Development of a decision support system for precision feeding application in pigs and poultry

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Brossard L.1, Quiniou N.2, Marcon M.2, Meda B.3, Dusart L.4, Lopez V.5, Dourmad J.-Y.1, Pomar J.5

1 Pegase, INRA, Agrocampus Ouest, 35590 Saint-Gilles, France. 2 IFIP institut du porc, 35651 Le Rheu, France. 3 URA, INRA, 37380 Nouzilly, France. 4 ITAVI, Domaine de l’Orfraise, 37380 Nouzilly, France. 5 Department of Agricultural Engineering, Universitat de Lleida, Av. Alcalde Rovira Roure 191, 25198 Lleida, Spain

Contact: ludovic.brossard@inra.fr

Precision feeding is a promising way to improve feed efficiency and thus economic and environmental sustainability of livestock production. A decision support system (DSS) was built to determine in real-time the nutritional requirements of animals and feed characteristics (composition, amount). This tool will be associated with a controlling module to be part of an automatic feeding system and exchange data with different devices for an application of precision feeding in pig and poultry commercial farms (Figure 1). This DSS tool, dedicated to animals managed individually or in group, is designed with a modular structure for adaptation to different feeder devices, species and production stage (growing pigs, gestating and lactating sows, broilers, laying hens) (Figure 2). The modules are built to perform specialized tasks in a cooperative way. It includes a data management module with a proper characterization of data by meta-data definition for precision feeding. It ensures standard encoding to allow data interoperability from any platform. Other modules are dedicated to data checking and correction for database filling, prediction of most probable body weight (BW) gain and feed intake (ad libitum or restricted feeding) and calculation of nutritional requirements. The BW and feed intake prediction is based on dynamic data analyses. For that, specific methods have been studied and selected depending on the number of available data, their type (BW or feed intake) and recording frequency. The calculation of nutritional requirements is performed using nutritional models specific to a species or a production stage. These two last modules are currently designed for healthy animals and will be refined to extent prediction to a larger range of field situations (e.g. health problems, climatic conditions) with nutritional models in development/refinement in other workpackages of the project. The general specifications of this DSS and dynamic data analyses will be illustrated for growing pigs.
Figure 1. General structure of proposed precision feeding system (DSS: decision support system) for application of precision feeding in pig and poultry commercial farms.

Figure 2. Modular structure of decision support system (DSS) developed in the Feed-a-Gene programme to determine in real-time the nutritional requirements of animals and feed characteristics (composition, amount) in precision feeding.