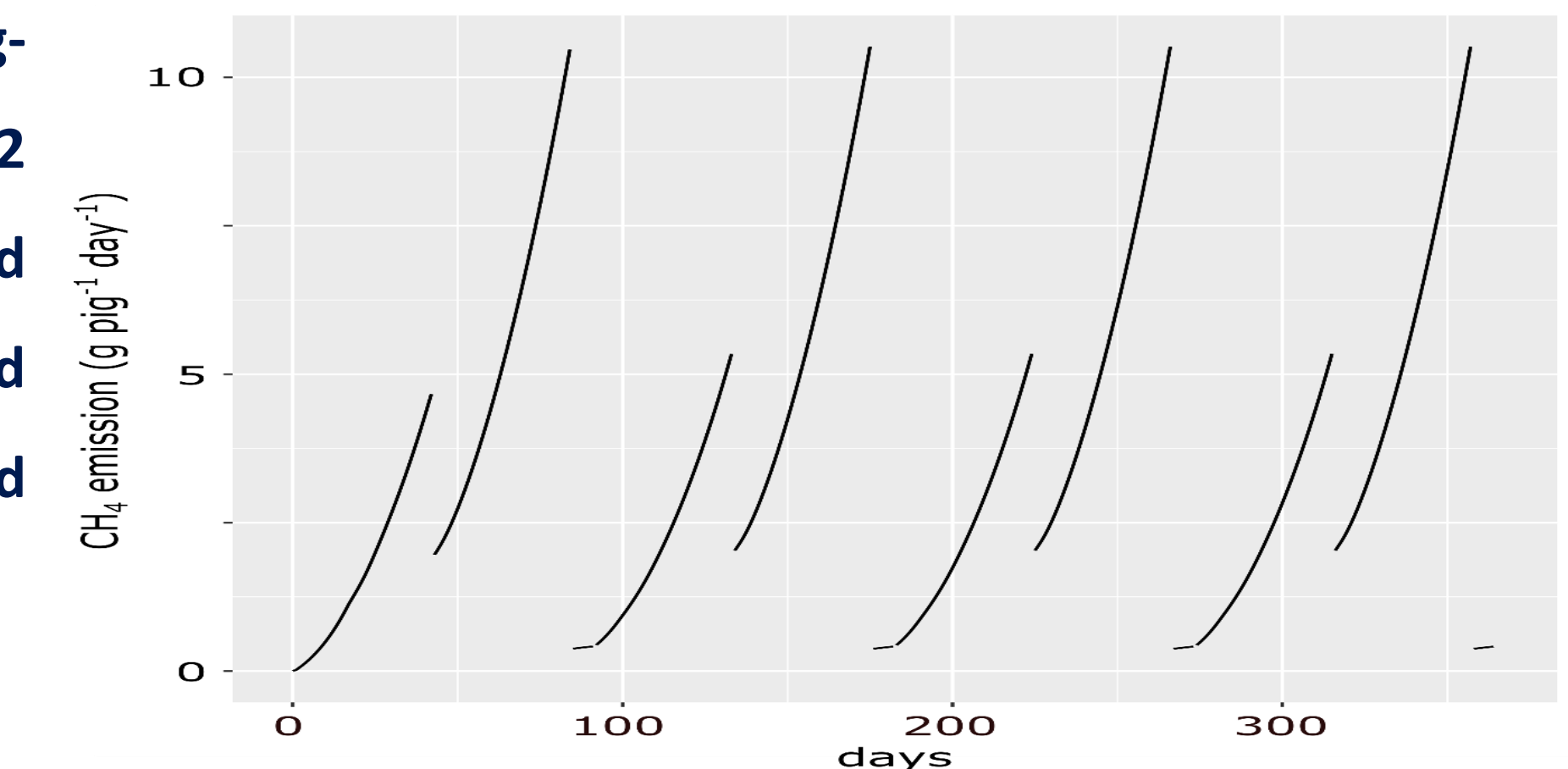


Figure 4. Simulation of barn methane emission from slurry, during 4 batches of growing-finishing pigs fed a typical Danish diet. Every 42 days, slurry channels were va-cuum flushed down to 3.5 cm height. Each batch of pigs lasted 84 days followed by 7 days for washing and drying of the section



Conclusion

Faecal composition calculated from actual feedstuff composition and standard table feed values can potentially improve precision of models for barn methane emission. Modelled barn methane emission from slurry was not affected by increased fat content in the diet.

Acknowledgment: The current project is financially supported by Ministry for food, agriculture and fisheries of Denmark

Figure 1. Schema for quantifying nutrients in feces, urine and gasses at animal level

