

UMR Herbivores

Team Design, Modelling and Evaluation of Herbivore farming Systems (COMETE)

Biotechnical and economic performance of mixed dairy cow-suckler cattle herd systems in mountain areas in the face of price variations: Bioeconomic simulations

Ruminant farming systems are questioned for their contribution to climate change and feed-food competition. Here, we analyse the economic and environmental performances of five sheep farming systems optimised in terms of ewe productivity and feeding costs. Systems are located in contrasting biogeographical areas along a gradient of decreasing agronomic potential from Ireland to the French Mediterranean rangelands.

The aim of this work was to test whether mixed herds of dairy cattle associated with beef cattle allow a better valorization of the plot and better economic performances. The functioning of two farms derived from two farm types representative of real mixed cattle mountain systems in the south of the Auvergne was simulated using the Orfee bioeconomic optimisation model. Different proportions of beef and dairy cattle were simulated. The results showed a better use of grazed grass with mixed herds than with specialized herds. The average income per worker unit was also higher, especially when the difference in profitability between the two activities (milk and meat) was small. Moreover, the mix of herds reduces the variability of profits, taking into account price and policy changes over the 2000-2015 period.

Ruminant production is predominant in mountainous areas, where grassland plots are often difficult to access or not harvestable. Many mountain livestock systems combine a herd of dairy cows with a herd of suckler cows. The aim was to determine the influence of herd composition on grassland value, livestock production and economic performance. The functioning of two farms from two types of cattle farms representative of mixed mountain systems in southern Auvergne (France) was simulated using the Orfee bioeconomic optimisation model with the price and public policy contexts corresponding to the 2000-2015 period. The experimental design used five simulations defined by the percentage of Livestock Unit found in the dairy herd (D): 100D, 75D, 50D, 25D, and 0D. A local sensitivity analysis of beef, milk and feed prices was combined with a global sensitivity analysis based on metamodels.

The results show better use of grazed grass with mixed herds than with specialized herds: suckler cattle can graze plots far from the farm and dairy cattle with higher needs and profitability value better grass in plots that are accessible to them. This better use of resources increases the average income per worker unit. In the simulated scenarios, the income is the highest for a distribution with half of the herd in dairy cattle. This share depends on the difference in profitability between the two enterprises and the grazing area not accessible to dairy cows. Moreover, mixing beef and dairy cows reduces the variability of profits, taking into account price and policy changes over the 2000-2015 period. In our simulations, profit is most stable (i.e. the coefficient of variation is the lowest) when there are approximately 25% dairy cows in the herd.

Other types of mix will be simulated (cattle-pig, cattle-sheep, crop-livestock) to highlight the complementarities between these enterprises and possible economies of scope as well as their interests and limits to secure income.

Publications:

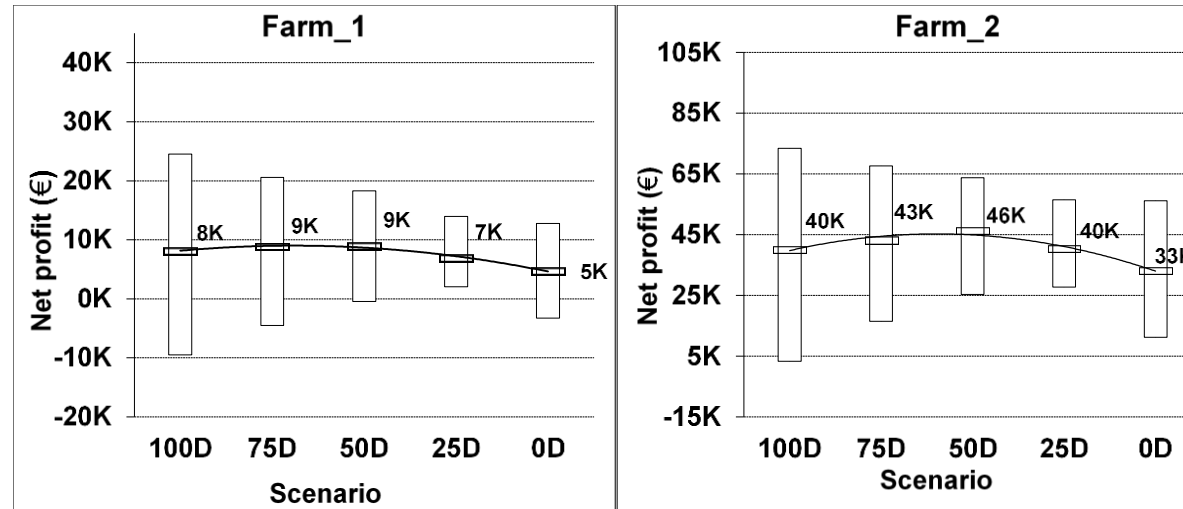
Diakit  et al. 2017, Capacities of dairy and suckling herds to valorize grassland resources in mountain areas: use of a bio economic optimization model to study the influence of the structure of livestock systems, Pr sentation Poster au 12th **International Meeting on Mountain cheese** 20-22 June 2017 at Padova, Italy, University Press Universit  degli Studi di Padova via 8 Febbraio 2, Padova www.padovauniversitypress.it ISBN 978-88-6938-059-4.

Diakit  et al. 2018. Grazing performance and the use of concentrate in double herds breeding systems with dairy cow and suckling cattle herds in mountain areas: a bioeconomic simulation analysis. Poster pour 10th. **International Symposium on the Nutrition of Herbivores** (ISNH10) ; du 2 au 6 Septembre , 2018. Clermont-Ferrand (France). Published: Advances in Animal Biosciences, 9 (3), Editeur: Cambridge University Press, Cambridge (Royaume Uni), ISSN : 2040-4700 Pages : 214-214.

Diakit , Z.R., Corson, M.S., Brunschwig, G., Baumont, R., Mosnier, C., 2019a. Profit stability of mixed dairy and beef production systems of the mountain area of southern Auvergne (France) in the face of price variations: Bioeconomic simulation. Agricultural Systems <https://doi.org/10.1016/j.agsy.2019.01.012>.

Diakit , Z.R., Mosnier, C., Baumont, R., Brunschwig, G., 2019b. Biotechnical and economic performance of mixed dairy cow-suckler cattle herd systems in mountain areas: Exploring the impact of herd proportions using the Orfee model. *Livestock Science* <https://doi.org/10.1016/j.livsci.2019.09.009>.

Contact: Mosnier, Claire, claire.mosnier@inra.fr, UMR Herbivores, F-63122 Saint-Gen s-Champanelle, France.



Legend: Mean net profit (€) for the five scenarios of the two farms as a function of a change in price of beef, milk, or "concentrated feed" (a mean of several feeds) by $\pm 25\%$ (from a factor of 0.75 to 1.25). Scenarios: 100D = dairy cattle herd, 75D = 75% dairy cattle, 50D = 50% dairy cattle, 25D = 25% dairy cattle, 0D = beef cattle herd. Diakit  et al 2019a.