

New Feeding Strategy: Individual Total Mixed Ration Based On Metabolic State

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In dairy feed management the aim is to provide cows daily their required amounts of protein, energy, nutrients, vitamins and minerals. However, nutrient requirements change according to parity and stage of lactation (Reist *et al.* 2003). Feeding a Total Mixed Ration (TMR) often causes a severe energy deficiency the first weeks after calving and overfeeding late lactation prior to drying off. A Partial Mixed Ration (PMR) with individual concentrate allocation meets the requirements better, and is the strategy used in robotic milking by Lely. However, supplying each individual cow the specific type and amount of energy to meet her real-time requirements is considered even more efficient, maximizing individual feed efficiency (Kneegsel *et al.* 2007). Therefore, the aim of this trial is to compare performance of cows fed an individual TMR ration with their control herd mates fed a traditional PMR with individual concentrate allocation.

Materials and Methods

The trial is ongoing on a farm in The Netherlands since October 2009. The cows are milked with Lely Astronaut[®] A3 milking robots with free traffic. Cows (n=36) were matched according to parity, days in lactation and milk yield and allocated at random to the individual TMR (T) or control (C) group. Cows are fed with individual feeding stations 24 hrs/day and ad libitum. To motivate the cows to visit the robot 2 kg/4.4 lbs of concentrates are fed in the milking robot. Rations were calculated according to Dutch standards and contain the ingredients as shown in Table 1.

Table 1: Composition of rations fed to C and T groups.

	Feed strategy				
	Control (C) group PMR + concentrate	TMR (T) group Individual TMR ration			
		Ration 1	Ration 2	Ration 3	Ration 4
Maize silage (% per kg-lbs DM)	50.2	50.0	50.3	44.8	40.7
Grass silage (% per kg-lbs DM)	29.5	14.0	14.1	22.2	32.0
Protein concentrate (% per kg-lbs DM)	5.4	24.7	24.4	20.7	14.4
Energy concentrate (% per kg-lbs DM)	9.4	6.2	6.1	7.0	7.0
Alfalfa (% per kg-lbs DM)	5.5	5.2	5.1	5.4	5.9

Cows in the TMR group are fed ration 1 until 20 DIM and then ration 2. The transitions from ration 2 to 3 and from 3 to 4 are based on an increase in the body condition score. Body condition scoring is performed every 3 weeks according to Edmonson *et al.* (1989). Milk testing for solids is performed weekly and daily milk yield, bodyweight and dry matter intake (DMI) are collected from the Lely T4C management program for analysis. Data are presented descriptively, as data gathering is still ongoing and current data are insufficient for statistical analysis.

Results and Discussion

Preliminary results indicate that the average daily milk yield and DMI is not different between groups (Table 2). Cows in the control group gain more weight than cows in the trial group. Consequently, feed conversion is higher in the control group as well. In relation with the milk production the control group probably uses the greater part of the expensive nutrients for weight gain instead of milk production. Hence, feed costs are reduced by 18% in the trial group, also as a result of feeding more energy and protein from the cheaper roughage instead of more expensive concentrate.

Table 2. Milk yield (FPCM=fat protein corrected milk), feed intake, weight change, feed costs and feed conversion change for the control and trial group

	Feed strategy	
	Control group PMR + concentrate	Trial group Individual TMR ration
Milk yield (FPCM/cow/day)	28.8 kg/63.4 lbs	28.9 kg/63.6 lbs
Feed intake (total DMI/cow/day)	18.5 kg/40.7 lbs	18.9 kg/41.6 lbs
Average weight gain per cow	+ 25 kg/55 lbs	+ 5 kg/11 lbs
Evolution of total feed costs in %	0%	- 18%
Evolution of feed conversion (DMI/FPCM)	+ 20%	0%

Applying the individual TMR strategy based on the metabolic state of the cow results in a more stable weight of the cows and a significant reduction in feed costs. The lower feed conversion in the trial group indicates a more efficient use of nutrients (mainly roughage) for milk production. The mechanism of storing excess energy as body fat and mobilizing it again when necessary is very inefficient. Besides an increased profit, using an individual TMR also maximizes the efficiency of the used natural resources, which is gaining importance and attention in today's dairy industry. In conclusion the individual TMR contributes to a mutual gain for people, planet and profit.

References

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