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# BREAK-EVEN ANALYSIS (BEA) IN EGG PRODUCTION

Jadranka Deže, Ljubica Ranogajec, Ana Crnčan, Jelena Kristić

Original scientific paper  
Izvorni znanstveni članak

## SUMMARY

**A conducted research analyzes two systems of egg production, the conventional, commercial egg production and the egg production with a higher nutritive value - PUFA n-3 enriched eggs. Financial result of eggs production with PUFA n-3 is significantly higher than that of the conventional production - profitability of the conventional production was 19.29% and the one with PUFA n-3 enriched eggs 36.10%. It is, therefore, important to evaluate the efficiency of the use of capital based on the profitability of capital that is in the conventional egg production 23.9%, and in the production of PUFA n-3 enriched eggs 56.1%. According to the results of investigation, it is necessary to produce 258 eggs in the conventional egg production, whereas in the production of enrichments eggs with PUFA n-3 break-even point (BEP) is lower and amounts 204 eggs per laying hen per year. A higher cover rate with a difference of 10% ( $42.99 \pm 53.07$ ) confirms that the production of enrichments eggs with PUFA n-3 is economically more efficient.**

**Key-words: egg production, PUFA n-3, break-even analysis (BEA)**

## INTRODUCTION

The commercial egg production is a very demanding process that requires decision making regarding both production and cost monitoring on a daily basis (Sossidou, 2005). In conditions, modern technical and technological solutions prevailed, it is necessary to provide optimal utilization level of capacities determined by a large number of factors, the most influential of which are costs and their structure (Beierlein, 1986). Qualitative and precise business decision-making is connected with the recognition of problems and finding potential solutions; it should, therefore, result in choosing the most favourable and achievable one (Chadwick, 2000). An important presumption in business decision-making is understanding of some cost movement. The purpose of this investigation is to monitor consumption (Tolušić, 2005) of the elements included in the production process, their prices and equivalent costs as well as the estimate and calculation of cost cover in commercial egg production between conventional egg production and production of eggs enriched with n-3 polyunsaturated fatty acids (PUFAs) (Lewis, 2000).

## MATERIAL AND METHODS

Efficiency of technology is the presumption of economic success. The analyzed data were collected on a farm with an average of laying hens of 15.431

( $16.668 \pm 14.194$ ) and total production of 4.929.172 eggs (319 eggs per laying hen annually) in the period of 56 weeks. The main flocks, expressed on the average of laying hens, were fed differently, resulted in the production of commercial eggs: conventional egg production (C-EP) and production of eggs enriched with n-3 polyunsaturated fatty acids – PUFAs (PUFA n-3-EP). Economic indicators of efficiency were calculated. In this way, adequacy levels for evaluating financial investments in innovative technologies in the production in relation to the realized production results were defined. The paper shows the results of the investigation regarding both the commercial egg production and production of eggs enriched with n-3 polyunsaturated fatty acids (PUFAs). Analytical calculation was used and, by coefficients of sensitivity, costs were divided into two groups: fixed and variable costs (Karić and Ranogajec, 2001).

$Contribution = Total\ turnover - Variable\ costs;$

$Contribution\ rate = (Contribution / Total\ turnover) \times 100,$

The calculation should figure out contributions as well as the rate of cost cover. BEA - Break even analysis should provide information on the required intensity regarding the use of production capacity of the main hen flock during the investigation period.

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- Break even point (BEP) =  $\frac{\text{Realized production}}{\text{Total cost}} \times \frac{\text{Total income}}{\text{Total income}}$

The analysis results from the point of coverage was expressed in the output quantity.

## RESULTS AND DISCUSSION

The number of feeding days on the farm was 6.031.242 and feed consumption per feeding day was 116 g of fodder (701.520:6.031.242), 142 g fodders were consumed per egg (701.520:4.929.172). The annual production of eggs amounts 4.929.172, respectively 319 eggs per average laying hen annually.

**Table 1. Analytic calculation in egg production (€)**

Tablica 1. Analitička kalkulacija u proizvodnji jaja (€)

| No. | Description (Opis)  | C-EP       | PUFA n-3-EP |
|-----|---|------------|-------------|
|     | <b>Sources of incomes (Izvor prihoda)</b>                                 |            |             |
|     | - Income of eggs  | 468.616.11 | 669.451.58  |
|     | - Income of hens weight gain  | 19.241.89  | 19.241.89   |
|     | - By-product; secondary products  | 6.021.58   | 6.021.58    |
|     | - Extracted hens  | 12.530.35  | 12.530.35   |
| A.  | <b>TOTAL INCOME (Ukupni prihod)</b>                                       | 506.409.93 | 707.245.40  |
|     | Cost of production:   |            |             |
|     | - Cost of feed  | 176.261.31 | 200.080.40  |
|     | - Cost of package   | 38.712.75  | 58.069.13   |
|     | - Cost of machinery   | 7.150.62   | 7.150.62    |
|     | - Cost of maintaining equipment   | 4.392.23   | 4.392.23    |
|     | - Depreciation  | 96.504.14  | 96.504.14   |
|     | - Cost of labour  | 50.930.33  | 50.930.33   |
|     | - Miscellaneous   | 19.122.64  | 19.122.64   |
|     | - Cost of selling   | 15.645.80  | 15.645.80   |
| B.  | <b>TOTAL COSTS (Ukupni troškovi)</b>                                      | 408.719.82 | 451.895.29  |
| C.  | <b>FINANCIAL RESULT (Financijski rezultat)</b>                            | 97.690.11  | 255.350.11  |
| D.  | <b>COST PRICES PER EGG (Cijena koštanja po jajetu) € egg<sup>-1</sup></b> | 0.08       | 0.09        |

C-EP = Conventional egg production

PUFA n-3-EP = Production of PUFA n-3 enriched eggs

As for the income structure, the greatest share is represented by egg production: in the *C-EP* it was 92.54%, and in the *PUFA n-3-EP* 94.66%. The importance of fodder can be also seen in the total cost structure (*C-EP* - 43.12% and *PUFA n-3-EP* - 44.28%). The second highest cost is depreciation. It is also related to the intensive way of modern technology in egg production. Depreciation costs

are determined by linear methods, and since they are a part of fixed costs, managers should pay attention to the increase of profit and loss account per capacity units (laying hen). Costs of packing are in the third position in the total cost structure of the *PUFA n-3-EP* production (13%), whereas in the *C-EP* production (9.5%) they rank fourth, next to costs of labour.

**Table 2. Economic indicators in egg production (€)**

Tablica 2. Ekonomski pokazatelji proizvodnje jaja (€)

| INDICATORS (Pokazatelji)  | C-EP       | PUFA n-3-EP |
|---|------------|-------------|
| A. TOTAL INCOME (Ukupni prihod)   | 506.409.93 | 707.245.40  |
| B. TOTAL COST (Ukupni trošak)   | 408.719.82 | 451.895.29  |
| C. FINANCIAL RESULT (Financijski rezultat)  | 97.690.11  | 255.350.11  |
| D. COST PRICES PER EGG (Cijena koštanja po jajetu) € egg <sup>-1</sup>                    | 0.08       | 0.09        |
| E. COST PRICES PER WEIGHT GAIN (Cijena koštanja prirasta) € kg <sup>-1</sup>              | 1.10       | 0.87        |
| F. Cost prices per extracted hens (Cijena koštanja izlučenih nesilica) € kg <sup>-1</sup> | 0.71       | 0.56        |
| G. Cost-effectiveness - A/B (Ekonomičnost proizvodnje)                                    | 1.24       | 1.57        |
| H. Return on assets - C/A (%) (Rentabilnost proizvodnje)                                  | 19.29      | 36.10       |
| I. Return on investment - C/D (%) (Povrat na ulaganja)                                    | 25.00      | 56.25       |
| J. Net cash return - C/B (%) (Neto povrat kapitala)                                       | 23.90      | 56.51       |

Cost – efficiency is higher in the PUFA n-3-EP production by 33% in comparison with C-EP production. In the investigated period, net profit of the farm was increased in relation to the income in the C-EP production by 19.29%, and in the PUFA n-3-EP production by 36.10%. Significant differences were determined by the analysis of investment return as a gain indicator with regard to costs (25% in the C-EP production and 56% in the PUFA n-3-EP production). Farm management is closely connected with production financing and it is, therefore, necessary to monitor the efficiency of the use of funds based on investment return (56.1% in the PUFA

n-3-EP production and 23% in the C-EP production). The PUFA n-3-EP production is highly cost-efficient, since the invested 100 € in the production will result in 56 € gain.

Many commercial egg producers find technological indicators more important and more precise than the economic ones. Qualitative business decision making of economic indicators is very important when structure and extent production changes occur. There is a high level of risk in commercial egg production in such situations, and it is, therefore, necessary to plan not only variable costs but also economic efficiency.

**Table 3. Calculation based on variable costs – direct costing (€)**

*Tablica 3. Kalkulacija na osnovi varijabilnih troškova (€)*

| Product (Proizvod)  | C-EP       | PUFA n-3-EP |
|---|------------|-------------|
| A. TOTAL INCOME (Ukupni prihodi)                              | 506.409.93 | 707.245.40  |
| Variable costs (Varijabilni troškovi)                         | 288.700.81 | 331.876.28  |
| Cover contribution (Doprinos za pokriće)                      | 217.709.12 | 375.369.12  |
| Rate of cover contribution (%) (Stopa doprinosa za pokriće-%) | 42.99      | 53.07       |
| Fixed costs (Fiksni troškovi)                                 | 120.019.01 | 120.019.01  |
| Cover contribution (Doprinos za pokriće)                      | 97.690.12  | 255.350.11  |
| Rate of cover contribution (%) (Stopa doprinosa za pokriće-%) | 44.87      | 68.03       |

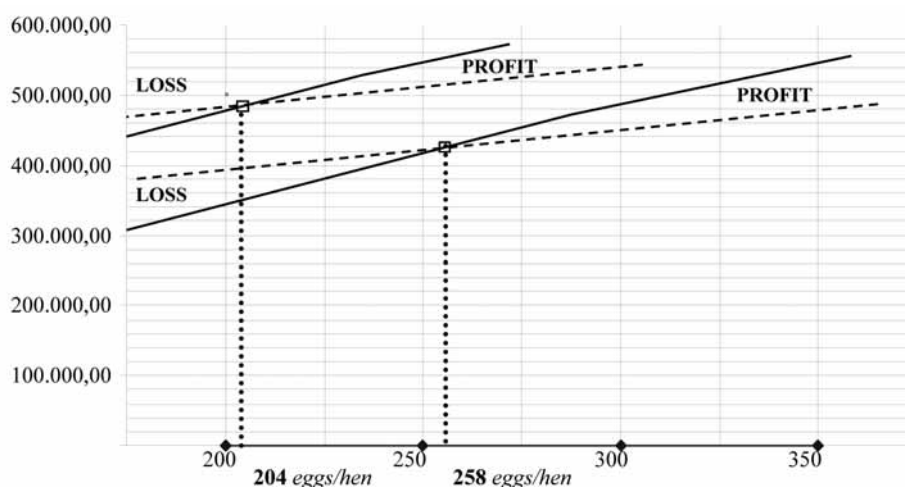
A higher contribution was realized (the PUFA n-3-EP production: 375.369.12 €; the C-EP production: 217.709.12 €) in the PUFA n-3-EP production to cover variable costs. The calculated rate of contribution to cover variable costs amounts 53.07% in the PUFA n-3-EP production related to 42.99% in the C-EP production. A higher cover rate along with a 10% difference (42.99±53.07) confirms that the PUFA n-3-EP production is economically more efficient.

The break even analysis is one of the most commonly used quantitative methods in which revenues and costs are equalized and which distinguishes between

zone profit and zone loss. In the analysis both technological (quantity of the realized production per laying hen) and economic indicators (value of production and value of consumed elements in the production) are used. Quantity of the realized production per laying hen is compared with the calculated production in the BEP.

$$BEP (C-EP) = 319 \times 408.719.82 / 506.409.93 = 258 \text{ eggs/hen}$$

$$BEP (PUFA n-3-EP) = 319 \times 451.895.29 / 707.245.40 = 204 \text{ eggs/hen}$$



**Graph 1. Break even point in egg production**

*Grafikon 1. Točka pokrića troškova u proizvodnji jaja*

According to the results obtained in the A production, it is necessary to produce 258 eggs per laying hens, unlike the B production, in which 204 eggs per laying hen are to be produced. If capacities are used below the calculated values, loss will be gained. Otherwise, the higher the revenue, the higher the utilization. If the break even is calculated, it is possible to compare management of the egg producers.

## CONCLUSION

One of the most common methods used in evaluating the economic feasibility of a new product is the break-even analysis. This paper analyzes two systems of egg production, the conventional commercial egg production and the egg production with a higher nutritive value - with PUFA n-3 enriched eggs. According to the research, the share of fodder costs in egg production amounts 43.12% - 44.28%. Financial result of the production of eggs with PUFA n-3 is significantly higher compared to the one conventional production - profitability of the conventional production being 19.29% and of the production of eggs enriched with PUFA n-3 is 36.10%. Efficiency of the use of capital based on the profitability of capital in the conventional egg production being 23.9%, and in the production of eggs enriched with PUFA n-3 was 56.1%. According to the results of investigation, it is necessary to produce 258 eggs in the conventional egg production, whereas in the production

of eggs enriched with PUFA n-3 break-even point (BEP) is lower and amounts 204 eggs per laying hen per year. There is a higher cover rate with a difference of 10% ( $42.99 \pm 53.07$ ) which confirms that the production of eggs enriched with PUFA n-3 is economically more efficient.

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## ANALIZA TOČKE POKRIĆA TROŠKOVA U PROIZVODNJI KONZUMNIH JAJA

### SAŽETAK

*Učinkovitost proizvodnje jaja moguće je analizirati tehnološki i ekonomski. Analizirana su dva sustava proizvodnje jaja, konvencionalna tržišna proizvodnja i proizvodnja jaja visoke nutritivne vrijednosti, obogaćena jaja s PUFA n-3. Financijski rezultat u proizvodnji obogaćenih jaja s PUFA n-3 značajno je viši u odnosu na konvencionalnu proizvodnju - profitabilnost konvencionalne proizvodnje bila je 19,29% a proizvodnje obogaćenih jaja s PUFA n-3 36,10%. Učinkovitost kapitala u konvencionalnoj proizvodnji jaja iznosi 23,9%, a u proizvodnji jaja obogaćenih s PUFA n-3 je 56,1%. Prema rezultatima istraživanja primjenom analize točke pokrića, neophodno je proizvesti 258 jaja u konvencionalnoj proizvodnji, dok je obogaćenih jaja s PUFA n-3 potrebno proizvesti 204 po nesilici godišnje. Viša stopa pokrića rezultira razlikom od 10% ( $42,99 \pm 53,07$ ), što potvrđuje da je proizvodnja obogaćenih jaja s PUFA n-3 ekonomski učinkovitija.*

**Ključne riječi:** proizvodnja jaja, PUFA n-3, analiza točke pokrića troškova (BEA)

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