

Economics of breeding schemes for improved methane efficiency in dairy cattle

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The objective of this project is to evaluate the economic and environmental impacts of various breeding schemes that include new methane efficiency traits at the dairy farm level.

Livestock is responsible for ~32% of anthropogenic methane emissions. Given the urgency in cutting methane from all sources, breeding for methane efficiency offers an additive and permanent solution to reduce methane from cattle. An estimated breeding value for methane efficiency in dairy cattle is already available commercially (e.g., in Canada by Semex; in the Netherlands by CRV). However, immediate adoption and uptake of the methane efficiency trait by dairy farmers is not guaranteed, especially because methane doesn't have an obvious economic value. In addition, long term economic impacts of breeding decisions at the farm level that incorporate the methane efficiency trait have not been evaluated. This evaluation is important to support the development of economic mechanisms to increase the emphasis of breeding for this trait by dairy farmers. We will evaluate 6 different breeding scenarios: 1) Maximizing the economic return using an existing economic selection index like Net Merit Dollars (NM\$) which currently does not include a methane efficiency trait, 2) Maximum emphasis on a methane efficiency trait, thereby maximizing genetic progress in methane reduction but giving up some economic returns, 3) Four breeding scenarios in which breeding schemes are designed between the two prior extreme scenarios, in search of major progress in methane efficiency without giving up much on economic returns. We are creating a dairy herd simulation model able to calculate the impacts of these 6 breeding schemes on dairy farm profitability and methane production over multiple generations (30 years). From this, we will estimate the reduction in methane emissions at the cow and herd level over time. We will also calculate the cost per ton of methane reduced in each scenario. Genetic and phenotypic correlations between the methane efficiency trait and older traits like milk production and functional traits will be modeled using Semex and CRV data.

These results will support the development of an economic value for the methane efficiency trait to be incorporated in selection indexes, and the development of policies and market-based mechanisms to support adoption of this trait by dairy farmers.