

Cost Computation for the Agricultural Products within the Vegetal Farms¹

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Abstract

Agriculture constitutes a specific sector of the national economy. It does not contribute significantly to the increase in the gross domestic product, however, it is expected to fulfill three important functions: economic, social and environmental. The cost computation for the agricultural products is different from the one in other activity sectors. Most of the papers addressing managerial accounting issues refer to manufacturing companies. We consider that our work is a relevant research paper as there are very few documents in the area. This article presents the characteristics of the cost computation for the agricultural products farms. Furthermore, the paper also exemplifies a calculation of the agricultural products obtained on a farm.

Key words: *agriculture, cost computation, agricultural products, farm expenses*

JEL Classification: *Q19, M41*

Introduction

At present agriculture fulfills three major functions: economic, social and spatial. The economic function refers mainly to the farmers' obligation to produce agricultural products in order to meet the requirement of feeding the farmers themselves, as well as other members of the society. At the same time, however, the products produced shall be of appropriate dietary value and quality. Furthermore, these products shall be delivered to the market at prices affordable to the consumers. Farms shall also create work places and provide the farmers and their families with fair incomes generated by their farming business. Additionally, the farmers are required to apply certain agricultural methods which would guarantee that the farmed land preserves its natural and environmental value.

¹ *This work was supported by CNCISIS – UEFISCSU, project number ID 1779 Romania facing a new challenge: accessing the structural funds for the sustainable development in agriculture. The convergence of financial reporting of the native entities with the European realities, PNII – IDEI code/2008*

Research Methodology

The research conducted in the paper is qualitative. This supposes a series of inductive processes involving the collection and the analysis of some qualitative data in order to define patterns, themes etc. This paper starts by analyzing the characteristics of cost computation on agricultural products farms and it appeals to the professional judgment for developing a case study designed to model the process by numerical data.

Cost Computation Characteristics for Agricultural Products of Farms

The characteristics of the agricultural production process and the organizing of the evidence system related to the consumption of resources influence the cost computation of agricultural products.

A first problem with the cost computation of agricultural products refers to the date when the calculation may be performed. Establishing the production cost of agricultural products at short time periods is difficult due to the mismatch between the period when resources are consumed and the moment the production is obtained.

The discrepancy between the time at which production costs and the production is differentiated according to the production profile of agricultural branches and the activities of the branches. This is quite visible in the branch of the plant production industry and this is influencing the livestock as well, as it provides the animals' food.

The relatively long time lag between costs and production, the quantitative irregularity of production, the costs generated especially in the process of administrating and managing farms and agricultural entities, occurring after production, are criteria to be taken into account to determine the moment when the unit cost computation may be performed.

The unit cost computation of production may be conducted monthly, provided of course the knowledge of both production and costs. The computation is performed cumulatively throughout the year period some time after the production was obtained.

The monthly computation of unit cost for the agricultural products and the cumulative computation for the entire timeout period elapsed from obtaining the required output is justified due to the mechanism of managing the agricultural entity. The limited character information provided by the unit cost of production during the year is first of all influenced by the particular production process in agriculture. On the other hand, the monthly computation of the production unit cost based on data from the reference month production should not be considered a definitive cost.

The unit cost of agricultural products, being computed by dividing the actual costs to the amount of output produced, requires that, at the year's end, the farms perform the final computation based on the actual resource consumption level. The computation of the unit cost can be made using the *simple division method*. This method can be applied in the vegetal farms as well, where all the expenses are made in order to obtain one type of production and there are no secondary products. All the expenses have a direct character, the unitary cost being established based on the total of the expenses divided by the quantity obtained.

The mutual transfer of goods between vegetable farms and livestock farms as well as the consumption of the own production of the same farm subunit, is also a characteristic with implications for unit cost computation for the agricultural products.

The complexity of agricultural production causes an exchange of activities between production farms or between farms and ancillary sectors. In this context, a solution in evaluating these

activities is necessary. The essential coordinate for the evaluation of this activity exchange, which would be considered in the computation of the unit cost, should be the actual level of the effort made by the farm subunit.

Since during the year the cost computed by farms and ancillary sectors is not a definitive cost, the *standard costs* may be used for evaluating the consumption of products from own production or the labour from ancillary sectors. By the end of the year, when the definitive computation of agricultural products costs is performed, it is necessary to include in the cost computation this *internal consumption* at the actual level.

Another issue with implications for the unit cost computation for the agricultural products is represented by the possibility of obtaining both the primary and secondary products from certain crops and types of animals.

The possibility of obtaining two or more primary products from certain crops and livestock categories leads to a system of criteria to identify the main product and the products that are considered to be, from calculation perspective, secondary production. This separation between the main products (with and without computation) and the secondary products (by-products) requires first the selection of calculation procedure and secondly, the assessment the main products assimilated to the secondary production. This problem is solved using one of the following methods:

- the remaining value method (deducting the value of the secondary product) or the rest method;
- the equivalent indexes method;
- the method of quantitative equivalent of the secondary product with the main product.

The remaining value method (deducting the value of the secondary product) or the rest method is used in all the cases in which two or more products can be obtained from a crop, disregarding their economic destination. For instance, for the cereals, the main object of the cost computation is the corn, the wheat etc. In these cases, the other products are considered products without computation (straws, corn cobs etc.).

The equivalent indexes method can be used in the case of the intercropping (e.g. corn with beans, corn with pumpkins, melons with beans etc.). In this case, production costs are normally collected on that group of cultures which are the subject of the cost computation. One can distinguish some individual direct costs, such as the seeds and harvesting, but in practice, this separation is not achieved. Collected total expenditure diminished with the value of the secondary production (assessed at the net realizable value) is divided to the main products according to a particular criterion. In practice, the criteria used include: net realizable value of products, nutrition units etc.

The method of quantitative equivalent of the secondary product with the main product is used where "coupled" products are obtained, one of which being considered the main product and the other the secondary product.

The computation of production unit cost is based on the data of production costs and obtained production, recorded and grouped in the operative accounts of each farm.

The expenses incurred during the period have a direct and an indirect character as regards cost objects, represented by the categories of crops and animals of the farm. The grouping of data on production costs of farm activities offers the possibility of performing post-computations. Essentially, these works consist of successive operations of allocation of expenses, which at the time of their recording have not been identified on cost objects.

In a generalized form, *post-computations*, in the order of succession, are as follows:

1. Centralization of production costs and obtained production data;
2. Allocation of indirect costs to cost objects;
3. Computation of the production unit cost.

1. *Centralization of production costs and obtained production data* consists in grouping the data from the farm records and preparing, to this aim, a “*Summary of production costs and obtained production*”. Data presentation in this summary should be made in accordance with the records of the farm where the expenses and the production were currently recorded. Since the computation of the production unit cost starts with this action and the subsequent control based on correlations is difficult to perform, this step requires a careful analysis of the data that are centralized.

2. *Allocation of indirect costs to cost objects* is a complex step, requiring the allocation of both the costs from ancillary sectors and the indirect cost of the farm. When performing this stage, the following *sub-stages* must be taken into consideration:

- a. *Allocation of tractors and agricultural equipments expenses.* This kind of expenses refers to a heterogeneous activity from the works’ content point of view. The diversity of works performed through tractors and other agricultural equipments is homogenized by a conventional measure unit called *hantru* (hectare standard plowing). Transforming all works in a conventional measure unit is based on differentiated coefficients considering the complexity degree of the performed works. Tractors and agricultural equipments expenses are allocated on farms’ activities based on the expenses established for conventional unit (*hantru*) and the works volume expressed as *hantri* on beneficiary activities.

$$\text{Expenses/hantru} = \frac{\text{Total expenses with tractors and agricultural equipments}}{\text{Total volume of works expressed in hantri}} \quad (1)$$

The expenses thus calculated for each conventional unit (*hantru*) are multiplied by the volume of works expressed in *hantri* for agricultural products (wheat, corn, etc.) and for other activities of the farm.

- b. *Allocation of motor combines expenses.* This kind of expenses collected in operative accounts refers to the harvesting of some agricultural products. The allocation of these expenses is performed considering the quantity of products harvested with the help of these machines. If combines have been used for harvesting only one agricultural product, then all the combines expenses will be allocated only to that agricultural product, without any allocation computation. Only when they are used for more than one product allocation computations must be performed.

$$\text{Combines expenses/tonne} = \frac{\text{Total of combines expenses}}{\text{The quantity of harvested products}} \quad (2)$$

The amount of expenses established per harvested tonne is multiplied by the number of tones harvested for each product where the combines have been used.

- c. *Allocation of irrigations expenses.* These expenses are allocated over the irrigated cultures proportionally to the water volume expressed in meters cubes, previously calculating the expenses for one meter cube of water. The total amount of irrigation expenses contains both the expenses allocated by hydro-ameliorations sector, as well as the expenses performed with the farm’s own means.

$$\text{Expenses/m}^3 \text{ water} = \frac{\text{Total irrigation expenses}}{\text{Water volume expressed in m}^3} \quad (3)$$

Expenses calculated for each m³ of water are multiplied with the water volume expressed in m³ used for irrigating cultures.

- d. *Allocation of expenses for natural fertilizers applied to land cultures.* Allocation of these expenses is established proportionally to the cultivated land, including the one prepared as cultivated field.

This kind of expenses consists of the book price of fertilizers and of transport and splitting expenses. These are allocated to all agricultural products, no matter if they received fertilizers or not. This kind of allocation is justified by the persistence of natural fertilizers and cultures rotation.

Natural fertilizers administered to trees plantations and wineries are not considered indirect expenses, being accounted for as direct expenses.

$$\begin{array}{l} \text{Expenses with} \\ \text{natural} \\ \text{fertilizers/ha} \end{array} = \frac{\text{Total expenses with natural fertilizers}}{\text{Total cultivated land}} \quad (4)$$

The expenses established on each ha are applied to the surface of each culture, no matter if one culture or another has or has not received natural fertilizers.

- e. *Allocation of farm overhead.* This is done by using the supplementing method based on single coefficient. As common allocation base for cost objects is chosen the total of expenses established till this stage on cost objects.

$$\text{K farm overhead} = \frac{\text{Farm overhead}}{\text{The sum of the allocation basis of cost object}} \quad (5)$$

This coefficient is applied to the allocation basis of each cost object.

By following the above steps, it can be reached the distribution of both direct costs and farm overheads to cost objects.

If the full cost is computed, then the general overheads and the distribution costs should also be distributed.

The general overhead costs of the agricultural entity are distributed to the production farms based on an allocation basis that is common to the farms, such as: the total of the direct costs and farm overhead, the income recorded for each farm etc.

The general overheads of the agricultural entity allocated to the farms become the subject of the allocation to the cost objects of the farm by using the supplementing method based on single coefficient.

If the distribution costs were not identified for each cost object, then they should be allocated using the supplement method.

3. *The computation of production cost per unit* is the final stage of calculation. To determine the unit cost of production, together with the complete and accurate determination of production costs, the proper identification of production on cost objects is of particular importance. Fundamentally, the computation of production unit cost is related to the two terms, namely: production costs and obtained production. Vegetable production refers to the production resulting from the harvest, as expressed in appropriate units (t / wheat, t / corn, etc.).

Establishing the unit cost of agricultural products is performed through several methods differentiated according to the particularities of the harvested products. Best practice of farms shows that for the calculation of production cost per unit there are used: simple dividing method, residual value method and, quite limited, equivalence indices method (for fodder cultures).

Particularities of Cost Computation on Vegetal Farms

The methodology presented for cost computation in agriculture has general validity. The complex character of agricultural production determines several particularities in establishing costs for certain domains of agricultural products (Cărbunescu et al., 1988). In this respect, we present the following particularities:

1. *Greenhouse cultures* are cultivated during two production cycles: cycle I, in the first half of the calendar year and cycle II, in the second half of the year. The cost computation is performed on production cycles for each culture and for the whole greenhouse production. Calculation on production cycles is imposed by the particularities of the production process during the two cycles concerning the nature and amount of production expenses and obtained production.

Concerning this aspect, delimitation of production expenses and obtained production in production cycles is mandatory. There are *two situations*:

- when the main production of the farm consists only in greenhouse cultures, besides the direct expenses two kinds of overheads have to be distinguished: overheads for each production cycle and overheads of the farm which are also common to the greenhouse;
- when the farm has other cultures as well besides the greenhouse ones, it is necessary to be distinguished three kinds of overheads: overheads for each production cycle, overheads for both cycles, that is for the whole greenhouse production and overheads of the farm.

The division of these groups of overheads for the greenhouse is due to the fact that inside the overheads of the farm, the overheads of the greenhouse have a significant percentage and they must be allocated only to those cultures so that the unit cost is not distorted. The greenhouse has important overheads such as depreciation and maintenance of installations, heating and irrigation expenses, etc. When allocating the overheads of the greenhouse the allocation criteria issue arises. We consider that these expenses should be allocated proportionally to the field occupied by each culture, expressed in square meters, multiplied by the number of vegetation days (m^2/day).

As regards the heated hotbeds, similar problems arise concerning the overheads.

2. *Permanent and annual fodder cultures* present several particularities in the calculation process regarding the delimitation on accounting periods and the method used for calculating the unit cost. The issue of delimitating production costs arises for establishing permanent cultures expenses, which are allocated during the whole period of the culture (2-3 years) as prepayments.

As to the calculation method, if the cost is determined on nutrition unit, then the equivalence indices method is recommended.

Case Study - Accounting for a Vegetal Farm

Calculate unit cost for a cereal production farm knowing the following information for one year:

- a. Beginning WIP:
 1. wheat 200 ha – 80,000 lei;
 2. corn 100 ha – 30,000 lei;
- b. farm expenses:
 1. wheat – 6,000 lei;
 2. corn – 15,000 lei;
 3. tractors – 30,000 lei allocated in proportion to the number of hectares of standard hsp;
 4. combines – 28,000 lei allocated in proportion to the number of tons harvested;

5. fertilizers – 3,000 lei allocated in proportion to the number of hectares sowed;
6. farm overhead – 16,400 lei allocated in proportion to the expenses above;
- c. general overhead allocated to the farm – 9,840 lei allocated in proportion to farm expenses;
- d. production:
 1. wheat: 900 t wheat and straw worth 17,520 lei;
 2. corn: 500 t corn and corn cobs worth 5,720 lei;

The value of the secondary products was established using the remaining value procedure (of deducting the value of the secondary product) or the rest procedure;

- e. agricultural works - 600 hsp: 200 hsp for wheat and 400 hsp for corn;
- f. standard costs of the products obtained:
 1. wheat: 105,000 lei;
 2. corn: 80,000 lei;
 3. straw: 15,000 lei;
 4. corn cobs: 5,000 lei.

Table 1. The computation of the full cost

Elements	Wheat	Corn
1. Beginning WIP	80,000	30,000
2. Direct costs	6,000	15,000
3. Tractor expense	10,000	20,000
4. Combine expense	18,000	10,000
5. Natural fertilizer expense	2,000	1,000
6. Overheads	7,200	9,200
7. Cost of by-products	17,520	5,720
8. Production cost (1 + 2 + 3 + 4 + 5 + 6 – 7)	105,680	79,480
9. Quantity (tons)	900	500
10. Production cost per unit	117.42	158.96
11. General overhead allocated to the farm	4,320	5,520
12. Production full cost (8 + 11)	110,000	85,000
13. Full cost per unit (12/9)	122.22	170

1. *Allocation of tractors expense* (hectare standard plowing)

Expense/hsp = Tractors Expense/hsp = 30,000/600 = 50 lei/hsp

Tractors expenses for each type of cereals:

- o wheat = 50*200 hsp = 10,000 lei;
- o corn = 50*400 hsp = 20,000 lei;

2. *Allocation of combine expense* (number of tons harvested)

Expense/ton = combine expense /tons harvested = 28,000/1.400 = 20 lei/ton

Combine expenses for each type of cereals:

- o wheat = 20*900 = 18,000 lei;
- o corn = 20*500 = 10,000 lei;

3. *Allocation of fertilizer expense* (allocated according to the surface covered by the two types of cereals, without considering if the fertilizers were used for the entire surface):

Expense/hectare = 3,000/300 = 10 lei/hectar;

Fertilizers expenses for each type of cereals:

- o wheat = 10*200 = 2,000 lei;
- o corn = 10*100 = 1,000 lei;

4. *Apportionment of farm overheads*

The apportionment of the farm overheads is computed on cost objects having an apportionment basis, which in this case is the total of the expenses established up to this moment of the cost calculation. To establish an apportionment basis for the cereals we have to add the direct expenses and the overheads apportioned up to this moment.

Expenses previously recorded:

- wheat: $6,000 + 10,000 + 18,000 + 2,000 = 36,000$ lei;
- corn: $15,000 + 20,000 + 10,000 + 1,000 = 46,000$ lei;

K_{farm} overhead = $16,400 / (36,000 + 46,000) = 0.2$;

- wheat = $0.2 * 36,000 = 7,200$ lei;
- corn = $0.2 * 46,000 = 9,200$ lei;

5. General overheads apportionment

We admit the computation of the full cost and as a consequence we have to apportion the general overheads as well. The computation is made using the total direct expenses and overheads established on cost objects.

The expenses registered at the level of the farm are:

- wheat: $36,000 + 7,200 = 43,200$ lei;
- corn: $46,000 + 9,200 = 55,200$ lei;

K_{general} overheads = $9,840 / (43,200 + 55,200) = 0.1$;

- wheat = $0.1 * 43,200 = 4,320$ lei;
- corn = $0.1 * 55,200 = 5,520$ lei.

Conclusions

Securing fair incomes for the farmers is at present a very important issue, widely discussed in Europe. Any such discussion shall be supported, however, with some tools which will effectively back up any further steps aimed at resolving this issue. The cost of the agricultural products is one of them. This research paper presented an attempt to calculate the cost of wheat and corn as examples of agricultural products.

In the future researches we shall try to use different computation methods, such as the target costing.

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Calculația costurilor producției agricole în cadrul fermelor cu profil vegetal

Rezumat

Agricultura constituie un sector specific al economiei naționale. Deși nu contribuie în mod semnificativ la creșterea produsului intern brut, se presupune că trebuie să îndeplinească trei funcții importante: economică, socială și de mediu. Calculația costului pentru produsele agricole este diferită de cea din alte sectoare. Multe dintre lucrările care tratează contabilitatea de gestiune se referă la companiile industriale. Considerăm că relevanța articolului derivă din faptul că, în domeniu, nu există decât un număr redus de lucrări. Articolul prezintă caracteristicile calculației costurilor pentru fermele agricole, exemplificând, totodată, calculația costurilor pentru produsele agricole obținute în cadrul unei ferme.