

# A Review of ABC Methodology for Agricultural Sector

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**Abstract.** This study examines recent advances in cost accounting methods with special reference to the application of Activity Based Costing methodology in primary sector. Large scale agricultural enterprises that depend heavily on capital investments require rational allocation of the available resources and efficient utilization of the existing production technology. The accurate and reliable computation of cost per unit of product is crucial for the evaluation of the economic performance of the enterprises and the investigation of the optimal allocation of the production factors in different activities. The concept of Activity Based Costing methodology, which is of great importance in the system of cost accounting, allows the allocation of indirect costs to specific activities and individual products, overcoming the drawbacks of the traditional method of cost accounting. A synopsis of the Activity Based Costing method is described, followed by a review of recent cost accounting applications to agricultural systems.

**Keywords:** Activity Based Costing, Cost accounting, Agriculture

## 1 Introduction

The primary sector in Greece remains one of the most important economic pillars, which plays a vital role from both a social and environmental perspective. Agriculture in Greece was based mainly on small-sized, family-owned dispersed productions units, however since the 2000's a rapid increase of large size, market-oriented farms was emerged along with the development of food-processing companies. These production units, which are of purely entrepreneurial nature, depend heavily on capital endowments and high human capital. Despite its diminishing contribution in GDP (about 5%) and employment (479.612 persons are employed in agriculture (ELSTAT, 2014), that is 12.5% of the total labor force), livestock and crop farming and agricultural processing industry constitute important production sectors for the Greek economy, that support manufacturing and boost rural economy. Agriculture supports rural family incomes offers employment to a

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large number of people and reverses depopulation and marginalization of mountainous and less-favored areas, contributing this way to the recovery of national economy and the stimulation of economic growth.

The economic crisis in Greece has undoubtedly influenced the productivity and economic performance of the primary sector, challenging the competitiveness of the agricultural farms and food-processing units. The high prices of inputs - mainly of fuel - affect the profitability of agricultural production units adversely, low producer prices cannot counterbalance income losses from the increased production cost and the uncertain overall economic environment which is the main cause of financial stress impedes the effective marketing of processed and non-processed products. The capital intensive agricultural enterprises with a significant share of indirect costs require efficient utilization of the existing production technology and rational allocation of the available resources, which implies the important role of management accounting in the evaluation of the operational performance of such modern agricultural enterprises.

In this context, the accurate computation of cost per input, activity and product can be a useful tool in order to design a medium - long term strategic plan regarding resource allocation and pricing, vital elements for the improvement of the producer's profitability. The purpose of this study is to examine recent advances in cost accounting with special reference to the Activity Based Costing methodology in primary sector.

## **2 The ABC methodology**

The concept of ABC was developed in the manufacturing sector of the United States during the 1970s and 1980s, however the method was first clearly defined in 1987 by Kaplan and Bruns. The Consortium of Advanced Management, International (CAM-I), an international consulting group, provided a formative role for studying and formalizing the principles that became more formally known as Activity-Based Costing (Cardos and Pete, 2011). The concept of ABC was introduced in order to overcome the shortcomings of the traditional method of cost accounting through the proper allocation of the fixed costs to products (Cooper and Kaplan, 1988). The traditional cost methods were used efficiently at a time when the dominant factors of production were labor and variable capital and hence, their corresponding direct costs were easy to allocate (Carli and Canavari, 2013). The inefficacy of the standard method occurs when the share of the indirect cost of the fixed capital (mainly maintenance, insurance and machine preparation) was significant in total production cost. The traditional cost accounting methods in modern business environment where the level of fixed costs is high usually leads to underestimation and overestimation of the cost per unit in small and large production units, respectively.

In recent years, many production units have improved their cost management by utilizing the ABC system, a tool for providing accurate and relevant cost information (Lee and Kao, 2001). Activity-based costing (ABC) is a costing methodology that identifies activities in an organization and assigns the cost of each activity with resources to all products and services according to the actual consumption by each.

This model assigns more indirect costs into direct costs compared to conventional costing. According to Dierks and Cokins (2000) ABC “measures costs and performances of activities, resources and cost objects<sup>1</sup>, assigns resources to activities and activities to cost objects based on their use and recognizes causal relationships of cost drivers to activities”. There are four steps involved in Activity-Based Costing (Lanen et al., 2008). The first step includes the identification of the key activities, by classifying them into value added and non value added activities. After the selection of the activities the resources consumed and the associated costs are allocated to individual activities. In the second step, the cost drivers (measure of output of an activity) are associated with each activity, while in the third step a cost rate per cost driver is computed. In the final step, costs are assigned to products (Fisher, 2012).

The ABC methodology is still developing and comprehensive reviews and extensions of the model can be found in Hansen and Mowen (2000). This methodology has been extended to the field of agriculture production activities, although limited studies have been so far focused on the estimation of the cost elements of entire products, activities and services through ABC.

### **3 Review of ABC studies in agriculture and their implications**

This section provides a review of empirical applications of Activity Based Costing to various agriculture production systems. In general, the implementation of ABC methodology is limited due to the high quantity of data required for its application. Especially in the farming and food processing sector the relevant studies on ABC applications are very few and include fish markets and fish processing, winemaking, ornamental plant cultivation, sawmilling, crop farming and dairy production.

Lee and Kao in 2001 analyzed the operational costs of the Pu-Shin wholesale fish market, which has the highest automation level in Taiwan, using a simulation technique as complement to activity-based costing model. The results of the simulation approach are used to obtain more accurate allocated resource costs and to avoid arbitrary allocation. The results of the ABC model indicate that the total processing cost is 2.36 NT\$ per kilogram of fish, 0.17 NT\$ higher than the cost calculated by using the traditional accounting methods. This can be attributed to the fact that Pu-Shin wholesale fish market does not calculate machinery depreciation during cost calculation. The authors claim that the ABC model used with system simulation can be applied to other agricultural systems.

ABC method has been also applied in Finish fish processing sector by Setälä and Gunasekaran (1996). The production process in fish industry in the country is highly automated and diversified. However the processors do not easily adopt tools in evaluating their economic performance. They believe that the accurate tracing of indirect costs and their efficient management is not a necessity for the success of the processing unit. Setälä and Gunasekaran applied ABC to fish filleting operations, which were split into ten micro-activities (cutting operations, washing, quality

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<sup>1</sup> Cost object is any item as products, departments, projects, activities, etc, for which costs are measured and assigned (Lee and Kao, 2001)

inspection, etc.) and cost drivers were calculated in proportion of fish taken to production. The time consumed by filleting activities and flesh loss ratio were the most important performance measures incorporated in the model. These new measurements required for the application of ABC technique increased the cost of the production system; however the benefits from more accurate and reliable cost information were greater than the cost of these new measurements. Concluding their case study, the authors claim that ABC would be an appropriate system in fish processing.

González-Gómez and Morini (2006) proposed the application of an adapted ABC system for the cost estimation of winemaking in Spain, a sector that faced many changes in production and in consumer demand. The ABC model was applied based on data which were collected from local equipment and grape providers and from surveys of winery managers and operators. In this study the production process is divided into activities performed in the harvesting, in the winemaking and in the complementary winemaking process. The costs for each activity are divided into direct and support costs. The findings of the study indicate that the ABC model could provide valuable cost information to assist winery managers in improving their business competitiveness.

The same authors applied ABC model for cost calculation and management in a multiproduct agricultural framework, using ornamental plant cultivation as a case in point (González-Gómez and Morini, 2009). In their approach internal costs are used instead of accounting data. The authors estimated the direct and indirect costs through economic and financial assessment of the activities, with the total cost being the sum of these components. After calculating the total cost and gross margin of each plant in the sample, an overall cost and performance analysis is conducted for a “standard crop” (weighted means of each plant). According to the authors the study achieves through the ABC model “a more objective assignment criterion for indirect costs as well as for the differentiation between several products and technologies in the cost calculation process”.

The study of Pockeviciute (2008) develops a budgeting model for dairy farms in Lithuania using the ABC method. The actual production cost budget per 1 kg of milk was estimated to be 0.572 TL/Kg, while the share of the overhead costs was 47% of the total production cost. The authors conclude that the calculations of the production cost of the milk yield (the cost driver) provided a detailed overview of the expenses and their contribution in total production cost of milk.

## **4 Conclusions**

The diversification and intensification of international competition, the adoption of new and innovative technologies on machinery and equipment and the uncertain economic environment has made proper and accurate production cost information essential to competitive success. The complexity of contemporary production units that produce a wide range of products and have a high share of overhead costs to total costs renders the reliable estimation of the cost per unit problematic. The ABC method provides the flexibility required for the accurate calculation of cost per unit

in modern businesses by tracing indirect costs first from resources to activities and then from activities to specific products. In comparison with traditional, conventional cost accounting systems, ABC is more adjustable, faster and more accurate, enabling a detailed cost analysis. The importance of ABC in agricultural systems is justified in large modern production units of non processed and processed products that have a significant share of indirect costs. ABC in crop and livestock production could be an important tool for planning and accounting analysis; however its applications in primary sector are still very limited.

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