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Integrating empirical and scientific knowledge to evaluate the transition to a once-a-day milking in dairy ewe farms

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1 Introduction

As for the whole French ovine sector, the Rayon de Roquefort sector is largely constrained by a conjuncture which combined an explosion of the production costs, a climatic variability which affects forage quality and an increase in the work load and drudgery. The once-a-day milking is an interesting technique in response to the breeders' expectations of finding livestock systems both economically and socially viable. It can lighten the routine work load in dairy flocks. The Lacaune ewe appears to be well adapted to the once-a-day milking situation (Vanbergue et al. 2013). However, the resort to this new technique in dairy ewe farms arises questions, both at the individual (balance between income and work load) and at the collective (collection and milking distribution) levels. In this study, we aim at presenting how an approach combining both empirical and scientific knowledges, and their consequential produced scenarios, are likely to stress the technical levers which could accompany the transition to the once-a-day milking in French dairy ewe flocks. The local stakeholders' (breeders, advisors and farms network) mobilisation was regularly held during the four years of the study to discuss on the modelling hypothesis, the scenarios to test and the validity of the results.

2 Materials and Methods

The model BOUSSOLE was developed to represent dairy ewe farms situated on the Rayon de Roquefort area. Its development is based on the use of virtual farm types. A virtual ideal farm type is the optimized economic and technical design of a farming system performed from a farm network. By providing a common language, the farm-types facilitate discussions between all the participants of the project. Seven virtual ideal farms were modelled to represent the diversity of production systems in the Rayon de Roquefort area. This diversity includes soil and climate conditions, farm dimensions, productions combinations in farms, and production periods. BOUSSOLE consists in three interactive modules representing: (1) the flock and its diet, (2) the forage system and (3) the farm's economy.

From the baseline scenario of the twice-a-day milking H0, BOUSSOLE renders it possible to design different configurations of the system. We modelled technical levers which aim at compensating the losses in both milk production and household income due to the transition of one milking per day. The selection of levers was based on (1) experimental results obtained through other parts of the Roquefort'In project in which this work is included; they take place in the Domaine de La Fage (Roquefort-sur-Soulzon, France) and in the agricultural secondary school of Saint-Affrique (Aveyron, France); (2) expertise of advisors in charge of technical support of dairy ewes farms in the Rayon de Roquefort area and (3) scientific experts from INRA and Livestock Institute. The management adaptations associated to these levers are simulated under several conditions of a once-a-day milking implementation: H1, where the transition to the once-a-day milking occurs at the lamb weaning (after about 30 days of lactation), at the first day of the milking period and H2, where the transition to the once-a-day milking occurs after the lamb weaning, and around the turnout date of the flock (around 8 and 10 weeks after the first day of the lactation period).

Finally, a 1250 farm sample under technical support is distributed into the seven farm-types according to their date of first day of milking. This distribution draws the 'virtual dairy area' from which the impact of collective scenarios of once-a-day milking implementation is explored.

3 Results – Discussion

For H1, the loss in milk production slightly varies according to the milking period duration of the farm-types analyzed (Table 1). Farm-types with short milking period are penalised far more than the others: e.g. 19 points of loss for ROQ05 (with 193 days of milking) and 17 points of loss for ROQ06 (with 273 days). A later transition to the once-a-day milking (H2) allows returning to the household income and milk production close to the baseline scenario values, but divides by two the gain in the routine work load obtained under the H1 scenario (Table 1).

Table 1. Impact of scenarios involving the transition to the once-a-day milking on the milk production of the flock (MP), Household Income (HI) and Routine Workload (RW) for the seven farm-types modelled (with an indice 100 = initial situation under twice-a-day milking H0).

	Scenarios H1 with management adaptations	Scenarios H2 with management adaptations				
	MP	HI	RW	MP	HI	RW
ROQ01	89	97	91	98	100	94
ROQ02	89	99	91	101	103	96
ROQ03	86	97	92	97	101	95
ROQ04	88	97	92	98	101	95
ROQ05	87	94	94	97	98	96
ROQ06	89	86	93	100	101	96
ROQ07	91	97	95	102	100	97
Mean	88	95	92	99	101	95

H0 : initial twice-a-day milking scenario / H1 : once-a-day milking at weaning / H2 : once-a-day milking around the turnout date

Assuming that the once-a-day milking would be accepted in the specification of the PDO Roquefort, the twelve breeders interviewed would applied it in their farm; certainly for nine on the twelve breeders of them, but under certain conditions for the others. Most of them considered that the once-a-day milking could occur in the middle of the milking period, around the turnout date. However one issue was noted. The transition to the once-a-day milking could present a social lock-in: «one is going to say that we will do nothing further» (*On va s'entendre dire qu'on ne fait plus rien*). Half of the breeders interviewed did not plan to associate any other technical levers with the implementation of the once-a-day milking (except the adjustment of the concentrates distributed). They also want to keep the flock size and to preserve some quiet time. For the other breeders, several ways of adaptations are possible such as to increase the duration of the milking period and/or a better use of pasture. The breeders questioned seem to be shifting towards a transition around the turnout date. For them, this option reduces the length of the working day and provides flexibility in the work day organisation during spring season.

If all farms use the once-a-day milking at weaning (H1), the amount of milk collected decreases of 18 points compared with the H0 situation (Table 2). The part of milk produced between January and April is slightly reduced. If all farms implemented the transition around the turnout date, the decrease in milk collected is lower (-8 points). With only 41% of the milk collected from the twice-a-day milking, mainly produced between December and February. At the dairy area level, the total amount of milk collected in H0 is almost reached the baseline scenario with the combination of 50% of farms transited around turnout date to a once-a-day milking production and 50 % of farms remaining in twice-a-day milking situation. However, it does not allow to reach volumes of milk from twice-a-day milking system required for the production of Roquefort under the specifications of the PDO.

Table 2. Impact of the implementation of several scenarios of the implementation of the once-a-day milking in farms on the milk collection of the 'virtual dairy area'

Scenarios	H0	Basis scenarios	H2 with adaptations		
			H1	H2	
Total amount of milk (millions of liters)		170	139 -18%	156 -8%	169 -1%
Total amount of milk from the twice-a-day milking (%)		100	0	41	69

H0 : initial twice-a-day milking scenario / H1 : once-a-day milking at weaning / H2 : once-a-day milking around the turnout date

In addition to the key assumptions associated to the system representation, the partners allow us to determine relevant indicators among the 72 output variables. The appropriate indicators facilitate the discussion within a large range of actors. Moreover, the actors embraced the notion of virtual dairy area. The outputs at both the farm and the dairy area collection levels elicited very relevant debates. As a consequence, discussion derived from the presentations of the simulated results to the actors (breeders, industrials...) allows us to complete the evaluation performed by modelling.

4 Conclusions

Based on current scientific knowledge on zootechnical response of Lacaune ewes and simulated results, an increase in the milking duration combined with a better use of pasture can limit losses in milk production and in household income due to the transition to the once-a-day milking. At the dairy area level, the scenarios tested show that the adoption of the once-a-day milking cannot be envisaged without modifications of the Roquefort PDO specifications.

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