Chapter 5

DSS in Pig Production Systems

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ABSTRACT

Decision support systems (DSS) is the natural framework where decision models should be included in order to support farmers, advisers or livestock management specialists in the decision making process. During last years, the increment of competition between pig producers caused the marginal benefits per unit of product to reduce. A concentration of production to maintain past profit levels is performed. In this context, there is an increasing interest in DSS tools capable of dealing with the uncertainty inherent to pig production systems for practical decision support. In this chapter the development of DSS for pig systems representing either the productive and reproductive behaviour of a group of breeding sows over time and their mathematical foundation are reviewed. It is in the aim to detect strong and weak points making DSS more suitable for practical use, explaining why actually few farmers and specialists are using them. New DSS tools adapted to particular production patterns beyond individual farms and the irruption of internet are also important issues in future developments. Arguments presented, discussion and conclusion can easily extended to other livestock systems.

INTRODUCTION

Decision support systems (DSS) is the natural framework where decision models should be included in order to support farmers, advisers or livestock management specialists in the decision making process.

During last years, the increment of competition between intensive livestock producers, in general and pig producers, in particular, caused the marginal benefits per unit of product to reduce. Pig production has changed a lot during the last decade within the European Union (EU) as well as in the rest of the world. As general response, a concentration of production to maintain past profit levels is performed. In this context of global
competition and complex management information is becoming very important. The development of computers and software has been of great help and lead to the adoption of advanced Information Systems (IS). Among this set of new information technologies, there is an increasing interest in DSS tools handling refined models and methods capable of dealing with the uncertainty inherent to livestock systems for practical decision support. This approach of delivering decision models is the most widely implemented in livestock systems and falls into the model-driven DSS category according Power’s taxonomy (Power, 2004).

Model-driven DSS use formal representations of decision models and provide analytical support using the tools of decision analysis, optimization, simulation, statistics and logic modeling (Bhargava et al. 2007). Mathematical models representing the production behaviour of a livestock herd have been used for a long time in livestock research and less in practice. These kinds of proposals have evolved not as much in mathematical terms as in software interfaces in which models are enveloped and delivered to users. They are important tools to analyse different management strategies. Through herd models, researchers first, and pig specialist and farm managers after, can better understand real farm behaviour and manage it. Researchers have had the benefit of advances in computing, database and solving software which have enabled farming systems to be described in greater detail and with greater ease (Kingwell, 1996). Nevertheless, research models are usually quite complex in connection with the system represented and they become less effective for practical use as yet. Despite the fact that the ultimate objective of model building in herd management should be to improve decision making, few models are transferred successfully to practical DSS and used by specialists and advisers, even less by farmers. Actually, the increasing ability to represent complex systems has to be corresponded with a practical problem solving involving end-users in every stage of DSS development as already pointed out Kamp (1999).

The decision process in a pig production system is intimately related with the management cycle and corresponding stages of planning-implementation-control at different levels: operational, tactical and strategic (de Hoop, 1988). Pig or herd management is the process by which certain goals of the farm manager, expressed as amount of product, are achieved by consuming a corresponding amount of production factors. In order to be able to combine these factors in an optimal way it is necessary to know the main interrelations among them and their influence on the final productivity of the system. It is usual to make system simplifications in order to get practical herd models but conserving the essence of the real system. The challenge of DSS application in livestock systems is to represent what is essential in the system in order to assist farm managers by finding relevant answers from a problematic situation that may initially seem chaotic.

The future of pig producers will depend on their ability to enhance their economic performance by improving productive efficiency rather than increasing farm size given actual constraints. Examples of these constraints are recent EU regulations concerning environment and pig welfare. Therefore, DSS can play an important role to facilitate the optimization of management alternatives or the trial of new ones. As shown in Figure 1, the main modeling approaches are two: simulation and optimisation. The role that time plays in these models is related to the scope of decisions involved and impacts on the complexity of the mathematical model behind.

The objective of this chapter is to review existing efforts in the development of DSS in pig systems representing either the productive and reproductive behaviour of a group of breeding sows over time and their mathematical foundation. It is in the aim to detect strong and weak points making DSS more or less suitable for practical use in these systems and explain why although