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**UNIVERSITY OF BELGRADE
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Book of Proceedings

The Seminar

**AGRICULTURE AND RURAL DEVELOPMENT -
CHALLENGES OF TRANSITION AND
INTEGRATION PROCESSES**

50th Anniversary

DEPARTMENT OF AGRICULTURAL ECONOMICS



Belgrade-Zemun, 2013.

Book of Proceedings

The Seminar
Agriculture and Rural Development -
Challenges of Transition and Integration Processes

Published by Department of Agricultural Economics,
Faculty of Agriculture, University of
Belgrade

For the Publisher Prof Milica Petrović, dean
Faculty of Agriculture, University of
Belgrade

Edited by Prof Natalija Bogdanov
Prof Simo Stevanović

Prepress Prof Simo Stevanović

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ISBN: 978-86-7834-181-6

**INVESTMENTS AND FINANCING
IN AGRIBUSINESS SECTOR**

APPLICATION OF ACTIVITY-BASED COSTING IN AGRICULTURAL ENTERPRISES¹

Vladimir Zakić², Natalija Borović³

Abstract

The subject of this paper is to analyze the advantages and disadvantages of Activity-Based Costing (ABC) in relation to the classical cost accounting methods. Traditional cost accounting methods were created in a time when direct costs of labor and materials were the dominant factors of production and when changes in technology and consumer demand were not so rapid. Allocation of indirect costs, which could not be directly linked to specific products, was based on specific keys: produced volume of different products, direct material costs, direct labor costs and so on. The problem of the traditional cost accounting became evident when the indirect costs (such as maintenance, insurance, production preparation, etc.) reached significant amount or even exceed the direct costs. In terms of producing multiple products, traditional cost accounting methods may underestimate the small batches production cost per unit and overestimate the mass production cost per unit.

In response to these concerns, during the 1980s in United States was created Activity-Based Costing. The conceptual frame of ABC is based on the activities of the company, which can be differentiated in various ways - the primary and secondary, activities that add value and those that do not add value. 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. ABC is generally used as a tool for understanding product and customer cost and profitability based on the production or performing processes. As such, ABC has predominantly been used to support strategic decisions such as pricing, outsourcing, identification and measurement of process improvement initiatives.

¹ This paper is the part of research activities on the project No. 179028, financed by Ministry of Education and Science of the Republic of Serbia, titled: Rural Labor Market and Rural Economy of Serbia - Income Diversification as a Tool to Overcome Rural Poverty.

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In evaluation of the advantages and disadvantages of ABC, there will be used methodology methods such as: quantitative method of comparison, the method of key business processes observation in the enterprise, as well as the inductive method.

The main objective of this paper is to define a model of activity-based costing in specific conditions of agricultural production and assess its practical significance for cost management process improvement. The results of this research will indicate that the application of ABC in agriculture enterprises can improve the accuracy of cost per unit calculation. However, it should be based on careful cost benefit analysis. Development of ABC could be expensive and implementation could be difficult.

Key words: *Activity-Based Costing, Cost management, Agricultural enterprises.*

JEL classification: *D24, D61, M41*

1. Introduction

The primary objective of management accounting is to provide the information to the managers of the company. Origin and first use of management accounting, bind to early 19th century in the United States, especially in the textile, railways, iron and steel production and distribution in retail stores. Corporation in these industries were specialized to certain economic activity - production, transport or distribution. Corporate managers have tried to make all or most phases and processes within these activities under their control. They found that higher profits can be created through centralized management of complete process compared to the traditional exchange of output of certain processes in the market. For example, the outputs of various processes in the textile industry, such as wool, fabrics and final products were traditionally exchanged in the market, largely through retailers. In the early 19th century, however, some entrepreneurs in the United States and Britain took control of the various stages in the production process. Initially, the owners felt that centralized management of all stages of the process lead to increased profits, through the increase in production and sales. Soon, however, they came to the conclusion that the increase in profits could substantially be achieved by reducing costs and increasing productivity. With this in mind, we can say that it was the creation and development of management accounting that significantly speed up the creation of large corporate enterprises and capital accumulation.

The difference between traditional and modern management accounting can be best illustrated through cost accounting methods. Traditionally, management accounting is based on the calculation of the full and variable costs and the actual (historical) and planned (standard) costs. Although these methods are used today in the vast majority of manufacturing enterprises, there are also numerous different techniques

that are used in complex modern systems of management costs. In this paper, special attention will be paid to the concept of Activity-Based Costing (ABC), which could be of great importance in the system of cost accounting.

Activity-Based Costing is one of the most important solutions that accounting theory and practice offered in the last decades of the 20th century. The advantages of this concept are especially obvious in companies with a significant share of indirect costs, a wider product range with a number of different activities.

Importance of an ABC and other modern methods of calculation and cost management can be directly related to the competitive strategy of the company. In companies that apply the cost leadership strategy, they can be of great importance. On the other hand, in companies whose strategy is based on differentiation and creation of unique or superior products (e.g. pharmaceuticals or computer components industry) cost management systems have a different role, which primarily involves providing informational support to managers for development and products marketing. The specificity of these activities is reflected in the fact that they require a significant investment in upgrading or creating a new product, for which there is great uncertainty whether it will be profitable, or even whether it will ever be placed on the market.

2. The disadvantages of the traditional costing methods

Before analyzing the modern costing techniques, it is necessary to point out the shortcomings of traditional methods, which occurred at a time when the direct costs of labor and materials were the dominant factors of production and when there were rapid changes in technology and consumer demand. Allocation of indirect costs, which could not be directly linked to specific products, were based on certain keys: volume of produced different products, direct material costs, direct labor costs and so on. The problem with the traditional calculation of the cost became evident when the indirect costs (such as maintenance, insurance, production preparation, etc.) reached significant amount compared to the direct costs. According to some research, in the 1990s indirect costs were usually higher than the direct costs by 150% and the beginning of the 21st century, this difference increased to 600% or even 1000% in highly-automated plant.¹

In the modern business environment, most of the traditional cost accounting methods lead to inadequate cost. As an example, some well-known authors state that many traditional systems very accurately calculate the cost at a five-decimal (eg, \$ 5.71462), but due to the arbitrariness of the calculation, the first digit (five)

¹ Blocher Edward, Chen Kung, Lin Thomas, (2002): Cost Management– second edition, Mc Graw-Hill Irwin, p. 104.

incorrect.¹ In terms of producing multiple products, traditional cost accounting methods usually lead to underestimation of the cost per unit in small batches and overestimate the cost per unit of mass production. This can be illustrated by a simple hypothetical example of two companies that produce the same products.

Factory A produces annually a million chocolate candies of the same type. On the other hand, the factory B also produces one million candies, but of different sizes and varieties of flavors - a total of 100 different species. Since they are making the same basic product, both plants will have about the same cost of direct labor and materials, as well as the insurance costs, heating, security guards, etc. On the other hand, the factory B will have to employ a much larger number of workers who will prepare the machine for special orders, make new design, improve existing products, promote products and so on. Also, as a result of more differentiated production there will be more stoppage, scrap, overtime etc. In other words, expanding of the product range and complexity of production typically increases indirect costs.

According to the traditional method of cost calculation indirect costs will be allocated first to the appropriate cost centers (e.g. production, administration and sales), and then to the products. If 99% of the total production of factory B refers to the mass production of standard chocolates, then their cost price would include 99% of the total indirect costs (excluding the part that is accounted as period expenses). On the other hand, special orders, which have approximately the same direct labor costs and material costs per unit as mass production (but require special machines preparation for the production and packaging, higher standards of workmanship, etc.) would calculate only 1% of the total indirect costs.

This means that the standard method of cost accounting gives essentially the same cost per unit for standard and special products, not taking into account the different levels and production requirements. Also, the switch to an alternative method of direct or variable costs calculations, would have similar effects: standard and special products have approximately the same direct costs of labor and materials.

3. Activity Based Costing

In response to these concerns, during the 1980s in the United States was created Activity Based Costing. The concept of ABC is based on the activities of the company, which can be differentiated in various ways - the primary and the secondary, the activities that add value and those effects that do not add value. According to the concept of ABC, cost drivers (effects) occur as a result of the

¹ Kaplan Robert, (2001): Introduction to Activity-Based Costing, Harvard Business School, No 9-197-076, July 2001, p. 3.

performance of different activities and the activities consume resources and create costs for the company. The most important feature of the ABC concept is that it significantly corrects the shortcomings of traditional cost accounting methods, through the connection of the product cost calculation and the varieties and the complexity of their production.

The basic question that should precede analysis of needs and the necessity of of ABC introduction is: Why indirect costs incur? The usual initial response to this question would be that these costs are necessary for the normal conduct of business and the improvement of business enterprises. The problem, however, occurs in the allocation of these costs to individual products or services of the company. ABC system, as a first step in solving this problem involves the identification of a set of activities that indirectly consume resources. There are several examples of these activities in a company: internal transport of materials, machines preparation, improvement or creation of new products and services, quality control, etc. In this sense, the team that designed the ABC program usually asks the following questions to key employees or managers:¹

- What kind of work or activity you performe?
- How much time do you spend doing these activities?
- What are the resources needed to carry out these activities?
- What operating data best reflect the performance of the action?
- What is the value of activity for the company?

After collecting the necessary data and compiling a list of activities, it is necessary to make a selection of key activities. Application of hundreds of activities that could have been identified in the complex manufacturing or commercial enterprise would be costly and inefficient. As a rough measure of the approximation to determine the importance of an activity, the practice will emphasize ignoring activities that use less than 5% of the time of an individual or total resource (expressed in working hours, monetary units, etc.). Number of activities, however, should be based on cost-benefit analysis and the real needs and specifications of each company (size, complexity, activities, etc.).

In the manufacturing companies three categories of activities are clearly distinguished:²

1. Unit level activity - the methodology of traditional costing were primarily based on data analysis from these activities: the direct costs of labor and materials, individual inspection of all products and so on.

¹ Blocher Edward, Chen Kung, Lin Thomas, op.cit., p. 110.

² Kaplan Robert, op. cit, p.3-5

2. Batch level activity - these activities occur every time a specific series or batches is being produced: setting machines, giving orders, internal transport of materials, selective inspection or testing of samples of the product group, etc.; resources necessary to carry out activities on the lots or batches of products have relatively fixed nature and usually are not related to the number of units of production within the party.
3. Product sustaining activity - include activities that are necessary to enable the entire production or production of individual types of products: technical design of products, special servicing, making tools, etc. Viewed in a broader sense, in this activity is necessary to include customer support activities (e.g. online or telephone technical support), aimed at enabling sales to the individual customer, but are independent of the volume of sales.

This categorization of activities in manufacturing companies is primarily based on the possibility of allocating the spent resources to the cost of individual products. On the other hand, there are very significant activities that are not included in this calculation, such as investment in research, development and marketing of new products, which can be classified in the activity of the brand creation. It is very difficult to accurately and reliably allocate resources spent in this activity to individual products or services, as is the case with facility sustaining activity (heating, insurance, security, etc).

After selection of key activities, the next step in the implementation of ABC is the allocation of resources spent on the activity, which can be seen in analogy to the traditional methods of cost allocation and the cost centers. Consumed resources can be allocated to individual activities based on direct measures or by estimation. Direct allocation of resources involves the calculation of an activity spending. For example, the proportion of total electricity bills related to the consumption of the machine can be directly calculated. On the other hand, if there is no possibility of direct measurements, it is necessary to make appropriate assessments (e.g. percentage of time that employees spend on performing certain actions).

After allocation of the spent resources on the activity, the next step is the allocation of costs calculated by the activities on the individual products. Depending on the extent of an activity use, the cost of activities are allocate on the individual products. Activity cost drivers are defined as a quantitative measure of output of an activity. Activity cost drivers explain why costs of an activity increases or decreases. An example of the classification of activities and activities cost drivers of the corporation John Deere is given in Figure 1

Illustration 1 Activities in the ABC system: corporations "John Deere"¹

Activity	Level of activity	Activity cost drivers
Materials purchasing	Unit	Materials Cost
Direct Labor	Unit	Direct labor cost
Machine Operations	Unit	Machine Hours
Machine Setups	Batch	Setup Hours
Production Order	Batch	Number of orders
Materials Handling	Batch	Number of loads
Parts Administration	Product-Sustaining	Number of parts
General and Administrative	Facility-Sustaining	Amount of value added

4. Conclusion

The problem of the traditional costing methods is particularly pronounced for companies that have a wide range of products and / or relatively high indirect costs. Application of ABC can provide a more precise calculation of the cost per unit, which is very important information on which managers make key decisions on the pricing of products, production lines, capital investment, etc.

In addition to the significant benefits of the ABC method, there are also some disadvantages: (1) the arbitrariness in the choice of activities and the allocation of costs to the cost objects, which is particularly pronounced in indirect costs (2) ABC does not include in the cost per unit calculation some very significant expenses related to marketing, research and development, which in the modern business environment can be characterized as an investment, (3) development of the ABC system can last for long periods and require significant costs.

Importance of an ABC in agricultural enterprises depends primarily on the size of the company and the share of overhead costs to total costs. It can be concluded that the use of ABC as a complementary method is fully justified in the larger corporate food industry businesses, which have a wider range of products and a significant share of indirect costs. Traditional cost accounting methods, however, will remain the most important basis for planning and accounting analysis.

¹ Cooper Robin, Kaplan Robert (1991): The Design of Cost Management Systems: Solution Manual and Teaching Notes, Englewood Cliffs, N.J.: Prantice Hall, p. 310

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