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Costing systems design for sustainability

Mihaela TURTUREA
The Bucharest University of Economic Studies
turtureamihaela@yahoo.com
Radu Dan TURCU
The Bucharest University of Economic Studies
turcuradudan@yahoo.com

Abstract. *The aim of this article is to present an overall image of the way Accounting responds to nowadays user's needs in relation to the quantification of the impact companies have towards the environment. Regarding this, there have been analyzed concepts like sustainable development, environmental accounting, environmental costs and there have been presented the main progress towards environmental cost identification and measurement from the perspective of Activity Based Costing system. To provide an overall image of this concepts, there have been used as research methodology methods the documentation from literature review, analysis, synthesis and comparison.*

Keywords: sustainable development; environmental accounting; environmental costs; methods of assessing environmental costs; Activity Based Costing.

JEL Classification: M41, O13, Q56.
REL Classification: 14I, 15D.

Introduction

Lately, we can state that environmental issues have become a common interest globally. One of the greatest challenges in the current economic context is the benefit maximization without damaging the environment. Thereby, environmental cost accounting together with its control have become of a great interest at the company's level.

Despite the fact that nowadays there is a high interest arising from both company and society regarding sustainability, this issue has become to be reflected in accounting only after the second half of the twentieth century.

The interest in this research is given by the opinion of many researchers that environmental costs are underestimated in financial reporting.

The purpose of this paper is to identify methods used to determine environmental costs and the extent to which monetary values can be assigned to them or might be fully reflected.

The research summarized in this article supports and presents from a theoretical and practical point of view that the accounting methods used in managerial accounting have to be aligned to the user's needs of financial information referring to a certain reporting that can take into account social and environmental factors involved in business development. By implementing Activity Based Costing method at a company operating in agricultural sector in Romania is shown the contribution of reflecting environmental costs from a sustainable perspective.

Environmental costs represent the starting point in this paper, US Environmental Protection Agency having defined them as „costs of environmental degradation that cannot be easily measured or remedied, difficult to assess and do not represent a legal responsibility".

1. The theoretical framework of the research

1.1. General approach on sustainable development

The concept of sustainable development can be found within literature since 1987, as defined in the Brundtland Commission Report (United Nations, 1987, p. 16) – "development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

Sustainability approach initially meant to draw attention to the fact that the increasing growth of industrialization causes serious damage to the environment,

thus determining a solution towards the ecological crisis we nowadays take part at (Berca et al., 2012, pp. 202-219).

According to a study issued by Dascălu et al. (2009, pp. 567-588), it can be observed globally that there is a manifestation of important enquiry towards sustainability reporting. In this respect, conferences focused on this topic in Stockholm (1972) and Rio de Janeiro (1992) bring to the fore the need of the environmental protection at a global level through the action of cohesive, controlled and harmonized forces. At the European level, the sustainable development policy was first mentioned in the Single European Act (1986), which implies that actions in one country must not cause impairments in another.

1.2. The concept of environmental accounting evolution

The concept of "environmental accounting" first appeared in 1970, and since then it has undergone a continuous development. Articles of the following authors Mobley (1970), Beams and Fertig (1971), Churchman (1971) are mentioned to be the first studies referring to environmental accounting according to a research published by Stanciu et al. (2011, pp. 265-280).

According to Stanciu et al. (2011, pp. 265-280), the first definition of environmental accounting is the one issued by Steele and Powell (2002), who define this concept as identification, allocation and analysis of material and the associated monetary flows using an environmental accounting system to ensure a good understanding of environmental impacts and related financial effects.

Letmathe and Doost (2000, pp. 424-431) explain the environmental cost accounting as "an extension of traditional management accounting to support the decisions."

According to Bartolomeo (2000), cited by Todea et al. (2011, pp. 653-654), environmental accounting "provides reports for internal use, which generate environmental information that supports management decisions regarding pricing, cost control and capital budget, and it also provides reports for external use by disclosing information about the environment to the public and the financial community".

Bețianu (2008) quotes Christophe Bernard who sees environmental accounting as "green acounting" and argues that "it shouldn't be confused with the mere reflection of environmental costs in traditional financial statements because it represents an efficient information system about the degree of rarefaction of natural elements, determined by the activity of entities and utilized to reduce these rarefactions and to inform third parties" (Stanciu et al., 2011, pp. 653-654).

Choi et al. (2003, pp. 680-681), in the book entitled "International finance and accounting handbook", present important issues relating to social and environmental reporting. The concepts of sustainability reporting, reporting from the perspective of social, economic and environmental (Triple Bottom Line) can be seen achieving a considerable development in recent years - mandatory and voluntary reporting.

1.3. Environmental costs from a green accounting perspective

An important aspect of environmental accounting refers to the recognition of environmental costs. The starting point for this purpose is the definition of the environmental cost.

In this regard, the main approach of environmental management accounting is the lack of existence of a standard definition of environmental costs (Rannou, Henri, 2010, pp. 29-32). Depending on different interests, environmental costs include a variety of costs, such as provision or investment costs, but also external costs generated outside the company. In addition, it becomes imperative to know how to identify and classify these costs as the most of these costs are not tracked systematically and not assigned to products and processes that generated them, being added to the structure as a whole.

Stanciu et al. (2011, pp. 265-280) present the concept of environmental costs defined by the European Commission (Recommendation no. 453/2001) as "costs of the actions undertaken by the economic entity and by third parties on behalf of an economic entity with the purpose of preventing, reducing or repairing the environmental damages resulted from operational activities. These costs include: waste storage and disposal, soil protection, underground and surface water protection, clean air and climate protection, noise reduction, biodiversity and landscape protection".

In order to identify all cost elements associated with their life cycle, some researchers sustain the upstream and downstream assessment of environmental costs arising from the use of resources, pollution and waste resulting from the production and supply of goods and services.

Post and Altman (1992, pp. 3-29) suggested that "a greater integration of environmental issues in decision-making will result in a higher performance of the company."

An interesting classification of environmental costs issued by Scavone (2000) is reflected in the article of Becerra et al. (2011, pp.1-18) which emphasize three ways of grouping the environmental costs to reflect relevant information:

environmental cost as a loss, environmental cost as a major investment or environmental cost as an expense.

US Environmental Protection Agency (1996) defines environmental costs as those costs which have a direct financial impact on a company (internal costs), and costs to individuals, society and the environment for which the company is not liable (external costs). Therefore, the types of costs included in an environmental accounting system determine the purpose of the system (De Beer, Friend, 2006, pp. 548-560).

Based on this classification, the Environmental Protection Agency (1996, pp. 1-39) goes further in stating that within internal costs, the company may record: conventional costs, hidden costs, contingent costs and image costs or relational costs.

1.4. Methods of assessment of environmental costs

The allocation of environmental degradation factors in the total cost is characterized by an increased degree of complexity because of the limitations involved in assigning monetary values to all external impacts (Caraiani et al., 2010, pp. 44-56).

The methods used by companies to assess environmental costs are life-cycle assessment, environmental balance, full cost accounting (the three dimensions of sustainable development), total cost accounting and Activity Based Costing. According to Rannou and Henri (2010, pp. 29-32), these methods are not exclusive and several methods may have in common a number of parameters.

In addition to these methods of assessing environmental costs there are other methods used in particular industries or other countries, which represent, actually, improved or adapted versions of those mentioned above. An example would be the EEGECOST model (Environmental Engineering Group environmental Costing Model), used to promote environmental accounting in South Africa, being based on total cost method (De Beer, Friend, 2006, pp. 548-560).

By analyzing these methods, there can be observed significant differences in terms of the fact that not all methods of cost assessment take into account all costs. For example, the average balance method considers only the consumption of natural resources, ignoring other costs. Another difference is that not all these methods can assign a numerical value to environmental costs such as life cycle costing methods, environmental balance and full cost accounting method. For example, life cycle costing method does not consider either intangible costs, including those resulting from the relationship with stakeholders, or contingent

costs, that cannot be associated with a specific phase of a product life-cycle. However, environmental balance method does not provide a numerical equivalent of resource consumption in monetary terms, but it can be estimated if required. Within the full cost accounting method arises the difficulty of determining a monetary value regarding externalities (Rannou, Henri, 2010, pp. 29-32).

However, the difficulty of implementing an environmental accounting system is not represented by choosing the right assessment method, but to identify all costs arising from the compliance with environmental regulations. Such costs may arise from the requirement to change the raw materials used with some less polluting ones, this change will be reflected most likely in an increase in raw material costs and not in environmental costs.

1.5. ABC Method – Activity Based Costing

Activity Based Costing (ABC method) is the starting point of ABM's model - Activity Based Management. ABM represents a method that enables companies to manage their own activities and processes in order to improve organizational performance and, also, the amount that will be received in the end by the client. By allotting direct and indirect costs to their generating business activities, ABM allows managers to gain an understanding of the costs and profits associated with a product, customer service or a workflow (Getting Started with SAS Activity Based Management, 2008, pp. 12-20).

Raiborn and Kinney (2011) present ABM as a model focusing on the control of production activities or performance in order to improve the value attributed to customer and to enhance profitability. ABM includes a wide range of concepts that can help the company to produce in a more effective way, to determine the costs more accurately, to control and evaluate more effectively the performance. An important component of ABM is represented by analyzing activities in order to classify them and to develop methods to reduce or eliminate those activities that increase costs and cannot materialize in bringing value to customers.

An important issue regarding environmental costs is represented by the allocation of these costs upon activities or products they are generated.

Therefore, many companies treat environmental costs as overheads and do not identify them properly, significantly contributing to the underestimation of the environmental costs. To be noticed is the fact that within this method, there has to be initially identified all environmental costs. Therefore, ABC can provide companies the opportunity to allocate environmental costs to activities, either by using a traditional or environmental related cost driver for allocating environmental costs in the first place to activities and then to products, or to

environmental activities to products generating them (Rannou, Henri, 2010, pp. 29-32).

Caraiani et al. (2010, pp. 44-56) underline the fact that the strength of ABC method is that it develops the understanding of the processes associated with each product (United Nations, 2001). It allows "the improvement of cost calculation usually recorded in overhead accounts towards polluting activities and products as determined by specific quantitative procedures implying professional judgement throughout the product lifecycle".

2. Research methodology

Conservation and regulatory pressure arising at a global level determines increasingly assessing environmental issues in agriculture. Therefore, the subsequent case study examines the impact this industry has on the environment by developing a costing system for sustainability - Activity Based Costing for companies operating in this field of activity. It also implies finding ways to reduce environmental impacts in agriculture.

In the following part of the article, we are developing an empirical study that will assess to which extent the environmental costs are reflected by the use of an ABC system developed within two companies operating in the agricultural field in Romania. At the basis of this case study underlie both companies' financial statements, payroll statements, and statements regarding agricultural crops, the effective output related to these, and the recorded data referring to the usage of tangible assets.

Regarding documentation of aspects of activities developed by both companies, this was done by collecting all necessary information having direct contact with the personnel registered in both organizations – Alsagri ltd. and Agroprest Sud ltd.

The main objective of this empirical study is to determine the cost per unit of producing wheat, corn and sunflower seeds by both companies using the ABC method and observing the environmental costs from this perspective.

3. Empirical study regarding the implementation of ABC method from a sustainable perspective

Alsagri ltd. and Agroprest Sud ltd. are limited liability companies enclosing private capital. They have become over time dynamic businesses with a clear strategy, with strong connections and a great position on a large segment of the internal market.

In order to meet global environmental requirements, there was considered to be important an analysis upon the costing system, considering operational costs as overheads. Also, in order to be successful on a global market today, companies need to generate high-quality products or services and to have competitive cost structures, and, especially, should take into account the activities undertaken to avoid causing damage of any kind to the ecosystem.

It is very important when determining the costs to take into account the actual causes that have underlie, namely the cost drivers.

3.1. Externalities approach

Within these companies there can be observed both types of externalities – positive and negative ones. The positive externality can be reflected by the fact that these companies having their headquarters in the same perimeter allowed a beekeeper to place his hives on their farm, thus benefiting of a better pollination of plants. But at the same time beekeeper bear a negative externality arising from the use of insecticides and pesticides in agriculture. According to recent studies carried out by EFSA, the European Food Safety Authority, it has been shown that the use of insecticides and pesticides in agriculture have acute effects on bees and bee colonies leading to depopulation of some areas in recent years.

Another negative externality that can be observed at these companies is reflected by the waste management, which can cause destructive effects on the environment through pollution. The cost of this type of externality is estimated based on the surface, but also in relation to the machine hours actually involved in this activity.

Chemical fertilizers are also subject to negative externalities having the possibility to reach the groundwater.

A positive externality that can be observed is the fact that these companies have attracted European funds through EAFRD programme – European Agricultural Fund for Rural Development. EAFRD supports financially the European Union member states to implement a common agricultural policy and to obtain rural development. These companies, through the EAFRD bought part of their fixed assets, the economic assessment of externalities being possible by using the cost control method explained in the literature by Henri et al. (2010, pp. 29-32). The assumption underlying this method is that the cost impacts on the environment (including pollution) determined by a company is equal to the cost of installation, handling and maintenance of technologies that could allow the company to avoid damage to the environment. Cost control is the simplest method of measuring the external costs and the most easily to justify, because it generates costs that the company incurred to avoid external costs.

Another type of positive externality may be attracting European funds through the EAFRD - European Agricultural Fund for Rural Development, which financially supports the European Union member states to implement a common agricultural policy and rural development. These companies bought part of their fixed assets through the EAFRD programme, economic evaluation of externalities being possible by means of cost control method which have been reflected in the literature by Rannou C. and Henri J.F. (2010, pp. 29-32). The assumption underlying this method is that the cost impacting the environment (including pollution) for a company is equal to the cost of installation, handling and maintenance of technologies that could allow the company to avoid damage to the environment. Cost control is the simplest method of measuring the external costs and the most easily justified because it generates costs that the company incurred to avoid external costs.

3.2. Description of activities operated by the two companies

In the context of developing the ABC costing model there are presented the main undertaken activities for growing wheat, sunflower and corn for year ended 2012.

Starting with the 2011th autumn, the land is prepared for a new exploitation cycle, in this case - wheat production by ploughing and harrowing. Ploughing, the oldest activity using plough, allows a better plant development. Meanwhile, harrowing breaks up and smoothes out the surface of the soil, crop residues being reintegrated in the soil consistence, thus a noticeable increase in the quality of the land can be seen. At this farm, ploughing, and harrowing are used only for wheat production.

Another activity is represented by seedbed preparation which helps ensuring proper germination conditions to crops that are likely to be sown. Through this activity it is aimed germination, uniform emergence and plant development under normal conditions on a field having no weeds.

Phytosanitary treatment is applied only on wheat crops, being used for prevention and pest control agents.

The activities which normally follow those already mentioned are roughly similar for all crops: sowing, fertilizing, herbiciding, harvesting and grains transfer to the farm. The difference among these activities is reflected by the machine used and the time spent on each activity.

Regarding the products used for crops, especially insecticides, pesticides, they are of a high quality and are distributed according to arisen issues during crop growth, problems caused by weeds, diseases and pests.

It should be mentioned that crops as a whole at these farms are rotated every year in order to obtain better outputs and to prevent various diseases of plants which may develop hereditary. In this way, by treating them, fertile land is maintained with a balanced physical and chemical composition.

The following table presents the main activities identified in crop production of corn, wheat and sunflower, as well as the cost drivers related to them:

Table 1. *Activities and cost drivers identification*

Crt. No.	Activities	Cost drivers
1	Ploughing	Ploughing hours
2	Soil scarification	Soil scarification hours
3	Harrowing	Harrowing hours
4	Seedbed preparation	Seedbed preparation hours
5	Sowing cereal plants	Sowing cereal plants hours
6	Sowing weeding plants	Sowing weeding plants
7	Fertilizing	Fertilizing hours
8	Herbiciding	Herbiciding hours
9	Phytosanitary treatment	Phytosanitary treatment hours
10	Weeding	Weeding hours
11	Harvesting	Harvesting hours
12	Harvesting weeding plants	Harvesting weeding plants
13	Grains transfer to the farm	Grains transfer to the farm hours
14	Managing machine wastage	Managing machine wastage hours
15	Managing package wastage	Ha

The area of land exploited by these companies is mainly rented, being equal to 791.75 ha. The total output for 2012 is divided as follows: wheat – 1,033.4 t/ha, corn – 362.3 t/ha and sunflower – 363.15 t/ ha.

Operational revenues are computed by taking into consideration both revenues from selling the finished goods and the surface subsidy accorded by APIA, the Agency for Payments and Intervention in Agriculture. This subsidy is given for agricultural land and its value registered in 2012 was 106 Euro per hectare. The average annual income per hectare is distributed as follows: wheat –1,464.22 lei, corn –1,506.96 lei and sunflower – 2,550.73 lei.

As for the waste management activities identified, these entities have externalized the service of recycling to other companies, managing to maintain a hygiene and environmental maintenance level. In terms of wastage related to equipment, these companies keep track of used oil and tires that would not be subsequently recovered.

Used oil is considered a hazardous waste to the environment. Waste packages containing such hazardous substances are classified as dangerous, these companies keeping track of them from the entry phase to their disposal.

Table 2. *Alloting overheads to activities*

Overheads	Type of activity	Estimated annual costs
Salaries	1-13	127,497.00
Fuel	1-13	158,238.00
Tractor John Deer 7930 depreciation	2,3	20,772.73
Tractor John Deer 6920 depreciation	6,10,13	20,797.08
Tractor John Deer 6230 depreciation	1,4,5,7,8,9,13	36,051.89
Reversible plow depreciation	1	1,344.36
Agram harrow depreciation	3	2,137.44
Seedbed machine depreciation	4	1,984.08
Kuhn Megant depreciation	5	13,444.06
Manure spreader depreciation	7	1,437.00
Agram stubble cultivator depreciation	2	5,170.00
Monosem hydraulic harrow	10	8,410.44
RAU atomizer depreciation	8,9	11,658.12
John Deer CTS combine harvester depreciation	11,12	18,592.80
CASE AXIAL FLOW 1680 combine depreciation	11,12	16,607.00
Heder CASE depreciation	11	18,532.80
Corn header Geringhoff depreciation	12	11,686.89
Cereal dump – 0172 series depreciation	13	8,216.28
Cereal Dump -0175 series depreciation	13	8,216.28
Monosem pneumatic sowing machine depreciation	6	10,446.04
Expenses related to managing the waste as:		
Used oil related to equipment	14	756.00
Used tires related to equipment	14	210.00
Packages containing dangerous substances	15	1,522.11
Total Overheads		503,728.40

The activities undergone by these companies are performed by using the following equipment: John Deere 6230 tractor, John Deere 6920 tractor, John Deere 7930 tractor, John Deere CTS combine harvester, CASE combine harvester.

In the case of tractors depreciation it is important to note that some activities are performed by a certain type of tractor. In this case, the soil scarification and harrowing are performed by John Deere 7930 tractor, while sowing weeding plants, weeding and grains transfer to the farm activities are performed using the John Deere 6920 tractor and other agricultural activities are performed by John Deere 6230 tractor.

To allocate the depreciation of the equipment used in both harvesting activities - harvesting and harvesting weeding plants should be noted that the wheat crop is harvested using both combines with their appropriate headers. Because harvesting the crops of sunflower and corn involve using a special header, being Geringhoff header related to John Deere CTS combine, this activity would only consider the asset depreciation related to these items.

Due to the fact that there are differences between agricultural equipment in terms of their engine capacity and their weight, there is used an adjustment factor taking into account each equipment, leading to an allocation of fuel consumption based on the characteristics presented below:

Table 3. *Registering of an adjustment coefficient*

Equipment	Fuel consumption (l/h)	Adjustment coefficient
6230	20.4	1
6920	31.1	1.52
7930	40.1	1.94
JD Combine	34.88	1.71
CASE Combine	30.4	1.49

When allocating cost drivers towards identified activities there have been used recorded data regarding the usage of tangible assets.

Caraiani et al. (2010) argues that applying the ABC method for recognition and measurement of costs, this "allows improvement of cost calculation by allocating costs that are usually registered in general expense accounts, upon polluting activities and products, being determined by specific quantitative procedures throughout the product life-cycle".

In order to determine the allocation of costs to activities that generated them, there have been used the allotment of cost drivers related to each activity on crops. The overheads identified in the operational activity of the organization: salaries, fuel and depreciation for each type of equipment. For example, computing the overhead cost related to ploughing activity there were taken into account: ploughing equipment depreciation, John Deere 6230 tractor, fuel and salaries.

The identified activities that are specific to sustainable development of a business for both companies are related to equipment and packaging wastage management resulting from the use of crop treatments. The cost associated with waste management activities such as packaging is allocated based on the area corresponding to each crop, and the one that includes waste from equipment usage is allocated according to the number of hours each machine was individually used.

The law which regulates wastage disposal is represented by the Law No. 211/15 June 2011, published in Romanian Official Monitor Journal No. 837/25 November 2011. It establishes the necessary measures that have to be undertaken in order to protect the environment and human health by preventing or reducing the adverse impacts of the generation and management of waste and by reducing overall impacts of resource usage and improving the efficiency of their use.

Packaging waste containing dangerous substances requires great care when removing them from the production process, these being classified as hazardous waste according to the Law No. 211/2011. Their relevant code under which they are reflected is 15.01.10 and refers to packaging containing residues or being contaminated by hazardous materials.

Also, the used oil is classified as hazardous waste. The code relating to it is 13.02.05, representing non-chlorinated mineral engine, gear and lubricating oil. Dead car batteries (code 16.06.01 - lead batteries) have the same treatment as used oil.

Both companies are responsible for this kind of transfer of waste treatment operations to an authorized economic operator performing waste disposal in accordance with law in force.

Table 4. *The results of allocating overheads by applying ABC method*

Indicators	Wheat	Sunflower	Corn	Total
Activity No.1 - Ploughing				
1. Cost drivers volume	315			315
2. Overheads allocation by cost drivers		175.98	m.u. /ploughing hours	
3. Activity overheads	55,433.74			55433.74
4. Activity overheads absorption ratio	100%			100%
Activity No.2- Soil scarification				
1. Cost drivers volume	-	57	84	141
2. Overheads allocation by cost drivers		332.79		
3. Activity overheads	-	18,969.16	27,954.55	46,923.71
4. Activity overheads absorption ratio	-	40.43%	59.57%	100 %
Activity No. 3 - Harrowing				
1. Cost drivers volume	76			76
2. Overheads allocation by cost drivers		324.25		
3. Activity overheads	24,642.99			24,642.99
4. Activity overheads absorption ratio	100%			100%
1. Cost drivers volume	*Activity No. 4 - Seedbed preparation*			
2. Overheads allocation by cost drivers	127	58	86	271
3. Activity overheads 4. Activity overheads absorption ratio		179,03		
1. Cost drivers volume	22,737.27	10,383.95	15,396.89	48,518.12
2. Overheads allocation by cost drivers	47%	21%	32%	100%

Indicators	Wheat	Sunflower	Corn	Total
Activity No. 5 - Sowing cereal plants				
1. Cost drivers volume	109			109.00
2. Overheads allocation by cost drivers		295.05		
3. Activity overheads	32.160,702			32.160,70
4. Activity overheads absorption ratio	100%			100%
Activity No. 6 - Sowing weeding plants				
1. Cost drivers volume		35	53	88
2. Overheads allocation by cost drivers		362.45		
3. Activity overheads		12,685.88	19,210.05	31,895.93
4. Activity overheads absorption ratio		39,77%	60,23%	100%
Activity No. 7 - Fertilizing				
1. Cost drivers volume	55	25	37	117
2. Overheads allocation by cost drivers		183.99		
3. Activity overheads	10.119,69	4.599,86	6.807,79	21.527,34
4. Activity overheads absorption ratio	47%	21%	32%	100%
Activity No. 8 – Herbiciding				
1. Cost drivers volume	55	25	37	117
2. Overheads allocation by cost drivers		239,49208		
3. Activity overheads	13,172.06	5,987.30	8,861.21	28,020.57
4. Activity overheads absorption ratio	47%	21%	32%	100%
Activity No. 9 - Phytosanitary treatment				
1. Cost drivers volume	55	-	-	55
2. Overheads allocation by cost drivers		239.49		
3. Activity overheads	13,172.06			13,172.06
4. Activity overheads absorption ratio	100%			100%
Activity No. 10 - Weeding				
1. Cost drivers volume	-	28	39	67
2. Overheads allocation by cost drivers		369.28		
3. Activity overheads	-	10.339,78	14.401,83	24.741,61
4. Activity overheads absorption ratio		42%	58%	100%
Activity No. 11 - Harvesting				
1. Cost drivers volume	71	0	0	71
2. Overheads allocation by cost drivers		867.91		
3. Activity overheads	61,621.78	0.00	0.00	61,621.78
4. Activity overheads absorption ratio	100%	-	-	100%
Activity No. 12 - Harvesting weeding plants				
1. Cost drivers volume	-	53	80	133
2. Overheads allocation by cost drivers		364.54		
3. Activity overheads	-	19,320,.84	29,163.54	48,484.38
4. Activity overheads absorption ratio	-	40%	60%	100%
Activity No. 13 - Grains transfer to the farm				
1. Cost drivers volume	40	35	65	140
2. Overheads allocation by cost drivers		457.84		
3. Activity overheads	18,313.53	16,024.34	29,759.49	64,097.36
4. Activity overheads absorption ratio	29%	25%	46%	100%
Activity No. 14 - Managing machine wastage				
1. Cost drivers volume	903	316	481	1,700
2. Overheads allocation by cost drivers		0.57	m.u./ *managing machine wastage hour*	
3. Activity overheads	513.12	179.56	273.32	966

Indicators	Wheat	Sunflower	Corn	Total
4. Activity overheads absorption ratio	53%	19%	28%	100%
Activity No. 15 - Managing package wastage				
1. Cost drivers volume	370.86	168.37	252.52	791.75
2. Overheads allocation by cost drivers		1.92	m.u./ha	
3. Activity overheads	712.96	323.69	485.46	1,522.11
4. Activity overheads absorption ratio	47%	21%	32%	100%
Total cost / cost object	252,599.91	98,814.36	152,314.13	503,728.40
I. COST PER UNIT	244.44	272.10	420.41	
II. MARGIN PER UNIT	924.16	2,031.30	1,097.44	

Using ABC costing system we can observe the influence of the volume of cost drivers has on each type of activity, and also that the relationship between cost and recognized consumption on each activity is a causality relationship. In this case, each cost object incurs overheads in the proportion related to the way they consume activities.

The wheat output consumes 100% of ploughing activity, having allotted 55,433.74 lei out of the total cost of this activity. This proportion can be found also in the total cost object of 252,599.91 lei.

The sunflower output consumes 40.43% of the activity of soil scarification, being allotted 18,969.16 lei out of the total cost of this activity. This proportion is reflected also in the total of the cost object which equals to 98,814.36 lei. In correspondence, the corn crop production consumes 59.57% of soil scarification activity being allocated 27,954.55 lei of the total cost of this activity.

Based on our calculations, soil scarification activity including both wages, fuel consumption, Agram stubble cultivator depreciation, and John Deere 7930 tractor depreciation, consume resources totalling 46,923.71 lei. The basis for overheads allocation is represented by the number of soil scarification hours, which are divided as follows 57 soil scarification hours for sunflower crops, and 84 hours for corn crops, consisting in 141 hours of soil scarification in total. Based on these amounts there has been determined a cost of 332.79 lei/hour of soil scarification.

Regarding managing package wastage activity, it consumes resources totalling 1,522.11 lei. This cost was allocated on a unit (hectare) basis, with a total of 791.95 ha, out of which 370.86 ha wheat, 252.52 hectares corn and 168.37 hectares sunflower.

Wheat consumes 47% of this activity being allocated the total value of 712.96 lei out of the total cost related to this activity, while sunflower crops consume 21% of this activity being assigned a cost of 323.69 lei out of the total cost of this activity and corn 32%, with a related cost of 485.46 lei.

Due to the complexity of the developed activity, the most resources are consumed during harvest activities for both types of plants – cereals and weeds. Thus, they consume a total of 110,106.16 lei, including combines depreciation, wages and fuel of this activity.

Depending on developing conditions and the difficulty of harvesting plants, it can be seen that wheat crops require more resource consuming than corn and sunflower put together. Another reason is that for the cultivation of wheat there are used both combines. In addition, the cost for grain harvesting hours is about 868 lei per hour, while the cost per harvesting hour for both corn and sunflower are approximately 365 lei.

Following the implementation of the ABC model in these companies it can be seen that it leads to indirect costs per unit determined on a cause and effect basis.

ABC method provides a more accurate perspective of a product cost. Allocation of overheads associated with the production of a good, and then its allocation to the final product, allows removal of irrelevant costs to products.

ABC method is built on the principle that the goods and services consume activities and activities consume resources. This led to a different allocation of operational overheads to the three cost objects. The cost per product is obtained by summing the costs of the fifteen activities identified, allocated in relation to their cost drivers set – usage hours of equipment implied by each activity, or hectares.

From the perspective implying usage of activities and, respectively resources for the wheat crop, the unit cost is 244.43 lei, which generates a unit margin of 924.16 lei.

Although it is very risky to predict something within agricultural activities, in terms of what type of crops to be sown for another exploitation cycle, due to unpredictable weather conditions, we can decide based on this model which crop are more profitable.

Due to the weather conditions recorded in the 2011- 2012 agricultural production cycle, the outputs recorded were affected by drought resulting in a halved production as compared to normal conditions.

We believe, based on the model developed, that in order to start a new operating cycle of crops we should concentrate primarily on sunflower, while corn and wheat production should come secondary on companies' production strategy.

Conclusions

The increasing interest for evaluating the impact on the environment is the consequence of the growing global economic development. The impact generated by the economic entities' actions over the biosphere determined the need for identifying viable solutions regarding financial reporting from an environmental and social perspective, including environmental costing methods.

In the actual economic context, both financial and management accounting must contribute to ensure sustainable development, by providing essential information regarding the companies' impact over environment and society as a whole. In this respect, one of the most important challenges is the development of a set of practices concerning the identification and assessment of environmental costs, which must provide alternatives for the pollution control, for the selection of those materials that may sustain the reduction of environmental costs and for facilitating the environmental protection.

We consider that a viable method of assessing environmental costs should capture most types of environmental costs, reflecting them in monetary terms. It may provide management a tangible view of these costs and compare them for different products or processes, and identify them in relation to the activities that generated them, in order to assess how profitable activities are in terms of impact towards the environment. Therefore it is not appropriate to consider a hierarchy of these methods. Instead, improvement of one method or a combination of methods discussed in this paper, based on the specific entities could be a solution.

Based on the performed research in respect to the development of this paper, we consider appropriate for future research the determination of environmental costs in accordance with the other four environmental costing methods presented above (life-cycle assessment model, environmental balance, full cost accounting and total cost assessment).

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