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Topic: Managing and Querying Derived Nutrient Parameters in the Swiss Feed Database

The Swiss Feed Database contains chemical parameters of 155 nutrients. This data is available for more than 600 animal feed types and is used by companies private farmers and research institutions to preserve healthy, effective and cheap animal feed. Depending on the nutrient, chemical parameters are derived in two ways. Firstly, parameters are measured through chemical analyses on field samples of different animal feeds. Secondly, parameters' values are computed from measurements of other nutrients.

The computation of derived nutrient parameters is based on known dependencies that are formalized with a help of algebraic expressions, aka, regressions. The complexity of regressions varies depending on the number of involved nutrients. In one case, a regression involves measurements of only one nutrient, in an other case, measurements of many nutrients are required to compute the regression. Furthermore, regressions might be defined recursively, i.e., based on the output of other regressions. In all cases, the large number of available regressions makes it hard to manually update the Feed Database as new data becomes available.

This thesis aims to integrate the computation of derived nutrient measurements into the Swiss Feed Database so that no interaction with the user is required. The major task of the work is to design a database that supports storage of all types of regressions and, at the same time, ensures fast querying and update operations. An essential requirement to the new design is the possibility to store the history of regressions and derived nutrient parameters.

This thesis is to be completed in close collaboration with research authorities of Agroscope, including one-day or long stay visits to the agriculture research institute in Posieux.

Tasks:

1. Analyses and classification of regressions to compute derived parameters of nutrients.

2. Design and implementation of an extension to the Swiss Feed Database that supports time varying regressions and derived nutrient parameters.
3. Development of SQL queries to update regressions and computation of derived nutrient parameters.
4. Write a bachelor thesis presenting your results.
5. Presentation of the results (15 minutes).

Literature:

- Elmasri and Navathe. Fundamentals of Database Systems, 5th Ed. Pearson International Edition, 2007.
- H. Gregersen and C. S. Jensen. Conceptual Modeling of Time-Varying Information. 1998.
- A. Tansel, J. Clifford, S. Gadia, S. Jajodia, A. Segev, and R. T. Snodgrass. Temporal Databases: Theory, Design, and Implementation. Benjamin/Cummings Publishing Company, 1993.
- A. Gupta and I. S. Mumick. Maintenance of materialized views: problems, techniques, and applications. MIT Press, Cambridge, MA, 1999.

Supervisor:

- Francesco Cafagna

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