Impact of grazing practices on farm self-sufficiency, milk and economic performances of three automatized farms.

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Abstract

The dairy sector is facing serious economic difficulties linked to low milk price and volatility of feedstuff price. In this context, reducing farm inputs is necessary. Optimization of use of grazed, ensiled or dried grass could be a key strategy to improve self-sufficiency and thus to decrease feeding costs. Yet, practice of grazing is disappearing due to several factors, including increased size of dairy herds and development of automation. However combining grazing and automatic milking systems (AMS) is possible. Three Walloon dairy farms equipped with an AMS were monitored to assess their grazing practices, grass proportion in the cows' diet both at barn and on pasture and the economic advantages linked to grass use in 2015. These farms practiced various grazing strategies including full-grass system (FG), day and night grass allocation (DNG), and rotational grazing (RG) completed with a partial mixed ration. The effects of grazing on milk yield (MY) were also evaluated. Grazing reduced the daily feeding costs per cow in all systems with variable impact due to grazing management. The most pronounced decline was observed in FG with a severe drop in MY. Conversely, the decrease in MY was less marked in the other farms.

Keywords: automatic milking system, feeding costs, self-sufficiency, grazing management

Introduction

In Wallonia, pasture provides an essential part of dairy cows' diet in winter as in summer. Its use is considered beneficial from several points of view including its positive impacts on farm economy and environment. However the increased automation of dairy farms and the increased size of herds have driven many farmers to stop grazing. Yet it is possible for farms equipped with an AMS to keep grazing through adopting different grazing management strategies. Three Walloon dairy herds with contrasting grazing practices were followed up in 2015 and the impact of grass use on milk yield (MY), milk composition and feeding costs at barn and during the grazing period have been evaluated. The aim of this study was to point out advantages and disadvantages of the grazing management options to help in a decision making process.

Materials and methods

A total of three Walloon dairy herds of Holstein cows with different grazing management practices were followed up in 2015. The herds were visited regularly to collect data on cows' diet, grazing practices, milk production and composition. The percentage of grazed pasture was determined following the method described by Lessire et al. (2015). Finally financial data were gathered. Winter and grazing time (WT – GT) data were compared by t-test to assess the effect of grazing on the selected parameters. Feeding costs were calculated for WT- GT in each herd. The effect of grazing was estimated by calculating the costs of feeding at barn and multiplying them by 153 days (d) of grazing and by the number of cows and comparing with

the costs of feeding during GT multiplied by 153 d and by the number of cows. The MY during all the grazing time was thus compared with MY recorded at barn during the same period of time for an identic number of cows. The difference in revenue of milk sales was calculated and put into relationship with the financial gain obtained by adapting cows' diet. The milk revenue was evaluated by using the average price paid for milk delivery in 2015, i.e 25.82€/100 kg milk.

Results and discussion

The main characteristics of the three dairy herds are summarized in Table 1.

Table 1. Main characteristics of the three selected herds.

	H1		H2		H3	
AMS	1 - mobile		1		2	
Herd size (number of cows)	52 ± 5		71 ± 3		105 ± 7	
Annual MY	427,354 kg		561,375 kg		1,095,338 kg	
Pastures available	22.11 ha		24.21 ha		35.75 ha	
Grazing strategies	FG		DNG		RG	
% of grass in cows' diet*	Barn 36%	Grazing 88%	Barn 51%	Grazing 50%	Barn 44%	Grazing 57%

Abbreviations: H: herd; AMS: automatic milking system; MY: milk yield. FG: full grazing; DNG: day and night grazing; RG: rotational grazing * % of grass in cow's diet is calculated by taking into account grazed, ensiled or dried grass - April and October being transition periods are not taken into consideration.

Herd 1 (H1) was equipped with a mobile robot moved to pastures during GT. During this period, cow's diet consisted of grass plus concentrates supplied at milking by the AMS (Full grazing – FG). At barn, cow's diet was composed of roughage (12.4 kg DM), cereals, by-products and soybean + canola meal. Concentrate supply (TMR +robot) averaged 5.2 kg $DM.cow^{-1}.d^{-1}$.

In H2 and H3, time spent by the cows in pastures was restricted. In H2, paddocks were divided into night and day blocks (DNG) and the change from paddock occurred when cows came back at barn (6 PM). They received a partial mixed ration (PMR) composed of roughage, by-product and concentrate for a total of 10 to 12 kg DM. Grazed grass was estimated at 50 % of the diet. During WT, the ration was adapted from the one received during the summer with an average of 4.6 kg DM concentrate (TMR + robot).

In Herd 3, rotational grazing (RG) was organized with cows coming back to the barn at 6 PM. They received then a PMR composed of roughage, brewers and concentrates (1.6 kg DM) for a total of 12.8 to 15.8 kg DM, fluctuating with grass availability. Cows left the barn for grazing at 8 AM once being milked. Grazed grass was estimated at 34% of the total diet. During WT, PMR was adapted to provide 23 kg DM and concentrate supply (TMR + robot) reached to 7.3 kg. Data collected from the herds are shown on Table 2.

Table 2. Parameters collected in the three herds during winter and grazing time.

	H1		H2		H3	
	WT	GT	WT	GT	WT	GT
DIM	171 ± 20 ***	199 ±19	212 ± 11 ***	217 ± 5	192 ± 9 ***	209 ± 4
MY ($kg.cow^{-1}.d^{-1}$)	26.2± 4.5 ***	18.4 ±2.2	22.3 ± 0.9 ***	20.9 ± 1.5	29.7 ± 1.0 ***	27.9 ± 0.7
F%	3.96 ± 0.09 ***	3.86 ± 0.21	4.18 ± 0.10 ***	4.02 ± 0.13	4.08 ± 0.06 ***	3.96 ± 0.12

P%	3.34 ± 0.07 ***	3.24 ± 0.13	3.44 ± 0.06 ***	3.48 ± 0.07	3.40 ± 0.05 ***	3.37 ± 0.07
Concentrate provided by the robot (kg.cow^{-1}.d^{-1})	4.3 ± 0.6 ***	2.6 ± 0.2	3.3 ± 0.2 ***	2.9 ± 0.3	4.2 ± 0.2 ***	3.5 ± 0.5
Feeding costs (€. cow^{-1}.d^{-1})	3.89	1.73	3.61	3.01	4.59	3.61
Feeding costs (€/100 kg milk)	15.4	9.0	15.7	13.9	15.4	12.8

Abbreviations: DIM: days in milk; F% fat percentage; P%: protein %; H: Herd; ***: value statistically different *P<0.01*; *: value statistically different *P<0.05*; ns: non-significant

For all herds, MY and feeding costs decreased during GT in proportion depending on the chosen strategy. Milk composition was slightly altered with a significant drop in fat percentage in all herds and variable impact on P percentage.

The FG system caused a huge reduction in feeding costs (difference between WT and GT = 2.16 €. cow^{-1}.d^{-1}) correlated with an important drop in MY by 7.8 kg. cow^{-1}.d^{-1}. It has to be noted that the end of the grazing season coincided with the end of lactation for most cows as calvings were grouped in winter. The gain in feeding costs over the GT averaged 17,185 €. Milk production over the GT was 62,057 kg lower than estimated during WT. The milk revenue was thus 16,023 € lower. The benefit of FG was thus 1,162 € i.e. 22.3 €. cow^{-1}.

In the other herds, the decrease in MY was less pronounced (H2: delta: 1.4 kg milk. cow^{-1}.d^{-1} – H3: 1.8 kg milk. cow^{-1}.d^{-1}). Feeding costs in H2 were lowered at barn and during the grazing season by maximizing the use of silages and by-products in cows' diet promoting self-sufficiency. The MY was moderate (Mean MY: 21.6 ± 1.6 kg.cow^{-1}.d^{-1}) with a decrease by 0.4 kg during GT. Feeding costs per 100 kg milk were higher than in other herds and dropped less sharply during GT. The gain in feeding costs over the GT averaged 6,517 €. Milk production over the GT was 15,208 kg lower than estimated during WT. The milk revenue was thus 3,927 € lower. The benefit of DNG was thus 2.590 € i.e. 36.5 €.cow^{-1}.

The third herd showed a high milk production level even at grazing. This was linked to a high rate of concentrate supply inducing higher feeding costs.cow^{-1}.d^{-1}. The gain in feeding costs over the GT averaged 15,743 €. Milk production over GT was 28,917 kg lower than estimated during WT and the milk revenue 7,466 € lower. The benefit of RG was thus 8,277 € i.e. 80.3 €.cow^{-1}.

Conclusion

Combining AMS and grazing is possible and provides an economic advantage. Full grazing system based on 88% grass is a viable strategy but affords the smallest economic gain. This result has to be balanced as the decrease in MY at grazing may also be due to calving strategy. In RG, high concentrate level allows to limit the decline in MY during GT. Herd 2 was less dependent on concentrate supply but lower MY recorded both at barn and during GT increased the costs/100 kg milk. Even at a low milk price, this strategy was less efficient.

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References

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