Dynamic analysis and forecast of effective development of the agri-food sector of European countries

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Abstract
One of the relevant and demanded directions at this stage is the creation of modern tools for analytical and predictive projects in the development of the agri-food sector. Of particular importance is the substantiation of the globalization of agri-food markets, the integration of various types of activities, ensuring food security, development of exports and imports of agricultural products, levelling the standards of food consumption by various social strata of the population. Research into the problems of food security and independence of the European countries is necessary to substantiate a strategy for the development of the agri-food sector, including its sustainable innovative development. In modern conditions, the active participation of various countries in the world and regional trade is associated with significant competitive advantages. It allows to more efficiently use the available resources, to join the world achievements of science and technology, to modernize the economy at the optimal time, to more fully meet the needs of the population. In this article, an integrated approach is applied, which includes the study, assessment and forecast of various processes and factors of innovative development of the agri-food sector in modern conditions.

Keywords: common agricultural policy, European Union states, agri-food sector, assessment, export, import, forecast.

Introduction
At the present stage, the Common Agricultural Policy is a set of forms and methods of orderly activities of the states of the European Union (hereinafter referred to as the EU) and their institutions, aimed at the formation of a rational and sustainable development of agriculture and its territories within the European community. The Common Agricultural Policy ensures efficient agricultural production and food security through the use of subsidies and stable food prices (at the minimum level). It defines the main role of the EU in world food production and trade: the EU countries account for 17% of the world food exports. The EU ranks second as a world exporter of dairy products, pork and third in poultry and grain exports (European Commission. Agriculture in the European Union - Statistical and Economic Information - Report 2010).

The EU agricultural sector is continuing to expand agricultural production to meet the growing global demand for food, which as the Food and Agriculture Organization (FAO) predicts, will increase by 70% by 2050 (European Commission. The CAP towards 2020. Meeting the food, natural resources and territorial challenges of the future.

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Today, as part of efforts to address global and regional food security in the face of climate change, new approaches to agriculture are being developed. One of such approaches, called Climate Smart Farming, is based on the need to farm in a way that can both increase productivity while being more resilient to climate change and reducing greenhouse gas emissions (FAO and EU see prospects for electronic agriculture development, 2020).

The agri-food sector of the European countries in the 21st century should be innovative and environmentally friendly, with a large number of "green" technologies that can meet the needs of the population for high-quality food and alternative fuels, while maintaining competitiveness in world markets.

To increase the efficiency of food production in the European Union, a course has been taken to stimulate research and innovation in the agricultural sector. Knowledge is becoming a decisive factor in increasing the productivity of the European agriculture and a factor in strengthening the EU's position in world food markets. The intensification of scientific and innovative activities in this area, stimulation of innovations and giving impetus to the innovative development of agricultural production are in line with the new EU development strategy until 2020, which provides for sustainable growth using "smart technologies", which will provide the EU countries with an advantage in the international competition market.

**Material and methods**

Official statistical information on innovation activity is formed on the basis of data from annual statistical observation. The methodology is based on the international recommendations of the economic cooperation organization and the Oslo Manual Guidelines organization for the collection and analysis of data on innovations, and innovation is defined as the end result of innovative activity, embodied in the form of a new or improved product, a new or improved technological process used in practice, or in a new approach to social services (Oslo Manual Guidelines. Recommendations for collecting and analyzing innovation data. Joint publication by OECD and Eurostat, 2010).

In this article, an integrated approach is applied, which includes the study, assessment and forecast of various processes and factors of innovative development of the agri-food sector in modern conditions.

The goals of agricultural development in the European Union countries are to ensure the food security of the EU countries; increasing the productivity of the agricultural sector with the optimal use of production factors (for example, labour, the introduction of the achievements of scientific and technological progress); ensuring normal standards of living for rural residents, in particular, increasing the level of individual income; stabilization of markets; providing an opportunity for the supply of products; guaranteeing fair living standards for the rural population; creating secure access to food supplies; providing consumers with food at affordable prices.

Each European country has its own peculiarities: geographic location, natural and climatic conditions, population density, factors of agricultural production, the achieved level and potential of innovative development. competitiveness in food markets, etc.

**Results and discussion**

The analysis showed that every European countries produce about 13% of the world's agricultural products and food (the share of livestock products is 5% higher than crop production) (Figure 1.)
The share of European countries in the overall structure of world trade in agricultural products and food is shown in Figure 2.

**Export**

![Export Diagram]

**Import**

![Import Diagram]

In 2018, European countries exported more than 80% of the world’s cheese, 74% of chocolate, 70% of butter, 67% of eggs, 62% of barley and 60% of dairy products; they import about half of the world’s volume of cheeses, cocoa and chocolate, coffee, butter, eggs, etc.

The main export goods of European countries are alcoholic and non-alcoholic beverages, dairy products, meat, fish, grain and finished products from it, etc.; as for import goods, they are fruits, alcoholic and...
non-alcoholic drinks, dairy products, meat, fish, vegetables, etc. (Figure 3).

**Export**

![Export chart](image)

**Import**

![Import chart](image)

**Figure 3 – Commodity structure of foreign trade of European countries in agricultural products and food in 2018, %**

Source: the figure is compiled according to TRAIDEMAP data

The total value of exports of agricultural products and foodstuffs to European countries in 2018 exceeded USD 675 bn, imports amounted to USD 650 bn. About 75% of trade flows are related to mutual trade within the region, mainly due to the countries of the European Union. In dynamics for 2016 - 2018 exports exceeded imports by USD 20 bn (Figure 4).

**Figure 4 – Dynamics of foreign trade of European countries in agricultural products and food in 2018, USD bn.**

Source: the figure is compiled according to UNCTAD data

Table 2 presents data on the turnover of the European countries that are most involved in the world trade in agricultural products and foodstuffs. A significant volume of export deliveries is observed in the Netherlands, Germany, France, Spain, Poland and Great Britain (while Germany and Great Britain have a negative foreign trade balance).

The highest density of foreign trade flows in the European continent is concentrated within the European Union (about 87% of exports and 90% of imports of the continent). In recent years, the EU countries have had a positive foreign trade balance. A distinctive feature of trade relations in the EU is the dominance of mutual trade both in export deliveries (over 73%) and in import purchases (about 70%) between themselves (Figure 5).

**Table 2 – European countries most involved in world trade in agri-food products, USD m**

| Country   | Export 2010 | Import 2010 | Balance 2010 | Export 2018 | Import 2018 | Balance 2018 | 2018 to 2010. % |
|-----------|-------------|-------------|--------------|-------------|-------------|--------------|----------------|
| Denmark   | 17636.9     | 11128.8     | 6508.1       | 19473.9     | 13738.6     | 5735.4       | 110.4          | 123.5          |
| France    | 61212.5     | 51056.4     | 10156.1      | 69071.1     | 62154.1     | 6917.0       | 112.8          | 121.7          |
| Germany   | 68692.2     | 79304.6     | -10612.3     | 81393.0     | 95315.5     | -13922.4     | 118.5          | 120.2          |
| Greece    | 5561.2      | 8169.5      | -2608.2      | 7107.4      | 7895.1      | -787.6       | 127.8          | 96.6           |
| Hungary   | 7190.5      | 4280.4      | 2910.1       | 9589.9      | 6543.4      | 3046.5       | 133.4          | 152.9          |
| Country   | Year 2000 | Year 2005 | Year 2010 | Year 2015 | Year 2016 | Year 2017 | Year 2018 |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Italy     | 35007.4   | 44320.9   | -9313.4   | 47186.5   | 49012.0   | -1825.6   | 134.8     | 110.6     |
| Netherlands | 83031.1  | 49422.2   | 33608.8   | 109343.4  | 72175.4   | 37168.0   | 131.7     | 146.0     |
| Norway    | 9445.2    | 6121.7    | 3323.5    | 12944.4   | 8057.9    | 4886.6    | 137.0     | 131.6     |
| Poland    | 16966.1   | 13313.7   | 3652.4    | 33743.1   | 22261.5   | 11481.6   | 198.9     | 167.2     |
| Spain     | 37077.7   | 33155.6   | 3922.1    | 54348.1   | 41791.0   | 12557.1   | 146.6     | 126.0     |
| Great Britain | 25836.5 | 56297.5   | -30461.0  | 31004.7   | 64182.9   | -33178.2  | 120       | 114.0     |

Source: the table is based on UNCTAD data

**Export**

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**Import**

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**Figure 5 – Share of foreign trade in agricultural products and food of European countries in the total structure of the world market, %**

Source: the figure is compiled according to UNCTAD data

The dynamics of the net production value of food products in the European countries is presented in Figures 6 and 7, the forecast is in Table 3.
Table 3 – Forecast of the net value of food production in European countries in the total structure of exports of goods

| Country | Forecasted value, USD bn | Growth rate, % 2023/2016 |
|---------|--------------------------|--------------------------|
|         | 2019 | 2020 | 2021 | 2022 | 2023 |
| Poland  | 19.7 | 19.8 | 19.9 | 20.0 | 20.1 | 104.1 |
| Bulgaria| 3.35 | 3.4  | 3.45 | 3.5  | 3.6  | 109.1 |

Source: these are the author’s calculations

According to the calculations performed, by 2023 the projected value of the net value of food production in Poland will reach USD 20.1 bn, which is 3.3% higher than in 2016 and in Bulgaria - 9.1%.

The dynamics of the added value in agriculture in different countries per worker is presented in Figures 8 and 9. The forecast is in Table 4.

Figure 8 – Dynamics of value added in agriculture per worker in Poland, USD thou

Source: these are the author’s calculations

Figure 9 – Dynamics of value added in agriculture per worker in Bulgaria, USD thou

Source: these are the author’s calculations

Table 4 – Forecast of value added in agriculture per worker

| Country | Forecasted value, USD thou | Growth rate, %. 2023/2018 |
|---------|---------------------------|---------------------------|
|         | 2019 | 2020 | 2021 | 2022 | 2023 |
| Poland  | 6.61 | 6.68 | 6.76 | 6.89 | 7.0  | 107.7 |
| Bulgaria| 11.3 | 12.4 | 15.6 | 17.8 | 22.5 | 210.2 |

Source: these are the author’s calculations

According to the calculations, by 2023, the predicted value of value added in agriculture per worker in Poland will reach 7 thousand US dollars, which is an increase of 7.7% compared to 2018 and in Bulgaria - an increase of almost 2 times.

An important factor in the innovative development of the economies of the European countries is the development of foreign trade. The volume of exports of goods and services in Poland in 2018 amounted to 325.3 billion US dollars, imports - 305.3 billion. In the structure of exports of goods and services, the largest share is occupied by mechanical engineering products (43%), food (13%), light industry and pulp and paper industry (8%), construction services (5%). Every year, goods and services become more competitive in the global and European markets. It should be noted, that the export of food products (fruits and vegetables, meat and dairy products) tends to increase (in recent years, the growth rate was 3.4%) (Figure 10).

Figure 10 – Share of food exports in Poland in the total structure of exports of goods, %

Source: these are the author’s calculations
The share of food exports in Bulgaria in the total structure of exports of goods is shown in Figure 11.

**Figure 11 – Share of food exports in Bulgaria in the total structure of export of goods, %**

Source: these are the author's calculations

The forecast of the share of food exports from various European countries (Poland, Bulgaria) in the total structure of exports of goods is shown in Table 5.

**Table 5 – Forecast of the share of food exports from various European countries in the total structure of exports of goods**

| Country | Forecasted value, % | Growth rate, % 2023 / 2018 |
|---------|---------------------|--------------------------|
| Poland  | 12.9                | 14.2                     |
| Bulgaria| 14.9                | 24.8                     |

Source: these are the author’s calculations

According to the calculations, by 2023 the projected value of the share of food exports in Poland will reach 14.2% in the total structure of exports of goods and services; in Germany - 6.8%; in Greece - 23.5% and in Bulgaria - 24.8%.

**Conclusions**

The agri-food sector of the European countries in the 21st century should be innovative and environmentally friendly, with a large number of "green" technologies that can meet the needs of the population for high-quality food and alternative fuels, while maintaining competitiveness in world markets.

The intensification of scientific and innovative activities in this area, stimulation of innovations and giving impetus to the innovative development of agricultural production are in line with the new EU development strategy until 2020, which provides for sustainable growth using “smart technologies”, which will provide the EU countries with an advantage in the international competition market.

Agricultural development in the European Union countries are to ensure the food security of the EU countries; increasing the productivity of the agricultural sector with the optimal use of production factors; ensuring normal standards of living for rural residents; stabilization of markets; providing an opportunity for the supply of products; guaranteeing fair living standards for the rural population; creating secure access to food supplies; providing consumers with food at affordable prices.

It allows to more efficiently use the available resources, to join the world achievements of science and technology, to modernize the economy at the optimal time, to more fully meet the needs of the population.

The analysis and forecast of foreign economic activity showed that during the study period there is an increase in trade turnover, the main share of sales in foreign markets in the total volume of exports falls on agricultural products and the most active trade is developing within the European Union, which provides a synergistic effect from interaction and cooperation.
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