Cownex, a tool to assess nitrogen efficiency, autonomy and excretion at dairy herd level

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COWNEX, A TOOL TO ASSESS NITROGEN EFFICIENCY, AUTONOMY AND EXCRETION AT DAIRY HERD LEVEL

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INTRODUCTION

The efficiency of nitrogen (N) use in dairy herds is an important challenge due to the environmental impacts of the N cascade and to the cost of protein resources. The assessment of global N efficiency and N excretion of dairy herds is complex due to the large diversity of feeding management during the year (several diets and several feeding groups). CowNex is designed to estimate the N parameters very simply for each farm situation.

MODEL/TOOL DESCRIPTION

CowNex is a new web application (http://www.cownex-record.inra.fr/) that facilitates the calculation of dry matter and nitrogen use in dairy herd according to the management, with a special attention to feeding management with user-friendly interface (Figure 1). It based on a subpart of the whole farm MELODIE model (Chardon et al. 2012) using the Record modelling platform. The model simulates the daily intake, production and excretion of the different categories of animal in a dairy herd according to the feeding management described by the users (Fig 2). CowNex enables the assessment of existing farms and the simulations of changes in feeding management both on production and excretion.

Figure 1. Example of the description of an annual feed management of a group of cattle with the CowNex web interface.

Applied to a large diversity of dairy systems encountered in France based on the "model farms" of INOSYS, CowNex was used to estimate the actual situation and to test some mitigation options to reduce NH_3 emissions and associated N2O emissions from manure. The estimation of these impacts was calculated using the EMEP-EEA equations with the CowNex results of N excretion (urine and faeces) either indoor of outdoor.

RESULTS AND DISCUSSION

The results of the different simulations are presented in figure 3. The reduction of protein supplementation to reach a crude protein content of 14% with maize silage based diets is a simple and efficient solution to highly reduce ammonia emissions and decrease GHG emissions between 10 and 20%, with a good choice of protein sources, but without changing any manure management options. In many systems, there is both economic and environmental benefit to pay attention to the protein supplementation.
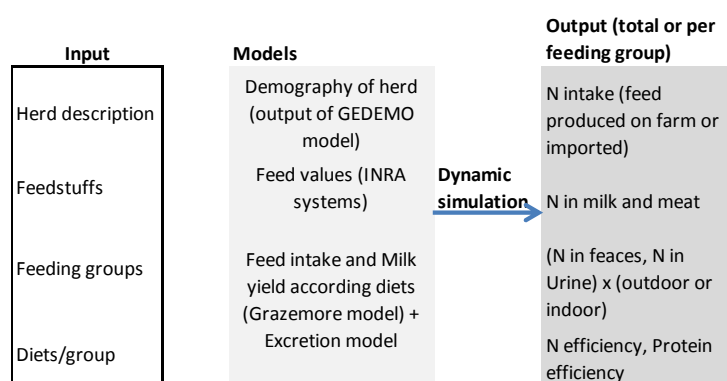
Figure 2. Simplified representation of CowNex tool, inputs outputs and model used.
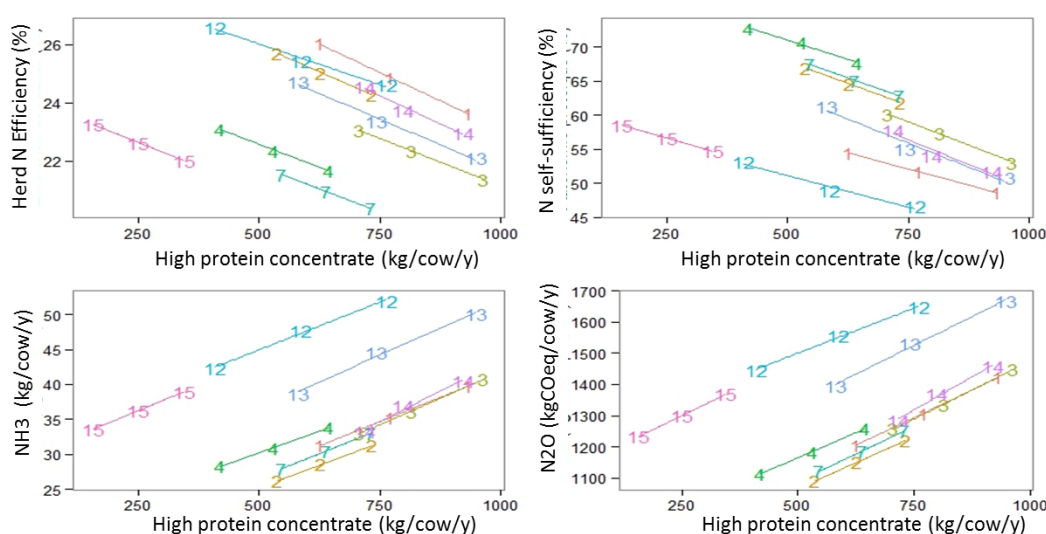

Figure 3. N efficiency ad N emissions for different model dairy systems with different protein supplementation.

CONCLUSION

CowNex is a free application to simply compare N excretion of different dairy systems with different feeding management. The reduction of protein supplementation during the indoor period is an efficient solution to reduce NH3 emissions of dairy cattle, but with different effects according to the farming system.

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