

THE COSTS CALCULATION WITHIN THE AGRICULTURAL PRODUCTS AREA

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Abstract: *The agricultural products are differentiated from the biological assets by the fact that they are separated from the latter, ceasing their vital processes. At the same time, they serve as raw materials for various branches of the food industry. A reference agricultural product is the wheat, from which it is obtained the flour, as the main raw material within the bakery industry. A careful calculation of the costs generates a fair image on the causes involved within the production process, in order that the effects obtained, manifested by the revenue, to be both profitable and competitive. This article aims to achieve a study on various methods of costs calculation, suitable for the bakery industry, emphasizing their importance for adopting relevant management decisions.*

Key words: *agricultural products, bakery industry, costs, calculation, methods*

INTRODUCTION

The production generates expenses, which form, by aggregation, costs, in two different ways [2]:

➤ the production as an economic process, which takes place in a certain organizational framework and which generates the expenses for organizing and leading the work process [6];

➤ the production as a result of the work process, which generates the constitutive expenses for the obtained products, the performed works and the provided services [5].

In both cases, the production has many particularities from one economic branch to another and from one entity to another, regarding several determinants of content, level, structure and cost dynamics, which are [3]:

- the object and the profile of the entity's activity;
- the technical structure of the production;
- the production technology;
- the main means of production used and their origin;
- the types of the products obtained;
- the performed works or the provided services and their beneficiaries;
- the organizational structure of the entity;
- the places and the sectors or the expenses centers;
- the bearers of expenses and costs;
- the management periods and the unit of cost calculations.

From the way of organization's point of view, within the industry, there are three types of production, namely [1]:

➤ individual production, consisting in obtaining a unique product with the same technology and in the same conditions [9];

➤ series production, consisting in obtaining batches of products based on a certain technology;

➤ mass production, consisting in obtaining large quantities and for long periods of time, of a product by using the same technology and the same equipment [11].

MATERIALS AND METHODS

In order to elaborate this study, there are taken into consideration calculation procedures regarding the distribution of expenses per unit of product, work or service,

procedures for separating the expenses into fixed and variable and, at last but not at least, procedures for allocating the indirect expenses [7].

The distribution of expenses per unit of product, work or service is based, in our case, on the equivalence figures/coefficients' method, which is used for sort-dimensional (by assortment) or type-dimensional (by type) production, assuming the following steps [4]:

1. Choosing the standard assortment or type (the most representative) [10].
2. Calculating the equivalence figures/coefficients for each assortment or type [13].

$$K_i = \frac{P_i}{P_{\text{standard}}}$$

i - the assortment or the type

K_i - the equivalence coefficient for each assortment or type

P_i - the parameter for each assortment or type

P_{standard} - the parameter of the standard assortment or type

3. Calculation of the total production in equivalent units [13].

$$Q_{ue} = \sum_{i=1}^n Q_i \times K_i$$

Q_{ue} - the total production in equivalent units

Q_i - the quantity corresponding to each assortment or type

4. Calculation of the cost of an equivalent unit.

$$C_{ue} = \frac{C}{Q_{ue}}$$

C_{ue} - the cost of the equivalent unit

C - the total cost

5. Calculation of the unit cost on each assortment or type.

$$C_{u_i} = K_i \times C_{ue}$$

C_{u_i} - the unit cost for each assortment or type

In order to separate the expenses in fixed and variable, the following procedures can be used: the least squares procedure and the maximum and minimum points procedure.

The least squares procedure involves the following steps [4]:

1. The determination of the average production (\bar{Q}).

$$\bar{Q} = \frac{\sum_{i=1}^n Q_i}{n}$$

\bar{Q} - the average production

Q_i - the production of a period (month, trimester, year)

i - the period (month, trimester, year)

n - the number of periods

2. The determination of the average cost (\bar{C}).

$$\bar{C} = \frac{\sum_{i=1}^n C_i}{n}$$

\bar{C} - the average cost

C_i - the cost of a period (month, trimester, year)

i - the period (month, trimester, year)

n - the number of periods

3. The determination of the deviations (X_i, Y_i).

$$X_i = Q_i - \bar{Q}$$

$$Y_i = C_i - \bar{C}$$

4. The determination of the unit variable expenses (CV_u).

$$CV_u = \frac{\sum X_i \times Y_i}{\sum X_i^2}$$

5. The determination of the variable expenses (CV).

$$CV = CV_u \times Q_{\text{planned}}$$

6. The determination of the fixed expenses (CF).

$$CF = C_{\text{last period}} - Q_{\text{last period}} \times CV_u$$

7. The determination of the total expenses (CT).

$$CT = CF + CV$$

The maximum and minimum points procedure involves the following steps [12]:

1. The determination of the unit variable expenses (CV_u).

$$CV_u = \frac{C_{i_{\max}} - C_{i_{\min}}}{Q_{i_{\max}} - Q_{i_{\min}}}$$

2. The determination of the variable expenses (CV).

$$CV = CV_u \times Q_{\text{planned}}$$

3. The determination of the fixed expenses (CF).

$$CF = C_{\text{last period}} - Q_{\text{last period}} \times CV_u$$

4. The determination of the total expenses (CT).

$$CT = CF + CV$$

Regarding the allocating of the indirect expenses, there can be used the supplementary procedure, which has two forms, namely the classical form and the relative structural figures form [7].

The supplementary procedure - the classical form involves the following steps [4]:

1. The choosing of a distribution base/key (b_r).
2. The determination of the supplementary coefficient (k_s).

$$k_s = \frac{C}{\sum_{i=1}^n b_{r_i}}$$

k_s - the supplementary coefficient

C - the indirect expenses in order to be allocated

b_r - the distribution base/key

i - the category of the indirect expense

3. The calculation of the share of each category of indirect expense in the total indirect expenses (C_i).

$$C_i = b_{r_i} \times k_s$$

The conditions that a distribution base/key must accomplish are [8]:

1. There should be interdependence between the expenses in order to be allocated and the distribution base/key;
2. The distribution base/key must be correctly calculated, because it is used in the pre-calculation, but also in the post-calculation;
3. The chosen distribution base/key should not be changed in order not to distort the costs from one month to another during the year.

The supplementary procedure - the relative structural figures form involves the following steps [4]:

1. The choosing of a distribution base/key (b_r).
2. The determination of the distribution base/key's share corresponding to each category of indirect expense in the total distribution base/key (p_i) [13].

$$p_i = \frac{b_{r_i}}{\sum_{i=1}^n b_{r_i}}$$

p - the distribution base/key's share corresponding to each category of indirect expense in the total distribution base/key

b_r - the distribution base/key

i - the category of the indirect expense

3. The calculation of each category of indirect expenses' share in the total of the expenses to be allocated (C_i).

$$C_i = C \times p_i$$

RESEARCH RESULTS

In the context of the practical study within the article, a local entity is considered, which carries out a production activity [14]. Happy Baking from Arad has as object of activity the obtaining of the bakery products [15].

Calculation procedures regarding the distribution of expenses per unit of product, work or service

The analyzed entity has a sort-dimensional production, which is why the equivalence figures/coefficients' method can be used.

The proposed case is based on the 2021 information.

Happy Baking is a bakery that obtains the following products: bread (A), croissants (B), braids (C) and rosettes (D) in the following quantities: $Q_A = 150$ pieces, $Q_B = 400$ pieces, $Q_C = 100$ pieces, $Q_D = 50$ pieces. The total cost for obtaining these quantities is 1,004.5 lei. The amount of flour required for each product is 0.8 kg/piece for bread (A), 0.08 kg/piece for croissants (B), 0.06 kg/piece for braids (C) and 0.12 kg/piece for rosettes. The chosen parameter is the quantity of the main raw material, i.e. the flour, incorporated in each product, and the most representative product (standard product) is the bread (A). We aim to determine the unit cost for each product and the total cost for each assortment.

1. Choosing the standard assortment or type (the most representative).

The first product = A → standard product

2. Calculating the equivalence figures/coefficients for each assortment or type.

$$P_A = 0.8 \text{ kg/piece}$$

$$P_B = 0.08 \text{ kg/piece}$$

$$P_C = 0.06 \text{ kg/piece}$$

$$P_D = 0.12 \text{ kg/piece}$$

$$K_A = \frac{P_A}{P_A} = \frac{0.8}{0.8} = 1$$

$$K_B = \frac{P_B}{P_A} = \frac{0.08}{0.8} = 0.1$$

$$K_C = \frac{P_C}{P_A} = \frac{0.06}{0.8} = 0.075$$

$$K_D = \frac{P_D}{P_A} = \frac{0.12}{0.8} = 0.15$$

3. Calculation of the total production in equivalent units.

$$Q_A = 150 \text{ pieces}$$

$$Q_B = 400 \text{ pieces}$$

$$Q_C = 100 \text{ pieces}$$

$$Q_D = 50 \text{ pieces}$$

$$\begin{aligned} Q_{u_e} &= Q_A \times K_A + Q_B \times K_B + Q_C \times K_C + Q_D \times K_D = \\ &= 150 \text{ pieces} \times 1 + 400 \text{ pieces} \times 0.1 + 100 \text{ pieces} \times 0.075 + 50 \text{ pieces} \times 0.15 = \\ &= 150 \text{ pieces} + 40 \text{ pieces} + 7.5 \text{ pieces} + 7.5 \text{ pieces} = \\ &= 205 \text{ pieces} \end{aligned}$$

4. Calculation of the cost of an equivalent unit.

$$C = 1,004.5 \text{ lei}$$

$$C_{u_e} = \frac{C}{Q_{u_e}} = \frac{1,004.5 \text{ lei}}{205 \text{ pieces}} = 4.9 \text{ lei/piece}$$

5. Calculation of the unit cost on each assortment or type.

$$C_{uA} = K_A \times C_{u_e} = 1 \times 4.9 \text{ lei/piece} = 4.9 \text{ lei/piece}$$

$$C_{uB} = K_B \times C_{u_e} = 0.1 \times 4.9 \text{ lei/piece} = 0.49 \text{ lei/piece}$$

$$C_{uC} = K_C \times C_{u_e} = 0.075 \times 4.9 \text{ lei/piece} = 0.3675 \text{ lei/piece}$$

$$C_{uD} = K_D \times C_{u_e} = 0.15 \times 4.9 \text{ lei/piece} = 0.735 \text{ lei/piece}$$

$$C_{tA} = C_{uA} \times Q_A = 4.9 \text{ lei/piece} \times 150 \text{ pieces} = 735 \text{ lei}$$

$$C_{tB} = C_{uB} \times Q_B = 0.49 \text{ lei/piece} \times 400 \text{ pieces} = 196 \text{ lei}$$

$$C_{tC} = C_{uC} \times Q_C = 0.3675 \text{ lei/piece} \times 100 \text{ pieces} = 36.75 \text{ lei}$$

$$C_{tD} = C_{uD} \times Q_D = 0.735 \text{ lei/piece} \times 50 \text{ pieces} = \underline{36.75 \text{ lei}}$$

$$1,004.5 \text{ lei}$$

Separating the expenses into fixed and variable

Happy Baking from Arad has as object of activity the obtaining of bakery products and presents the following situation of the production and of the expenses for the last 3 years (2019, 2020 and 2021):

Year	Production (Q _i) (pieces)	Expenses (C _i)(lei)
2019	Q ₁ = 600 pieces	C ₁ = 900 lei
2020	Q ₂ = 650 pieces	C ₂ = 955 lei
2021	Q ₃ = 700 pieces	C ₃ = 1,004.5 lei

We propose to estimate the total expenses for the year 2022, for which is forecast a production of 800 pieces, both by the least squares procedure and the maximum and minimum points procedure.

The least squares procedure

1. The determination of the average production (\bar{Q}).

$$\bar{Q} = \frac{\sum_{i=1}^n Q_i}{n} = \frac{Q_1 + Q_2 + Q_3}{3} = \frac{600 \text{ pieces} + 650 \text{ pieces} + 700 \text{ pieces}}{3} = \frac{1,950 \text{ pieces}}{3} = 650 \text{ pieces}$$

2. The determination of the average cost (\bar{C}).

$$\bar{C} = \frac{\sum_{i=1}^n C_i}{n} = \frac{C_1 + C_2 + C_3}{3} = \frac{900 \text{ lei} + 955 \text{ lei} + 1,004.5 \text{ lei}}{3} = \frac{2,854.5}{3} = 951.5 \text{ lei}$$

3. The determination of the deviations (X_i, Y_i).

Year	Q _i (pieces)	C _i (lei)	X _i (pieces)	Y _i (LEI)	X _i × Y _i	X _i ²
2019	600	900	600 - 650 = -50	900 - 951.5 = -51.5	2,575	2,500
2020	650	955	650 - 650 = 0	955 - 951.5 = 3.5	0	0
2021	700	1,004.5	700 - 650 = 50	1,004.5 - 951.5 = 53	2,650	2,500
TOTAL					5,225	5,000

4. The determination of the unit variable expenses (CV_u).

$$CV_u = \frac{\sum X_i \times Y_i}{\sum X_i^2} = \frac{5,225 \text{ lei}}{5,000 \text{ pieces}} = 1.045 \text{ lei/piece}$$

5. The determination of the variable expenses (CV).

$$CV = CV_u \times Q_{\text{planned}} = 1.045 \text{ lei/piece} \times 800 \text{ pieces} = 836 \text{ lei}$$

6. The determination of the fixed expenses (CF).

$$CF = C_{\text{last period}} - Q_{\text{last period}} \times CV_u = 1,004.5 \text{ lei} - 700 \text{ pieces} \times 1.045 \text{ lei/pieces} = 1,004.5 \text{ lei} - 731.5 \text{ lei} = 273 \text{ lei}$$

7. The determination of the total expenses (CT).

$$CT = CF + CV = 273 \text{ lei} + 836 \text{ lei} = 1,109 \text{ lei}$$

The maximum and minimum points procedure

1. The determination of the unit variable expenses (CV_u).

$$CV_u = \frac{C_{i_{\max}} - C_{i_{\min}}}{Q_{i_{\max}} - Q_{i_{\min}}} = \frac{1,004.5 \text{ lei} - 900 \text{ lei}}{700 \text{ pieces} - 600 \text{ pieces}} = \frac{104.5 \text{ lei}}{100 \text{ pieces}} = 1.045 \text{ lei/piece}$$

2. The determination of the variable expenses (CV).

$$CV = CV_u \times Q_{\text{planned}} = 1.045 \text{ lei/piece} \times 800 \text{ pieces} = 836 \text{ lei}$$

3. The determination of the fixed expenses (CF).

$$CF = C_{\text{last period}} - Q_{\text{last period}} \times CV_u = 1,004.5 \text{ lei} - 700 \text{ pieces} \times 1.045 \text{ lei/pieces} = 1,004.5 \text{ lei} - 731.5 \text{ lei} = 273 \text{ lei}$$

4. The determination of the total expenses (CT).

$$CT = CF + CV = 273 \text{ lei} + 836 \text{ lei} = 1,109 \text{ lei}$$

Procedures for allocating the indirect expenses

The entity's production naturally covers both direct and indirect expenses.

The proposed case is based on the 2021 information.

The entity obtains the following products: bread (A), croissants (B), braids (C) and rosettes (D).

The total cost amount, in order to obtain these products, is 1,004.5 lei, consisting of 804.5 lei direct expenses and 200 lei indirect expenses.

The common section expenses in order to be distributed are, as a consequence, in the amount of 200 lei (indirect expenses). It is known that the direct salaries for the four types of products are: 200 lei for product A, 50 lei for product B, 30 lei for product C, and respectively 40 lei for product D, these being the distribution basis/keys for each product.

We intend to determine the section expenses related to each type of product, both by the classical form and the relative structural figures form.

The supplementary procedure - the classical form

1. The choosing of a distribution base/key (b_r).

$$b_{rA} = 200 \text{ lei}$$

$$b_{rB} = 50 \text{ lei}$$

$$b_{rC} = 30 \text{ lei}$$

$$b_{rD} = 40 \text{ lei}$$

2. The determination of the supplementary coefficient (k_s).

$$k_s = \frac{C}{\sum_{i=1}^n b_{r_i}} = \frac{200 \text{ lei}}{200 \text{ lei} + 50 \text{ lei} + 30 \text{ lei} + 40 \text{ lei}} = \frac{200 \text{ lei}}{320 \text{ lei}} = 0.625$$

3. The calculation of the share of each category of indirect expense in the total indirect expenses (C_i).

$$\begin{aligned}
 C_A &= 200 \text{ lei} \times 0.625 = 125 \text{ lei} \\
 C_B &= 50 \text{ lei} \times 0.625 = 31.25 \text{ lei} \\
 C_C &= 30 \text{ lei} \times 0.625 = 18.75 \text{ lei} \\
 C_D &= 40 \text{ lei} \times 0.625 = 25 \text{ lei} \\
 C_A + C_B + C_C + C_D &= \\
 &= 125 \text{ lei} + 31.25 \text{ lei} + 18.75 \text{ lei} + 25 \text{ lei} \\
 &= 200 \text{ lei}
 \end{aligned}$$

The supplementary procedure - the relative structural figures form

1. The choosing of a distribution base/key (b_r).

$$\begin{aligned}
 b_{rA} &= 200 \text{ lei} \\
 b_{rB} &= 50 \text{ lei} \\
 b_{rC} &= 30 \text{ lei} \\
 b_{rD} &= 40 \text{ lei}
 \end{aligned}$$

2. The determination of the distribution base/key's share corresponding to each category of indirect expense in the total distribution base/key (p_i).

$$\begin{aligned}
 p_A &= \frac{200 \text{ lei}}{200 \text{ lei} + 50 \text{ lei} + 30 \text{ lei} + 40 \text{ lei}} = \frac{200 \text{ lei}}{320 \text{ lei}} = 0.625 \\
 p_B &= \frac{50 \text{ lei}}{200 \text{ lei} + 50 \text{ lei} + 30 \text{ lei} + 40 \text{ lei}} = \frac{50 \text{ lei}}{320 \text{ lei}} = 0.15625 \\
 p_C &= \frac{30 \text{ lei}}{200 \text{ lei} + 50 \text{ lei} + 30 \text{ lei} + 40 \text{ lei}} = \frac{175.000 \text{ lei}}{500.000 \text{ lei}} = 0.09375 \\
 p_D &= \frac{40 \text{ lei}}{200 \text{ lei} + 50 \text{ lei} + 30 \text{ lei} + 40 \text{ lei}} = \frac{40 \text{ lei}}{320 \text{ lei}} = 0.125
 \end{aligned}$$

3. The calculation of each category of indirect expenses' share in the total of the expenses to be allocated (C_i).

$$\begin{aligned}
 C_A &= 200 \text{ lei} \times 0.625 = 125 \text{ lei} \\
 C_B &= 200 \text{ lei} \times 0.15625 = 31.25 \text{ lei} \\
 C_C &= 200 \text{ lei} \times 0.09375 = 18.75 \text{ lei} \\
 C_D &= 200 \text{ lei} \times 0.125 = 25 \text{ lei} \\
 C_A + C_B + C_C + C_D &= \\
 &= 125 \text{ lei} + 31.25 \text{ lei} + 18.75 \text{ lei} + 25 \text{ lei} \\
 &= 200 \text{ lei}
 \end{aligned}$$

CONCLUSIONS

The calculation of costs represents a very important step in determining the full cost and, implicitly, in correctly substantiating the selling price, in order to achieve, in the highest possible way, the objective of maximizing the income. There are various methods and procedures in this regard, some of them being highlighted through the prism of this material. Some methods and procedures return the results with a higher accuracy, others with a lower accuracy, depending on the approximations imposed by the calculation relations used. A detailed, careful and relevant cost calculation entails the substantiation of highly relevant and correct managerial decisions.

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