

Improving nutritional accuracy using integrated data pipelines: A practical application of the University of Wisconsin Dairy Brain project

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We are developing a real-time, data-integrated, data-driven, continuous decision-making engine, a Dairy Brain. We illustrate our Dairy Brain concept with a practical application of nutritional grouping that, respecting farm management strategy, provides more accurate diets to cows by automatically aggregating and analyzing data streams from management, feed, Dairy Herd Improvement (DHI), and milking parlor records. All adult cows ($N \sim 2,374 \pm 185$) in a farm are weekly re-grouped in 14 same-size pens according to their parity and lactation stage and fed 9 diets following lists the manager generates from printouts of disjointed data sources. Diets are seldom reformulated and nutritional requirements are not factored to allocate cows to pens. The same 14 pens were used to simulate the implementation of our data-integrated model that allocated, continuously, cows nutritionally alike to more homogeneous groups. Predicted metabolizable protein (MP, g/kg DM) and net energy for lactation (NE_L, Mcal/kg DM) aggregated at the group level were used to formulate diets respecting feed ingredients, feed prices, and other farm criteria. Results indicate that our algorithm improves herd's nutritional accuracy. The average diet cost (\$/cow per year) is \$3,250 with the current farm protocol, but it could be \$3,219 applying our algorithm, which would result in \$31/cow per year of diet costs savings. We are securely advancing towards our overarching goal of developing our Dairy Brain. This is an ongoing innovative project that is anticipated to transform how dairy farms operate.

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