Trends and economic forecast of sustainable development of world production of meat and meat products

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Abstract

The article presents an analysis of the world production of meat and meat products in general, by type and by region, and a forecast for production of poultry meat is calculated. In general, the world market of meat and meat products is characterized by positive trends in increasing production and processing volumes, expanding the range, which is reflected in the level of consumption by the population. In most countries, production of meat and meat products is focused on the domestic market. An assessment of the dynamics of exports and imports of meat and meat products is given, a forecast for world exports of poultry meat is made. The dynamics was studied and a forecast of sustainable production and export of chicken meat in Poland was given. The results of the analysis carried out are necessary to assess the level of food security and its determinants, as well as to develop a strategy that takes into account current trends in the global agriculture food market. Promising directions for sustainable development of the global meat and meat products market have been developed: development and effective use of innovative resource-saving technologies, improving quality and competitiveness of products, taking into account consumer preferences and food personalizing, strengthening national positions and increasing export supplies to the international food market.

Keywords: production of meat, meat products, forecast, exports, imports, sustainable production, food security, innovative technologies.

Introduction

Providing the population with food is the main element of the economic and social security of a state. The most important factor in the system of ensuring national food security is the agricultural and food market. The ever-increasing world population and rising incomes create a high demand for food, including meat and meat products, the expansion of production of which is limited by possibilities of using resources.

The world structure of meat production by types is changing towards an increase in the share of cheap types of meat. Stable and safe provision of the population with meat products, the main source of animal protein and other valuable components in the diet, is one of the most important conditions for achieving a quality standard of living and food security of the state. The supply of meat and meat products at the level of consumption of a medically justified norm is achieved as a result of interaction of agriculture, processing, service, trade and public catering, which, in close relationship with the final consumer, forms the market for meat and meat products. The market for meat and meat products, being formed at the level of national economies, is at the same time an integral part of the world food market. In this regard, study of trends and determination of prospects for development of the market for meat and meat products necessitate research taking into account the processes characteristic of the current stage of

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The agricultural food market is characterized by global trends, such as:

– creation of new products of various functional orientations, expansion of production of products for children (with a high content of probiotics, vitamins, etc.);
– increased attention of consumers and manufacturers to the content of ingredients in products;
– transition to the criteria of sustainable production, providing for traceability of raw materials and technologies, use of certified palm oil and other ingredients, ecological packaging of the product and transparency of information for the consumer;
– sustainable preservation of the dominant position of world leaders in the field of food production;
– strengthening the role of corporate and product brands in the formation of the added value of products and the innovative direction of development of companies as a key factor in competition in the global food markets (Pilipuk, A. V., Kondratenko, S. A., 2019).

The goal is to study main trends in the development of the global meat and meat products market and develop promising directions for its development, taking into account the features, principles and modern factors.

**Material and methods**

An important place in implementation of foreign trade food policy at various levels is occupied by a system of planning, organization, analysis, a comprehensive study of the competitive environment and monitoring of agricultural food markets. In this context, the experience of different countries in building a national system for monitoring foreign agricultural food markets is interesting. For example, the USA has an Agricultural Marketing Service (AMS) with a budget of $1.2 billion. AMS provides manufacturers with research and technical information about the national food transportation system, shippers, exporters. Also assists in planning and design of marketing facilities, processes and methods in conjunction with state and local governments, universities, and other entities in the US food industry.

The European Union (EU) operates the European System of Integrated Research Networks in Agriculture (ESCORENA), a network of research and educational institutions specialized in monitoring global, regional (EU market) and national food markets. ESCORENA operates as a neutral platform where participants from different parts of the world can participate. Its main objectives are to promote voluntary exchange of information and experimental data on selected topics, support joint research projects, develop cooperation between European researchers and institutions working on similar topics, disseminate and promote the transfer of European technologies, and cooperation with developing countries.

The research methodology is a systematic approach to modern conditions of functioning and development of the world production of meat and meat products. In the process of research, general scientific methods of theoretical knowledge were used: statistical and logical analysis, synthesis, comparison, deduction and generalization, classification, etc. A methodological approach to sustainable development has been developed based on construction of predictive models that reflect the world production and export of poultry meat.

**Results and discussion**

At this stage, the volume of the world market of meat and meat products is more than 2 trillion USD, which is equal to 2.4% of the world’s gross domestic product (GDP) (FAOSTAT, 2022). Figure 1 shows the dynamics of world meat production.
The data shown in Figure 1 shows that the volume of world meat production in 2020 amounted to 338.1 million tons, which is higher by 0.26% compared to 2019, and by 0.86% compared to 2017. However, in 2019, compared to 2018, it decreased by 1.71%.

Figure 2 shows the world meat production by region.

The data shown in Figure 2 shows that the largest meat production was achieved in Asia: in 2020 – 134.5 million tons, which is 1 million tons lower than in 2019. Europe occupies the second position in terms of meat production: in 2020 – 65.5 million tons, which is 1.2 million tons higher than in 2019. Asia is the only region in which a decrease in meat production was recorded, which is due to the negative impact of African swine fever in China, the Philippines, and Vietnam. In North and South America, during this period, production increased by 1% and amounted to 53.8 and 46 million tons, respectively.

Figure 3 shows the structure of world meat production by regions.

The data shown in Figure 3 show that in 2020, Asia occupies the largest share in the total structure of world meat production – 40%, which includes the largest meat-producing country – China, which accounts for the share of 23.1% of world production. Next came Europe (19%), North America (16%), South America (14%), Africa (6%) and other countries (5%).

Figure 4 shows the dynamics of world meat production by type: poultry, pork, cattle and sheep.
The data shown in Figure 4 shows that the global production of pork and cattle meat decreased in 2020 compared to 2019 (by 0.27% and 0.11% respectively) due to restrictions on the purchase, transportation of animals, interruptions in supplies due to the epidemiological situation. A shorter production cycle of poultry meat contributed to an increase in its production over the study period – by 1.36%, despite outbreaks of bird flu in a number of European countries. The increased demand in the food market for poultry meat was provided by the USA, the Russian Federation, Turkey and the Republic of Belarus.

Figure 5 shows the structure of world meat production by types.

The data shown in Figure 5 show that in 2020 the largest share in the total structure of world meat production is occupied by poultry meat (39%), pork meat (33%), cattle meat (21%), sheep meat (5%), other (2%).

Let’s fulfill the forecast of poultry meat in the world for the period up to 2025. Let’s build a trend equation, for this we choose a polynomial growth curve of the second degree, since it more accurately repeats the dynamics of the original time series (Figure 6).

The curve for poultry meat in the world is described by the equation: $y = -0.0839x^2 + 2.7275x + 86.61$.

$R^2 = 0.943$.
Using the equation obtained on the graph, we calculate the forecast for the world production of poultry meat (table 1).

Table 1 – Forecast of the increase in world production of poultry meat

<table>
<thead>
<tr>
<th>Title</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
<th>Growth rate, 2025/2021, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>World production of poultry meat, million tons</td>
<td>99.2</td>
<td>101.6</td>
<td>103.1</td>
<td>104.4</td>
<td>105.4</td>
<td>106.3</td>
</tr>
</tbody>
</table>

Source: build by the author

The data presented in Table 1 show that the growth rate of world poultry meat production in 2025 compared to 2021 will be 6.3%, which reflects a steady trend in its development.

The most likely scenario is based on an extrapolation of current trends in global production of meat and meat products. Extrapolation was carried out using the standard FORECAST function of MS EXCEL. When calculating in this way, the method of linear regression was used. Prospects for development of world production of meat and meat products are determined taking into account external factors: the growth rates of the resource base, population growth, income growth, which are taken at the level of actual data for the last six years. A sustainable scenario assumes intensive economic growth through the introduction of innovative technologies in production and management. Implementation of this scenario for development of the world production of meat and meat products is possible with an increase in the quality, safety and competitiveness of products.

Table 2 shows the dynamics and forecast of chicken meat production in Poland.

Table 2. Dynamics and forecast of sustainable production and export of chicken meat in Poland, thousand tons

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</tr>
</thead>
<tbody>
<tr>
<td>production of chicken meat</td>
<td>1465,6</td>
<td>1483,9</td>
<td>1492,7</td>
<td>2079,9</td>
<td>2110,7</td>
<td>2200,3</td>
<td>probable</td>
<td>2419,63</td>
<td>2595,09</td>
<td>2770,55</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>stable</td>
<td>2540,61</td>
<td>2724,84</td>
<td>2909,07</td>
</tr>
<tr>
<td>export of chicken meat</td>
<td>488,1</td>
<td>618,4</td>
<td>725,3</td>
<td>812,5</td>
<td>920,5</td>
<td>941,2</td>
<td>probable</td>
<td>1076,9</td>
<td>1170,01</td>
<td>1263,13</td>
</tr>
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<td></td>
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<td></td>
<td></td>
<td>stable</td>
<td>1130,75</td>
<td>1228,52</td>
<td>1326,29</td>
</tr>
</tbody>
</table>

Source: build by the author

It should be noted that in most countries, production of meat and meat products is focused on the domestic market. Meat consumption per capita in 2020 decreased from 43.3 to 43 kg compared to 2019, due to a decrease in the purchasing power of the population and a temporary ban on eating in public places due to coronavirus infection (Review of the market of meat and meat products of the Republic of Belarus, 2022).

The main factor influencing the sustainable global production of meat and meat products is intensification of foreign economic cooperation. As the structure of consumption and production changes, trade in agricultural products, raw materials and food play an important role in meeting needs of the population of food-deficit countries (Efimenko, A. G., Mitskevich, B., 2020, Volkova, E. V., 2019, Mickiewicz, B., Efimenko, A., Volkova E., 2021).

Figure 7 shows the dynamics of the volume of world exports and imports of meat.

Figure 7. The volume of world exports and imports of meat in 2016–2020, million tons

Source: suggested by the author
The data shown in Figure 7 shows that global meat exports in 2020 amounted to 41.7 million tons, which is 15.6% higher than in 2019. Average annual export growth rate for 2016–2020 is 7%, which significantly exceeds the average annual growth rate of world meat production (equal to 0.7%). World meat imports in 2020 increased by 15.43% compared to 2019 and amounted to 38.9 million tons.

Figure 8 shows the dynamics of the volume of world exports and imports of meat by region.

The data shown in Figure 8 shows that in 2020 Europe is the largest exporter of meat (the share in the total export structure is 21.1%) – 11.5 million tons, then North America – 10.7 million tons and South America – 10.5 million tons (the share of which in the total export structure is 20.3%). The share of Asian countries in the total structure of world meat imports is approximately 63%, which is due to the continuing influence of African swine fever and in 2020 is 22.8 million tons. The largest importer is China, which accounts for 30% of world imports. In 2020, China’s imports are 11.7 million tons, which is 57.6% higher compared to 2019.

Figure 9 shows the structure of world meat trade by types.

The data shown in Figure 9 show that in 2020 the largest share in the total structure of world meat production is occupied by poultry meat (37%), pork (31%), beef (28%), mutton (3%), other (1%).

Let’s fulfill the forecast of world poultry meat exports until 2025. Let’s build a trend equation, for this we choose a linear growth curve, since it repeats the dynamics of the original time series more accurately (Figure 10).

Using the equation obtained on the graph, we will calculate the forecast for the world production of poultry meat (table 3).
Table 3. Forecast of the world production of poultry meat

<table>
<thead>
<tr>
<th>Title</th>
<th>2021</th>
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</tr>
</thead>
<tbody>
<tr>
<td>World export of poultry meat, million tons</td>
<td>13.2</td>
<td>13.6</td>
<td>13.9</td>
<td>14.2</td>
<td>14.5</td>
<td>109.8</td>
</tr>
</tbody>
</table>

Source: build by the author

Calculations showed that the growth rate of world poultry meat exports in 2025 compared to 2021 will be 9.8%, which reflects a steady trend in both production and exports.

The factor influencing the development of exports is the level of international prices for meat, which decreased both in general and for each type of meat in 2020. The decline is due to an excess of export supplies in the face of a widespread reduction in imports, especially for countries that account for 70% of imports. Despite lower prices and reduced purchases, global imports have increased (mainly due to increased pork imports to China). Figure 11 shows world meat prices by types for years 2019–2020.

Figure 12 shows the FAO price index (FAOSTAT, 2022).

Figure 12. FAO price index in 2016–2020, 2014–2016=100

Source: suggested by the author

The data shown in Figure 7 shows that the average annual meat price index in 2020 was 95.5%, which is 4.5% less compared to 2019, and compared to 2017 – 4.5%. The price index, for example, for poultry meat decreased by 9.8%, and the average annual price per ton from 1374 USD in 2019 to 1239 USD in 2020.

Conclusions

Achieving food security based on sustainable growth in production should take into account the balance in the interstate distribution of resources and sources of commodity flows, which leads to increased interdependence of the agricultural food sector and international trade. The current stage of development of the world food market is characterized by constant changes in conditions, principles and risks. The principle of orientation of production to consumer interests and preferences is dominant in the system of market relations, which is aimed at increasing the competitiveness of products and involves continuous improvement.
of technical and technological base, flexibility and efficiency of production and management, taking into account market conditions, changing needs and national traditions.

The market of meat and meat products is one of dynamically developing sectors of the world economy. Main directions of formation and development of sustainable production of meat and meat products are:

- creation of equal conditions for implementation of entrepreneurial activities of various forms of ownership and business entities;
- harmonization of regulations and other documents establishing mandatory compliance

References


