FINANCIAL EFFECTS FROM INTRODUCTION OF EUROPEAN EGG MARKETING STANDARDS ON THE LAYER FARMS IN R. MACEDONIA

Dimitrievski Zarko[1], Kotevska Ana[2], Azderski Jovan[2], Kocevski Dragoslav[2]

[1]Ministry of Agriculture, Forestry and Water Economy, Skopje, R. Macedonia
[2]University "Ss Cyril and Methodius" Faculty of agricultural sciences and food, Skopje, R. Macedonia

Corresponding author: Dragoslav.Kocevski@yahoo.com

Abstract
This paper presents the financial effects from introduction of the new EU method for grading the eggs according the size (weight) in 4 classes instead of Macedonian method of grading in 7 weight classes based on the comparative analyze of production records in three flocks of ISA commercial layers (Flock 1 - 18125, Flock 2 – 17587, Flock 3 - 16818). The comparison of the financial effects of the introduction of the EU grading system is made by the partial budgeting analysis. Application of European model for egg grading resulted in increased income of about 18-37 denars per average hen-day layer that improves the financial effects at the layer farms. Expressed per unit of production, egg grading based on the egg weight in 4 classes results in increased income per unit of production of 0.1-0.2 denars and is significant increase of the farm profitability knowing that each layer produces around 300 eggs during one production cycle of one year. Hence, the use of standards goes beyond marketing aspects, and can financially support the market without budgetary implications.

Keywords: layers, eggs, grading, profitability.

Introduction

Quality is highly subjective attribute determined in the buyer's mind. Nevertheless, food quality standards are commonly accepted differentiation of food products in term of their value to buyers. It is so, since grades, as uniform categories according to quality standards, reduce marketing and transaction costs. They contribute to greater consumer satisfaction by matching their needs with the different available qualities and also enable producers to gain from price premiums (Kohls and Uhl, 2002). Size is one of the quality traits that contribute to the food products value. Egg weight is a direct proportion of albumen, yolk and shell (Shi, Wang, Dou, and Yang, 2009). Therefore, egg size is considered to be the most important quality trait that influences the egg quality, and subsequently the grading and market price (ibid). The egg weight classification of eggs allows a uniform formation of the price of eggs, which is easily acceptable for all stakeholders, i.e. producers, retailers and consumers. Still, some studies debate whether the egg quality standards truly reflect consumer preferences, questioning the consumers' distinction of egg grades in blind test and their willingness to pay premium prices (Kohls and Uhl, 2002). In order to harmonize with the EU standards and the single European market, since 2010 the egg size standards in the Republic of Macedonia (hereafter MK classification) (OG 1989) has been replaced with the European Union classification system (hereafter EU classification) (OG 2007, OG 2008.). The new classification system is introduced with the Law on quality of agricultural products (OG, 2010, OG, 2011a, OG, 2011b, OG, 2012). According to the MK classification there are seven classes of eggs: SS (Super Sofia, weighing 70 grams and more, S (Sofia, 65-70 grams), A (Ana, 60-65 grams), B (Bertha, 55-60 grams), C (Caesar, 50-55 grams), D (Dora, 45-50 grams) and E (Emma, weighing less than 45 grams). The EU classification has four classes: extra large (XL, with 73 grams and more), large (L, 63-73 grams), medium (M, 53-63 grams) and small (S, less than 53 grams). With the new classification the number of egg classes is reduced (from seven to four), whereas the weight range per class is increased (from five to ten grams). Changes in the standardization of market weight, qualities and practices may affect the financial

results in the related industry. The economic benefits of these changes in the classes reflected through the price changes are still unconfirmed. The aim of this paper is to determine the financial effects of the replacement of the egg weight standards of consumer eggs and their impact on the profitability on an egg farm. To perform a comparative analysis of the financial effects of the two different classification systems we use data (distribution of eggs per classes according to the both classifications) on three flocks analyzed in the first cycle of exploitation. Small adjustments decisions also affect farm revenue and expenses. They could be evaluated by comparing two-whole-farm budgets, but on behalf of the time, costs and effort to collect and organize all information, even those that do not change with the proposed change and therefore does not affect the decision. The comparison of the financial effects of the introduction of the EU classification in this paper is made by the partial budgeting analysis, as a convenient and practical quantitative method for analysing such small changes (Kay and Edwards, 1999) to compare the effects of change to the previous situation. After the introductory part, the paper presents the material and method used to evaluate the effects of the change in the classification system. Then the results and discussion are presented. The paper ends with conclusion.

Material and methods

One of the biological features of the laying hens is the variation in egg size during the exploitation cycle that depends on age, diet and breeding conditions. This constraint reflects in the realized income per laying hen, and is therefore taken into account in analyzing the financial effects on the egg farm. During one egg production cycle, the young layers produce eggs with a smaller weight. Once they reach full adult live weight, the eggs size gradually increases, so that sometimes at the end of the cycle, the size of the eggs should be controlled not to cause a drop in the quality of the egg shell. This biological constraint leads to a production of approximately 300-315 eggs of varying size distributed in several weight classes during one-year exploitation.Therefore, we use data on distribution of eggs per egg size in three flocks analyzed in the first cycle of exploitation. The flocks belong to a Company “ZIVA-JAJCE” daughter company of “ZITO VARDAR” holding. Layers were housed in farm houses located on one location, equipped with battery cages system (approximately the same in-house environmental conditions) and fed with complete feed mixtures formulated following nutrient recommendation of the breeding company according age and intensity of egg production. The observation is made in 2013/2014 production year. Based on the distribution of eggs per weight classes and price per class, we calculated the expected revenue according to the both classifications (MK and EU). These data are presented along with the table with results, Table 2.The partial budget analysis is a “formal and consistent method for calculating the expected change in profit from a proposed change in the farm business” (Kay and Edwards, 1999, p. 182). As such, it is a useful tool that assists the decision-making process by showing the effect of the change. The term "partial" refers to the fact that only the costs and revenue that are affected by the potential change are included, i.e. the additional revenue and costs and the reduced revenue and costs. Given that, in this case, the change occurs only on the revenue side (change in the price of eggs due to new class), without changes in the breeding technology or in the input prices, the used partial budget analysis has a simplified form where the net-result is a difference between the total revenue per average hen calculated according to the EU classification and the total revenue per average hen calculated according to the MK classification.

Results and discussion

Sample description

The basic production data for the three flocks included in the survey are shown in Table 1. The first flock is the largest with an average number of 17.357 layers, the second flock has 15.986 layers, whereas the third flock is the smallest with 15.016 layers. The mortality rate of the layers goes in the reverse order: the highest rate is observed in the flock 3 (28,58%), slightly lower in the flock 2 (25,19%), whereas the lowest rate is observed in flock 1 (11,11%). Hence, most of the eggs are

produced in the first flock (5.435.250), less in flock 2 (5.240.700) and the least in flock 3 (5.011.040). Presented per average layer, the number of eggs is the lowest in the first flock (313 pieces), whereas little higher in the second and the third flock (328 and 334 pieces, respectively). The feed consumption per layer, as one of the most significant costs in the egg production, ranges from 46,06 kg to 48,01 kg that indicates a similar breeding technology.

Table 1. Basic production data

Indicator	Flock 1	Flock 2	Flock 3
Average layers, number	17,357	15,986	15,016
Egg production, total	5,435,250	5,240,700	5,011,040
Eggs per hen	313	328	334
Total feed consumption, in kg	813,690	735,990	720,950
Feed consumption per layer, in kg	46.88	46.04	48.01
Mortality rate, %	11.11	25.19	28.58

Source: own calculation

Weight class structure

The distribution of the number of eggs and expected revenue per classes according to the both classification are presented in Table 2. The table is divided into two parts: the first part, part A, contains the number and value of the eggs according to the MK classification, whereas the second part, section B, contains the number and value of the eggs according to the EU classification. The analysis of the structure in the egg size in the first flock shows that a quarter of the eggs are of class Anna (25%), followed by class Sofia (20%) and Bertha (17%), whereas 10 percents of the eggs are the Super Sofia class and 6% are of class Caesar, and only small shares are class Dora and Emma (2 and 1 %). This flock produced largest share of eggs in non-marketable class, as dirty or cracked (18 and 2%). The same pattern is observed if analysed the revenue structure per egg classes. The structure in the eggs size in the other two flocks (flock 2 and 3) is quite similar. The largest share of eggs are in class Anna (30%, both) and class Bertha (27 and 26%), followed by class Sofia (16%, both) and class Caesar (9%, both). The largest egg size class, class Super Sofia, is represented with only 5%, whereas, the smallest egg size are represented in very small share (class Dora with 2% in both flocks, and class Emma with 1% in flock 3). Regarding the eggs in non-marketable class, these two flocks produced smaller number of eggs as dirty (10%) or cracked (1% and 2%, respectively). The structure analysis according to the EU classification shows that none of the flock produces extra large eggs. The largest share of eggs are medium size (42% in flock 1, 57% in flock 2 and 56% in flock 3), followed by large eggs (30% in flock 1, and 20% in flock 2 and 3). Small eggs are represented at least (9% in flock 1, and 12% in flock 2 and 3). The share of dirty or cracked eggs is the same, since they are not included as classes in the both classifications.

The same pattern is observed if analysed the revenue structure per egg classes, in both MK and EU classification (Table 2). According to the MK classification, the expected revenue from the first exploitation cycle of Flock 1 is 1202.38 denars per average hen, in Flock 2 it is 1238.50 denars, and Flock 3 is 1260.54 denars. According to the number of eggs and the income generation, the classes Sofia and Anna in the first flock take the largest share, whereas Ana and Berta are the most significant in the other two flocks. If sorted by to the EU classification, the expected revenue in the first flock is 1220.25 denars per average layer whereas in the other two flocks (2 and 3) the total revenue is 1274.90 den and 1297.28 days per average layer. According to EU classification, the largest share the number and produced income in the flock 1 is from large eggs and medium size eggs, whereas the medium size eggs are the most common in the other two flocks.

Table 2. Distribution of egg number and expected revenue per classes

A: Number of eggs and expected revenue per average layer by MK classification							
Class	Price	Flock 1		Flock 2		Flock 3	
	MKD	Number	MKD	Number	MKD	Number	MKD
SS (above 70 g)	4.50	31.21	140.45	15.21	68.45	15.47	69.62
S (65-70 g)	4.20	61.29	257.42	51.71	217.18	52.83	221.89
A (60-65 g)	3.90	78.89	307.67	98.21	383.02	101.19	394.64
B (55-60 g)	3.60	51.99	187.16	88.07	317.05	86.87	312.73
C (50-55 g)	3.30	19.10	63.03	28.65	94.55	29.56	97.55
D (45-50 g)	3.00	5.93	17.79	7.54	22.62	7.41	22.23
E (below 45 g)	2.70	2.57	6.94	1.58	4.27	2.23	6.02
- dirty	3.60	55.97	201.49	32.32	116.35	33.14	119.30
- cracked and broken	3.30	6.19	20.43	4.55	15.02	5.02	16.57
- melange	3.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		313.1	1,202.4	327.8	1,238.5	333.7	1,260.5
B: Number of eggs and expected revenue per average layer by EU classification							
Class	Price	Flock 1		Flock 2		Flock 3	
	MKD	Number	MKD	Number	MKD	Number	MKD
XL (above 73 g)	4.50	0	0.00	0	0.00	0	0.00
L (63-73 g)	4.20	92.50	388.50	66.92	281.06	68.3	286.86
M (53-63 g)	3.90	130.88	510.43	186.28	726.49	188.06	733.43
S (below 53 g)	3.60	27.61	99.40	37.77	135.97	39.2	141.12
- dirty	3.60	55.97	201.49	32.32	116.35	33.14	119.30
- cracked and broken	3.30	6.19	20.43	4.55	15.02	5.02	16.57
- melange	3.00	0.00	0.00	0	0.00	0	0.00
Total		313.14	1,220.2	327.83	1,274.9	333.71	1,297.3

Source: own calculation

Partial budget analysis

The procedure and the result of the partial budgeting analysis are shown in Table 3. The table has the common form including the four categories: additional costs, reduced revenue, additional revenue and reduced costs. The net-results is calculated step-wise, by first calculating the positive aspects of the change (sum of the additional revenue and reduced costs) and the negative aspects of the change (sum of the additional costs and reduced revenue), and then the difference between them. The net-change in profit is presented in absolute and relative value. The reduced revenue due to the replacing the MK classification, in the first exploitation cycle of Flock 1 is 980,46 denars per average hen, in Flock 2 it is 1107.13 denars, and 1124.67 denars in Flock 3. On the other side, the revenue gained by implementing the EU classification is 998.33 denars in Flock 1, 1143.53 denars in Flock 2, and 1161.41 denars in Flock 3. The net change in profit per average layer in Flock 1 is 17.87 denars more than the previous classification, whereas in the other two flocks, 2 and 3, the increased profit per layer is 36.40 denars and 36.74 denars, respectively. The positive sign of the net-result calculated in the partial budget analysis confirms the higher revenue per average hen gained from the introduction of the EU classification (Table 3).

Table 3. Partial budget analysis

Problem: Replacement of the MK classification of eggs with the EU classification of eggs							Unit: MKD, per layer
	Flock 1	Flock 2	Flock 3		Flock 1	Flock 2	Flock 3
Reduced Revenue:				Additional Revenue:			
Total	980.46	1,107.13	1,124.67	Total	998.33	1,143.53	1,161.41
SS (above 70 g)	140.45	68.45	69.62	XL (above 73 g)	0.00	0.00	0.00
S (65-70 g)	257.42	217.18	221.89	L (63-73 g)	388.50	281.06	286.86
A (60-65 g)	307.67	383.02	394.64	M (53-63 g)	510.43	726.49	733.43
B (55-60 g)	187.16	317.05	312.73	S (below 53 g)	99.40	135.97	141.12
C (50-55 g)	63.03	94.55	97.55				
D (45-50 g)	17.79	22.62	22.23				
E (below 45 g)	6.94	4.27	6.02				
Additional Costs:				Reduced costs:			
	0	0	0		0	0	0
A. Total additional costs and reduced revenue				B. Total additional revenue and reduced costs			
	980.46	1,107.13	1,124.67		998.33	1,143.53	1,161.41
				Net change in profit (B minus A)	17.87	36.40	36.74
				Increase (%)	1.49	2.94	2.91

Source: own calculation

Farm profitability is analysed by comparing income and expenses, whereas partial budget compares only the changes in revenue and expenses. Therefore, we should emphasise that partial budget analysis measures only the change in profit, but not the existing profitability. The results from the partial budget analysis show that the analysed change brings a positive impact on the farm profitability.The increased revenue comes from the larger span of the medium size eggs (according to the EU classification), which has the largest share in the income structure in all three flocks; it includes eggs according to three classes from the MK classification (Anna, Bertha, and Caesar), with a price that is at the level of class Anna. This comparison of egg weight classes' span and market price is visually presented in Figure 1.

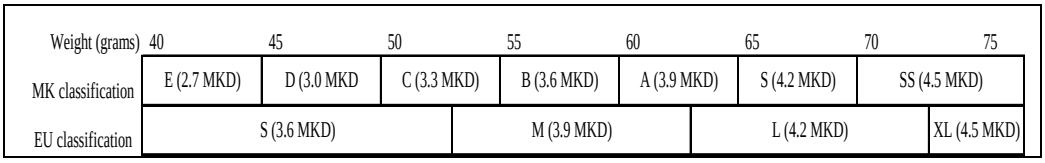

Figure 1. Comparison of egg weight classes and market price

Source: own

This visualization reveals that almost all classes gain from the new prices for weight ranges. For instance, with the EU classification, eggs that weight less than 55 g (class Emma, Dora and Caesar according to MK classification) are valued as the class Bertha, whereas class Bertha is valued as class Ana. Class Sofia has the same price, but due to the wider weight range it brings an increase in the price for those eggs that were previously sorted under class Ana. The only shortfall is noted for eggs weighting 70-73 grams that were previously sorted as Super Sofia and valued with the premium price. The evaluated flocks do not have eggs from this size; thus this price change did not affect their expected revenue in the observed flocks.

Market implications

The increased price of eggs due to a change in the classification of eggs brings an increase of the producer income. This change in price is expected to alter the behavior of producers and consumers, and shift the demand and supply curves. Considering that there is not any budgetary support in this process, and based on the welfare economics principles, the increased price increases the producers' surplus on behalf of the consumers' surplus. We try to illustrate the expected revenue

increase in the whole egg sector with a simple calculation. If we assume the same revenue increase as in the sample in this paper affects the whole egg sector in the Republic of Macedonia (30.34 denars per layer or 2.46%, an average), we estimate the broader market implications of introducing the new classification. The total number of layers in the Republic of Macedonia in 2015 is 1,352,564, out of which 929,387 (69%) are in the individual agricultural holdings (with 118 eggs per hen), and 423,177 (31%) in the agricultural enterprises (with 221 eggs per hen) (SSO 2016). If applied the average increase of 30.34 denars per layer to the total number of layers, we estimate the increase of the sector revenue for about 43 million denars (that is 667 thousand Euros), without any budgetary implications. If calculated per egg, this revenue increase is in average 0.20 denars. This is a good example, how standards can be used for a broader agricultural policy purpose, and support the market without any budgetary implications.

Conclusions

The aim of this paper was to determine the financial effects of the replacement of the egg weight standards of consumer eggs by introducing the EU classification system and their impact on the profitability on an egg farm. The applied partial budget analysis reveals that the EU classification of eggs provides higher revenue per average hen than the previous classification system, thus an increase of the profitability level on an egg farm. The increased revenue comes from the larger span of the medium sized eggs (according to the EU classification), which has the largest share in the income structure in all observed flocks. This class includes eggs according to three classes from the MK classification (Anna, Bertha, and Caesar), with a price at the level of class A (Anna). The evaluated flocks do not have eggs weighting 70-73 grams that were only egg size with a price decrease. Therefore, the introduction of the new classification system brings an increase in the sector income. It also reveals that the use of standards can go beyond the marketing aspects, and can be used as a measure to financially support the market without any budgetary implications.

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