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Prospects of table eggs production in Belarus

Abstract. Problems of development of egg production in Belarus are considered. Dynamics of volume of egg production is considered for the period of 1995-2009. Results of production and sale of eggs by integrated (mass production) poultry farms are analyzed by means of a correlation method.

Key words: egg production, poultry farming, production efficiency, efficiency factors.

Introduction

Poultry farming is one of the basic branches of agriculture worldwide. Eggs, meat of young and adult birds like hens, ducks, geese, turkeys, guinea-fowls and also processed products (egg powder, liver meat pie, ends of cuts, powdered soup sets, edible offal, canned food, sausages) and a lot of others are on the list of products which are supplied by poultry farming. Altogether 3 billion eggs is produced annually in Belarus, including 1.8 of billion in the public sector and 1.2 billion in private homesteads. It makes 300 eggs a year, or 18 kg per capita a year. In the European Union countries it is 14 kg, in the USA and France 18 kg, in the Baltic states, Poland and Ukraine between 11 kg and 12 kg are produced per capita. It is visible from the above quoted data that the level of egg production reached in Belarus corresponds to the level in the developed countries. It is planned in Belarus for 2010 to produce 2.2 billion eggs, and taking into account their production in private homesteads run by part-time farmers not less than 3.5 billion eggs as well as 258 thousand ton of poultry meat [Волчков 2007; Михалевич 2010].

However, growth in production volume does not mean an efficiency growth. Actually, there are a lot of problems in this sphere. The domestic market of Belarus cannot absorb such quantity of eggs and therefore a considerable part of this production is sold in the foreign markets, in particular in the Russian Federation. Recently, it has appeared that the export price for this kind of product is falls below the cost. On the other hand, the prices of industrial inputs have increased. Investments are required for re-equipment of integrated poultry farms according to modern technologies. At the same time the profitability of egg production has decreased in relation to the previous period, the quantity of unprofitable

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organizations has increased. All that has caused a need of detailed analysis of the situation and determination of development prospects for the Belarussian poultry farming in the tideway of world tendencies.

Object and methods of research

As an initial information for carrying out the research, data on the work of organizations belonging to a republican association 'Belptitseprom' for years 2007-2009 have served. As technical, economic and productive indicators of functioning of individual integrated poultry farms, the following ones have been chosen:

- production cost of thousand eggs, thousand rubles
- cost of 1 tonne of fodder, thousand rubles
- sale price per thousand eggs, thousand rubles
- egg production, million eggs
- expense of fodder per thousand eggs, fodder units
- annual egg production per hen, eggs
- labour input per thousand eggs, man-hours
- enterprise profit, million rubles
- profitability level, %.

Correlation analysis has been used to reveal tendencies of branch development. It has also been used in defining the degree of influence of efficiency factors on production in the poultry-farming enterprises of republican association 'Belptitseprom'.

Results of research

The Belarussian poultry farming has passed a long way of development. It has evolved from a secondary branch to a developed specialized branch of agriculture nowadays. Poultry farming shows rates of fast development all over the world. It is one of basic, rather inexpensive, sources of a dietary food for the population. The basic producers in poultry farming in Belarus are the agricultural enterprises. They are a part of the republican association 'Belptitseprom'. It consists of 4 poultry breeding enterprises, 12 egg producing enterprises, 11 poultry meat producing enterprises, 2 enterprises of fodder mix industry and the Kvasevichsky feather and down processing factory. The largest egg producing integrated poultry farms are located in Orshansk, Gorodok, Kobrinsk, Baranovichy, Grodno, Novobelitsk, Bobruisk, Pridneprovsk, Soligorsk, then come the First Minsk and Krupsky enterprises. An average number of laying hens stays over 300 thousand heads and the total production of eggs makes about 100 million eggs [Цыбульский 2009]. They produce 58% of eggs in 'Belptitseprom'. The poultry-farming enterprises satisfy completely the demand from the population of republic and they export a part of their produce to the nearest countries.

A tendency of recession in total production of eggs was observed in Belarus throughout a number of years (Table 1). It was reflected in production numbers per capita of the population.

Table 1. Production of food eggs by enterprises of all categories

Indicator	Year										
	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Bird livestock, million heads	26.4	27.4	26.2	25.2	24.5	25.1	28.5	28.7	29.4	31.2	34.1
Total national egg production, million egg	3373	3288	3144	2923	2824	2950	3103	3337	3228	3312	3430
Within that regions:											
- Brest	506	535	513	484	467	502	505	530	479	500	528
- Vitebsk	528	490	464	424	385	380	414	441	443	482	489
- Gomel	463	469	455	393	385	392	422	467	456	501	498
- Grodno	467	449	417	398	370	382	388	367	364	363	385
- Minsk	943	927	901	838	855	921	979	1108	1056	1029	1082
- Mogilyov	466	418	394	386	362	373	395	424	430	437	448
Production per capita, egg	331	329	315	294	286	300	317	343	333	342	355
Consumption per capita, egg	237	224	224	227	224	238	256	276	275	279	286

Source: http://mshp.minsk.by

Then the population of Belarus began to consume more eggs. The consumption level per capita has come nearer to a scientifically approved level in 2009. However, the egg production in the country exceeds the consumption level (by 24% in 2009). It means that the production volume makes it necessary to find sales markets abroad.

The most of egg production is concentrated in the Minsk region.

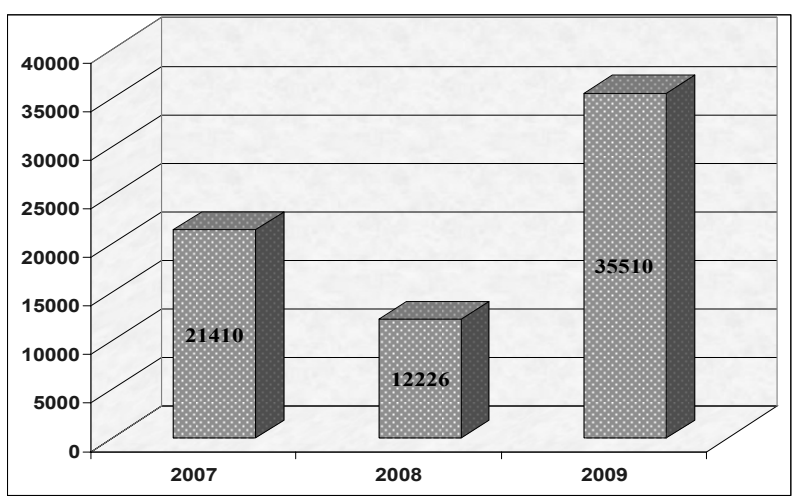

Fig. 1. Profits in egg production, million ruble[3]

Source: own calculations basing on data from the State Committee of Statistics of Belarus.

[3] 3000 BRB (Byelorussian ruble) = 1 USD.

An overall indicator of performance of integrated poultry farms is the size of the received profit or loss.

Therefore, the dynamics of profit in the integrated poultry farms specialized in egg production in years 2007-2009 has been considered (Figure 1).

The profit received by the enterprises in 2009 exceeded almost three times the profit in 2008. It is a positive tendency but insufficiently steady.

Table 2. Structure of the egg production costs, %

Cost item	Unprofitable enterprises	Enterprises with profitability of 15.0% and more	All enterprises
Wages	7.9	3.8	4.3
Fodder	54.3	74.3	70.0
Heating	3.1	1.6	1.9
Electricity	1.7	2.2	2.0
Veterinary aid	2.0	1.2	1.5
Repairs	2.1	1.9	2.0
Depreciation	-	-	-
Miscellaneous costs	22.4	10.0	13.0
Overhead charge	6.5	5.0	5.3
Cost of 1000 eggs, thousand rubles	251.4	141.4	172.0

Source: own calculations basing on data from 'Belptitseprom'.

Table 3. Matrix of correlation between efficiency factors

Indicator	cost of 1 thousand eggs	cost of 1 tonne of fodder	sale price per thousand eggs	volume of egg product-ion	expense of fodder on 1 thousand eggs	annual egg product-ion per hen	labour input for 1 thousand eggs	enterprise profit	level of profit-ability
cost of 1 thousand eggs	1.000								
cost of 1 tonne of fodder	.534	1.000							
sale price per thousand eggs	.776	.441	1.000						
volume of egg production	-.637	-.413	-.406	1.000					
expense of fodder on 1 thousand eggs	.915	.373	.575	-.552	1.000				
annual egg production per hen	-.810	-.332	-.460	.486	-.952	1.000			
labour input for one thousand eggs	.748	.078	.589	-.582	.631	-.463	1.000		
enterprise profit	-.669	-.317	-.297	.898	-.585	.461	-.750	1.000	
level of profitability	-.937	-.441	-.564	.556	-.888	.764	-.772	.722	1.000

Source: own calculations basing on data from 'Belptitseprom'.

The economic efficiency of poultry farming is determined by five major factors.

- Production processes take place in a specific environment. They can be regulated in the necessary direction.

- High rates of reproduction and precocity.
- Fast economic recovery of fodder inputs.
- Integrated poultry farms are technically equipped with complex mechanization of technological processes.
- High profitability of poultry farming and recovery of capital investments.

Therefore it is further necessary to analyze the condition of specified factors. First, the cost structure of egg production was considered. The set of integrated poultry farms has been divided into two groups on the grounds of their profitability.

The profitable enterprises spend more on fodder. In the unprofitable integrated poultry farms the expense of fodder (Table 2) is smaller.

The production cost of 1000 eggs in the unprofitable enterprises was 78% higher than in the profitable ones.

A question arises about the degree of influence of various factors on results of production and its efficiency.

An analysis of the matrix of pair correlations between the factors (Table 3) allows to draw a conclusion that the cost of 1 thousand eggs is closely connected with the production volume ($r_{1.4}$ = -0.637), the expense of fodder on 1 thousand eggs ($r_{1.5}$ = 0.915), the productivity per hen ($r_{1.6}$ = -0.810) and the labour input per 1 thousand eggs ($r_{1.7}$ = 0.748).

The profit is closely connected with the production volume ($r_{8.4}$ = 0.898), the expense of fodder on 1 thousand eggs ($r_{8.5}$ = -0.585) and the labour input per 1 thousand eggs ($r_{8.7}$ = -0.750).

The profitability level is connected closely with the cost and with the sale price ($r_{9.1}$ = -0.937 and $r_{9.4}$ = 0.564 respectively).

An analysis of variance testifies that the profitability of production is formed in 73.4% depending on variation of the production cost and only in 26.6 % depending on the sale price.

Hence, the end results are formed in appreciable way by concrete parameters in the enterprises of the branch. The role of so called external factors is much smaller.

It is a result of the republican government's work on stabilization of production inputs markets and sales markets (in 2007 and in 2008 the shares of the specified components were approximately equal to 51.2% and 48.8% respectively).

A regression model has been constructed for revealing the quantitative influence of individual factors on production cost (Y). The following factors have been included:

X_1 – cost of 1 tonne of fodder, thousand ruble

X_2 – volume of egg production, million eggs

X_3 – expense of fodder on 1 thousand eggs, fodder units

X_4 – annual egg productivity per 1 hen, eggs

X_5 – labour input per 1 thousand eggs, man-hours.

The following model has been received as a result of calculations and a check on significance of the coefficients

$Y = -110.9634 + 0.1361X_1 – 0.0098X_2 + 1.3462X_3 – 0.1048X_4 + 20.3630X_5$

$R = 0.977$,

$F = 58.4$

The determination coefficient (R^2) shows that the variation of production cost is determined in 95.4% by the variation of factors included in the model.

Enterprises of the branch have been grouped on the grounds of the level of use of factors specified in the model. The criterion of grouping was defined as a relation of the cost according to the model to its actual level, multiplied by 100 (Table 4).

An analysis of data in Table 4 shows the highest production profitability in the group of enterprises with cost of fodder smaller than 600 thousand ruble per tonne.

These enterprises receive also higher profits and bear less cost per 1000 eggs.

Table 4. Cost of 1 ton of fodder and the egg production efficiency

Group of enterprises by fodder cost, thousand ruble/tonne	Average in the group, thousand ruble/tonne	Production cost per 1000 eggs, thousand ruble	Profit on 1000 eggs, thousand ruble	Level of profitability, %
up to 600.0	566.7	151.9	18.7	12.3
600.1 - 750.0	642.7	162.6	18.5	11.4
above 750.0	817.0	213.8	6.8	3.2
average	665.4	172.0	17.4	10.1

Source: own calculations basing on data from 'Belptitseprom'.

Grouping of integrated poultry farms by the level of expense of fodder on 1000 eggs is presented in Table 5. The production profitability is the highest in the group with the expense of fodder smaller than 135 fodder units per 1000 eggs. The cost is lower in this group and the profit higher in comparison to the other groups.

Table 5. Expense of fodder per 1000 eggs and production efficiency

Group of enterprises by the fodder expense per thousand eggs, fodder units	Average expense in the group, fodder units	Cost of 1000 eggs, thousand ruble	Profit on 1000 eggs, thousand ruble	Level of profitability, %
up to 135	133	147.9	25.1	17.0
141 - 150	144	155.9	18.4	11.8
above 150	174	214.1	-2.1	-0.9
average	150	172.0	17.44	10.1

Source: own calculations basing on data from 'Belptitseprom'.

Volume of egg production exerts a considerable impact on its efficiency. Therefore three groups of the enterprises have been discerned according to the volume of production (Table 6).

Table 6. Production volume and an overall performance of the enterprises

Group of enterprises by volume of egg production, million egg	Average volume in the group, million egg	Labour input per 1000 eggs, man-hours	. Cost of 1000 eggs, thousand ruble	Profit per 1000 eggs, million ruble	Level of profitability, %
up to 100.0	41.6	0.3	138.6	180	1.8
100.1 - 200.0	154.7	0.8	150.1	2790.5	11.6
above 200.0	290.2	1.6	199.4	7767.0	16.9
average	112.9	1.1	172.0	1968.5	10.1

Source: own calculations basing on data from 'Belptitseprom'.

Apparently, great volumes of egg production allow to receive better economic results. The profitability in the group of integrated poultry farms with volume of production bigger than 200 million eggs a year is the highest and reaches 16.9%. However, the labour inputs and the cost of 1000 eggs are also the highest in these enterprises. But these expenses pay off with a higher profit.

Not all enterprises use available resources in 100%. Therefore, it is possible to discern two groups of enterprises from this perspective and check on the production efficiency in each of them. The enterprises using resources in more than 100% spend less cost for 1000 eggs. The more intensive farms use less labour and fodder per 1000 eggs and they receive more eggs from 1 layer (Table 7).

Table 7. Level of resource use and an overall performance of the enterprises

Group of enterprises by level of resources use, %	Average level of use in the group, %	Production of eggs, million egg	Expense of fodder per 1000 eggs, fodder unit	Labour input per 1000 eggs, man-hour	Productivity of 1 hen, eggs/year	Cost per 1000 eggs, thousand ruble
up to 100.0	96.3	116.2	156.2	1.3	292.8	187.4
above 100.0	104.6	110.1	145.1	0.9	305.3	158.7
average	100.0	112.9	150.4	1.1	299.5	172.0

Source: own calculations basing on data from 'Belptitseprom'.

It is known that a higher level of bird's productivity allows to lower specific expenses and to increase production efficiency. Therefore three groups of integrated poultry farms, basing on annual number of eggs from 1 layer, were distinguished (Table 8).

Table 8. Layer productivity and an overall performance of the enterprises

Group of enterprises by annual production of eggs from 1 hen-layer, egg	Average production in the group, egg	Labour input per 1000 eggs, man-hour	Expense of fodder per 1000 eggs, fodder unit	Profit per 1000 eggs, thousand ruble	Level of profitability, %
up to 300	258	2.10	181.7	-6.1	-6.5
301 - 310	307	0.93	143.2	14.9	9.9
above 310	319	0.6	137.8	25.4	14.3
average	300	1.1	150.4	17.4	10.1

Source: own calculations basing on data from 'Belptitseprom'.

The profitability in the group with number of eggs from 1 layer bigger than 310 eggs a year is the highest. In this group the highest profit is connected with smaller inputs of labour and fodder per 1000 eggs.

The Belarussian poultry farming has had an export orientation. The basic sale market is the Russian one. The export prices of eggs have increased from 0.04$ to 0.076$ per egg in the period of 2003-2008. Therefore the integrated poultry farms can receive profit only when the production cost of 1000 eggs is less than 228 thousand ruble. But the price situation can change at any moment and the prices can fall. Those enterprises can receive profit which have smaller costs, bigger production volume and an above average level of use of resources.

Conclusions

Thus, the research allows for drawing the following conclusions.

- A part of integrated poultry farms in Belarus produces in an ineffective way. Too big inputs of labour and fodder lead to a high production cost of eggs. Production of eggs is most effective in the enterprises using cheaper fodder (less than 600 thousand ruble per tonne), producing over 200 million eggs a year, using resources more than in 100 %, reaching productivity of more than 310 eggs per 1 layer a year.
- The volume of egg production exceeds the level of their consumption by the population of Belarus. Therefore, the branch will further keep the export orientation. The market of Russian Federation still remains the main sale market. But search of other outlet markets is necessary. Otherwise the production volume might need a reduction. It can be reflected negatively in the branch condition.

References

Волчков В. [2007]: Птица рискует догнать яйцо. *Рэспубліка. Экономическая среда* 21 March, p.5.
Михалевич И. [2010]: Выеденное яйцо экспортное и золотое. *Экономическая газета* 18 June, p. 24.
Цыбульский А. [2009]: Уверенная поступь лидера. *Белорусское сельское хозяйство* no.11, pp. 9-13.