Using Multiple Correspondence Analysis to Evaluate Milking Parlour Performance

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**Abstract.** Modern milking parlours allow the automated collection of many data for each cow being milked that can potentially be used to monitor the overall performance of the milking process. A group of 24 dairy farms from Lombardy (Italy) was visited to collect the following data from the herd management software: cows milked/stall per hour [n]; milk yield/stall per hour [kg]; milking efficiency [%]. Additional information were: number of milking stalls, ratio stalls/milker, exit from milking parlour (rapid or conventional), and type of milking routine (full or partial). Common conditions to all the systems were the electronic identification of cows using RFID technology, the use of milk meters to measure milk yield for individual cows, the adoption of the same herd management software (AfiFarm v. 3.07, Afimilk), and the milking machine settings (42 kPa system vacuum, 60 cycles/min pulsator rate, and 60 % pulsator ratio). Quantitative variables were transformed into 3 classes, using their quantile position with respect to the mean. This provided the frequencies of observations that were within the quantiles: <25%, between 25 and 75%, and >75% of the mean value for a chosen variable. Relationships among variables were evaluated through a multiple correspondence analysis (MCA). Significant differences (P<0.05) between class means were tested by a one-way ANOVA with Tukey–Kramer mean comparison (JMP Pro 16.1, SAS Institute). MCA identified three main groups of related parameters: in the first group large parlours (>32 milking stalls) were associated with a high number of stalls/milker (>15), low number of cows milked/stall per hour (<2.5), low milking efficiency (<31 %), low milk yield/stall per hour (<39 kg). On the contrary, small parlours (<16 milking stalls) were associated with a low ratio stall/milker (<8), high performance in terms of cows milked and milk yield per stall per hour (>3.5 and >52 kg) and milking efficiency (>39 %). Parlours of medium size (16-32 milking stalls) were associated with intermediate performance. Small and medium size milking parlours usually applied a full milking routine (predipping, forestripping, teats drying before milking cluster attachment) while in large parlours teats were only wiped or stripped before milking unit attachment. Rapid exit characterized all large parlours. Small milking parlours showed significant (P<0.05) higher performance in terms of cows milked/stall per hour (+24 % and + 28 %) and milking efficiency (+22 % and +30 %) if compared respectively with medium and large parlours. No significant differences were observed in terms of milk yield/stall per hour between parlours of different size. Results suggest that MCA can potentially be used to evaluate milking parlours performance.