"SYSTOOL", A NEW CALCULATION TOOL FOR THE FRENCH "SYSTALI" PROJECT

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Objectives

The new French feed unit system, developed by INRA in the Systali project, is based on digestive flows of nutrients and multiple animal responses (Sauvant et al., EAAP 2013). It integrates a mechanistic digestion model accounting for the effects of feeding level (FL), proportion of concentrate (PCO) and rumen protein balance (RPB), on digestive processes. A new calculation tool has been developed in order to determine the new nutritive values and nutrient flows easily and to validate them by comparing them to the animal responses described in published experimentations.

Systool design

Systool is implemented with Excel and linked to the new INRA feed table proposing feed values calculated with a reference value for FL, with the hypothesis of PCO=0 and ignoring RPB. Systool calculates the feed and ration values by taking into account the digestive interactions (DI) due to FL, PCO and RPB *(Figure 1)* and compares them to the observed values in the publications.

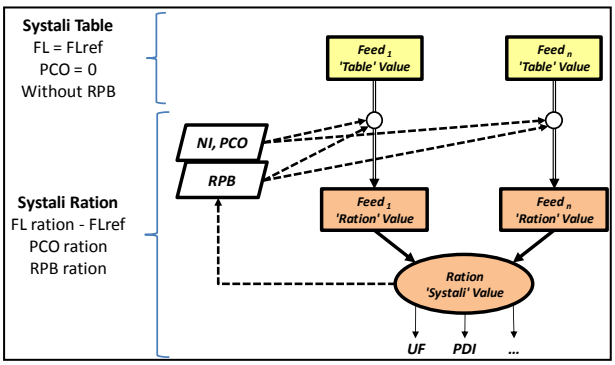

Figure 1 : Feed and ration evaluation in Systali project

Systool operation mode

1. The trial is described: characteristics of animals (species, body weight), feedstuffs (20 feeds max) and rations (feed and diet composition, *in vivo* measurements…) for different treatments (16 max).

2. Feeds whose composition best matches the reported data are selected in the INRA table by the user, who specifies their level of incorporation in the diets (X_j)

3. The Systali 'Table' values of each feed (FTV_j) are automatically extracted from the INRA table *(yellow values in Figure 2)*.

4. Systool calculates the nutrient flows and the values of feeds "in the ration" (FRV_j) according to the FL and PCO of the actual diet. The RPB of the ration, calculated as an output variable, can also modify these FRV_j thanks to an iterative calculating process, which rapidly converges toward a final prediction *(orange values in Figure 2)*.

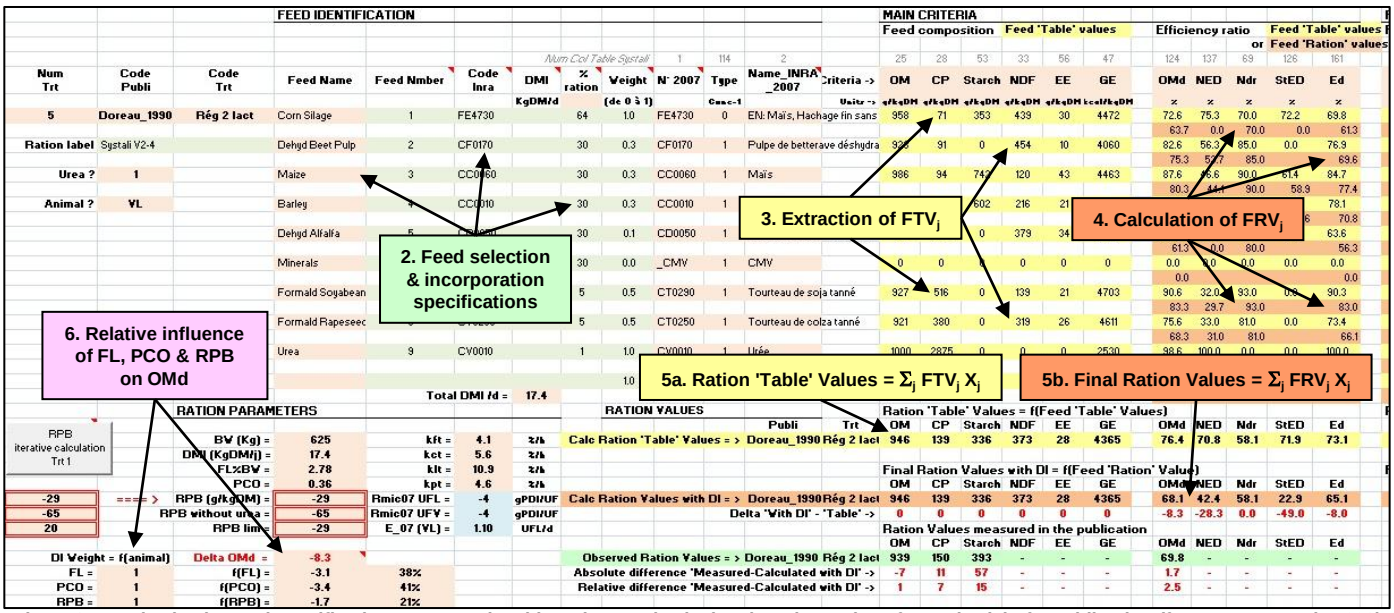

Figure 2 : Feed selection and specifications, extracted 'Table' values and calculated 'Ration' values for each trial of a publication (from Doreau et al., 1990)

5. Systali final ration values, calculated without *(yellow)* or with *(orange)* DI, can be compared, and related to the observed measures in the publication *(green)* and/or to the INRA 2007 values *(blue)*.

6. The influence of FL, PCO and RPB can be weighted in the DI calculation according to the type of animal *(Cattle vs Small ruminants)*. Their relative influence upon OMd are presented. Special attention is paid to the utilization of urea in the diet *(Chapoutot et al., 3R 2013)*

Conclusion

Systool: a regularly updated user-friendly tool, used to test and validate the Systali hypothesis in comparing the new model output with numerous scientific publication results *(Nozière et al., EAAP 2013).*