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An Activity Based Costing Model for a Food Processing Industry

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Abstract:
Food processing sector has vital importance in developing a country's economy that is primarily driven by agriculture sector, like India. It provides significant linkages and synergies between two important aspects of economy, i.e. industry and agriculture. Activity based costing (ABC) is a modern management tool that analyzes cost of a product or service at various activity levels and provides more accurate cost information, thus helping the decision makers to devise various strategies to efficiently utilize an organization's resources, activities and people. This paper deals with the application of an ABC model in a pulse mill in India to quantify cost of its various products. Although, there are limited published research papers related to implementation of ABC models in agriculture sector, but till date, ABC has not been applied in any food processing organization of India. The results derived from the adopted ABC model in the pulse mill provide more detailed and precise cost information that facilitate various managerial decisions, like setting of selling price, ascertaining profitability of products, taking a make or buy decision etc.

Keywords*: activity based costing; pulse mill; cost; food processing industry; by-products*

1. Introduction

The commercial and economic success of the organizations in food processing sector is essential for a country's sustainable economic growth. Their strong performance can raise farm gate prices, decrease wastages, ensure value addition, encourage crop diversification, create employment opportunities and strengthen exports. It is all more imperative in the context of Indian economy, where the domestic food market is expected to touch US$ 258 billion by 2015 according to the survey report of Confederation of Indian Industry published in 2010. This sector can be broadly classified into two categories, i.e. primary processed food industries, and value-added processed food industries. Primary processed food industries comprise of enterprises processing products, like fruits and vegetables, packed milk, unbranded edible oil, milled rice, flour, tea, coffee, pulses, spices, and salt. On the other hand, organizations producing products, like processed fruits and vegetables, juices, jams, pickles, squashes, processed dairy products, processed poultry and marine products, chocolates, and alcoholic beverages are segregated under value-added processed food industries**.** Food processing sector in India is mainly dominated by small and unorganized enterprises. Traditional costing systems practiced in the majority of those organizations are unable to provide comprehensive and accurate cost information to their managers for effective decision making, planning, directing and controlling. This incapability of the traditional costing systems is due to the fact that they employ single volume-based driver to allocate overhead cost. Activity based costing (ABC) model, developed as a modern accounting tool to overcome the limitations of traditional volume-based costing systems, employs multiple cost drivers and allocation bases to assign overhead cost to final product/service. It significantly improves accuracy of the product/service cost data. The ABC model also presents cost information at different activity levels of the organization. Therefore, it is an appropriate management tool to provide account information for tactical and strategic planning, and decision making in food processing organizations. In this paper, a pulse mill located in India is considered for application of ABC model to demonstrate its superiority in providing more accurate and comprehensive cost information than the traditional accounting system.

2. Review of the Literature

Baykasoglu and Kaplanoglu [1] presented an ABC model for a land transportation organization in Turkey and showed that it would be more effective in costing services of the said organization. Kim [2] proposed a framework based on ABC approach to quantify the cost savings that the implementation of an ERP system should achieve in order to make the investment justifiable. Moolman et al. [3] developed a new approach based on ABC model to determine cost for vehicle routing problems. Roztocki [4] explored the application of ABC model in e-commerce, which might lead to better organization performance of many enterprises in offering their products and

services over the internet platform. Rajabi and Dabiri [5] evaluated the use of ABC methodology to estimate cost of various remedial services in a hospital. Palaiologk et al. [6] developed an ABC model for estimating the costs of preserving digital research data and identifying options for improving and sustaining relevant activities. Shafiee et al. [7] combined the principles of ABC with performance measurement to help managers to understand the true costs of providing products and services, and the factors that would drive those costs, while addressing other concerns, such as customer satisfaction. Shil and Pramanik [8] analyzed how an ABC model could improve an organization's operations to meet the needs of customers in a more cost effective manner. Jänkälä and Silvola [9] investigated the lagging effects of the use of ABC model on small organization's performance. Coskun and Yilmaz [10] implemented the ABC model in a private school to determine its annual fees. Elhamma and Fei [11] studied the relationship between ABC, business strategy and organizational performance in 62 Moroccan enterprises. Carli and Canavari [12] proposed a model for a new information system for agribusiness management that would support direct costing and ABC methodologies. Gupta [13] presented the application of ABC model in a global manufacturing enterprise having diverse product lines to demonstrate its impact on the organization's performance. Dandago et al. [14] examined the level of application of ABC models in the manufacturing organization in Zaria local government area of Kaduna state, Nigeria. Phan et al. [15] examined the association between organizational life cycle stages and use and success of activity based management practices.

It can be concluded from the review of the past researches that ABC model has been successfully applied in diverse fields of manufacturing as well as service sectors for providing more precise cost data for making effective strategic decisions. But, till date, it has not been implemented in any of the food processing industries in India. So, this paper proposes the application of an ABC model in a pulse mill of India to cost its entire range of products. The derived results from the implemented ABC model in the pulse mill now assist the managers to take various pricing decisions on its various products, perform cost control process and plan for effective utilization of its resources.

3. Development of ABC Model

The accounting system of a pulse mill, processing Red Lentil, is considered here for development and implementation of the ABC model. The identity of this mill is not disclosed due to secrecy purpose. A hypothetical name FR Mill is assigned to this real enterprise. It is a proprietorship organization, located in the state of Bihar in India, and has a processing capacity of 10,000 kg of pulse per day. FR Mill sells its products in the local market besides supplying these products to various traders in the neighbouring states of Assam and West Bengal.

In modern, technologically advanced and competitive business environment, traditional costing system has lost its relevance in providing accurate and reliable product cost information. It is predominantly because of the fact that the day-by-day overhead costs of a contemporary organization are increasing as a percentage of its total cost. Therefore, the ABC model is developed as an alternative accounting tool to supplement the traditional costing system that provides more precise and dependable information on product cost. The ABC can be defined as a special costing model that identifies activities in an organization, and assigns the cost of each activity with resources to all products and services in accordance with its actual consumption. Various steps involved in developing an ABC model are discussed as below:

- Identification and determination of the cost object, i.e. Products/services produced/delivered by the organization,
- Recognition of all activities consumed by the considered product/service,
- Identification of the resources required for each activity,
- Allocation of resources' cost to various activities using a range of resource cost drivers, and
- Assignment of activities' cost to cost objects using various activity cost drivers.

FR Mill produces different grades of pulse and cattle feed, which are processed from Red Lentil in its plant. The outputs of FR Mill can be put into various categories of by-products as they are produced simultaneously by a common process or series of processes. A critical analysis of the production process in FR Mill is carried out to reveal its different processes and by-products, as shown in Figure 1.

It can be observed that there are altogether four processes in FR Mill. In process 1, 100 kg of raw material (Red Lentil) is refined using a reel machine to remove dust and mud particles from it. At the end of process 1, there are two by-products, i.e. 4 kg of product A and 92 kg of product B. Product A, referred to as 'Misia', a kind of cattle feed, is readily saleable in the market. On the other hand, product B undergoes through process 2 for rolling and peeling. Emery rollers are used for this purpose. Process 2 also provides two by-products, i.e. product C and D. Product C is termed as 'Chunni' (another grade of cattle feed) in the local market, and it does not need any additional processing. While, product D is further sorted and graded using reel machine and high speed fans to produce product E (two piece pulse, also named as Fati in the regional language), product F (Chunni), and product G (four different categories of pulse classified according to their size). A colour sorting machine is then used to eliminate the remaining impurities from product G to produce the final output (G1, G2, G3 and G4) in process 4. The impurities obtained from this process, i.e. Cf are sold in the form of a cattle feed.

For costing the by-products of FR Mill, the resource costs should be traced down to the processes eventually. Some resource costs can be directly allocated to the processes and some should be traced to the processes using activities as the inter-mediums of cost assignment [16]. The cost associated with various by-products of FR Mill is estimated in three stages as discussed below.

3.1. Stage 1. Tracing the direct cost to processes

It is observed that there are three resource costs in FR Mill, i.e. raw material cost, labour cost and machine-related cost that can be directly traced for an individual process separately. Therefore, it is calculated that the total cost associated with those resources allocated to four processes are Rs. 4360 per 100 kg in process 1, Rs. 12 per 100 kg in process 2, Rs. 10 per 100 kg in process 3 and Rs. 16 per 100 kg in process 4.

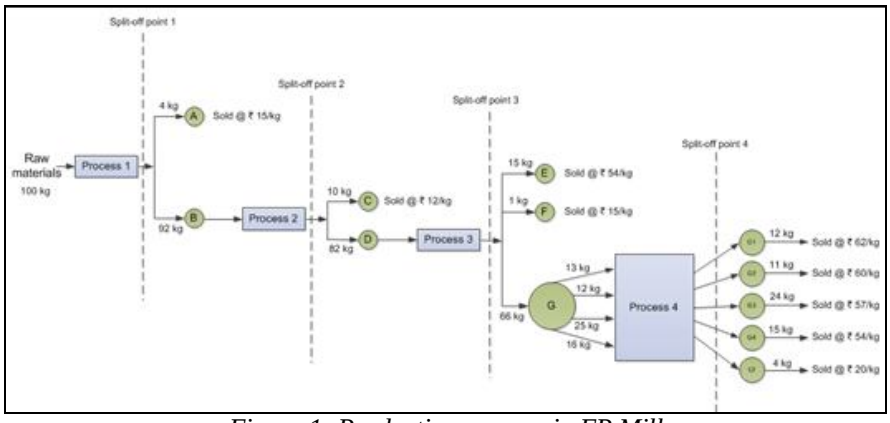

Figure 1: Production process in FR Mill

3.2. Stage 2. Allocating activities' cost to processes

It is noticed that there are two activities in FR Mill which are utilized by all the processes. Costs related to those two activities are accumulated in the activity pool of maintenance and supervision respectively. The total maintenance activity pool cost is apportioned amongst processes 1, 2, 3 and 4 according to their proportionate maintenance times, and is estimated as Rs. 10 per 100 kg, Rs. 12 per 100 kg, Rs. 4 per 100 kg and Rs. 9 per 100 kg respectively. The total supervision activity pool cost is also similarly assigned to processes 1, 2, 3 and 4 in accordance with the proportion of time devoted by the supervisors in a particular process. It is computed that the total supervision activity pool cost allocated to process 1 is Rs. 8 per 100 kg, process 2 is Rs. 11 per 100 kg, process 3 is Rs. 6 per 100 kg and process 4 is Rs. 5 per 100 kg.

3.3. Stage 3. Assigning process cost to final product

In this step, the joint process cost is allocated to the by-products using the net realizable value method. It assigns joint costs based on hypothetical sales values because there may not be a ready market for the product at the split-off point. This method is particularly useful when one or more products cannot be sold at the split-off point, but must be processed further. Equation 1 is used here to calculate the hypothetical sales value.

Hypothetical sales value = Market price – Further processing costs after split-off point (1)

For example, there are two products after process 1, i.e. A and B. Product A can be sold at the rate of Rs. 15 per kg and its net realizable market value is calculated as Rs. 60. On the other hand, product B needs to be processed further to command price from the market. So, the hypothetical net realizable value of product B is computed as Rs. 4522. The cost related with process 1 is then allocated to two products according to their proportionate net realizable values at split-off point 1, and is calculated as Rs. 14.25 per kg for product A and Rs. 47.34 per kg for product B. This procedure is applied at split-off points 2, 3 and 4 to derive the cost information on the remaining by-products of FR Mill. Table 1 shows the cost per kg for various by-products of FR Mill as calculated using ABC model.

Name of the product	Cost estimated by ABC model (Rs./kg)
A	14.25
C	11.50
E	51.60
F	14.00
G1	59.33
G2	57.36
G3	54.54
G4	51.66
Cf	19.00

Table 1: Cost/kg of various by-products in FR Mill estimated using ABC model

In the traditional costing system as practiced by the FR Mill managers, the total cost is calculated adding raw material cost and overhead cost. Overhead cost is used to be estimated as certain percentage of the raw material cost, which is arbitrarily determined by the mangers using past experience and prevailing market condition. This random allocation more often than not distorts the product

cost and diminishes its accuracy. The total cost of processing 100 kg of Red Lentil in FR Mill is calculated as Rs. 4481 per 100 kg using the traditional costing system, and Rs. 4463 per 100 kg using ABC model.

4. Conclusion

India is the second largest producer of food, and has the potential to be the largest on a global scale according to a Corporate Catalyst India survey. So, a well developed food processing sector can act as leverage in development of its economy. This paper presents the application of an ABC model in a pulse mill in a simple and cost effective manner to demonstrate its efficiency and appropriateness in accurately measuring various cost information of the mill. These cost information can be utilized by the decision makers of various food processing industries for their effective management and cost control.

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