Effect of nutrient excretion on greenhouse gas emission from pig manure

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Reduced dietary protein intake decreases N and C excretion by pigs and N_2O, and CH_4 emissions from manure. We calculated the impact of feeding reduced protein, amino acid supplemented diets, on GHG emissions from pig manure.

Carbon and nitrogen excretion from sows and finishing pigs fed conventional (HP) or reduced protein, amino acid supplemented (LP) diets, formulated to achieve equal animal performance, were measured. Estimates of GHG emissions were calculated at low (5% of N, 3% of C in manure) or high (30% of N, 20% of C in manure) conversion rates of excreted N to N_2O and C to CH_4. CO_2 emissions were estimated to contribute approximately 1% to the CO_2-equivalent emitted from manure as N_2O and CH_4.

At low rates of transformation, the CO_2-equivalent from manure would be 443 (HP) and 368 kg/pig/year (LP) for finisher pigs fed wheat-barley-canola diets. The emissions increased to 2743 (HP) and 2289 kg (LP) at high conversion rates. The reduction of CO_2-equivalent caused by dietary reduction was similar at 17% for the low and high conversion rates. This was due to the reduction of N_2O emissions; the CH_4 emissions were virtually identical, commensurate with the C excretion. CO_2-equivalent from manure was 497 (HP) and 457 kg/pig and year (LP) for finisher pigs fed corn-soybean diets. These amounts were 3053 (HP) and 2806 (LP) kg/pig and year of CO_2-equivalents at high conversion rates. The reduction in emissions occurred to a similar degree for the N_2O and CH_4 emissions. CO_2-equivalents emitted from manure per sow per year were at least 50% greater than for finishing pigs: 742 (HP) and 621 kg (LP) at low and 4597 (HP) and 3861 kg (LP) at the high conversion rates. Emissions were reduced by approximately 10% per 10% relative dietary protein reduction for wheat-barley-canola diets, but only by about 6% for corn-soybean diets.

Implications: Less expensive diet manipulation should be used to reduce GHG emissions before investment in expensive manure management technology. Supported by Alberta Pork, Alberta Agricultural Research Institute, Climate Change Funding Initiative – CARC, and Degussa AG
