Event Montreal (CA), ICAR 2022 Annual Conference
Subject Abstract presented manuscript as ORAL presentation

Title of the presentation

Prediction of grass-based diet from indirect traits using milk MIR-based predictors to assess the feeding typology of farms

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Session: Artificial intelligence for adding value (to be confirmed)

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ABSTRACT

Grassland provides access to a local and low-cost food resource usable by livestock. Some specifications asked the farmers is to put their cows on pasture for a minimum period or feed their cows mainly with a grass-based diet. Due to the fingerprint of this feed in milk, this work aims to predict indirectly the level of grass in the cows' diet using features estimated from milk mid-infrared (MIR) spectrometry. Over 3 million records were collected between 2011 and 2021 on 2,449 farms and included the fat, protein, lactose, and urea contents estimated by the spectrometers and 44 MIR-based predictors reflecting the milk fatty acid composition, the protein fraction, the minerals, and the lactoferrin content. As no grazing calendars and detailed feed composition were available, the innovation consisted of estimating the grass-based diet using a trait defined from the month of analysis of bulk milk. Indeed, the records collected from 5th to 8th months were assumed coming from a grass-based diet (i.e., "GRASS") as nearly all herds were on pasture. Records collected during the 1st, 2nd, 11th, and 12th months were considered as related to a ration without grass (i.e., "NOGRASS"). The remaining records were considered as "OTHER". The calibration set used 30% of the farms chosen randomly and only GRASS and NOGRASS records (N=593,096). The external validation was composed of the remaining GRASS and NOGRASS records (N=778,942). A partial least squares regression was used to discriminate these 2 groups. The validation accuracy was 89.35%. The 10-folds cross-validation sensitivity was equal to 86.91 ± 0.18. Then, the probability of belonging to the GRASS modality was used to observe the feeding typology of the farm. This probability was estimated for the entire dataset. Then a new dataset was created containing 12 columns related to the average probability for each month, farm, and year. A hierarchical clustering using Ward distance was applied on the records without missing values (N=25,832). Based on the explained inertia, 5 clusters were identified and represented the farm typology. One cluster was associated to farms given a diet rich in long-chain fatty acids throughout the year. The remaining 5 clusters show a grazing period but different degrees of grass quality and quantity. In

conclusion, using the MIR analysis of bulk milk, it is feasible to detect the presence of grass in the cow diet and estimate potentially the number of grazing days during a year. :

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