“International aspects of assessing the logistic potential of the main countries of agricultural production”

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INTERNATIONAL ASPECTS OF ASSESSING THE LOGISTIC POTENTIAL OF THE MAIN COUNTRIES OF AGRICULTURAL PRODUCTION

Abstract

One of the main conditions for improving the overall competitiveness of the country is the formation of its sustainable logistic potential, since logistics is responsible for promoting the country's products, both in the domestic and foreign markets. This is also characteristic for agricultural companies of the main countries of agricultural production in the world, which need to manage their logistic business processes effectively. The business processes of logistics sphere include the processes of warehousing, transportation and further distribution of agricultural products between the entities of the agrarian market (warehousing, traders, wholesale and retail trade network, consumers) at the national, as well as international level. Internationalization of agricultural production includes the formation of cooperative industrial relations in the agrarian sphere between the countries in the chain of "production, processing and marketing", and the management of business processes in the logistics sphere. The latter is characterized by the business process management of the warehousing, transport, distribution areas at the national and international levels and food safety, which represents increasing demand for food in many countries of the world. These are some of the main signs of sustainable logistic development at the national and international levels. A methodical approach to assessing the logistic potential of the main countries of agricultural production in the world is improved; this method is characterized by a set of competitive elements and includes the assessment of logistics management of countries by blocks: product safety, internationalization of production and logistics, management of business processes. The result of this improved method of assessing the logistic potential of the world countries is a developed criterial basis, which allows making effective managerial decisions at the interstate and state levels regarding the logistic development of agrarian productions.

Keywords analysis, logistics management, internationalization, business processes, agrarian companies

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INTRODUCTION

When facing constant market fluctuations in demand and supply in the food market, many world leaders are paying attention to the development of their logistic potential. On the one hand, it is aimed at increasing the level of inter-state cooperation in the agrarian sector, which characterizes the processes of internationalization of agricultural products between countries. On the other hand, it can lead to an increase in the efficiency of managing business processes in the agrarian companies due to the intergovernmental partnership and the introduction of innovative technologies in the agricultural complex. Having analyzed the works of Ceniga and Sukalova (2015), Pietrosemoli and Rodrigues-Monroy (2019), statistical information of the analytical research of the Global Competitiveness Index made by K. Schwab (Schwab, 2018), we noticed the signs that may negatively

affect the level of logistic potential of the countries engaged in agrarian production. They are as follows: decline in the food production in many countries due to natural causes (African countries such as Rwanda, Zimbabwe, Zaire, Central African Republic, Democratic Republic of the Congo, Mozambique), political circumstances (Latin American countries: Venezuela, Peru), military events (countries of Asia: Syria, Afghanistan, Palestinian autonomy), decline in the agricultural land use efficiency as a result of erosion and neglect (Asia: Mongolia, China, Africa: Sudan, Ethiopia, Egypt, Algeria), climate change in the countries because of global warming (Africa, Latin America and Oceania countries), trade wars between countries (implementing economic embargo on goods and services as an example of difficult trade relations between Ukraine and Russia). Considering these signs, there is a need for the increase of the logistic potential of main countries of agricultural production of the world and its evaluation as an element of the implementation of the system of food monitoring, the pledges of increasing the level of food security in many countries of the world and making effective management decisions at the state and interstate levels in the field of logistics management of agricultural production. On the other hand, the assessment of the logistic potential of countries includes the establishment of the level of interaction between countries in the field of agricultural production, warehousing and agricultural trade, which leads to the strengthening of logistic links between countries and increases the level of economic efficiency of management of business processes of agrarian industries, as well the introduction of advanced technologies of the leading countries in the agrarian complex of other countries, which is the sign of the internationalization of agricultural production. The main purpose of this scientific research is to improve theoretical and methodological approaches to international aspects of assessing the logistic potential of the world main countries of agricultural production.

1. LITERATURE REVIEW

1.1. Logistics management: conceptual approaches

It is worth noting the importance of the formation of a theoretical basis while studying the methods for assessing the logistics management in the operation of business entities of the countries, as the theoretical provision of this management is the basis for the formation of conceptual approaches to the logistics of the countries and provides the opportunity to form a methodological and methodical basis of the logistics management. Economists Cain and Verma (2018) studied methodological provisions for logistics management in the supply chain of products.

The processes of globalization play an important role in the formation of an effective mechanism of logistics management in the work of the companies, since the process of globalization carries positive externalities, such as the introduction of advanced technologies of the leading countries (Switzerland, Japan, the USA, Canada, Australia, China) in the work of the companies of other countries (countries of Latin America, Africa, Asia, Eastern Europe), optimization of production costs of the companies due to increased competition between the countries for current and new markets (as the examples of the markets in China, Taiwan, South Korea and Japan), the transfer of manufactures of well-known brands from the developed countries (the USA, Canada, Japan, Switzerland, South Korea, Germany, Australia) into the developing countries with low costs of raw materials, materials and labor resources (China, Taiwan, Singapore, Ukraine, Belorus, Vietnam). Ceniga and Sukalova (2015) carried out the study of the issues of the influence of the logistics management on the processes of world globalization.

An increase in the level of digitization of the economy has also affected the development of the logistics management of the companies in the world. In our opinion, an introduction of the results of the third and fourth industrial revolutions in the logistics of the world countries has a positive effect, as it leads to an increase in the speed of business processes in logistics between different countries of the world. Govindan, Cheng, Mishra, and Shukla (2018) studied the issues of the formation of large analytical databases in the goods logistics and the improvement of the tools for managing the supply chains of finished goods.

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Studying the conceptual provisions of the logistics management, we should also study the impact of environmental factors on the logistics of companies, as the concept of sustainable development of the country should be closely interconnected with the concept of the modern logistics management, which leads to an increase in the value added of environmentally oriented goods in the world markets. A good case study is the introduction of green electricity tariffs in many countries around the world, and an increase in the GDP of Scandinavian countries (Sweden, Norway, Denmark, Iceland) due to the environmentally-friendly production and green taxes. Sekora-Stolka (2016) studied the implementation of green initiatives in the management of natural resources and logistics of enterprises.

Studying the conceptual provisions of logistic control, one should also pay attention to the elements of the theoretical basis, which are a system of knowledge, theory, algorithms, and tools of logistics. These issues were considered in the work of Cuthbertson (1998).

Increasing the value added of products, which is the goal for many developing countries, characterizes the containment of the vector of production from the raw material to innovation and customer oriented, so the concept of the logistics management in the information society should emphasize the requirements and proposals of the consumer of goods and services. These issues were studied in the work of Shalchi (1994).

1.2. Logistics of the countries and internationalization of agrarian productions

One of the main features in the formation of conceptual approaches to the logistics management in the work of the world economic entities is the impact of logistics on the technical efficiency of world production, since introduction of the scientific and technological progress in the technology of goods production, including agricultural products, affects the increase of productivity and the results of the production of goods and their further promotion in the world markets. These issues were highlighted in the work of Coto-Millán, Fernández, Pesquera, and Agüeros (2016).

Conducting a scientific inquiry in the field of macroeconomic issues of countries' logistics in the system of internationalization of agrarian companies, it is worth emphasizing the importance of studying the sectoral aspects of goods distribution in the countries of the world, as this process is closely linked to the management of logistic processes both at the regional and interstate levels. Study of the activity of Catalan firms of the agrarian complex and the distribution of their products to the markets of Europe were considered by Cantos, Gil, Melé, Viladomiu, Aparicio, and Martí (1997).

It is worth noting that studying the efficiency of logistics in the countries is the main indicator of the success of the implementation of the state commodity policy. Thus, special attention should be paid to the study of methods for assessing the logistic management. Yi and Xie (2017) studied the comparison methods in determining the effects of the logistics industry in China.

Internationalization aspects in logistics management are necessary for successful co-operation between countries in terms of commodity flow management. In this context, it is important to combine the production of goods with their further promotion to international markets, so co-operation between countries is an indisputable component of successful logistics. Studying agrarian aspects of cooperation between the countries is a combination of agricultural production in the countries with the corresponding natural and climatic conditions of agricultural production and further promotion of these products in other countries, which can act as trade representatives, transit partners, and end users of agricultural products. Torbianelli and Mazzarino (2010) worked with the formation of optimal logistics between the countries in terms of promoting agricultural products and commercializing ties between Italy and Russia.

In addition, the influence of institutional factors on the logistics management in the activity of agrarian companies at the state and interstate levels plays an important role. Finchelstein (2017) investigated the role of state institutions in the internationalization of firms in Brazil, Argentina, and Chile.

One of the advantages of successful logistics between the countries is the implementation of organizational factors of the companies' internationalization inside the country. International scientists, such as Carneiro, Bamiatzi, and Cavusgil (2018), studied the issue of implementing the organizational weakness of Brazilian business entities as a necessity of the internationalization of large companies, including agribusinesses.

1.3. Logistics of the countries and management of business processes of agrarian companies

It is worth noting that under the conditions of the modern development of agro-industrial production, the process-oriented management becomes even more relevant, which enables to manage business processes at the horizontal level, thus significantly increasing the economic efficiency of an agrarian company. In the system of the logistics management, there is also an urgent need for the use of the process-oriented management, which enables all actors of logistics to take an active part in the economic process and influence the economic result. The founders of the business process re-engineering are Hammer and Champy (1993). They were the first to highlight the concept of radical re-design of business processes in the activities of companies from various sectors of the economy of the US, Japan.

It is important to detect errors during the design and next following implementation of business processes in logistics. The issues of machine learning and error detection during the forecast of business processes were studied by Borkowski, Fdhila, Nardelli, Rinderle-Ma, and Schulte (2019).

Risk management in business process logistics is the key to the successful management of business processes of the company, since the introduction of crisis management procedures aimed at reducing the risk of logistics contributes to increasing overall efficiency in logistics management. These issues in the activities of Chinese companies were outlined in the article of Choy, Chiu, and Chana (2016).

Determining the impact of social and economic factors on the business process logistics of agrarian productions of the countries is one of the important features in managing business processes, as it is necessary to monitor the external and internal environment, which has a positive and negative impact on the activities of agro-industrial companies. Sineviciene, Sotnyk, and Kubatko (2018) studied economic factors that characterize energy efficiency in the activities of agrarian companies of Eastern Europe.

To achieve high efficiency of the business process management in the country's logistics sphere, the main thing is to remove auxiliary business processes with a low value added. An example may be the removal of the main equipment outsourced by the leading countries of the world (Germany, the Netherlands) in the sphere of agricultural machine building and providing this agricultural machinery for leasing to agro firms in Ukraine, Moldova. Another example is the provision of agro-industrial equipment for leasing to Mexico, Nicaragua, Panama by the leader country US, while China's agrarian machinery is successfully used by North Korean agribusinesses. The research of the role of the business process outsourcing management in enhancing the outsourcing efficiency of the logistic processes of production in China was highlighted by Zhu, Ng, Wang, and Zhao (2017).

Studying the technics of managing the business processes in agricultural production, attention should be paid to the management of wastes, which are formed during harvesting and in the follow-up process of the raw materials processing. It is particularly important in the activities of agrarian companies in developing countries, where the concept of sustainable development did not get enough attention from the governments of these countries, and getting income is their only priority. The case is the developing Latin American countries (Honduras, Nicaragua, Panama, Peru, Chile), as well as a number of countries in Central and Eastern Africa (Angola, Zaire, Central African Republic, Côte d'Ivoire, Rwanda, Congo), East Asian countries (Vietnam, Cambodia, Bahrain, China, Laos, Bhutan, Yemen), South Asia (India, Bangladesh). Netro, Álvarez, Carrillo, and Flores (2017) considered the issues of solid waste management in the activities of Mexican companies and the formation of return logistics of wastes.

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1.4. Assessment of logistics management in the activities of agricultural companies in the countries

To form an effective mechanism of logistics management in the activities of agricultural enterprises of the countries, it is necessary to focus on the methodical toolset for assessing the logistics of agricultural companies in order to determine the economic efficiency of their logistic work. Taraniuk, Kobyzskyi, and Thomson (2018) proposed a methodical approach to the assessment of the logistics of sales of machine-building products (pumping equipment for the irrigation of agricultural land) for agricultural production.

Determining the level of stability of the countries in the management of logistic processes of agricultural production is a key point in shaping the comparative characteristics of the efficiency of logistics in the agro-industrial complex and its impact on the macroeconomic indicators of the state development. Leonov, Vasilieva, and Lyulyov (2018) substantiated the macroeconomic stability in the low- and middle-income countries at the sectoral level.

The analysis of the technological readiness of the world agrarian companies is important in determining the readiness for innovation development of companies in the agrarian sector and their correlation with modern scientific and technological progress. The influence of technological factors on the work of Brazilian agrarian companies in the process of agrarian reform was studied by Gonzaga, Vilpoux, and Pereira (2019).

At the present stage of the development of productive forces, agricultural companies restrain from the centralized (functional) management to the client-oriented (process) management. Studying the aspects of the logistics management assessment in the activities of agricultural companies, attention should be paid to the assessment of sustainable development of agricultural production, which includes ecologically oriented production technologies, as well as agricultural production, focused on the requirements of the final customer. The issues of the formation of agro-ecosystems in Poland and the Czech Republic in the system from administrative to market farming were analyzed in the works of Grešlová, Štych, Salata, Hernik, Knížková, Bičík, Jeleček, Prus, and Noszczyk (2019).

In the economy of international relations, authorities of the countries should pay much attention to the assessment of the natural environment and the study of the impact on agricultural production on the inter-governmental level. The case is the policy of protecting forest resources of the European Union states that declares a complete ban on the felling of young forests and the formation of new protected areas, as well as a careful farmers' attitude to the forest and land resources. Berck, Levy, and Chowdhury (2012) carried out an analysis of the environment and population dynamics at the world level, and the influence of anthropogenic factors on this environment.

It is also worth focusing on the impact of externalities on the activities of agrarian complexes in the countries, which are the climate change in the nature of the world countries, as well as the formation of an effective system of strategic management in the agricultural production in case of climate changes. Amare, Ayoade, Adelekan, and Zelek (2018) studied the impact of climatic zones on the national economy, including agribusiness in Ethiopia, and the formation of crisis strategic management in the companies' activities in terms of climate changes.

2. METHOD

2.1. Research approach

The basis for the implementation of the methodological part of this scientific research was the method of comparative analysis used in the development of the main trends in the development of agricultural production in the countries across the world and management of its logistics flows; the method of factor analysis used in determining positive and negative factors that influence the product development of the agrarian sector of the world countries; an improved method of recruitment of competitive elements in the assessment of logistic potential of the world countries, which in-

cludes the assessment of the logistics management of the agrarian countries in blocks: product safety, internationalization of production and logistics, business process management; the Sturges method used in determining the criterial basis of the levels of logistic potential of the countries across the world, which are the main agricultural producers; the method of generalization used for the development of the main approaches to increase the level of internationalization and efficiency of the business process management of agrarian industries in the countries across the world.

2.2. Participants

In assessing the logistic potential of the world main countries of agricultural production, Schwab's (2018) study of the analysis of the Global Competitiveness Index of the world countries was used. The world main countries of agricultural production according to the scientific research of Simpson (2012) were the object of the assessment. These countries are the USA (grains, corn, and soybean), Germany (vegetable crops, beans), Canada (grains), China (wheat, rice, corn, and vegetable crops), Russia (wheat, oats, and beans), India (cereals and vegetable crops, beans, millet), Brazil (fruit crops), Ukraine (wheat, oilseed crops, oats, rape, and corn), Nigeria (fruit crops, millet).

2.3. Measurement tools

An assessment of the logistics management of the countries across the world was done by Schwab (2018) calculating the Global Competitiveness Index of the countries across the world. The main point of his research is to calculate the Global Competitiveness Index of the countries across the world, which makes it possible to identify the leaders and outsiders of economic development at the macroeconomic level.

The analysis of the Global Competitiveness Index of the countries across the world provided the indicators to be used as a measurement tool for assessing the logistic potential of the main countries of agricultural production. The method of recruitment of competitive elements proposed by Kononenko (1998) was improved by generating criterial indicators in blocks: product safety (quality of land management, ownership right, prevalence of non-tariff barriers, market capitalization, application of trademarks); internationalization of production and logistics (international joint inventions, simplicity of hiring the foreign labor, efficiency of air transport services, rail transport efficiency, traffic communication index); business process management (effects of the reform process, market dominance volume, payment and productivity, growth of innovative companies, cooperation between many stakeholders) when calculating the logistic potential of the main world countries of agricultural production in order to identify the countries-leaders and countries-outsiders in the logistics management.

The measurement tools also contain the developed criterial base of the logistic potential of the main countries of agricultural production, which contains a six-level ranking of the logistic potential of the countries at corresponding levels. Formation of the criterial basis of the logistics potential of the countries allows making effective managerial decisions at the state and interstate level in terms of logistics management. Thiede, Turetskyy, Kwade, Kara, and Herrmann (2019) carried out the formation of multi-criteria indicators and their values in the system of integral assessment of the work of manufacturing companies.

2.4. Procedure

We will conduct an algorithm for assessing the logistic potential of the countries across the world using an advanced methodological approach to a set of competitive elements. To do this, one needs to examine the procedure for implementing this methodological approach in more detail.

At the first stage of this methodological approach, a list of indicators that characterize incoming analytical information is created. In this case, this is the information for analyzing the logistics management of the main countries of agricultural production of the world, which is given in Table 1.

At the second stage of this methodological approach, a matrix of determining the ranking of the logistics management indicators of the countries across the world is formed. A ranking assessment of each indicator is performed in the blocks "Product safety", "Internationalization of produc-

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tion and logistics", "Business process management", where, based on absolute values indicators (Table 1), the ranks of each indicator $\left(R_{ij}\right)$ are determined. In this case, the weight of each indicator $\left(Vaga_i\right)$ is formed, which is determined by the method of expert evaluation. In this scientific study, the weight of indicators was determined by involving various expert groups of representatives, namely: specialists of Sumy Chamber of Commerce and Industry (Ukraine); scientific experts of international economic relations of Sumy State University (Ukraine) and Henan University of Science and Technology (China).

At the third stage, a weighted assessment of each indicator of the corresponding block of the logistic management of the countries is determined considering the importance of each indicator in assessing the logistic potential of the countries by the formula:

$$Rang_i = \sum R_{ij} \cdot Vaga_i, \quad (1)$$

where $Rang_i$ is the weighted assessment of the i-th indicator, $\sum R_{ij}$ is the weight of all indicators of the logistics management of the j-th country, $Vaga_i$ is the weight of the second indicator of logistics management.

At the fourth stage, based on a well-balanced assessment of the logistics management indicators of the countries, the leader countries (L) and outsider countries of the logistics management (A) are determined.

At the fifth stage, the range of the distance between the leader country and the outsider country of the logistics management is determined by the formula:

$$D_v = Rang_A - Rang_L, \quad (2)$$

where D_v is the range of the distance between the leader country and the outsider country, $Rang_A$ is a weighted assessment of the outsider country logistics management, $Rang_L$ is a weighted assessment of the leader country logistics management.

At the sixth stage, the country's competitiveness in the field of logistics management is calculated according to the formula:

$$KSOP_{ia} = \frac{Rang_A - Rang_I}{D_v}, \quad (3)$$

where $KSOP_{ia}$ is the competitiveness of the i-th country according to the first sphere of logistics management, $Rang_I$ is a weighted assessment of the country, an entity of the logistics management.

The seventh and eighth stages of this evaluation characterize the improvement of the methodological approach of a set of competitive elements.

At the seventh stage, the assessment is used to determine the level of perception of the risk of entrepreneurial activities, which is closely connected with the logistics management in the country's agro-industrial complex, using the formula:

$$RKS_i = \frac{ER_c}{ER_p}, \quad (4)$$

where RKS_i is the level of perception of the risk of entrepreneurial activities of the country, ER_c the attitude to the entrepreneurial risk of the c (current) value, ER_p is the attitude to the entrepreneurial risk of the p (best) value.

At the eighth stage, the level of logistic potential of the country is assessed by the formula:

$$LP_i = KSOP_{ia} \cdot RKS_i, \quad (5)$$

where LP_i is the level of logistic potential of the i-th country.

At the ninth stage of the assessment, to determine the levels of logistic potential, it is necessary to establish a range of logistic potential values that divide each of its levels using the Sturges method by the formula:

$$k_{LP_i} = \frac{LP_{i_{\max}} - LP_{i_{\min}}}{1 + 3.322 \lg N}, \quad (6)$$

where k_{LP_i} is the Sturges coefficient, which characterizes the range of criterial values of the logistic potential of the i-th country, $LP_{i_{\max}}$ is the maximum value of the logistic potential of the i-th country, $LP_{i_{\min}}$ is the maximum value of the logistic potential of the i-th country, N is the number of countries, objects of assessment.

3. RESULTS

3.1. Analytical and theoretical aspects

Assessing the logistic potential of the main countries of agricultural production of the world, taking into account the impact of the processes of internationalization and business process management of agrarian industries, it is necessary to distinguish the main indicators that characterize the logistic potential of the countries. The indicators are determined in the blocks of product safety, internationalization of production and logistics, business process management that characterize the processes of influencing the logistic management of the countries, while allocating countries by the criterion of agro-market size, the level of agricultural export and the number of consumers in the country according to the research of Simpson (2012) and Schwab (2018) (Table 1).

3.2. Descriptive statistics of the logistics management

After a comparative analysis of logistic management of agricultural producers in the world, certain conclusions should be made about the trends of logistic development of the countries in these blocks. Thus, in the food safety block, Russia is the leader (26 c.u.) upon the quality of land administration indicator, which is an important component of the efficient land use for agricultural production. This is due to the large territory of the country, favorable climatic conditions for the cultivation of many types of agricultural crops with high fertility of the land in the European zone that increases the level of agricultural production efficiency. On the other hand, Nigeria (7.4 c.u.) is an outsider country in terms of quality of land administration, due to the unfavorable tropical climate, land erosion caused by drought, low water resources, lack of logistic infrastructure

Table 1. Comparative analysis of the logistic management of the main countries of agricultural production of the worl in 2018, c.u./location

Source: Based on Simpson (2012), Schwab (2018).

Names of economic indicators	USA	Germany	Canada	China	Russia	India	Brazil	Ukraine	Nigeria
Product safety block									
Quality of land administration	17.6	22.0	21.5	18.3	26.0	8.2	13.8	14.5	7.4
Property rights	5.8	5.5	6.1	4.6	3.7	4.8	4.0	3.3	3.7
Prevalence of non-tariff barriers	5.3	5.1	4.5	4.5	3.9	4.5	3.4	4.1	4.6
Market capitalization	145.4	48.3	116.1	65.6	32.0	72.8	34.6	20.3	9.6
Trademark applications	2,890.49	8,457.38	1,904.45	1,561.67	397.29	200.94	699.0	653.8	111.52
Internationalization of production and logistics block									
International co-inventions	12.3	21.26	15.93	0.99	0.75	0.38	0.30	0.50	0.01
Ease of hiring foreign labor	5.0	5.0	4.0	4.5	3.8	4.4	3.4	4.1	4.5
Efficiency of air transport services	5.9	5.6	5.4	4.6	4.9	4.8	4.4	4.0	3.1
Efficiency of train service	5.7	5.5	4.3	4.5	4.9	4.5	2.5	4.3	1.7
Road connectivity index	100	93.5	93.4	88.4	78.0	62.0	63.7	72.7	66.6
Business process management block									
Efficiency of the clearance process	3.8	4.1	3.6	3.3	2.4	3.0	2.4	2.5	2.0
Market dominance volume	5.7	5.5	4.5	4.5	3.7	4.6	3.8	3.3	3.4
Payment and productivity	5.8	5.3	5.0	4.6	4.5	4.7	3.4	4.2	3.6
Growth of innovative companies	5.8	5.4	4.7	4.4	3.7	4.7	4.1	3.5	4.1
Multi-stakeholder collaboration	5.8	5.4	4.6	4.4	4.0	4.6	3.7	3.7	3.1
Integral assessment									
Global Competitiveness Index (assessment/location)	85.6 (1)	82.8 (3)	79.9 (12)	72.6 (28)	65.6 (43)	62 (58)	59.5 (72)	57 (83)	47.5 (115)

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(agricultural terminals, processing centres), which significantly reduces the effectiveness of agricultural production.

Concerning the block of internationalization of production and logistics, attention should be paid to the indicator of international co-inventions, which characterizes the cooperation between countries in goods production, including the agro-industrial complex. Thus, Germany is the leader country upon this indicator (21.26 c.u.), which characterizes this country as a leader, with regard to the creation of joint centres for the use of agricultural equipment, joint production with innovative components, research companies (spin-offs), and the outsider country is Nigeria (0.01 c.u.), which has a very low percentage of the production internationalization. This is due to the ineffective state policy of attracting foreign capital, the instability of the political and economic system, which leads to the de-nationalization of production and its backwardness from the modern trends in agribusiness development. In addition, a logistic component in the internationalization of production is also worth noting that. Thus, according to the road connectivity index, the US is the leader (100 c.u.) due to efficient traffic between cities and agrarian centres, which increases the level of logistics management in the agrarian sector (transportation of agricultural products from the producer to the consumer). India, though, is an outsider (62 c.u.), upon this indicator, which is conditioned by the low level of transport links between agrarian centres due to high forest virginity (tropical forests), ground roads, which, during the seasonal rains, leads to a decrease in logistic flows, delayed delivery of agricultural products between producer and consumer, economic losses of agricultural producers.

Market dominance volume is one of the important indicators for agricultural producers in management of business processes block, as this indicator characterizes the level of market segmentation by the producer and agricultural products in this segment of the market. The leader country upon this indicator is the US (5.7 c.u.) due to high competition in the agricultural production of this country between the national commodity producers and their number in the market segment. An outsider country is Ukraine (3.3 c.u.) due to the high import component of agricultural products in the market, the ineffective state policy of protecting the national producer, lack of warehouse logistics of the collected agricultural products.

The conclusions of the analysis allow stating the necessity of introduction of internationalization of productions and increase of efficiency of the business process management of agricultural products in the countries located in the zone closer to the outsider countries, in order to increase the level of logistics management in the given countries. After the comparative analysis of logistics management of the world countries in the blocks of product safety, internationalization of production and logistics, business process management, positive and negative factors that influence the product development of countries in the agrarian sector should be distinguished. Some positive factors include:

- globalization of commodity markets, which enables to raise the level of competitiveness of agricultural products at national markets;
- introduction of scientific and technological progress by the leader countries, which makes it possible to use leading innovative technologies by other countries and to increase the level of logistics management in the agrarian sector;
- concern of many countries at the interstate level about increasing the level of food safety, as a factor deceleration of the processes of food and water scarcity, especially in the countries of Africa and Latin America;
- formation of the sustainable development processes in agricultural production of the countries as a result of the production of environmentally oriented agricultural products with high value added.

The negative factors that influence the product development of the countries in the agrarian sector include:

- climatic conditions for agricultural production (drought, water scarcity, natural disasters);
- the ineffective policy of the developing country governments in terms of the logistics management due to the political and economic crisis, military actions;

- governments' focus on economic enrichment rather than on the sustainable development of the country.

The result is the formation of domestic substitutes (soybean food, fast food products), high level of low-quality imports, and GMO products.

It is worth noting that the issues of the factor influence on food security of Pakistan were studied by Abdullah, Zhou, Shah, Ali, Ahmad, Ud Din, and Ilyas (2019). The scholars highlighted a social component of the factors affecting the country's food security.

3.3. Assessment of logistic potential

Below is the assessment of logistic potential of the main countries of agricultural production of the world based on the improved methodological approach of a set of competitive elements, according to the procedure indicated in subsection 2.4 (Table 2). The obtained results were used for research purposes only.

According to the logistic potential assessment of the main countries of agricultural production of the world, logistic potential of the leader country (US) has been established to be 0.83 c.u., which indicates

Table 2. Assessment of logistic potential of the main countries of agricultural production of the world in 2018 (rank, weight)

Source: Authors.

Names of economic indicators	USA	Germany	Canada	China	Russia	India	Brazil	Ukraine	Nigeria
Product safety block									
Quality of land administration	5; 0.05	2; 0.05	3; 0.05	4; 0.05	1; 0.05	8; 0.1	7; 0.1	6; 0.05	9; 0.1
Property rights	2; 0.05	3; 0.04	1;0.1	5;0.04	8;0.05	4;0.05	6;0.05	9;0.1	7;0.1
Prevalence of non-tariff barriers	1; 0.04	2; 0.05	4; 0.05	5; 0.05	8; 0.05	6; 0.1	9; 0.02	7; 0.05	3; 0.05
Market capitalization	1; 0.1	5; 0.06	2; 0.1	4; 0.1	7; 0.1	3; 0.02	6; 0.1	8; 0.05	9; 0.02
Trademark applications	2; 0.06	1; 0.1	3; 0.05	4; 0.1	7; 0.05	8; 0.1	5; 0.1	6; 0.1	9; 0.02
Internationalization of production and logistics block									
International co-inventions	3; 0.05	1; 0.1	2; 0.1	4; 0.05	5; 0.1	7; 0.05	8; 0.05	6; 0.1	9; 0.05
Ease of hiring foreign labor	1; 0.1	2; 0.05	7; 0.06	3; 0.05	8; 0.1	5; 0.05	9; 0.02	6; 0.05	4; 0.05
Efficiency of air transport services	1; 0.05	2; 0.05	3; 0.04	6; 0.05	4; 0.05	5; 0.05	7; 0.1	8; 0.05	9; 0.1
Efficiency of train service	1; 0.05	2; 0.05	6; 0.06	4; 0.05	3; 0.05	5; 0.1	8; 0.02	7; 0.05	9; 0.1
Road connectivity index	1; 0.05	2; 0.1	3; 0.05	4; 0.06	5; 0.1	9; 0.1	8; 0.1	6; 0.02	7; 0.02
Business process management block									
Efficiency of the clearance process	2; 0.04	1; 0.1	3; 0.1	4; 0.05	7; 0.05	5; 0.05	8; 0.1	6; 0.08	9; 0.02
Market dominance volume	1; 0.06	2; 0.05	5; 0.04	4; 0.05	7; 0.05	3; 0.08	6; 0.1	9; 0.1	8; 0.2
Payment and productivity	1; 0.1	2; 0.05	3; 0.05	5; 0.1	6; 0.1	4; 0.05	9; 0.02	7; 0.1	8; 0.02
Growth of innovative companies	1; 0.1	2; 0.1	3; 0.05	5; 0.1	8; 0.05	4; 0.1	6; 0.02	9; 0.05	7; 0.05
Multi-stakeholder collaboration	1; 0.1	2; 0.05	3; 0.1	5; 0.1	6; 0.05	4; 0.1	8; 0.1	7; 0.05	9; 0.1
$Rang_i$, y.o.	1.45	1.92	3.15	3.82	6.05	6.2	7.02	7.2	7.89
$Rang_A$, y.o.					7.89				
$Rang_L$, y.o.					1.45				
D_v, y.o.					6.44				
Attitude towards entrepreneurial risk (ER_c), c.u., (ER_p = 7 c.u.) (Schwab, 2018)	5.8	5.1	4.4	4.5	4.3	4.7	4.1	4.7	4.8
Level of perception of entrepreneurial risk (RKS_i), c.u.	0.83	0.73	0.63	0.64	0.61	0.67	0.59	0.67	0.69
Logistic potential (LP_i), c.u.	0.83	0.68	0.47	0.40	0.18	0.17	0.08	0.07	0.0

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the highest level of the logistic management in the country, according to the data of Table 3, considering current world trends, while the logistic potential of the outsider country (Nigeria) is 0.0 c.u., which indicates the lowest level of the logistics management in this country, according to Table 3.

3.4. Criterial analysis

We will form a criterial basis for the logistics management in the specified countries (Table 3), which contains a description of the levels of logistic potential enabling to make effective managerial decisions at the state and interstate level in the sphere of commodity flow logistics of agrarian products.

We set the range of values of the logistic potential, which distinguishes each level using the Sturges method:

$$k_{LP_i} = \frac{0.83 - 0.00}{1 + 3.322 \lg 9} = 0.1. \qquad (7)$$

Table 3 presents a criterial basis for assessing the logistic potential of countries across the world.

The formation of a criterial basis for assessing the logistics management of the country of agricultural production in the world allows ranking the level of logistics in the countries of the world to separate the countries into different clusters regarding the effectiveness of their logistic activities, which may affect the level of investment and innovation attractiveness of the country for real and potential investors, the countries of the processing of agro-industrial products, international transport companies and other participants of business processes in the agrarian production.

4. DISCUSSION

The issues of the assessment of logistics management should be studied at the macroeconomic level. Thus, this analysis is relevant in the frame of globalization challenges, the instability of the world economic system, and the influence of state leaders on the world economy. The role of developing countries is also worth noting, as efficient logistics of transport flows, including agricultur-

Table 3. Criteria of logistic potential of countries across the world

LP_i, c.u.	Characteristic of the range of criterial values
$LP_i \geq 0.5$	The range of criterial values of logistic potential shows the highest level of the logistics management of the country of agricultural production, which characterizes the progressive level of product safety, internationalization of production and logistics, business process management, investment and innovation attractiveness of the leader country's logistics for various stakeholders (governments of the countries of agricultural production, traders, investors, partners, innovation centres)
$0.4 \leq LP_i < 0.5$	The range of criterial values of logistic potential shows a high level of the logistics management of the country of agricultural production, which characterizes a high level of product safety, internationalization of production and logistics, business process management, investment and innovative attractiveness of the country's logistics for various stakeholders (governments of the countries of agricultural production, traders, investors, partners, innovation centres)
$0.3 \leq LP_i < 0.4$	The range of criterial values of logistic potential indicates a sufficient level of the logistics management of the country of agricultural production, which characterizes a sufficient level of product safety, internationalization of production and logistics, business process management, investment and innovative attractiveness of the logistics of the country for various stakeholders (governments of countries of agricultural production, traders, investors, partners, innovation centres)
$0.2 \leq LP_i < 0.3$	The range of criterial values of logistic potential indicates a satisfactory level of the logistics management of the country of agricultural production, which characterizes a satisfactory level of product safety, internationalization of production and logistics, business process management, investment and innovative attractiveness of the country's logistics for various stakeholders (governments of countries of agricultural production, traders, investors, partners, innovation centres)
$0.1 \leq LP_i < 0.2$	The range of criterial values of logistic potential indicates a low level of the logistics management of the country of agricultural production, which characterizes a low level of product safety, internationalization of production and logistics, business process management, investment and innovative attractiveness of the country's logistics for various stakeholders (governments of countries of agricultural production, traders, investors, partners, innovation centres)
$0 \leq LP_i < 0.1$	The range of criterial values of logistic potential indicates the lowest level of the logistics management of the country of agricultural production, which characterizes an extremely low level of product safety, internationalization of production and logistics, business process management, investment and innovative attractiveness of the outsider country's logistics for various stakeholders (governments of countries of agricultural production, traders, investors, partners, innovation centres)

al products, is the key to successful entrance to new markets, for example, the economy of Asian countries (China, Vietnam, Taiwan, Malaysia, and Singapore) and the western vector of product export from these countries. The Chinese New Silk Road concept should be noted, where various transport corridors for the delivery of Chinese products to European countries are considered, thus involving the logistics infrastructure of Kazakhstan, Russia, Belarus, and Ukraine. Marsden (2017) studied the impact of the trader's logistics of Chinese products to the countries of Europe, Central Asia, and Afghanistan, and the correlation of the New Silk Road program in the Chinese economy with the export opportunities of this program.

It is worth noting the need to formulate the main approaches to increase the level of internationalization and efficiency of business processes of agrarian industries in the world, which play an important role in the formation of high level of logistic potential of countries. These approaches are as follows:

- changing the geopolitical vector of development of the countries from the West to the East, as a result of strengthening the Asian economies (China, Vietnam, South Korea, Taiwan, and Malaysia) and increasing the level of internationalization and business process management in agricultural production in these countries due to cheap raw materials and labor resources;

- reversification of investments in the Asian countries (China, Vietnam, South Korea, Taiwan, and Malaysia), where the main objective is to increase the competitiveness of the countries in the world market;

- internationalization and introduction of business process management standards (BPM) for agribusiness in the African countries (Morocco, Algeria, and Egypt) and Latin America (Argentina, Brazil) in the near future as a potential market for logistics and agricultural product marketing in the leader countries;

- the establishment of free economic zones (FEZs) in countries (simplified and concessional taxation) with a favorable geopolitical position, in order to increase the level of logistics of agrarian products, for example, in Ukraine – for goods transportation from the Asian countries to the countries of the European Union; in Turkey – for transportation of energy resources of Azerbaijan, in Turkmenistan – for agriculture of the European Union countries.

5. EFFECTS FOR MANAGEMENT

Studying methodological approaches to the assessment of logistic potential of the main countries of agricultural production of the world, it is worth noting the need for a clear ranking of logistic potential levels. This enables the authorities of the investor countries to identify the leaders or outsiders in the development of agricultural logistics and to simulate the optimal logistics flow of agricultural production, which aims to optimize all transport costs for the delivery of agricultural products to the markets. One should also take into account the influence of external economic factors that can be negatively reflected in the economy of the countries. An example is the political and energy crisis in Venezuela and the redistribution of zones of influence on the country's commodity markets, including the United States agricultural markets and local authorities in Venezuela that produce a negative effect on the logistics of the country. Pietrosemoli and Rodrigues-Monroy (2019) conducted studies of the energy crisis in Venezuela and its impact on the country's commodity market.

CONCLUSION AND RECOMMENDATIONS

In the course of the comparative analysis of the logistics management of agricultural producers in the world, positive factors that influence their product development have been identified. They are globalization, innovation, green production. The negative factors are the natural and climatic impact, lack of

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policies for effective logistics and sustainable development of the governments of developing countries. The assessment of the logistic potential of the main countries of agricultural production of the world has been determined; the leader country is the USA with a high logistic potential of 0.83 c.u. and the outsider is Nigeria with the lowest logistic potential of 0.0 c.u. The criterial base of the logistic potential of the countries of the world main countries of agricultural production in the six-level system of ranking the levels with a step of 0.1 c.u. has been developed. Based on the level of logistic potential of the main countries of agricultural production of the world, the ways of increasing the level of internationalization and efficiency of business processes of agrarian enterprises in the world have been identified. They are as follows: the change of the production vector, investment reversal, the integration and BPM of agricultural producers, the formation of the SEZ. In terms of further research, the theoretical and methodological work needs to be influenced by the logistics management of the countries of agricultural production of the external (macroeconomics, geopolitics, external co-operation) and internal economic factors (national development, investments, innovations, labor resources).

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