

EFFICIENCY OF SALES OF EDIBLE EGGS BY WEIGHT AND CATEGORIES. PRICING METHODOLOGY

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Abstract. The yields of eggs of various categories from modern highly productive crosses of chickens (SP-789, Lohmann LSL Classic, Lohmann Brown Lite) were studied. The comparative efficiency of the egg sale by weight and categories, the development of a pricing methodology are discussed. It was found that for the considered crosses the first category is the modal class or the class of the highest frequency of occurrence. The average weight, the cost of 1 g of egg weight, and the new selling price of eggs of the first category practically coincide with the average values of these parameters of the general set. The most economically feasible is the sale of edible eggs by weight. However, it requires additional financial investments for the purchase, installation, and maintenance of weighing equipment. In this regard, the author has developed and proposed a methodology for determining the single-piece price sale of eggs of different categories, which makes it possible to increase the income of an enterprise as compared to selling eggs by weight. According to the new methodology the selling price of the first category eggs is taken as a basis for assessing the selling price of eggs of other categories. This value is multiplied by the coefficients for the corresponding categories, which are calculated by dividing the new price of eggs of each category by the new price of eggs of the first category. These coefficients should be developed for each specific cross, taking into account the duration of the productive seasons and the conditions of the farms.

1 Introduction

In modern economic conditions increasing the efficiency of production in poultry farming becomes not only the main direction of its development but also practically the only opportunity to further increase the production of eggs and poultry meat, and to increase the competitiveness and profitability of the industry [1-4]. The efficiency of the productive activity of poultry farms depends on a set of interrelated factors: housing conditions, productivity, livability and duration of productive use of poultry, product quality, feed and labor costs for production, market prices of products [5-12].

Currently, poultry farms in Russia and the CIS countries sell edible eggs to the consumer by item, taking into account weight categories [13] while in the EU countries edible eggs are sold by weight [14].

According to the Russian State Standard GOST 31654 - 2012 “Edible chicken eggs. Specifications” [15], edible eggs are divided into 5 weight categories: the third (35-44.9 g), the second (45-54.9 g), the first (55-64.9), selected (65-74.9 g), and the highest (75 g and more). The disadvantage of this standard is that each weight category of eggs has a fairly large interval (9.9 g) [16]. So, when eggs are sold by the categorized items, the selling price of the lightest and the heaviest eggs within each category and the resulting income of the farm will be the same.

Analysis of the work of poultry enterprises in Russia showed that there is no single methodology for determining the selling price of eggs of various categories, and this process is arbitrary. For example, during the period of studies the selling price of 10 eggs of the third, second, first, selected and highest categories amounted to 24.7, 27.3, 38.8, 45.7 and 52.6 rubles (SP1) at the Selection and Genetic Center “Zagorskoe Experimental Breeding Farm” of the Moscow region. These selling prices at the Mendeleevskaya poultry farm in the Perm Territory were 20.0, 29.1, 35.4, 38.2, and 41.5 rubles (SP2); and 29.0, 31.0, 37.0, 38.0 and 39.0 rubles (SP3) at the Druzhba poultry farm in the Krasnodar Territory.

The purpose of this work was to study the yields of eggs of different categories for some modern highly productive crosses of chickens, to compare the efficiency of egg selling by weight and categories, and to develop a unified pricing methodology.

2 Materials and methods

The studies were carried out at the Selection and Genetic Center “Zagorskoe Experimental Breeding Farm” of the Federal Scientific Center “All-Russian Research and Technological Institute of Poultry” of Russian Academy of Sciences (SGC ARRTPI) of the Moscow region and the poultry farm Mendeleevskaya of the Perm Territory.

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Table 1. Weight and yield of eggs by category.

Egg categories	SP-789 cross				Lohmann LSL Classic cross				Lohmann Brown Lite cross			
	Number of eggs		Mass of eggs, g		Number of eggs		Mass of eggs, g		Number of eggs		Mass of eggs, g	
	pcs.	%	total	average	pcs.	%	total	average	pcs.	%	total	average
Third	11	0.79	478	43.46	4	0.28	173	43.23	46	3.18	1915	41.63
Second	319	22.84	16338	51.22	252	17.52	13204	52.40	145	10.03	7409	51.10
First	806	57.69	48127	59.71	913	63.49	54600	59.80	871	60.24	52802	60.62
Selected	248	17.75	16867	68.01	257	17.87	17475	68.00	373	25.79	25398	68.09
Highest	13	0.93	1037	79.77	12	0.84	929	77.43	11	0.76	923	83.91
Total and in average	1397	100	82840	59.30	1438	100	86381	60.07	1446	100	88447	61.17

1397 eggs from chickens of the productive flocks of cross SP-789 (SGC ARRTPI) and 1438 and 1446 eggs from crosses Lohmann LSL Classic and Lohmann Brown Lite (Mende-leevskaya), respectively, were weighed individually monthly (three days in a row) during their productive period. The laboratory scales with an accuracy of 0.1 g were used. The total and average weights of eggs; the yields of eggs of the highest, selected, first, second, third categories [15]; the total and average weights of eggs by category were determined.

3 Results and discussion

During the productive period the yields of eggs of the third, second, first selected and highest categories were as follows:

- 0.79, 22.84, 57.69, 17.75, and 0.93%, respectively, for the SP-789 cross with an average egg weight of

43.46, 51.22, 59.71, 68.01, 79.77 g;

- 0.28, 17.52, 63.49, 17.87, and 0.84 % for the Lohmann LSL Classic with an average egg weight of 43.23, 52.40, 59.80, 68.00, 77.43 g;

- 3.18, 10.03, 60.24, 25.79, and 0.76 % for the Lohmann Brown Lite with an average egg weight of 41.63, 51.10, 60.62, 68.09, 83.91 g, respectively.

The total and average weights of all weighed eggs were 82,840 and 59.30 g for the SP-789 cross, 86,381 and 60.07 g for the Lohmann LSL Classic, 88,447 and 61.17 g for the Lohmann Brown Lite (Table 1).

Taking into account the listed characteristics and the selling prices for eggs categories, mathematical calculations were performed to determine the comparative efficiency of selling the edible eggs by weight and by category (by item). The following parameters were calculated:

- The cost of 1 g of egg weight - by dividing the

Table 2. Prices when selling eggs by category according to SP1 prices and by weight.

Egg categories	Sales of eggs by category		Sales of eggs by weight		The cost of 1 egg for the cost of 1 g of egg mass of the 1st category, rubles (new price)
	Selling price of 1 egg, rub.	Income, rubles	Cost of 1 g of egg mass, rub.	Income based on the price of 1 g of egg mass of the 1st category, rub.	
SP-789 cross					
Third	2.47	27.2	0.057	31	2.82
Second	2.73	871	0.053	1062	3.33
First	3.88	3127	0.065	3128	3.88
Selected	4.57	1133	0.067	1096	4.42
Highest	5.26	68	0.066	67	5.19
Total and in average	3.74	5226	0.063	5384	3.85
Lohmann LSL Classic cross					
Third	2.47	10	0.057	11	2.81
Second	2.73	688	0.052	858	3.41
First	3.88	3542	0.065	3549	3.89
Selected	4.57	1174	0.067	1136	4.42
Highest	5.26	63	0.068	60	5.03
Total and in average	3.81	5477	0.063	5614	3.90
Lohmann Brown Lite cross					
Third	2.47	114	0.059	123	2.66
Second	2.73	396	0.054	474	3.27
First	3.88	3379	0.064	3379	3.88
Selected	4.57	1705	0.067	1625	4.36
Highest	5.26	58	0.063	59	5.37
Total and in average	3.91	5652	0.064	5660	3.91

Table 3. Prices when selling eggs by category according to SP2 prices and by weight.

Egg categories	Sales of eggs by category		Sales of eggs by weight		The cost of 1 egg for the cost of 1 g of egg mass of the 1st category, rubles (new price)
	Selling price of 1 egg, rub.	Income, rubles	Cost of 1 g of egg mass, rub.	Income based on the price of 1 g of egg mass of the 1st category, rub.	
SP-789 cross					
Third	2.00	22	0.046	28	2.56
Second	2.91	928	0.057	964	3.02
First	3.54	2853	0.059	2839	3.52
Selected	3.82	947	0.056	995	4.01
Highest	4.15	54	0.052	61	4.71
Total and in average	3.44	4804	0.058	4887	3.50
Lohmann LSL Classic cross					
Third	2.00	8	0.046	10	2.55
Second	2.91	733	0.056	779	3.09
First	3.54	3232	0.059	3221	3.53
Selected	3.82	982	0.056	1031	4.01
Highest	4.15	50	0.054	55	4.57
Total and in average	3.48	5005	0.058	5096	3.54
Lohmann Brown Lite cross					
Third	2.00	92	0.048	111	2.41
Second	2.91	422	0.057	430	2.96
First	3.54	3083	0.058	3063	3.52
Selected	3.82	1425	0.056	1473	3.95
Highest	4.15	46	0.050	54	4.87
Total and in average	3.51	5068	0.058	5131	3.55

selling price of 1 egg by the average weight of eggs in each category;

- Income from the sale of eggs by weight - by multiplying the cost of 1 g of egg weight of the first category by the total weight of eggs in each category;
- A new selling price for eggs of different categories - by multiplying the cost of 1 g of egg weight of the first category by the average weight of eggs in each category.

It was found that when selling eggs by categories according to SP1 (Table 2), the SP-789 cross got a total income of 5226 rubles, while when selling eggs by weight, based on the cost of 1 g of egg mass of the 1st category (0.065 rubles) it amounted to 5384 rubles. For the Lohmann LSL Classic cross, the total income from the sale of eggs by category was 5,477 rubles, and from the sale of eggs by weight, based on the cost of 1 g of egg mass of the 1st category (0.065 rubles) it was 5,614 rubles. For the Lohmann Brown Lite cross, the total income from the sale of eggs by category amounted to 5652 rubles, and from the sale of eggs by weight, based on the cost of 1 g of egg mass of the 1st category (0.064 rubles) it was 5660 rubles.

When selling eggs by categories according to SP2 (Table 3), the total income of the SP-789 cross was 4804 rubles, while when selling eggs by weight, based on the cost of 1 g of egg mass of the 1st category (0.059 rubles) it amounted to 4887 rubles. For the Lohmann LSL Classic cross, the total income from the sale of eggs by category was 5005 rubles, and from the sale of eggs by weight, it was 5096 rubles. For the Lohmann Brown Lite cross, the total income from the sale of eggs by category amounted to 5068 rubles, and from the sale of eggs by

weight, based on the cost of 1 g of egg mass of the 1st category (0.058 rubles) it was 5131 rubles.

Similarly, when selling eggs by categories according to SP3 (Table 4), the total income of the SP-789 cross was 4996 rubles, and when selling eggs by weight, based on the cost of 1 g of egg mass of the 1st category (0.062 rubles) it was 5137 rubles. For the Lohmann LSL Classic cross total income from the sale of eggs by category was 5195 rubles, and when selling eggs by weight, based on the cost of 1 g of egg mass of the 1st category (0.062 rubles) it was 5361 rubles. For the Lohmann Brown Lite cross, the total income from the sale of eggs by category amounted to 5266 rubles, and from the sale of eggs by weight, based on the cost of 1 g of egg mass of the 1st category (0.061 rubles) it was 5394 rubles.

The presented data show that it is most economically feasible to sell edible eggs by weight. When selling eggs by weight based on the cost of 1 g of egg weight of the 1st category in comparison with selling by categories (by item) according to the prices SP1, SP2, and SP3 for SP-789, Lohmann LSL Classic, and Lohmann Brown Lite, the additional income was 158, 137 and 8; 83, 91 and 63; 141, 166 and 128 rubles. Per 10 eggs it is 1.13, 0.95 and 0.06; 0.60, 0.63, and 0.44; 1.01, 1.15, and 0.89 rubles, which in the scale of a poultry farm of average capacity producing 155 million eggs per year will provide additional income of 17.52, 14.73, and 0.93; 9.30, 9.77, and 6.82; 15.66, 17.83, and 13.80 million rubles per year, respectively.

So, the data in Tables 2, 3, and 4 indicate that when selling edible eggs by weight, compared to selling by categories (by item), income from the SP-789, Lohmann LSL Classic, and Lohmann Brown Lite crosses rises by

Table 4. Prices when selling eggs by category according to SP3 prices and by weight.

Egg categories	Sales of eggs by category		Sales of eggs by weight		The cost of 1 egg for the cost of 1 g of egg mass of the 1st category, rubles (new price)
	Selling price of 1 egg, rub.	Income, rubles	Cost of 1 g of egg mass, rub.	Income based on the price of 1 g of egg mass of the 1st category, rub.	
SP-789 cross					
Third	2.90	32	0.067	30	2.70
Second	3.10	989	0.061	1013	3.18
First	3.70	2982	0.062	2984	3.70
Selected	3.80	942	0.056	1046	4.22
Highest	3.90	51	0.049	64	4.95
Total and in average	3.58	4996	0,061	5137	3.68
Lohmann LSL Classic cross					
Third	2.90	12	0.067	11	2.68
Second	3.10	781	0.059	819	3.25
First	3.70	3378	0.062	3 385	3.71
Selected	3.80	977	0.056	1084	4.22
Highest	3.90	47	0.050	62	4.80
Total and in average	3.61	5195	0.061	5361	3.73
Lohmann Brown Lite cross					
Third	2.90	133	0.070	117	2.54
Second	3.10	450	0.061	452	3.12
First	3.70	3223	0.061	3221	3.70
Selected	3.80	1417	0.056	1549	4.15
Highest	3.90	43	0.047	56	5.12
Total and in average	3.64	5266	0.060	5394	3.73

Table 5. Coefficients for determining the selling price of eggs of various categories.

Egg categories	SP-789 cross				Lohmann LSL Classic cross				Lohmann Brown Lite			
	SP1	SP2	SP3	In average	SP1	SP2	SP3	In average	SP1	SP2	SP3	In average
Third	0.727	0.727	0.730	0.729	0.722	0.722	0.722	0.722	0.686	0.685	0.687	0.686
Second	0.858	0.858	0.860	0.859	0.877	0.875	0.876	0.876	0.843	0.841	0.843	0.842
First	1	1	1	1	1	1	1	1	1	1	1	1
Selected	1.139	1.139	1.141	1.140	1.136	1.136	1.138	1.137	1.124	1.122	1.122	1.123
Highest	1.338	1.338	1.338	1.338	1.293	1.295	1.294	1.294	1.384	1.384	1.384	1.384

3.02, 2.50 and 0.14 % for SP1 prices; by 1.73, 1.82 and 1.24 % for SP2 prices, and by 2.82, 3.20, and 2.43 % for SP3 prices.

As a result of the study, it was found that for all three crosses, the modal class or the class of the highest frequency of occurrence is the first category (57.69-63.49%). The average weight of eggs, the cost of 1 g of egg weight and the new selling price of eggs of this category practically coincides with the average values of the general set.

It should be noted that the sale of eggs by weight requires additional financial investments for the purchase, installation and maintenance of weighing equipment. In this regard, in order to minimize financial losses of enterprises when selling eggs, coefficients have been developed (Table 5) to determine the selling price of eggs of different categories for the studied crosses. They are calculated by dividing the new price of eggs in each category by the new price of eggs in the first category (see tables 2, 3 and 4).

Coefficients for determining the selling price of eggs of different categories should be developed for each specific cross, taking into account the duration of the operation of chickens and the conditions of the farms. According to the new methodology, the selling price of eggs of the first category is taken as the basis for determining the selling price of eggs of different categories, and this indicator is multiplied by the coefficients for the corresponding categories.

Example: if the estimated selling price of 10 eggs of the first category is 42 rubles, then for the SP-789 cross the selling price of 10 eggs of the third, second, selected and highest categories will be 30.62 (42 rubles x 0.729), 36.08 (42 x 0.859), 47.88 (42 x 1.140) and 56.20 (42 x 1.338) rubles. For the Lohmann LSL Classic cross the prices will be 30.32 (42 x 0.722), 36.79 (42 x 0.876), 47.75 (42 x 1.137), and 54.35 (42 x 1.294) rubles. For the Lohmann Brown Lite cross the prices will be 28.81 (42 x 0.686), 35.36 (42 x 0.842), 47.17 (42 x 1.123), and 58.13 (42 x 1.384) rubles, respectively.

4 Conclusion

The study showed that for all the considered crosses the modal class or the class of the highest frequency of occurrence is the first category (57.69-63.49%). The average weight of eggs, the cost of 1 g of egg weight and the new selling price of eggs of this category practically coincide with the average values of these parameters of the general set. It was found that it is most economically reasonable to sell edible eggs by weight. The developed methodology for determining the selling price of eggs of different categories makes it possible to increase the income of enterprises to the level of income when selling eggs by weight.

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