Conceptual approaches to assessing the market potential of poultry meat and its forecast

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Abstract. Poultry meat is a strategic product, which determines the relevance of studying its market from the standpoint of the availability of resources, existing problems, promising directions for expanding this segment and methodological approaches to its assessment. A review of existing methods for such an assessment shows that none of them can be fully adapted to the poultry industry. In this regard, the article under consideration has consistently studied the conceptual apparatus of the market potential of poultry products with its subsequent clarification, and also proposed a model for building relationships between economic entities in the production of this type of product, which were the starting point in the development of conceptual approaches to the methodology for assessing the market potential of poultry meat with its practical implementation in the poultry industry.

1. Introduction

Today, the world food market is going through a crisis period, which in the face of an increasing risk of socio-economic tension makes the search for sustainable development reserves and, above all, the agro-industrial complex, which is the key to ensuring the country's food security, actual. It should be noted that the fastest growing segment of the world meat market is poultry meat; in terms of broiler meat production, Russia occupies the 4th place. In the structure of the meat balance of our country, poultry meat is about 40%, and its share in the total volume of consumed animal protein, necessary for the full development of a person, is 26.4%. Moreover, for poultry meat, the level of the Food Security Doctrine was exceeded according to the corresponding target indicators. This type of product is considered one of the most complete food products containing animal protein in an amount of 21.6% per 100 grams of product.

The broiler meat market is developing dynamically with an increase in the volume of its own resources against the background of a decrease in imports and an increase in export interventions. Basically, the resources of this market segment are concentrated in agricultural organizations, which indicates the industrialization of the industry. At the same time, we can state the presence of market niches for broiler meat due to differences in the level of its consumption in the context of regions, insufficient volumes of its processing and insignificant volumes of export of these products. However,
the progressive development of the market potential of broiler meat is hindered by a number of external and internal factors, the main of which can be attributed to import dependence on breeding resources, inflation expectations, a decrease in the real disposable income of the population, the continuing disparity in consumed resources and products sold, tax burden, low level profitability of business entities in the industry.

In this regard, in order to develop a development strategy for this target market, it is necessary to assess its market potential. Therefore, it is necessary to study the existing methods for assessing market potential, integrate the most progressive elements of each of them and develop conceptual approaches based on the features of the industry, the hierarchical structure of its economic entities with access to the mathematical tools for assessing the market potential of products, which does not exist in the industry today. These circumstances actualize the issue of developing theoretical and methodological approaches to assess the market potential of poultry meat.

2. Problem statement

The issue under study is that in order to develop a strategy for the target market for poultry meat, it is required to estimate the value of its market potential for the main, by-products and by-products.

1. The purpose of the study is to develop a methodology for assessing the market potential of poultry meat.

2. Research methods: dialectical approach, methods of induction and deduction, methods of systemic, structural and comparative analysis, economic and mathematical methods.

3. Conclusions

The research process began with the study of the accumulated theoretical experience regarding the conceptual apparatus of market potential and methodological approaches to its assessment. A set of different points of view on the market potential of the scientific community is considered, which made it possible to single out the main approaches to its definition based on the hierarchy of the levels of its implementation [1, 2, 4].

1. The market potential of the enterprise's products is divided depending on the maximum possible volume of demand satisfied by the enterprise in the aggregate demand (sales volume in the industry) is divided into:
   a) the market potential of the enterprise, calculated based on the existing share of the enterprise in the aggregate demand for products industry (in terms of sales);
   b) the market potential of the enterprise - the maximum possible volume of sales, calculated based on the maximum production capabilities of the enterprise in the implementation of market activities; (this includes theories);
   c) the market potential of the enterprise, calculated based on the existing share of the enterprise in the total demand for the industry's products (in sales), as well as taking into account the production capabilities of the enterprise (including its competitiveness);

2. The market potential of the industry's products according to the criterion of the maximum possible volume of satisfied needs is divided into:
   a) the market potential of the industry, calculated by the volume of absolute needs (according to rational, medical consumption rates);
   b) market potential industry, calculated according to the volume of relative, solvent needs (according to the maximum possible demand, based on the indicators of the economic affordability of food to the population - cash income, consumer prices);
   c) the market potential of the industry, calculated based on the existing share of domestic producers in the total the demand for the industry's products.

At the same time, an interpretation of the market potential of poultry products is given: this is the maximum possible value of the capacity of target markets, formed on the basis of the law of diminishing marginal utility and the theory of consumer choice. For the complexity of the studied aspects, a review of the existing theoretical developments concerning the assessment of market potential was made [5]. A number of scientists and practitioners believe that agriculture is characterized by a diversified
structure, which is based on the biological characteristics of the production of finished products and its technological schemes [3, 11, 14]. In this regard, the market potential of products should be formed in the interconnection of biological and economic laws. Poultry farming has a competitive advantage over other livestock sectors. To increase them, it is required to develop an information map-model about the market potential of poultry products. When constructing it, the generally accepted scheme of four linear cross-country of poultry of the meat direction was used. To determine the target markets for poultry meat, the life cycle of its production was analysed and an appropriate conceptual model was built taking into account the hierarchy of the sectoral structure of poultry farming entities (figure 1).

**Figure 1.** Conceptual model of the interrelationship between the subjects of the industry in the production of poultry meat.
According to this model, the market potential of poultry meat was considered in the context of two blocks: pedigree and commercial products by types (main, accompanying and secondary).

This model was used as the basis for the algorithmizing of the methodology for assessing the market potential of poultry meat. Along with this, an analytical review of various approaches to assessing the market potential of products was carried out [7]. It should be noted that the entire arsenal of existing techniques is reduced mainly to the approach presented by E.V. Popov, who considers this assessment from the point of view of commodity policy [9, 10, 12, 13].

The contradiction of the existing methods on the indicated topic is the lack of matching in the analysis of real market opportunities for realizing the market potential of products and the arsenal of mathematical tools available in science and practice for such an assessment. In this regard, a methodology for assessing the market potential of poultry products was developed, taking into account the conceptual approach, the hierarchy of obtaining products by economic entities of the industry.

The theoretical aspects of the implementation of the developed assessment methodology have a certain sequence and corresponding calculation algorithms [8]. When calculating the market potential by types of products, priority is given to the main products at all hierarchical levels of economic entities of the industry in their production. The logic behind the construction of this calculation algorithm is the pyramid of obtaining marketable products, which is built from the bottom up. The total value of the market potential of poultry products is as follows:

\[
\text{MPCOmp} = \frac{\text{Nr} \cdot P \cdot \bar{y} \cdot \bar{E}}{2} \cdot \left( I \cdot (1 + \Delta E) \right) \cdot \left( 1 - (1 + \Delta I) \right) [\text{kg}]
\]

\[
\text{MPCOmp} \rightarrow \text{market potential of commodity output in meat poultry production, kg}
\]

- \(\text{Nr}\) – rational norm of poultry meat consumption, recommended by the Ministry of Health and Social Development of the Russian Federation, kg
- \(P\) – population, people
- \(\bar{y}\) – geometric mean of the competitiveness coefficient
- \(\bar{E}\) – root-sum-square of the coefficient of cross-elasticity
- \(E\) – value of exports, kg
- \(\Delta E\) – change in value of future-oriented exports, shares
- \(I\) – value of imports, kg
- \(\Delta I\) – change in value of future-oriented imports, shares

Further calculations of the market potential of each hierarchical level involved the determination of the corresponding livestock and specific regulatory data. So, the livestock of the final hybrid of broiler poultry farming was adjusted for the average weight of a carcass - a broiler for meat production:

\[
\text{MPCOmp} = \frac{\text{MPCOmp}}{m_c} \left[ \text{chickens} \right]
\]

\[
\text{MPCOmp} \rightarrow \text{market potential of commodity output in meat poultry production, chickens}
\]

- \(m_c\) – average mass of a broiler chicken of meat poultry production, kg

The following algorithm is used to determine the size of the breeder flock to ensure the final hybrid:

\[
\text{MPR2_m} = \frac{\text{MPCOmp}}{N_o} \cdot \frac{N_o \cdot F_r}{H} \left[ \text{chickens} \right]
\]

\[
\text{MPR2_m} \rightarrow \text{market potential of commodity output of a second-order reproducer in meat poultry production}
\]

- \(f_r\) – ratio of roosters to hens for breeding purposes (there are usually 8 hens for 1 rooster in meat chicken-keeping)

When calculating the livestock of the progenitor herd in meat poultry farming, it is necessary to take into account the ratio of males and females:

\[
\text{MPR1_m} = \frac{\text{MPR2_m}}{N_o/2} + \frac{\text{MPR2_m}}{N_o/2} \cdot \frac{F_r}{H} + \frac{\text{MPR2_m}}{N_o/2} + \frac{\text{MPR2_m}}{N_o/2} \cdot \frac{F_r}{H}
\]

\[
\text{MPR1_m} \rightarrow \text{market potential of commodity output of a first-order reproducer in meat poultry production}
\]

- \(F_r\) – increased selection pressure.
When determining the livestock of the breeding and genetic centre, all normative ratios typical for breeding purposes increased by 2 times, which was taken into account in the corresponding algorithm:

$$ MPBGC_m = \frac{MPR1_m / N_0 / 4 + MPR1_m / N_0 / 4 * \frac{r}{h}}{hens} \quad MPBGCm - \text{market potential of commodity output of a breeding and genetic center in meat poultry production}$$

$$ 4 \text{ - increased selection pressure.}$$

The next step in this assessment methodology was to determine the market potential of related products. Due to the fact that there is no market potential for related products in meat poultry farming, we will consistently present the calculations, starting with the second-order grower.

$$ MPCPR2_m = \frac{MPCPR2_m / N_0 * m_{c} * S_{s} * S_{egg-laying hen} + MPCPR2_m / N_0 * m_{c} * S_{s} / * \frac{r}{h} * m_r}{chicken}$$

$$ + \frac{MPR2_m * m_c * S_0}{sorted-out chicks}$$

$$ MPCPR2m - \text{market potential of co-products of a second-order reproducer in meat poultry production}$$

$$ m_c - \text{meat yield from one chicken}$$

$$ S_{s} - \text{percentage of safety stock}$$

$$ m_{egg-laying hen} - \text{average mass of an egg-laying hen}$$

$$ m_r - \text{average mass of a rooster}$$

$$ m_{c} - \text{average mass of a chick}$$

$$ S_0 - \text{weight of sorted-out chicks}$$

Similar calculations of the market potential of poultry meat for the first-order grower are presented by the following algorithm:

$$ MPCPR1_m = \frac{((MPR2_m / N_0 / 2 + MPR2_m / N_0 / 2 / 2) * m_{egg-laying hen} + MPR2_m / N_0 / 2 * \frac{r}{h} + MPR2_m / N_0 / 2 / 2 * \frac{r}{h}) * m_r}{hens} * m_{c} \cdot S_{s}$$

$$ + \frac{MPR2_m / N_0 \cdot m_{c} \cdot S_{0}}{chickens}$$

$$ MPCPR1m - \text{market potential of co-products of a first-order reproducer in meat poultry production}$$

Taking into account the required standards, the market potential of related products in the breeding and genetic centre was calculated, the mathematical expression of which has the following form:

$$ MPCPBGC_m = \frac{(MPR1_m / N_0 / 4 * m_{egg-laying hen} + MPR1_m / N_0 / 4 * m_r / \frac{r}{h} * m_{c} * S_{s}}{roosters}$$

$$ + \frac{MPR1_m / m_{c} * S_{0}}{sorted-out chicks}$$

$$ MPCPBGCm - \text{market potential of co-products of a breeding and genetic center of meat poultry production}$$

The market potential of by-products is presented as the output of feathers, fat and droppings at all hierarchical levels of production of the main and related products, which are formalized for commercial production by the following algorithms:

$$ MPBP_{feathers}CP_m = MPBO_m * %_{feathers}$$

$$ MPBP_{fat}CP_m = MPBO_m * %_{fat}$$

$$ MPBP_{litter}CP_m = MPBO_m * m_t * T$$

$$ MPBP_{feathersCPm} - \text{market potential of by-products (feathers) of commercial production in meat poultry production}$$

$$ MPBP_{fatCPm} - \text{market potential of by-products (fat) of commercial production in meat poultry production}$$
MPBP\text{Litter}CPm \text{ – market potential of by-products (litter) of commercial production in meat poultry production} \\
\%\text{feathers} \text{ – feather output from 1 kg of poultry meat, } \% \\
\%\text{fat} \text{ – fat yield per 1 kg of meat, } \% \\
m_l \text{ – weight of poultry litter, kg} \\
T \text{ – the duration of raising and keeping poultry, depending on the group of production purpose and the age of the poultry} \\
The basis for calculating feathers and fat is the volume of not marketable, but related products, but with respect to droppings, the biomass yield per head is used [15]. This approach is typical when calculating the market potential of by-products in reproducers of the 2nd and 1st order, as well as in the breeding and genetic centre, the mathematical apparatus of which is illustrated by the following algorithms:

in a second-order reproducer:
\[
\begin{align*}
\text{MPBP}_{\text{feathers}}^{R2_m} &= \text{MPCPR}_{2_m} \times \%\text{feathers} \\
\text{MPBP}_{\text{fat}}^{R2_m} &= \text{MPCPR}_{2_m} \times \%\text{fat} \\
\text{MPBP}_{\text{litter}}^{R2_m} &= \text{MPR}_{2_m} \times m_l \times T 
\end{align*}
\]

MPBP_{\text{feathers}}^{R2_m} \text{ – market potential of by-products (feathers) of a second-order reproducer in meat poultry production} \\
MPBP_{\text{fat}}^{R2_m} \text{ – market potential of by-products (fat) of a second-order reproducer in meat poultry production} \\
MPBP_{\text{litter}}^{R2_m} \text{ – market potential of by-products (litter) of a second-order reproducer in meat poultry production} \\

in a first-order reproducer:
\[
\begin{align*}
\text{MPBP}_{\text{feathers}}^{R1_m} &= \text{MPCPR}_{1_m} \times \%\text{feathers} \\
\text{MPBP}_{\text{fat}}^{R1_m} &= \text{MPCPR}_{1_m} \times \%\text{fat} \\
\text{MPBP}_{\text{litter}}^{R1_m} &= \text{MPCPR}_{1_m} \times m_l \times T 
\end{align*}
\]

MPBP_{\text{feathers}}^{R1_m} \text{ – market potential of by-products (feathers) of a first-order reproducer in meat poultry production} \\
MPBP_{\text{fat}}^{R1_m} \text{ – market potential of by-products (fat) of a first-order reproducer in meat poultry production} \\
MPBP_{\text{litter}}^{R1_m} \text{ – market potential of by-products (litter) of a first-order reproducer in meat poultry production} \\

in a breeding and genetic center:
\[
\begin{align*}
\text{MPBP}_{\text{feathers}}^{\text{BGC}} &= \text{MPCPBGC} \times \%\text{feathers} \\
\text{MPBP}_{\text{fat}}^{\text{BGC}} &= \text{MPCPBGC} \times \%\text{fat} \\
\text{MPBP}_{\text{litter}}^{\text{BGC}} &= \text{MPBGC} \times m_l \times T 
\end{align*}
\]

MPBP_{\text{feathers}}^{\text{BGC}} \text{ – market potential of by-products (feathers) of a breeding and genetic center in meat poultry production} \\
MPBP_{\text{fat}}^{\text{BGC}} \text{ – market potential of by-products (fat) of a breeding and genetic center in meat poultry production} \\
MPBP_{\text{litter}}^{\text{BGC}} \text{ – market potential of by-products (litter) of a breeding and genetic center in meat poultry production} \\

Thus, the presented methodology for assessing market potential can be classified as universal for other sectors of the agro-industrial complex. It is built on the conceptual principles of obtaining appropriate products on the basis of a single hierarchical level, taking into account the specific features of each of the subsectors.

3. Conclusion

Integrating the results of the study, it can be stated that the market potential of poultry meat has niche segments in relation to the meat of turkeys, guinea fowl, quail, as well as processed products in general in terms of the balance of poultry meat. Along with this, there are reserves for increasing the export
potential of this target market. However, in order to identify a possible vector of development for expanding the market potential of poultry meat, it is necessary to assess it and forecast the output parameters of the directions for expanding this assortment portfolio. In this regard, the study involved the study of theoretical aspects of market potential, the results of which clarified the interpretation of its concept. Along with this, a structured model of the relationship between economic entities when receiving products is given, taking into account its hierarchy. It was these developments that served as a platform for a conceptual approach to the methodology for assessing the market potential of poultry products. Its adaptation in relation to the poultry industry was carried out taking into account the specifics of the production of products at each hierarchical level, starting with commercial production. At the same time, the applied nature of the developed methodology and its effectiveness consisted in an integrated approach of the entire set of products obtained from the main, accompanying and secondary products on the basis of standard values specific to each business process.

Thus, theoretical and practical developments regarding the market potential of poultry products for poultry meat will contribute to the development of this market segment.

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