The effect of including methane traits in selection indexes for ruminants

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Sustainable ruminant breeding programs increasingly incorporate methane emission traits into selection indexes. We compare indexes for dairy, beef and sheep.

A critical first step is clearly defining the breeding objective and the perspective from which it is optimised. For example, the global objective is to reduce methane emissions while maintaining a profitable and efficient animal production industry. Therefore, changes in methane emission must be evaluated against changes in output, implying an objective like methane intensity (methane produced per unit of product). Methane intensity is a ratio that can be improved by either decreasing the numerator (methane output) or increasing the denominator (production output). An optimal balance must be found between selecting for reduced methane and selecting for productivity and other economically important traits. Selecting on methane intensity as a ratio trait is undesirable as it complicates optimising economic response. We therefore recommend linear selection indexes that include component traits such as methane production, feed intake and production output. While the economic value of genetic changes in methane emission traits remains unclear due to lack of clear producer incentives, different selection strategies can be compared provided genetic parameters exist, including genetic correlations between methane traits and other breeding objective traits.

Comparing responses to selection on indexes for dairy, beef and sheep demonstrates that reducing methane per head is generally not desirable as it typically results in lower productivity, negatively impacting methane intensity improvement. Much of the improvement in methane intensity is achieved through productivity gains. The trade-off between improving productivity and curbing methane emissions depends strongly on correlations between methane output and productivity traits, which differ somewhat between species and production systems. We present various examples illustrating principles for achieving such balance in typical industry indexes across species.