animal

Foreword

Modelling within the livestock farming systems research field: from cows to birds and farmers

S. Ingrand[1,2,3,4†]

[1]INRA, UMR Métafort, F-63122 Saint-Genes-Champanelle, France; [2]Clermont Université, VetAgro Sup, UMR 1273, BP 10448, F-63000, Clermont-Ferrand, France; [3]AgroParisTech, UMR 1273, BP 90054, F-63172, Aubiere, France; [4]Cemagref, UMR 1273, BP 50085, F-63172, Aubiere, France

According to Gibon *et al.* (1999), the overall objectives of Livestock Farming Systems (LFS) research are as follows:

1. To increase knowledge about livestock farming systems and their diversity.
2. To build management aids for livestock farmers and tools for advisors.
3. To build tools to aid negotiation between actors within a given framework at local, regional or national scales for questions dealing with rural development and animal industries.

Annual meetings of the European Association for Animal Production (EAAP) are good opportunities to assess the very latest developments in modelling in the field of animal sciences (not only from European teams but also from others). Concerning the specific area of LFS[1] (see communications made within the sessions managed or co-managed by members of the LFS commission), there is a specific challenge in modelling, as on one hand, several research areas are involved (firstly animal sciences, but with strong links to social sciences), and on the other hand, several components, including decisional and biological ones, animal, herbage and crops, must be included in the model, as they are parts of the system to be modelled (through both space and time).

The following three papers were presented in the 58th and 59th annual meetings of EAAP in 2007 and 2008, respectively (Dublin and Vilnius).

Birds are involved in the first paper (Tichit *et al.*, 2010) that deals with the necessity for LFS systems to cope with environmental issues, that is, the multifunctional aspect of farming. Other modelling papers dealing with the environment at system level are, for example, Vayssières *et al.* (2007), biomass flow operations); Dourmad *et al.* (2009),

manure composition); Rigolot *et al.* (2010), manure management); Wall *et al.* (2010), greenhouse gas emissions), To be multifunctional means to manage trade-offs, to define some indicators and to be able to assess the impact of the 'whole' system (what is a whole system?) using multicriteria assessment methods. The question then is what indicators to choose (again a multicriteria issue!), especially between their accuracy and their cost. The authors present some methodological results applied to the assessment of the impact of LFS on the environment, that is, for predicting the presence of two bird species in a French marsh area covered by grassland.

Cows are the main target in the second paper (Gouttenoire *et al.*, 2010) that deals with a non-systemic issue (reproductive performances of dairy cows), but with the necessity to choose a systemic approach to asses and solve it. More precisely, the authors propose to combine both analytical and systemic approaches arguing with the complementarity of physiological knowledge on animals and management strategies of the decision-maker (the stockbreeder). Thus far, the objective is not to propose a model for decision-making about a biological function (see Gardner *et al.*, 2008; Benoit *et al.*, 2009; Lesnoff and Lancelot, 2009; Friggens *et al.*, 2010), but to show the added value of mixing different points of view to solve a bio-technical problem within the herd.

The third paper is centred around the farmers (Magne *et al.*, 2010), as it deals with modelling their informational activity. The aim here is to be able to propose some ideas to renew advising methods with the hypothesis that we first have to understand which information is relevant for farmers (i.e. stockbreeders) to deal with the situations they encounter and to adapt their farming practices. Such approaches at the farm scale, making the link between performances and farmer goals, are also present in recent studies, such as in Fiorelli *et al.*, 2007; Madelrieux and Dedieu, 2008; García-Martínez *et al.*, 2009), but no formalisation of the farmer's system of information is proposed.

---

† E-mail: stephane.ingrand@clermont.inra.fr
[1] See Dedieu *et al.*, 2008 for definitions and analyses about the concept of livestock farming system.

In conclusion, we assume that these three papers show how modelling within the farming systems can contribute to solve the challenge of putting back agriculture in concordance with the demands and expectations of society, including (we assume that is the case…) cows, birds and farmers together in the countryside.

References

Benoit M, Tournadre H, Dulphy JP, Laignel G, Prache S and Cabaret J 2009. Is intensification of reproduction rhythm sustainable in an organic sheep production system? A 4-year interdisciplinary study. Animal 3, 753–763.

Dedieu B, Faverdin P, Dourmad JY and Gibon A 2008. Système d'élevage, un concept pour raisonner les transformations de l'élevage. INRA Productions Animales 21, 45–58.

Dourmad JY, Hassouna M, Robin P, Guingand N, Meunier-Salaün MC and Lebret B 2009. Influence of pig rearing system on animal performance and manure composition. Animal 2, 606–616.

Fiorelli C, Dedieu B and Pailleux JY 2007. Explaining diversity of livestock-farming management strategies of multiple-job holders: importance of level of production objectives and role of farming in the household. Animal 1, 1209–1218.

Friggens NC, Disenhaus C and Petit HV 2010. Nutritional sub-fertility in the dairy cow: towards improved reproductive management through a better biological understanding. Animal, in press, doi:10.1017/S1751731109991601.

García-Martínez A, Olaizola A and Bernués A 2009. Trajectories of evolution and drivers of change in European mountain cattle farming systems. Animal 3, 152–165.

Gardner DS, Lea RG and Sinclair KD 2008. Developmental programming of reproduction and fertility: what is the evidence? Animal 2, 1128–1134.

Gibon A, Sibbald AR, Flamant JC, Lhoste P, Revilla R, Rubino R and Sørensen JT 1999. Livestock fanning systems research in Europe and its potential contribution for managing towards sustainability in livestock farming. Livestock Production Science 61, 121–137.

Gouttenoire L, Fiorelli JL, Trommenschlager JM, Coquil X and Cournut S 2010. Understanding the reproductive performance of a dairy cattle herd by using both analytical and systemic approaches: a case study based on a system experiment. Animal 4, 827–841.

Lesnoff M and Lancelot R 2009. Evaluation of crude annual parturition rate estimates in a small-holder African ruminant farming system. Animal 3, 1347–1353.

Madelrieux S and Dedieu B 2008. Qualification and assessment of work organisation in livestock farms. Animal 2, 435–446.

Magne MA, Cerf M and Ingrand S 2010. A conceptual model of farmers' informational activity: a tool for improved support of livestock farming management. Animal 4, 842–852.

Rigolot C, Espagnol S, Robin P, Hassouna M, Béline F, Paillat JM and Dourmad JY 2010. Modelling of manure production by pigs and NH_3 N_2O and CH_4 emissions. Part II: effect of animal housing manure storage and treatment practices. Animal, in press, doi:10.1017/S1751731110000509.

Tichit M, Barbottin A and Makowski D 2010. A methodological approach to identify cheap and accurate indicators for biodiversity assessment: application to grazing management and two grassland bird species. Animal 4, 819–826.

Vayssières J, Lecomte P, Guerrin F and Nidumolu UB 2007. Modelling farmers' action: decision rules capture methodology and formalisation structure: a case of biomass flow operations in dairy farms of a tropical island. Animal 1, 716–733.

Wall E, Simm G and Moran D 2010. Developing breeding schemes to assist mitigation of greenhouse gas emissions. Animal 4, 366–376.