

Introducing Activity-Based Costing in Farm Management: The Design of the FarmBO System

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ABSTRACT

Recent research indicates that farm managers do not rely on adequate informative support in their decision making processes. This paper proposes a model of a Farm Management Information System which integrates the Activity-Based Costing approach. In describing the design and development of the "FarmBO" system, it provides a detailed functional requirement definition and the description of a working system prototype. The solution is designed to show the impact of general costs on the different crops, allocating them on the basis of the production cycle complexity. It includes a report section directly linked to the database which provides crop balance sheets and simulations in terms of what-if analyses. The system allows farm managers to 1) analyze deviations between budgeted and actual costs; 2) compare crop balance sheets across different years; 3) perform sensitivity analyses. This work accounts for prototype validation in two farms and discuss results and possible developments.

Keywords: Activity-Based Costing, Decision Support System, Farm Management Information Systems, FarmBO System, Management

1. INTRODUCTION

In the last few years, new technologies applied on machines and equipment, new Web-based services, and new solutions from Precision Agriculture have proven able to generate large amounts of data that could improve farm management activities (Nikkilä, Seilonen, & Koskinen, 2010). Research on Farm Management Information Systems (FMIS) has proposed many models of information systems oriented towards the integration of multiple

data sources, benefiting from the support of new methodologies (Sørensen, Pesonen, et al., 2010) and languages (Papajorgji, Pinet, Miralles, Jallas, & Pardalos, 2010). One of the efforts of this pervasive data collection activity is to enable cost analysis, which is a core part of the managerial decision-making activity. Nowadays, farmers are required to select not only the most profitable crops, but also the right level of investment in machines and the proper use of external services. All these decisions relate with cost analysis. Although agricultural

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practice may look simple, farms are complex organizations which produce several products and a large part of the costs are indirect with respect to products. A long-standing problem is connected to the use of different procedures for the allocation of indirect costs to products and their impact on how the economic performance of products is reported and interpreted.

Surprisingly, current commercial FMIS present highly customized approaches towards product costing, and the existing literature has dedicated less attention to the design of cost analysis procedures. Furthermore, the great availability of data is not complemented by new developments in the elaboration phase (Sørensen, Fountas, et al., 2010): FMIS research remains focused on connecting new devices and stakeholders rather than on transforming heterogeneous data into useful information for farmers. In particular, cost analyses appear not particularly developed in FMIS. The current approaches tend to rely on parametric estimations of costs or on very specific approaches not validated in common managerial research and practice. Since indirect costs (e.g.: machine depreciation) are becoming the most important part of total costs in agricultural practice, their allocation plays a pivotal role. This is a classic problem in industrial accounting, and Activity-Based Costing is a well-known approach for allocating indirect costs to final cost objects, be they products, services or clients. Activity-Based Costing allows a part of the indirect costs proportional to their real use of the resources which originated those costs to be allocated to the final cost objects. Nevertheless, in agricultural research less attention has been focussed on this topic, and the few existing studies cover a limited range of applications and are related to a punctual use of Activity-Based Costing approach rather than to a broad definition of a systematic approach supported by an FMIS.

Hence, the possibility of integrating Activity-Based Costing procedures in an FMIS model is still questioned. The aim of this paper is to propose a model of FMIS which integrates Activity-Based Costing procedures. In this study, we present the development of the FarmBO system (the name comes from a contraction

of Farm and University of Bologna), starting from the collection of functional requirements; we then describe the design aspects; finally, we show the reports produced by the system. FarmBO was tested in two validation cases, where it provided detailed support in understanding the cost of final products, comparing crops and performing crop choices in a farm.

This paper is structured as follows: first, the relevant literature about FMIS and Activity-Based Costing applied in farm management is reviewed. Second, the methodology applied in designing the FarmBO system, the functional requirements and the database model are presented. Then, the potentialities of the report section are shown. Finally, the advantages of introducing Activity-Based Costing procedure in FMIS are discussed.

2. THEORETICAL BACKGROUND

In recent years, the development of new technologies on machines and equipment has led to the generation of a large amount of data from the field. The information processing workload is increasing (Sørensen, Fountas, et al., 2010), and this stimulates the adoption of IT solutions in farms. Moreover, the introduction of Precision Agriculture technologies poses new challenges, requiring FMIS to process large amounts of raw data from multiple and dispersed sources (McBratney, Whelan, Ancev, & Bouma, 2005; Zhang, Wang, & Wang, 2002). The panorama remains very articulated: a vast group of farmers do not rely on IT technologies either for their day-by-day activities or for their decisional processes, but another smaller group is more oriented towards new technologies, not only related to machinery or equipment, but also devoted to information processing and decision support. While many software houses are incorporating cost analysis functionalities in their products, in many cases their solutions do not propose validated accounting approaches. Research about FMIS has developed a rich framework to address the data management issues of modern agriculture and PA applications. In this section,

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