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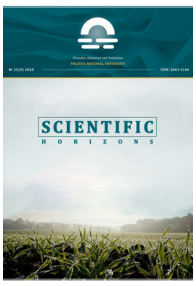

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Foreign-Economic Priorities of the Development of Investment Infrastructure of Agri-Food Production Entities

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Abstract. The article considers foreign economic priorities of investment infrastructure development of agri-food production entities of Ukraine. A comprehensive methodological approach to assessing the effective diversification of investment infrastructure of agri-food production entities has been developed. It is substantiated diagnostics of attracting foreign direct investment in the development of agri-food production allows forming an export-oriented type of state economy, identify the main sources of technical equipment for agribusiness and master innovative technologies, form production potential and mechanism for implementing strategic investment goals. An algorithm for calculating the level of attractiveness of the investment infrastructure of agri-food production entities has been developed. The dynamics of foreign trade in agri-food products of the steppe zone of Ukraine is given. The amount of foreign direct investment from foreign economic activity of agri-food production entities in the economy of the regions of the Steppe zone of Ukraine is determined. The geography of agri-food exports of the steppe zone of Ukraine in the international trade markets is presented. The forecast volume of exports of agri-food products in the regions is calculated and the limit parameters of indicators of attractiveness of investment infrastructure of subjects at attraction of direct foreign investments from foreign economic operations are defined

Keywords: foreign direct investment, foreign economic activity, investment infrastructure, agri-food production entities, export, import

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INTRODUCTION

The rapid growth of world trade determines one of the most important trends in the global economy – a high degree of foreign economic activity, increasing the volume of which allows to form an export-oriented type of economy, which is typical of Western Europe and North America. In this trend, the positions of other countries are strengthening, such as China, "4 Asian Tigers", India, etc. In addition, foreign economic integration of developed countries in the technological process of ensuring a high-quality structure of production in countries with weak economies requires finding alternative scenarios for investment development of agri-food production in international trade relations, given competitive advantages in international markets.

It should be noted that agri-food production of countries with weak economies requires specific areas to optimize the impact of numerous external and domestic factors, including – the dynamics of increasing world trade in agriculture and processing industry, stabilization of foreign economic export potential and foreign investment. At the same time, taking into account the specifics of the formation of the cost of agri-food production, it should be noted that the conditions and restrictions of foreign trade significantly affect the final price of products, which determines the level of its competitiveness. This requires assessing the impact of international markets on changes in the competitiveness of agri-food production, which differs in many groups of indicators: prices, production volumes, export-import of goods by country, consumption in domestic markets of exporting and importing countries, the number of global exporting competitors, major world importers-consumers, the size of customs tariffs, the volume of quotas for duty-free imports and temporary quotas, the volume of stocks of exporting and importing countries, the degree of investment development of agri-food production in product (market) terms, the share of foreign exchange earnings, etc.

Research of the newest problems of formation of competitiveness of agri-food sector in the conditions of globalization is made in the works of I. Iholkin [1], S. Kvasha, V. Vlasov and N. Kryvenko [2], A. Kliuchnyk [3], Yu. Zaitsev [4], A. Zavhorodnii [5], Zh. Zosymova [6]. The following works are devoted to the study of the problems of development of foreign economic activity of agri-food enterprises: Yu. Kozak, N. Prytula and O. Yermakova [7], P. Leonenko and O. Cherepnina [8]. In turn, the problems of foreign trade development, in particular agricultural products, are a priority for the following scientists: M. Lepekha, H. Svyrydenko [9], D. Lukianenko, A. Poruchnyk and L. Antoniuk [10], M. Makarenko [11], M. Zos-Kior and N. Sokolova [12]. Based on the obtained results of formation of competitiveness of agri-food sector in the conditions of globalization, a powerful school of international economic relations was formed, where trade relations play a special role, the research of which is carried out by C. Berry [13], N. Čučković, J. Krešimir, V. Vučković [14], J. Davis and R. Gilbert [15], M. Gort [16], I. Kirzner [17], M. Moraliyska [18], M. Porter [19], M. Rafat [20], D. Rodrik [21], J. Svobodová, L. Dömeová and A. Jindrová [22], W. Su, D. Zhang, C. Zhang, J. Abrhám, M. Simionescu, N. Yaroshevich and V. Guseva [23]. Despite the obtained scientific achievements, the doctrine of agri-food development requires further research, eliminating negative crises and stimulating territorial socio-economic growth, primarily by determining foreign economic priorities for investment development of agri-food production in the context of international trade relations.

The priority of our study is the implementation of a comprehensive methodological approach to assessing the effective diversification of investment infrastructure of agri-food entities, which under the influence of foreign direct investment in agribusiness determine investment opportunities in foreign economic activity, provide foreign exchange earnings to the economy of the state, activate the export potential of regional producers in international trade markets.

MATERIALS AND METHODS

Foreign economic activity as a system of economic relations, due to the movement of commodity and financial resources in the context of globalization of agri-food production is a vector of economic development of any country. It defines the activities of the subjects of economic relations of the state and foreign entities engaged in cooperation and partnership both on its own territory and abroad. Foreign economic priorities of agri-food production entities are often identified with the implementation of foreign trade operations, the share of which reaches 80% of the total volume of international relations. International diversification, which takes place under the influence of technological processes for commercial and social purposes, enables entrepreneurs to effectively use existing marketing levers in the domestic market and form proposals at the global level, constantly increase investment efficiency, increase profits, reduce existing business risks through effective business environment management. Thus, the effective functioning of the economy of agricultural enterprises cannot happen without a developed system of foreign economic relations in the agricultural sector. The inclusion of the agri-food sector in the system of world economic processes and the formation of effective strategies for foreign economic activity of agricultural enterprises has a positive effect on the development of the agricultural sector and contributes to increasing the technical level of production, eliminating shortages of certain goods, rational use of natural resources and improving the living standards of the population [22].

The general approaches to assessing the effectiveness of the strategy of diversification of investment infrastructure of agri-food production entities (AFP) are

exports; joint venture; direct investment [2]. At the same time, a comprehensive system for assessing the diversification of investment infrastructure in foreign economic activity of agricultural entities provides: 1) identification of its strengths and weaknesses based on critical analysis of economic effects and economic efficiency of each type and direction of foreign economic transactions; 2) identification of development reserves and minimization of the complex of costs; 3) optimization of the structure of foreign economic operations and increase their efficiency.

In terms of the methodological approach to assessing the effectiveness of the implementation of measures for the development of investment infrastructure of foreign economic activity from foreign trade operations, the following indicators are most often used: indicators of full efficiency of exports and imports, as well as the effect of their use.

Full export performance indicator [24]:

$$ke = \frac{V_e}{S_e} \quad (1)$$

where V_e – the value of exported products at foreign trade prices or foreign exchange earnings from sales of products on the international market; S_e – the cost of purchasing export products or the cost of purchasing national goods for sale on the international market.

Export effect [24]:

$$E_e = V_e - S_e \quad (2)$$

Full import efficiency indicator [24]:

$$k_i = \frac{V_i}{S_i} \quad (3)$$

where V_i – the value of imported products at foreign trade prices or foreign exchange funds spent on the purchase of imported goods; S_i – the cost of purchasing national goods similar to imported ones.

Effects from imports [24]:

$$E_i = V_i - S_i \quad (4)$$

The implementation of foreign economic priorities for the development of investment infrastructure (AFP) at the regional level is diagnosed by defining a system of quantitative and qualitative indicators, which include the openness ratio, the index of actual comparative advantage, the balance of international trade and more. The description of the most important indicators allows:

1) to quickly and objectively form an idea of the state, development trends and efficiency of technological processes of AFP for the entry of products and goods on the world market;

2) determine the level of competitiveness of agricultural and food products;

3) to establish a promising commodity and geographical structure of international trade in agri-food products;

4) identify the weaknesses and strengths of the enterprises of the region's AFP as participants in foreign economic activity [2].

To determine the level of risk of territorial orientation of export-import operations of agri-food products, we propose to use the index of risk of geographical diversification (IDR), which helps to determine the level of risk of product groups in their exports and imports. Geographical diversification of exports is the distribution of export supplies of goods among a large number of importing countries in order to reduce the risk of possible losses of markets, increase the efficiency of foreign trade operations, resulting in priority conditions for international relations, reduces the risk of export transactions (connected with political, economic, legal factors), as well as expanding opportunities to overcome negative situations when changing market conditions [24].

In view of the above, effective geographical diversification of exports (imports) is associated with a more or less even distribution of export (import) products among a relatively large number of importing (exporting) countries. The risk index of geographical diversification is calculated by formula (5), [24]:

$$IDR = \sum_{i=1}^{m} E_i - {}^{m}/_{n} \quad (5)$$

where n – is the total number of importing countries of a particular product; m – is the number of importing countries whose exports exceed or equal to the average value of exports formula (6), [24]:

$$\overset{1}{\underset{m}{E_i}} \geq E_c, \; E_c = E/n \quad (6)$$

where $\sum_{i=1}^{m} E_i$ – the volume of exports of certain goods in m countries.

In turn, IDR depends on the total number of countries to which the goods are exported, the number of countries to which exports exceed or equal to the average value, as well as the total volume of exports to these countries. The value IDR ranges from 0 to 1, because [24]:

$$\sum_{i=1}^{m} E_i \geq mE_c \quad \text{or} \quad \sum_{i=1}^{m} E_i \leq 1 \quad (7)$$

Obviously, the smaller the number of countries whose exports exceed E_c, the greater the value IDR, and vice versa. That is, with significant volumes of exports to a small number of countries, there is a diversification risk, and when combined with other risks (political, economic, etc.) poses a threat to exports of this product. If exports are evenly distributed (i.e., with an increase in the number of countries whose exports exceed E_c), the risk of exporting a particular product decreases [24]. However, most often the efficiency of the investment infrastructure of agri-food production entities at the

state (or regional) level is determined through the use of a system of absolute indicators of export-import operations, etc.

Methodical principles of diagnosing the state of attracting foreign direct investment in the development of agri-food production allows to form an export-oriented type of state economy, identify the main sources of technical equipment for agribusiness and master innovative technologies, form production potential and mechanism for implementing strategic investment goals of the region. Most countries with weakened economies need to significantly increase investment in the real sector of the economy, create an effective and adapted system for attracting investment capital to ensure economic growth in the regions, improve the socio-economic situation and improve the welfare of the population. It is in the field of agri-food production that investment activity is a source of food and economic security of the state, a guarantor of the development of its industries in the regions and the implementation of environmental principles of natural resources. Accordingly, the stabilization of the macroeconomic situation in the country allows not only to optimize the investment processes of agri-food production (AFP), but also to ensure a sufficient level of investment activity of economic entities at the international level.

The efficiency of attracting foreign investment is closely related to increasing the economic efficiency of agri-food production and the assessment of international cooperation takes into account the specific features of this sector at the regional level, namely: the degree of foreign investment in industries and the effectiveness of innovative technologies to improve processing quality and storage of agricultural products, use of resources, saturation of the domestic market with high quality food, creation of new jobs, increase of export potential, establishment of economic relations between economic entities, etc. [18].

Implementation of foreign economic priorities for the development of investment infrastructure of agri-food production is associated with the formation of a comprehensive, dynamic and structurally balanced system that can sufficiently intensify investment processes, ensure production and technological modernization, expand production capacity, increase efficiency, and strengthen competitiveness of agro-industrial production in general. The system of investment infrastructure of agri-food production acquires the character of horizontal-vertical cooperation (in the form of a "map" of institutional elements at the intersection of planes "management levels – functions"), where horizontal interaction is manifested through the creation and coordination of institutional elements of the system at the micro, meso, sectoral, macro and global levels; vertical integration - the interaction of elements of the system in order to implement the main functions, which should perform a full and developed investment infrastructure of the industry complex. At the same time, the integrated assessment of the investment infrastructure of agri-food entities in the regions of the country should include a set of quantitative and qualitative indicators that determine its impact on foreign economic priorities of cooperation and attracting foreign investment in the agricultural sector. Quantitative indicators in their entirety are ranked according to the level of impact on the ratio of investment resources in the fixed capital of agri-food entities, which indicates their investment activity, while identifying indicators that determine its risk component [25]. The comparison of quantitative and qualitative indicators is made using a scale, according to which each individual indicator receives a weighting factor according to the method of priorities. That is, the foreign economic priorities of agri-food production entities depending on the value of the investment infrastructure indicator in the region are classified as [26]: low investment infrastructure of agri-food production entities in the region – $K<0.05$; below average – $0.05<K<0.1$; intermediate level – $0.1<K<0.2$; above average – $0.2<K<0.4$; high – $K>0.4$.

It should be noted that for most agribusiness entities it is important to implement investment projects. One of the most important criteria for evaluating investment projects is the financial probability of its implementation, which is characterized by the availability of sufficient financial opportunities. To determine the effectiveness of the project, quantitative characteristics are used, which are based on individual qualitative characteristics.

The main methods and indicators for assessing the effectiveness of investment projects are given in (Table 1). The choice of investment option can be made by discounting future income. Entities of agri-food production, implementing an investment project, evaluate it based on a comparison of expected income and costs for the acquisition and operation of such a project.

***Table 1**. The main methods and indicators for evaluating the effectiveness of investment projects*

Indicator	Calculation algorithm	Legend
Static methods in assessing the effectiveness of investment projects		
Payback Period of Investments (PP)	*PP=min n,* at which $\sum_{k=1}^{n} DK_k \geq I$	where DK_k – annual income from the project for the *k-th* year; I– investment costs; n – the number of years of calculation
Accounting Rate of Return (ARR)	$ARR = \frac{NP}{1/2 \times (CL + I)}$	The indicator is often compared with the rate of return on advanced capital, which is calculated by dividing the total net profit of the enterprise by the total amount of funds advanced to its activities (the sum of the average net balance)
Dynamic methods in assessing the effectiveness of investment projects		
Present Value (PV)	$PV = \sum_{k=1}^{n} \frac{DK}{(1+r)^k}$ $NPV = \sum_{k=1}^{n} \frac{DK_k}{(1+r)^k} - I$	
Net Present Value (NPV)	If the investments related to the future implementation of the project are carried out in several stages (intervals – m years), then the calculation – m years), then the calculation NPV is as follows: $NPV = \sum_{k=1}^{n} \frac{DK_k}{(1+r)^k} - \sum_{k=1}^{m} \frac{I}{(1+r)^k}$	where DK – the amount of cash flow; I – the amount of initial investment (costs); r – discount rate (rate); n– project implementation time
Internal Rate of Return (IRR)	*IRR=r,* at which *NPV=IRR=0*	*IRR>CC* – the project should be accepted; *IRR<CC* – the project should be rejected; *IRR=CC* – the project is neither profitable nor unprofitable. Where *CC* – cost of capital
Profitability Index (PI)	$PI = \sum_{k=1}^{n} \frac{DK_k}{(1+r)^k} \div I$	*PI*>1, the project should be accepted; *PI*<1 – to abandon it; *PI*=1, the project is neither profitable nor unprofitable
Modified internal Rate of Return (MIRR)	$\sum_{k=0}^{n} \frac{OC_k}{(1+r)^k} = \frac{\sum_{k=1}^{n} PC_k \times (1+r)^{n-k}}{(1+MIRR)}$	where PC_k – cash inflows in the period; OC_k– cash outflow in the period (in absolute terms); r – discount rate (or cost of capital); n – duration of the project
Discounted Payback Period (DPP)	*DPP=min n*, at which $\sum_{k=1}^{n} \frac{DK_k}{(1+r)^k} \geq I$	Under the condition of discounting, the payback period increases, i.e., always *DPP>PP*. Given a low discount rate, typical of a stable economy, the indicator improves the result by a small amount, but at a higher discount rate changes the estimated value of the payback period (i.e., a project acceptable by criterion *PP*, may be unacceptable by criterion *DPP*)

***Source**: summarized by the authors according to data [27]*

The projected income is calculated from the annual income from the operation of capital implementations (technologies) during their validity, while the investment is made simultaneously. In this regard, the amount of investment in capital implementation is determined in order to obtain the required income for some time [26]. Such calculations are called discounting of future income, and the amount to be paid for capital investments at present – the discounted value. The discounted value depends on the interest rate. The discounted value (D_c) for the same amount of annual income is calculated by formula (8) [26]:

$$D_c = {}^{O}/_{(1+I_r)^x} \quad (8)$$

where: O – the amount to be received by the agri-food entity at the annual interest rate of the bank (I_r); x – the number of years during which the annual income is expected.

If the annual return on investment is different, the size of the discounted value (D_p) is determined by formula (9) [28]:

$$D_p = \frac{O_1}{(1+I_r)^1} + \frac{O_2}{(1+I_r)^2} + \ldots + \frac{O_3}{(1+I_r)^n} \quad (9)$$

where O_1, O_2, O_n – expected amounts of annual income, EUR; n – the number of years during which annual income is expected.

When making decisions about long-term investments, there is a need to predict their effectiveness. To this end, a long-term analysis of income and expenses is made. The methods that are taken into account in the analysis of the diversification of investment infrastructure of the agri-food entity are divided into 2 groups. It depends on the time factor: static (based on accounting estimates); dynamic (based on discounted estimates). Static methods, where cash flows that arise at different times are considered equivalent (i.e., the concept of change in the value of capital over time is not used) and are characterized by indicators: PP, ARR. Dynamic methods, where the cash flows that appear during the project, are reduced to an equivalent basis by discounting and ensure the comparability of different cash flows, are characterized by indicators: NPV, IRR, PI, DPP, MIRR. The algorithm for calculating the level of attractiveness of the investment infrastructure of agri-food production entities is proposed in Figure 1.

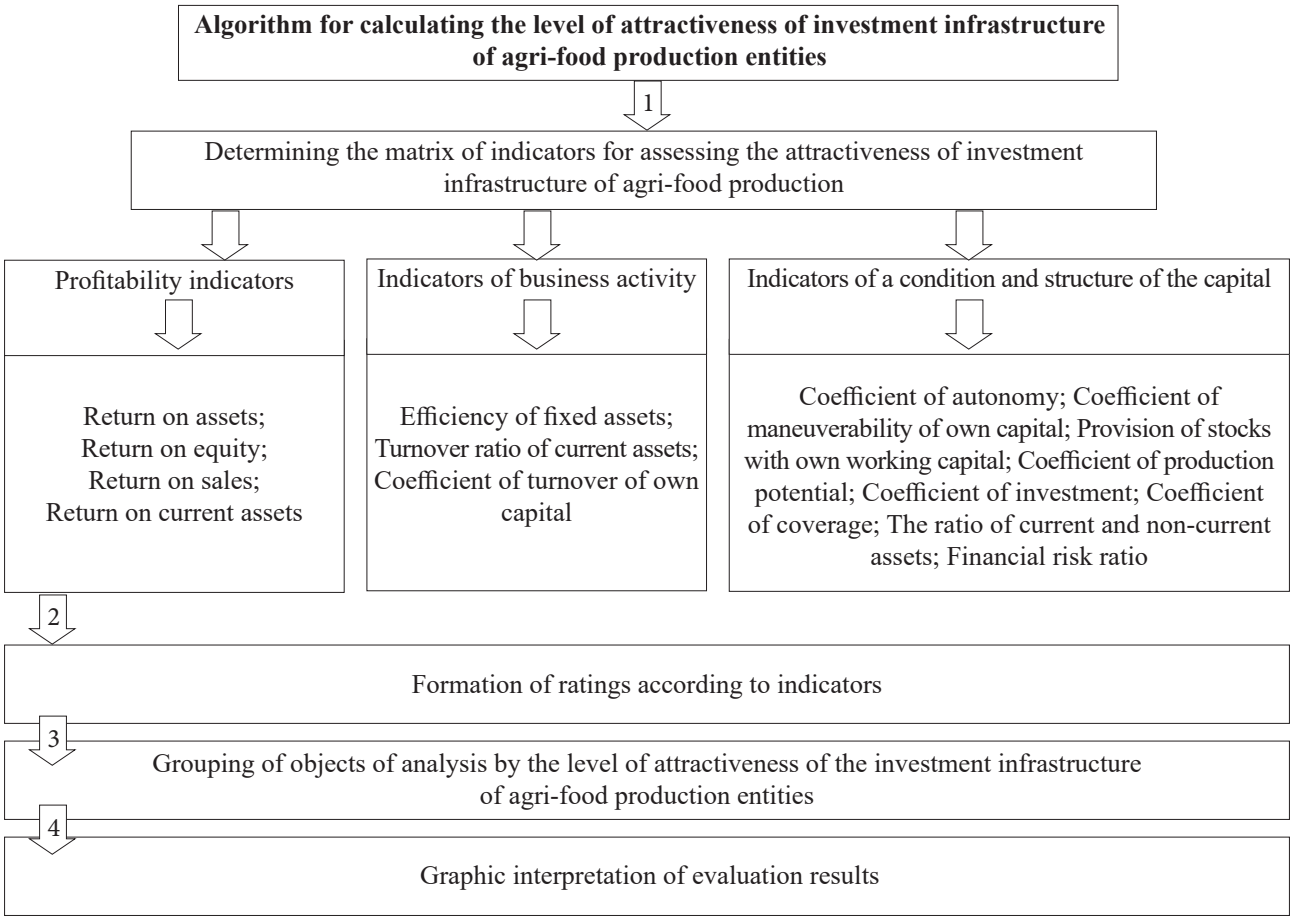

***Figure 1**. Algorithm for calculating the level of attractiveness of investment infrastructure of agri-food production entities*

***Source**: developed by the authors*

The scientific society uses methods of rating the attractiveness of the investment infrastructure of agri-food entities, based on their financial and economic indicators, among which are: Global 1000; Fortune 500; Business Week 1000. These methods are used to estimate the value of assets, income, quality of investment, growth of current and non-current assets and the level of market value of enterprises [29]. Estimation of attractiveness of investment infrastructure according to the offered algorithm is defined for subjects of agri-food production on the basis of the analysis of the corresponding groups of indicators given in (Table 2).

***Table 2**. Indicators of attractiveness of investment infrastructure of agri-food production entities*

Indicators	Determination algorithm	Score (1 point)
	Profitability indicators	
Return on assets	Net profit (loss) / Average annual value of assets	>0.14
Return on equity	Net profit (loss) / Average annual cost of equity	>0.2

Table 2, Continued

Indicators	Determination algorithm	Score (1 point)
Profitability of realization	Gross profit (loss) / Net income from sales	Increasing
Return on working capital	Net profit (loss) / Average annual value of current assets	Increasing
	Indicators of business activity	
Efficiency of fixed assets	Net income from sales / Average annual value of fixed assets	Increasing
Turnover ratio of current assets	Net income from sales of products / Average annual value of current assets	Increasing
Equity turnover ratio	Net income from sales / Average annual cost of capital	Increasing
	Indicators of the state and structure of capital	
Coefficient of autonomy	Equity / Balance Currency	>0.5
Equity maneuverability ratio	Own working capital / Equity	Increasing
Provision of inventories with own working capital	Own working capital / Inventories	Increasing
Coefficient of production potential	Current assets + Fixed assets / Balance sheet currency	Increasing
Investment ratio	Non-current assets / Equity + Long-term liabilities and collateral	>1
Coverage ratio	Current assets / Current liabilities	>1
The ratio of current and non-current assets	Current assets / Non-current assets	
Financial risk ratio	Liabilities / Equity	>1

***Source**: compiled by the authors based on data [30]*

Increasing the attractiveness of investment infrastructure of AFP entities and increasing the efficiency of their foreign economic activity depends on the accelerated adaptation of domestic institutions and institutes to market conditions and the formation of an effective, stimulating regulatory framework for their activities in the domestic and foreign markets. Institutional approaches at the state level to support, stimulate and protect national agricultural producers, form the export potential of AFP entities, and optimize the commodity and geographical structure of agricultural exports need to be reviewed. Particular attention should be paid to increasing the share of ready-to-eat products in agricultural exports. At the same time, imports should be dominated not by food, but by technology, modern equipment and resources for the organization of modern agricultural production. We propose to introduce diagnostics of ensuring the attractiveness of the investment infrastructure for the development of foreign economic activity of the agri-food production entities of the region at the regional (state), sectoral and business levels (i.e., at the macro, meso and micro levels). With this in mind, for such an assessment at the regional (state) and sectoral levels, we propose to use integrated methods of assessment of Macro- and MesoIPFEA-analysis (macro- and meso-infrastructural support of foreign economic activity), which allow to determine the system, share value of influence and forecast the dynamics of environmental factors, in particular: customs, consulting, legal, information-analytical, marketing, personnel, insurance, banking, logistics (Fig. 2).

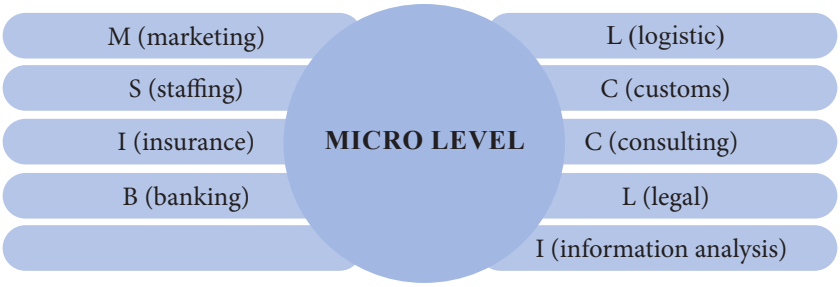

***Figure 2**. MicroIPFEA-analysis of ensuring the attractiveness of investment infrastructure for the development of foreign economic activity of entities of agri-food production of the region*

***Source**: developed by the authors according to data [31]*

At the same time, the basic elements of the development of the investment infrastructure of the region's AFP entities in the implementation of foreign economic activity should be: state admin-istration bodies (State regional administrations, city councils, Customs of the State Fiscal Admin-istration); financial and credit institutions, organizations, investment funds and companies in the region; scientific and research institutions, organizations; subjects of agri-food production; foreign trade firms and intermediaries (commodity exchanges of the agro-industrial complex), insurance institutions and organizations of the region; logistics and forwarding companies; territorial bodies of the State Fiscal Service, the Antimonopoly Committee, the Department of the State Food and Con-sumer Service. We believe that the proposed comprehensive methodological approach to assessing the effectiveness of diversification of investment infrastructure of agri-food production in foreign economic activity, taking into account all factors and conditions of territorial and sectoral development, should have a basic platform of the above methods, which provide the formation of the analytical basis of the investment business environment, uniting institutions, organizations and economic entities for the sustainable development of the agri-food sector of the regions in order to integrate it into the international economic system for successful business, growth of gross value added in eco-nomic areas activities and gross domestic product of the state. This will meet the demand for goods and services, create the conditions for effective investment and modernization of production, the introduction of innovative technologies. The proposed methods are based on expert assessment of the effectiveness of factors, is a set of quantitative (integrated) effects due to the manifestation of certain factors on the development of foreign economic activity of agri-food production, the relationship and interdependence between which determines their priority.

RESULTS AND DISCUSSION

The modern economic complex of Ukraine consists of socio-economic systems of the regions, each of which has its own characteristics of composition and development. Thus, the dynamics of the volume of export-import operations of the Steppe zone regions, their geographical structure allows the subjects of agri-food production to develop promising areas of foreign trade (Fig. 3).

The total volume of foreign trade turnover of agri-food production in the Steppe zone increased from 2011 by 41.9% to the mark of 102.3 million EUR, i.e., reached a maximum for the period under study, despite the fact that in 2017 its regression to the mark of 73.1 million EUR was recorded. The volume of regional agri-food exports during the study period increased 2 times to the level of 87.3 million EUR, while the level of its growth compared to 2016 was 24.5%. This state is marked by the trend line of the linear function, which is described by the equation with the approximation value R^2=0.840.

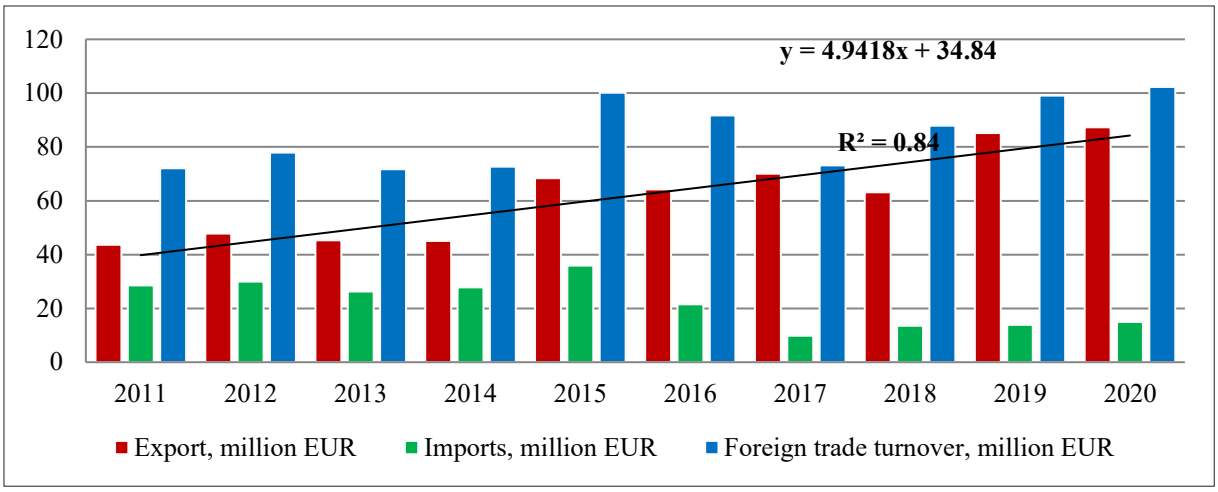

***Figure 3**. Foreign trade of agri-food products of the regions of the Steppe zone of Ukraine for 2011-2020, million EUR*

***Source**: calculated by the authors according to data [32]*

The structure of agri-food exports and imports of the administrative regions of the Steppe zone of Ukraine is presented in Figure 4-5. Thus, the largest volume of agri-food production in the Steppe zone of Ukraine is carried out by the entities of the Mykolayiv region, the volume of which in 2020 amounted to 44.7 million EUR. At the same time, the increase in exports against the level of 2011 increased by 72.1%, while against 2016 it amounted to only 38.2%. The total volume of export of agri-food products of the Mykolayiv region exceeded the indicator of the Zaporizhzhia region on the average for 2018-2020 on 5.4%, the Kherson region – in 7.2 times.

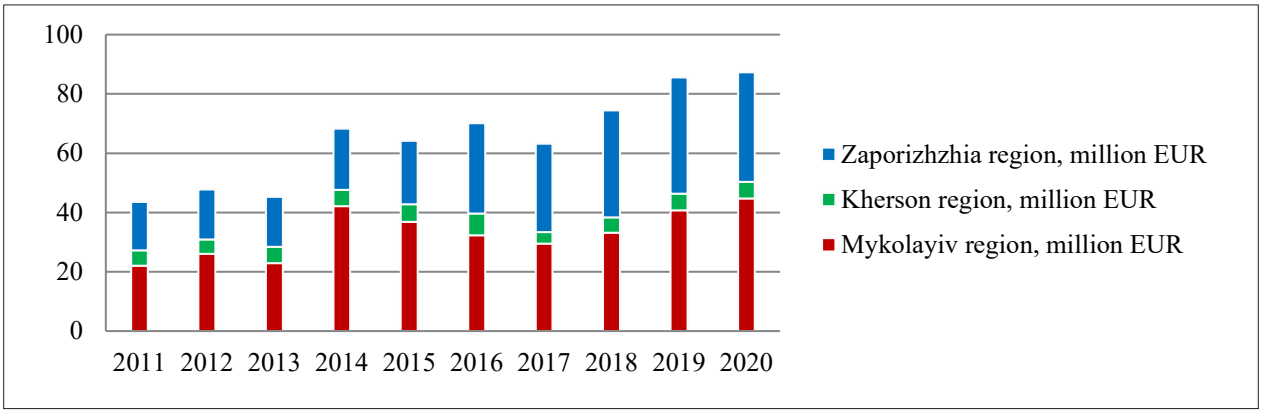

***Figure 4**. The structure of exports of agri-food products in terms of administrative regions of the Steppe zone of Ukraine for 2011-2020, million EUR*

***Source**: calculated by the authors according to data [32]*

The volume of agri-food imports, in contrast to the dynamics of export operations in terms of administrative regions of the Steppe zone of Ukraine, has a negative tendency to decrease (the average value for 2018-2020 – 14.1 million EUR). At the same time, over the last ten years (2011-2020) its volumes have decreased by 49.8% and in relation to the level of 2016 – by 30.7% respectively. The leader of import operations on agricultural products and food products is the Zaporizhzhia region, but since 2016, there has been a clear trend to slow down the import of agri-food products by 31.5%. On average, in 2018-2020, products were imported only by 10.6 million EUR, but this figure exceeds the total value of the Mykolayiv and Kherson regions by 3.4 times.

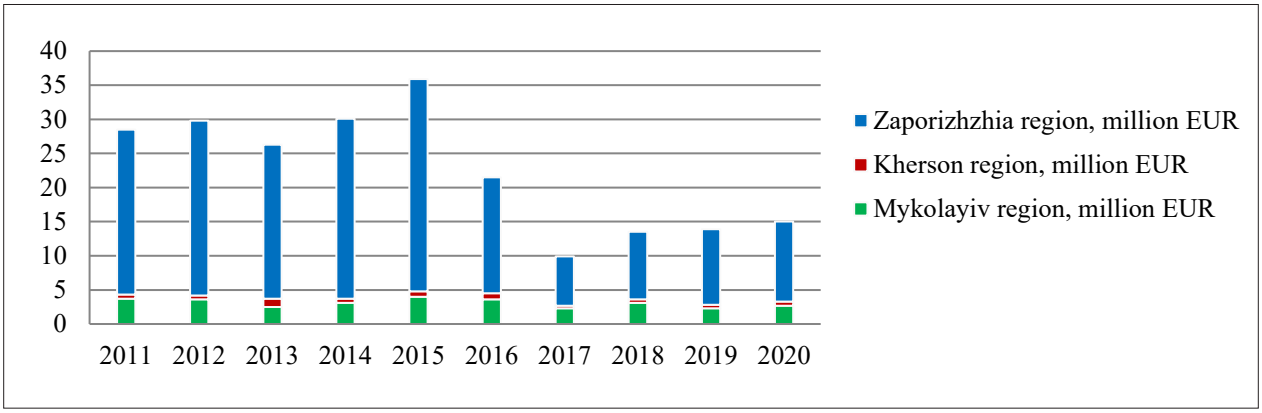

***Figure 5**. The structure of imports of agri-food products in terms of administrative regions of the Steppe zone of Ukraine for 2011-2020, million EUR*

***Source**: calculated by the authors according to data [32]*

It should be noted that the specialization of agri-food production entities in the regions of the Steppe zone is manifested in the commodity structure of foreign trade operations (Fig. 6). Thus, in 2011 there was an increase in exports of live animals and products of animal origin in 2.3 times and products of plant origin – in 2.2 times. However, in 2020, exports of products under the group "Fats and oils of animal or vegetable origin" and "Prepared food products" fluctuated at the level 17.0% and 22.8% respectively. The growth of total agri-food exports in the Steppe zone of Ukraine in 2020 compared to 2016 is less accelerated – only by 24.5% (82.7% compared to 2011). The reason for this situation is the reduction by 25.2% the share of exports by group of goods "Live animals, products of animal origin".

The largest share in the structure of agri-food exports of the Steppe zone of Ukraine is provided by the food market of plant products, the average amount of income from which for 2018-2020 amounted to 60.9 million EUR; the group of products "Animal or vegetable fats and oils" and "Prepared food products" provided an average of 11.8 and 7.9 million EUR respectively; export of products "Live animals; products of animal origin" – only 1.5 million EUR, or 1.9% of the total.

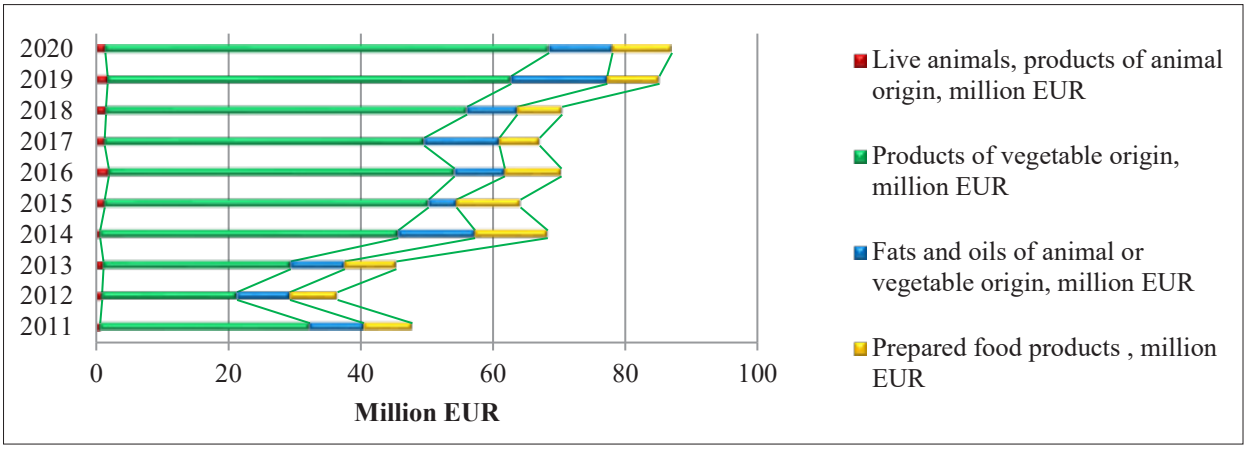

Figure 6. *Export of agri-food products of economic entities of the Steppe zone of Ukraine by groups of goods for 2011-2020, million EUR*

Source: *calculated by the authors according to data [32]*

The largest volume of foreign direct investment comes (FDI) to the economy of the Zaporizhzhia region, the amount of which on average for the period 2018-2020 amounted to 111.9 million EUR, which is 5.6-5.8 times higher than their income to the Mykolaiyv and Kherson regions, respectively. At the same time, since 2010 in general in the regions of the Steppe zone there has been a trend of increasing FDI involvement within 13.7-39.8%. However, in 2020 compared to the level of 2014 there was a tendency to reduce the amount of investment from the world (Virgin Islands, UK, Cyprus, Monaco, the Netherlands, Germany, Panama, Singapore, USA, France, Switzerland) by 19.5%, 18.2% and 27.8% respectively (Fig. 7).

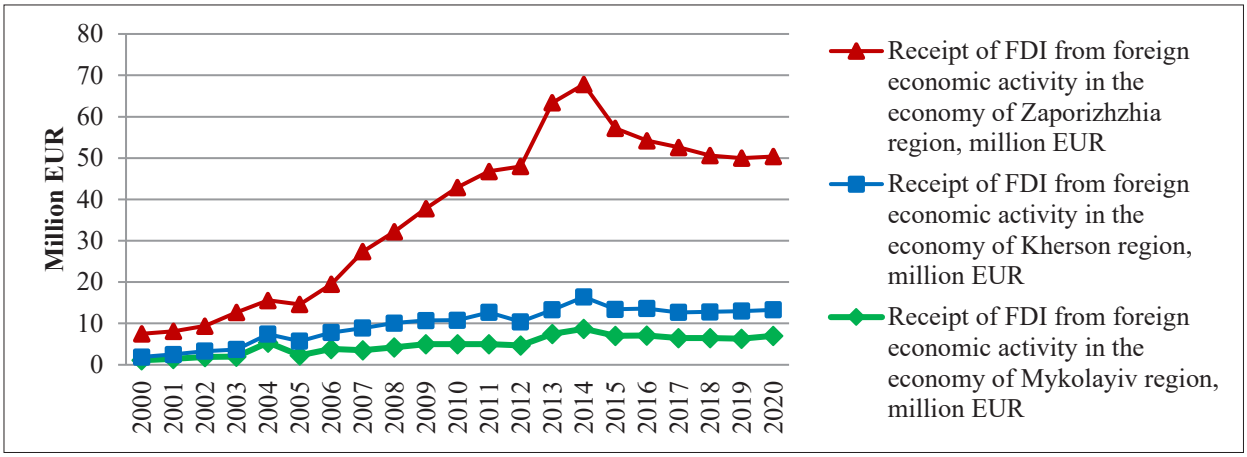

Figure 7. *FDI inflows from foreign economic activity of agri-food production entities into the economy of the regions of the Steppe Zone of Ukraine for 2000-2020, million EUR*

Source: *calculated by the authors according to data [32]*

The total amount of attracted foreign direct investment from foreign economic activity in the investment infrastructure of the agri-food production of the Steppe zone is presented in Figure 8.

Sectoral distribution of foreign direct investment from foreign economic activity involved in the infrastructure of agri-food production of the Steppe zone allows to stabilize the production po-tential and increase the investment attractiveness of agriculture, forestry and fisheries, ensure food, beverage and tobacco production (Fig. 9).

It should be noted that in 2020, the distribution of foreign direct investment at the level of 5.7% provided 0.4 million EUR additional funds for the development of agriculture, forestry and fisheries. The increase in foreign investment in the production of food, beverages and tobacco to 94.3% provided 0.7 million EUR in cash inflows to the Steppe regions. The main investor who invests in the development of agri-food production entities from foreign economic activity is Cyprus, due to preferential taxation.

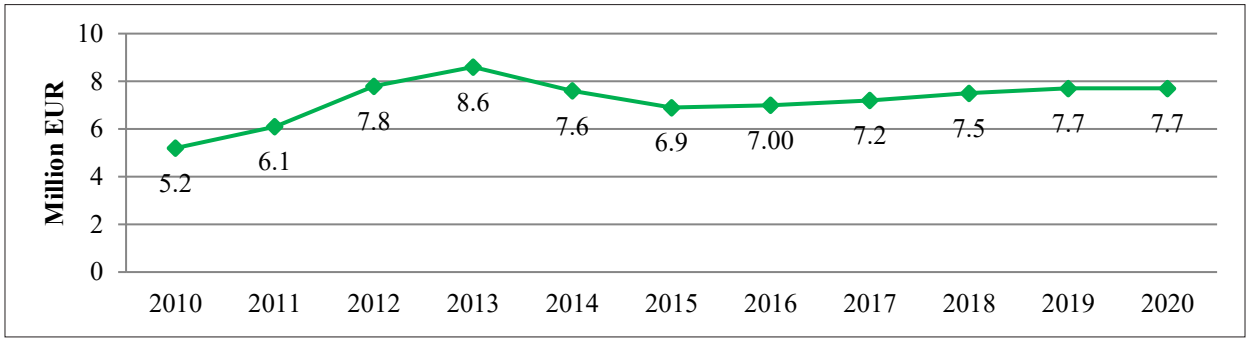

***Figure 8**. Attracting FDI for the development of investment infrastructure of agri-food production entities of the Steppe zone for 2010-2020, million EUR*

***Source**: calculated by the authors according to data [32]*

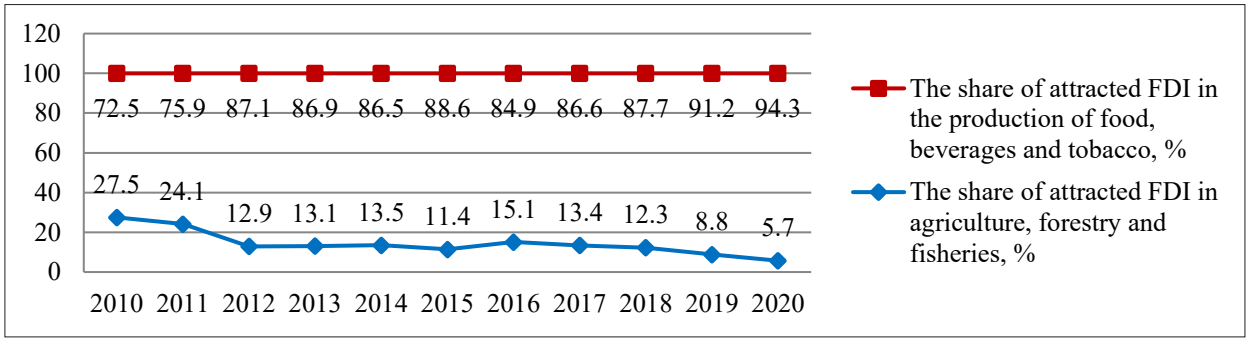

***Figure 9**. Sectoral distribution of FDI involved in the investment infrastructure of agri-food production of the Steppe zone for 2010-2020, %*

***Source**: calculated by the authors according to data [32]*

The geography of sales of agri-food products of the Steppe zone of Ukraine for the last 2010-2020 has significantly expanded in Europe and Asia (Fig. 10-11). Supplies to the Middle East and North Africa are relatively stable; exports to Southeast Asia have increased 8 times in recent years, in the EU – in 13 times. In 2020, compared to 2019, the leaders who increased the supply of Ukrainian food are: Germany, where the increase was 8.2 million EUR, reaching the value of 20.5 million EUR of imports from Ukraine; Saudi Arabia (increase 7.1 million EUR to the amount of 18.1 million EUR); Philippines (increase 5.5 million EUR to the amount of 9.9 million EUR); Iraq (increase 5.2 million EUR to the amount of 10.9 million EUR); Indonesia (increase +5.0 million EUR to the amount of 15.5 million EUR).

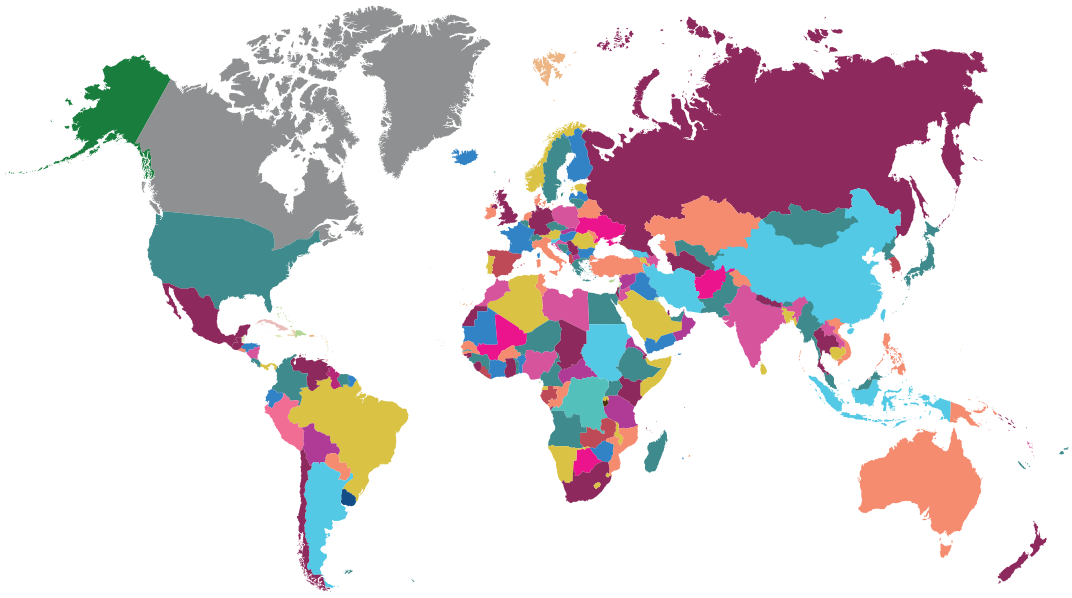

***Figure 10**. Geography of agri-food exports of the Steppe zone of Ukraine in international trade markets*

***Source**: built by the authors according to data [33]*

To predict the size of exports of agri-food products of the studied regions of the Steppe zone, we choose the method of time trend. The solution to the extrapolation problem is to find a dependence $X=f(t)$ that describes with sufficient accuracy the behavior of the variable X in the past and at the same time is also defined for some time interval in the future. The choice of the type of function is based on a theoretical analysis of the essence of the phenomenon, which studies the nature of its dynamics. Usually, preference is given to functions whose parameters have a clear economic meaning and measure the absolute or relative rate of development.

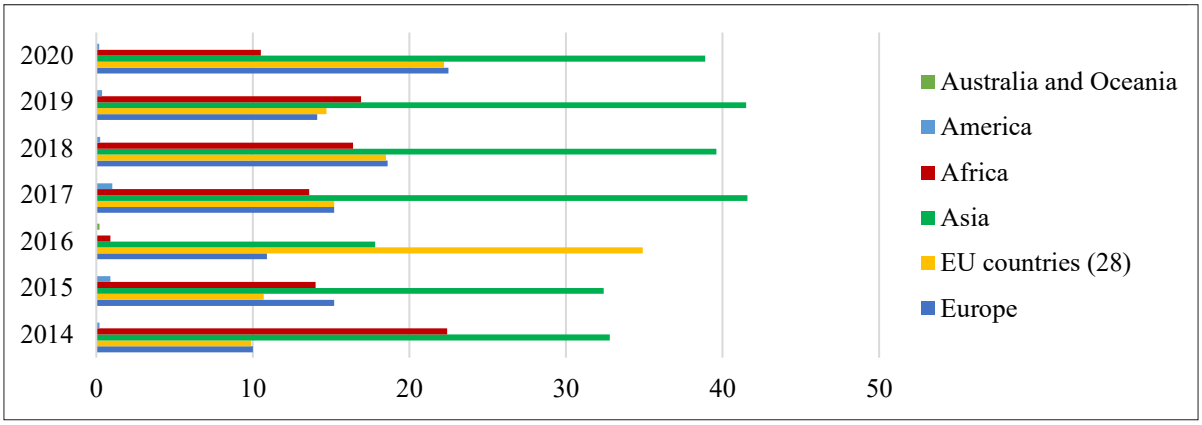

Figure 11. *Geographical structure of agri-food exports to one region of the Steppe zone of Ukraine for 2014-2020, %*
Source: *calculated by the authors according to data [32]*

When choosing the functions, the analysis of the chain characteristics of the intensity of dynamics is used. If the chain absolute increments are relatively stable, do not have a clear tendency to increase or decrease, the alignment of the series is performed on the basis of a linear function: $Y_t=a+bt$. If the chain growth rates are relatively stable, then the exponent $Y_t=ab^t$ is the most adequate to this type of dynamics. In these functions t – is the ordinal number of the period (date), and a – is the level of the series at t=0. The parameter b characterizes the rate of dynamics: the average absolute in the linear function and the average relative in the exponent. When the characteristics of the rate of development increase (or decrease), we use other functions (parabola of the 2nd degree, modified exponent, etc.). The projected size of export of production of the entities of agri-food production of the Mykolayiv region of the Steppe zone of Ukraine for 2021-2022 is calculated according to data of (Fig. 9) and (Fig. 12).

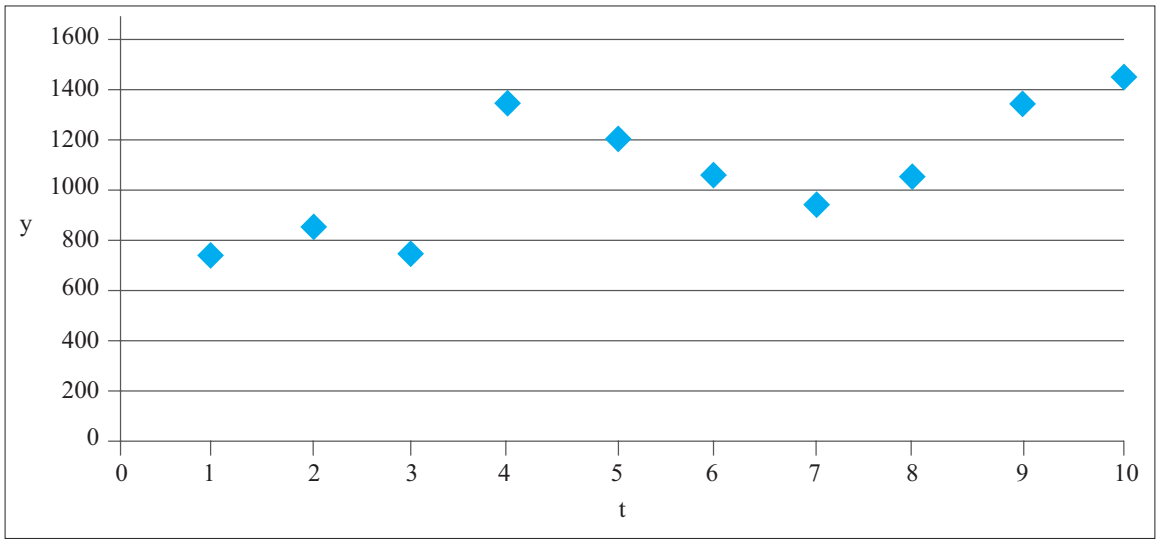

Figure 12. *Actual dynamics of export of production of the entities of agri-food production of the Mykolayiv region of the Steppe zone for 2010-2020, thousand EUR (t=1-10)*
Source: *calculated by the authors according to data [32]*

The model of the linear trend of export production volume of the entities of agri-food production of the Mykolayiv region is equal $y(t)=733.42+61.72t$, thousand EUR. Thus, the annual size of exports of agri-food products in the region will increase by an average of 61.72 thousand EUR.

Predicted values:

$y(2021)=733.42+61.72\times11=1412.34$ thousand EUR.

$y(2022)=733.42+61.72\times12=1474.06$ thousand EUR.

The actual dynamics of the size of exports of products of agri-food production for extrapolation forecasting of its volume in the Kherson region of the Steppe zone of Ukraine is shown in Figure 13.

The model of the linear trend of the volume of export of products of agri-food production of the region is equal to $y(t)=172.87+0.8861t$, thousand EUR. Accordingly, the annual export of agri-food products of the region will increase by an average of 0.8861 thousand EUR.

Predicted values:

$y(2021)=172.87+0.8861\times11=182.617$ thousand EUR.

$y(2022)=172.87+0.8861\times12=183.503$ thousand EUR.

The actual dynamics of the size of exports of products of agri-food production for extrapolation forecasting of its volume in the Zaporizhzhia region of the Steppe zone of Ukraine is shown in Figure 14. The model of the linear trend of the volume of export of products of agri-food production of the region is equal to $y(t)=348.79+95.045t$, thousand EUR. Thus, the annual size of exports of agri-food products in the region will increase by an average of 95.045 thousand EUR.

Predicted values:

$y(2021)=348.79+95.045\times11=1394.285$ thousand EUR.

$y(2022)=348.79+95.045\times12=1489.33$ thousand EUR.

In general, the projected size of exports of agri-food products of the Steppe zone in attracting foreign investment from foreign economic activity in 2021 will provide cash inflows to the economy of the studied regions at 2989.242 thousand EUR, in 2022 – at 3146.893 thousand EUR. However, in order to further intensify foreign economic activity for the development of investment infrastructure of agri-food production entities, the priority is to intensify the export potential of the regions.

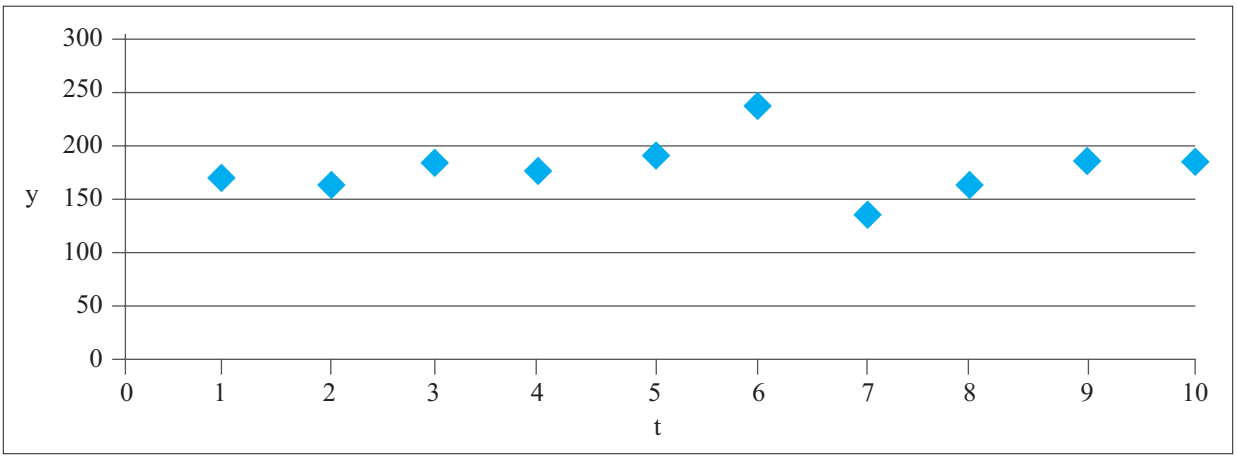

***Figure 13**. The actual dynamics of exports of products of agri-food production of the Kherson region of the Steppe zone for 2010-2020, thousand EUR (t=1-10)*

***Source**: calculated by the authors according to data [32]*

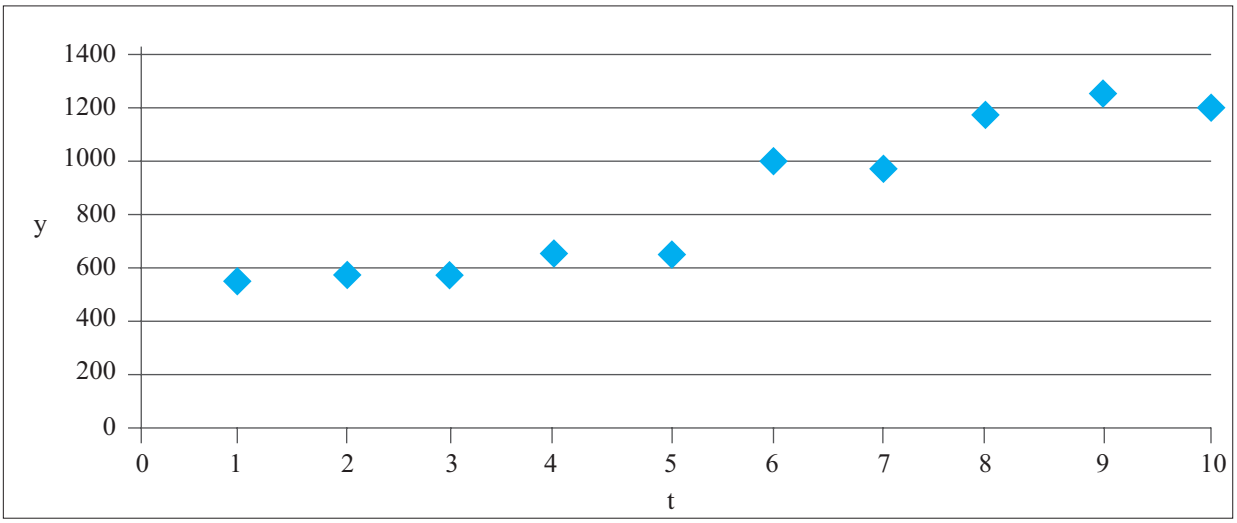

***Figure 14**. The actual dynamics of exports of agricultural products of the Zaporizhzhia region of the Steppe zone for 2010-2020, thousand EUR (t=1-10)*

***Source**: calculated by the authors according to data [32]*

According to the developed comprehensive approach to assessing the attractiveness of investment infrastructure of agri-food entities of the Steppe zone, we have calculated four scenarios of threshold parameters for indicators that enhance foreign economic activity by attracting foreign direct investment to the regions in the short term, i.e., 2021-2022 (Table 2).

***Table 2**. Forecast parameters of indicators of attractiveness of investment infrastructure of agri-food production entities of the Steppe zone when attracting foreign direct investment from foreign economic activity*

Indicators	Forecast	
	2021	2022
Scenario I (Live animals, products of animal origin)		
Gross value added, thousand EUR	34.0	85.5
Efficiency of fixed assets, EUR	0.41	0.62
Net profit, thousand EUR	3.1	11.0
Profitability of production, %	22.1	18.2
Scenario II (Fats and oils of animal or vegetable origin)		
Gross value added, thousand EUR	55.4	67.1
Efficiency of fixed assets, EUR	0.35	0.39
Net profit, thousand EUR	7.1	8.7
Profitability of production, %	15.4	23.8
Scenario III (Products of vegetable origin)		
Gross value added, thousand EUR	369.2	454.5
Efficiency of fixed assets, EUR	1.42	1.65
Net profit, thousand EUR	78.5	121.4
Profitability of production, %	40.3	45.6
Scenario IV (Prepared food products)		
Gross value added, thousand EUR	262.9	358.2
Efficiency of fixed assets, EUR	1.8	1.82
Net profit, thousand EUR	79.0	115.4
Profitability of production, %	56.1	62.2

***Source**: calculated by the authors*

The calculations prove the feasibility of developing the investment infrastructure of agri-food production entities in the Steppe regions and combining them into clusters with processing enterprises, which will improve foreign economic activity and increase the production and export potential of the agricultural sector.

CONCLUSIONS

Thus, the constant development of export capacity is the main condition for the effective operation of economic entities in the dynamic environment of the modern market. At the same time, approaches to the development of export potential reflect different levels: countries, regions, industries and enterprises. Export potential at the level of agri-food production entities, which directly creates material goods, provides conditions for an efficient process of investment operations and enables the production of competitive products. The processes of export-import operations are closely interconnected and interdependent, resulting in increased efficiency of many financial and economic indicators and profitability. In addition, the level of providing foreign food producers with foreign currency is growing. This, in turn, provides further innovative development through the acquisition of modern technologies and the latest machinery (equipment, machinery, etc.) from foreign partners. Participation in export-import operations creates opportunities to balance the structure and range of exports of agri-food products in the direction of increasing its commodity form instead of materials and raw materials.

However, without significant state support of domestic farmers, the implementation of these intentions is impossible. The mechanism of state support and regulation of domestic producers, including through the

support of export operations, should include the use of various forms, methods and techniques of legal and economic nature. In this case, the state should act as a guarantor of investment security, socio-economic stability for foreign and domestic investors.

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Зовнішньоекономічні пріоритети розвитку інвестиційної інфраструктури суб'єктів агропродовольчого виробництва

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Анотація. У статті розглянуто зовнішньоекономічні пріоритети розвитку інвестиційної інфраструктури суб'єктів агропродовольчого виробництва України. Розроблено комплексний методологічний підхід до оцінки ефективної диверсифікації інвестиційної інфраструктури суб'єктів агропродовольчого виробництва. Обґрунтована діагностика залучення прямих іноземних інвестицій у розвиток агропродовольчого виробництва дозволяє сформувати експортно-орієнтований тип державної економіки, визначити основні джерела технічного оснащення агробізнесу та освоїти інноваційні технології, сформувати виробничий потенціал та механізм реалізації стратегічних інвестиційних цілій. Розроблено алгоритм розрахунку рівня привабливості інвестиційної інфраструктури суб'єктів агропродовольчого виробництва. Наведено динаміку зовнішньої торгівлі агропродовольчими товарами степової зони України. Визначається обсяг прямих іноземних інвестицій від зовнішньоекономічної діяльності суб'єктів агропродовольчого виробництва в економіці регіонів Степової зони України. Представлено географію експорту агропродовольчих товарів степової зони України на міжнародних торгових ринках. Розраховано прогнозний обсяг експорту агропродовольчих товарів у регіонах та визначено граничні параметри показників привабливості інвестиційної інфраструктури суб'єктів при залученні прямих іноземних інвестицій із зовнішньоекономічних операцій

Ключові слова: прямі іноземні інвестиції, зовнішньоекономічна діяльність, інвестиційна інфраструктура, суб'єкти агропродовольчого виробництва, експорт, імпорт