

SCIENTIFIC HORIZONS

Journal homepage: <https://sciencehorizon.com.ua>

Scientific Horizons, 25(5), 125-133



UDC 636.92.053.112.385.4

DOI: 10.48077/scihor.25(5).2022.125-133

Dynamics of Development of Production and Export of Agricultural Products in the Context of Foreign Trade in Australia

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Article's History:

Received: 14.06.2022

Revised: 12.07.2022

Accepted: 13.08.2022

Suggested Citation:

Tulush, L., Korchyńska, O., Krushelnytskyi, M., Babicheva, O., & Pivtorak, A. (2022). Dynamics of development of production and export of agricultural products in the context of foreign trade in Australia. *Scientific Horizons*, 25(5), 125-133.

Abstract. The agricultural sector is one of the main branches of the Australian economy and of the country's exports. This contributes to the considerable level of agricultural development and resource specialisation in international trade in general. Ukraine in this respect is like Australia, which makes the current state of the agrarian sector in both countries relevant. The purpose of this study was to investigate the state of the agricultural sector in Australia and find elements of development that would help change the Ukrainian agriculture. Statistical methods, such as graphical and statistical analysis, became the main methods in the study. This is conditioned upon the formation of conclusions mostly based on statistical information, graphs and tables presented in the article and constructed with statistical TradeMap. During the study, the author concluded that the fate of agricultural exports in the country was reduced due to the current orientation of the country towards the export of resources, namely iron. Within the structure of export of agricultural products, considerable changes are taking place, the main of which is the transition to production of animal products. Ukraine may adopt some features of the sector in Australia, namely how the country is conducting investment policy in the sector. Nevertheless, it was found that there are significant differences in the agricultural sector of both countries. Because of this, it is impossible to completely change the plan of operation of the Australian agriculture. Research on the future development of the industry in Australia, considering current trends and their impact on foreign policy and trade in the country, may be promising. This article will be useful for studying the functioning of the economy of Australia and Ukraine, namely their agricultural sectors; to form the national policy of the agrarian sector and foreign trade; for students to learn economic disciplines and write corresponding theses

Keywords: agricultural sector, economy, resources, international trade, population



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INTRODUCTION

The agrarian sector of the country's economy is an integral complex intricately connected with natural conditions, resources, technical capabilities, and qualified specialists aimed at the production of livestock and plant-growing products (Evans *et al.*, 2019). For any country, agriculture is the leader in economic development (Boulay & Lenoir, 2020; Kumar & Khanna, 2019). This was especially true in the period of subsistence economy when all gross domestic product (GDP) of the country was formed at the expense of this sector. This is not the case currently, as other industries (e.g., IT) generate more added value (Bandiera & Tsiropoulos, 2020). The figures confirm that: in 1958, agriculture occupied 25% of employment and formed 14% of GDP, while in 35 years these figures changed to 5.7% and 2.5% (Yang *et al.*, 2021). However, for developing countries, where agriculture is often low-intensive, with low yield, and unable to attract investment, the development of this sector is one of the main ways for future prosperity (Mimken & Belmar, 2020). This sector is quickly and relatively easily equipped, and its development leads to a significant improvement in the living standards of the local population. For scientists all over the world, agriculture is one of the important components for achieving the concept of "sustainable development" (Freire *et al.*, 2022; Ara *et al.*, 2021).

Australia is a special country in this case. It is a highly developed country, but it is still a significant exporter of raw materials (similar to developing countries): the main types of resources exported in 2020 include steel, slag, ash, different types of materials, precious metals, and agricultural products (Trademap, 2022; Malerba *et al.*, 2022). The reason for this specialisation of the country is its late opening (Cassman & Grassini, 2020). The first expedition to the continent, conducted by the Dutch, was launched only in 1606, the first British colonies were founded in 1788, and in 1931 under the Westminster Statute (which the country ratified in 1942) Australia became virtually independent from the UK (Cohen *et al.*, 2019). Due to the late opening of the continent, many of its minerals stay unexplored. In this Australia is like Canada and America (Su *et al.*, 2021; Brown & Cunningham, 2019). However, the business in agriculture is going on. The country has long-standing landscapes with soil, and the climate of most of the territory is dry and very variable from year to year (the rains fall a little and they are not stable); therefore, the soil in the country is low-fertile (Ibn-Mohammed *et al.*, 2021; Ranjbari *et al.*, 2022). It is possible to compare Australia with Ukraine, which is also specialised in agricultural production but has quite different natural and climatic conditions, and much more fertile soils (Chancellor *et al.*, 2021; Koshkalda *et al.*, 2020). The technological part of agriculture grows rapidly and has recently come to use nanotechnology, which helps to create hybrids of

existing plant species, increasing their economic value (Palamarchuk *et al.*, 2021; Antle, 2019). The use of manual labour is still widespread in Ukraine, which, despite all climatic advantages, makes the agricultural sector of Ukraine much less competitive.

Ukrainian agriculture is at an important stage today, which is connected primarily with the official opening of the land market in 2024 (Kaminskyi *et al.*, 2020; Reznik & Oleksandr, 2020); besides, the country has considerable potential for the development of this sector, and prerequisites for further development (Mykhailenko & Kinchenko, 2019). For Ukraine, increasing the competitiveness of its domestic enterprises in the external markets to achieve the main goals (development of business and trade support services; creation of favorable conditions that stimulate trade and innovation for export diversification) still is extremely important (Khodakivska *et al.*, 2022). As the country's agriculture is actively involved in international economic integration and is beginning to play an increasingly significant role in economic development (Patyka *et al.*, 2021), consideration of the development of Australia's agriculture in the context of its foreign trade and the use of its experience for further reforms is relevant.

The purpose of this study was to demonstrate the state of the agricultural sector in the country and how its practices can be applied in the current conditions of Ukrainian development.

MATERIALS AND METHODS

When authoring this article, the main methods of research were empirical. Among them, it is possible to distinguish the graphical method and statistical observation, which are based respectively on the construction of graphs for the formation of conclusions and research of statistical data in general. The theoretical methods, such as analysis (works of scientists from different countries, as well as data on the development of foreign trade in Australia); historical (research in time of changes in the Australian and Ukrainian agriculture); forecasting (future changes in the agrarian sector of countries), induction and others. The study itself comprised three main stages. The first shows the key features of the development of Australian agriculture in general. The second stage features the statistical analysis of the country's exports and in particular its agricultural products. Based on the first two stages, conclusions were drawn of the agrarian sector and the probable trends in its development. In the last part of the study, the agricultures in Ukraine and Australia were compared by borrowing the Australian practices of development of the sector.

In analysis of dynamics of export of Australia, the indicator which can be called "the concentration ratio of export" was used. It shows how specialised the country is and how dependent on the export of certain

types of goods. The conditional formula for determining this indicator (Eq. 1):

$$W_n = \frac{\sum_{i=1}^n Ex_n}{Ex} \quad (1)$$

where W_n is the “the concentration ratio of export” of the first n export positions; Ex_n is the monetary expression of the n^{th} position in the export of the country; $\sum_{i=1}^n Ex_n$ is the sum of the first n export positions in the currency expression; Ex is the whole export of the country in the currency expression.

The larger this indicator is, the more concentrated on certain types of products are the exports of the country. Although the country must specialise in the production, diversification of exports (or entire economies) is also a vital component, as it is less dependent on changes in prices for goods and resources in the international market. Therefore, it is important to support the balance between export specialisation and diversification. This is especially relevant for countries that specialise in exporting resources, to which Australia belongs.

Statistical data for analysis was taken from an open Internet source called TradeMap (Trademap, 2022).

Therefore, the classification is formed based on this source. Thus, the following formation is used in the study: “animal wool, fine or coarse wool; yarn of horsehair and fabric”, however, it is not specified exactly how much wool or yarn has been exported separately; this also applies to other complicated indicators (with separate exceptions). Most of the data in the study is represented by graphs and tables of data on which conclusions are drawn. The categories marked with * and “not fully specified” are the same on the TradeMap site (the complete list of products in these components is not listed on this statistical Internet source).

RESULTS AND DISCUSSION

In the context of this study, it is worth considering the composition of export of trade in Australia. Table 1 shows how the fate of some goods in the export structure of the country has changed over the past 5 years.

Table 1 shows that the concentration of exports has increased significantly over the past five years, i.e., the amount of money that the country receives from exports of the first n goods has increased. This is detailed in Table 2.

Table 1. Dynamics of change of share of some types of goods in export of Australia, %

Number n	Year	2016	2017	2018	2019	2020
	All exports	100	100	100	100	100
1	Ores, slag, and ash	25.76	26.19	23.50	28.91	35.66
2	Mineral fuel, mineral oil, and products of distillation	25.10	29.14	34.64	32.61	25.95
3	Natural or cultured pearls, precious or semiprecious stones, precious metals	8.33	6.69	6.31	6.62	7.68
4	Meat and edible meat co-products	4.36	3.97	4.02	4.25	4.09
5	Inorganic chemical; organic or inorganic compound of precious metals, rare earth metals	3.07	2.47	1.80	1.71	2.10
6	Cars, mechanical gauges, nuclear power reactor, boilers; its details	2.58	2.02	1.90	1.77	1.72
7	Cereals	2.69	2.87	1.90	1.26	1.50
8	Pharmaceutical products	1.25	1.10	1.17	1.39	1.36
9	Electrical machines, equipment, and its details; sound recorders and reproducers	1.42	1.36	1.27	1.29	1.22
10	Aluminium and aluminium products	1.52	1.37	1.51	1.21	1.20
11	Optical, photographic, cinematic, measuring, medical, surgical, and other equipment	1.53	1.34	1.25	1.22	1.16
12	Cooper and cooper products	1.30	1.11	1.14	1.13	1.08
13	Other goods	20.03	19.34	18.60	16.66	14.34

Source: compiled by author based on TradeMap data

Table 2. Dynamics of changes of the first 1, 3, 5, 7 and 10 positions in export of the country

Year	2016	2017	2018	2019	2020	Difference (2020-2016)	
Number n	1	25.76	26.19	23.50	28.91	35.66	9.9
	3	59.19	62.01	64.44	68.14	69.29	10.1
	5	66.62	68.45	70.26	74.09	75.48	8.86
	7	71.89	73.34	74.06	77.12	78.70	6.81
	10	76.09	77.17	78.01	81.01	82.48	6.39

Source: compiled by author based on TradeMap data

As Table 2 demonstrates, the concentration of exports in the country is increasing at a significant rate. This leads to a certain danger for the Australian economy because it means a gradual decline in economic

diversification. However, to conclude on the extent of diversification, it is necessary to compare it with other countries. This is presented below in Table 3.

Table 3. Export concentration index (first 1, 3, 5, 7, and 10 items in exports) of some countries as of 2020, %

Number n	Country									
	Australia	USA	China	Russia	Ukraine	German	Canada	France	Japan	India
1	35.66	12.82	27.41	42.10	19.07	17.14	17.67	11.51	19.11	10.03
3	69.29	34.85	48.63	62.77	46.30	43.47	36.90	28.92	54.08	25.60
5	75.48	48.10	55.45	70.29	60.41	55.96	47.93	43.00	66.33	38.45
7	78.70	58.03	61.31	75.18	68.01	62.53	54.56	50.81	73.87	48.05
10	82.48	68.88	69.22	80.55	75.84	68.63	62.40	60.56	80.17	57.45

Source: compiled by author based on TradeMap data

Table 3 shows that among the ten countries considered, Australia is one of the most concentrated. Similar to it by concentration level are other countries specialising in the export of resources, namely Russia and China. It is also interesting that Canada, which is also a resource-exporting country, is much less concentrated in other countries.

This suggests the danger of Australia's dependence on resource prices on its economy. Next, the study considered the dynamics of foreign trade in Australia by agriculture. Fig. 1 shows the schedule of changes in the share of agricultural production to the whole exported production, and Fig. 2 shows the number of products in billions of dollars.

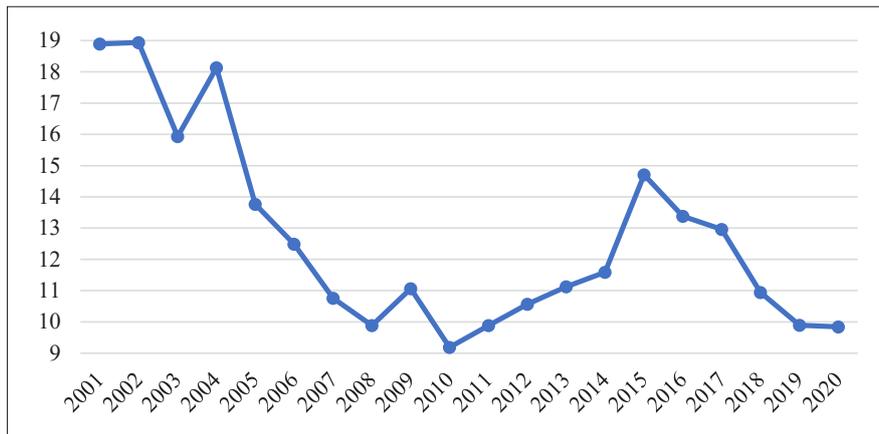


Figure 1. The percentage change of the share of agricultural production to the whole export production from 2001 to 2020, %
Source: compiled by author based on TradeMap data

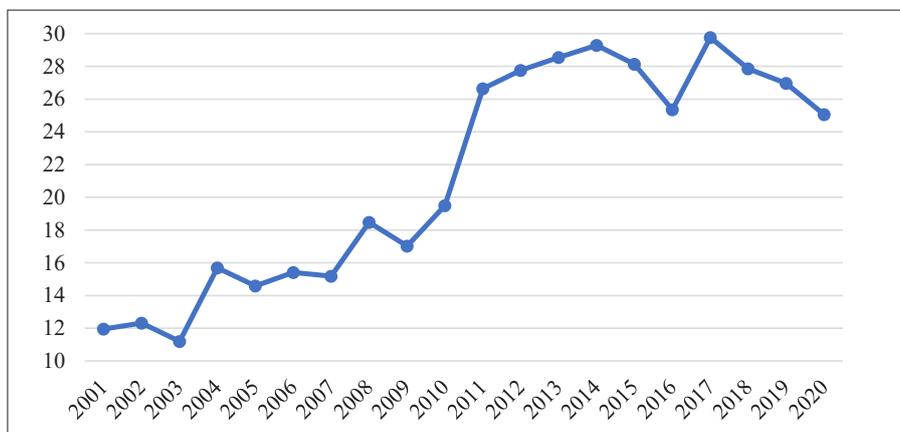


Figure 1. Absolute change in quantity of exported products from 2001 to 2020, million dollars
Source: compiled by author based on TradeMap data

As the two graphs show, the share of agriculture export is much lower (twice) than the country's total exports, while the total number of products increases each year (also twice). This is presented in the following Fig. 3.

Analysing other types of export crops in the region, the author concluded that such changes were due to a significant increase in the export of raw materials,

namely, ore, slag, and ash. In 2001, only 8.1% of total exports were involved in this type of export, and in 2020, 35.7% were engaged. This role was also played by an increase in the export of diverse types of minerals from 20% of exports to 25%. Figure 4 shows the growth rates of these two types of export crops compared to the export of the whole country and the agricultural sector.

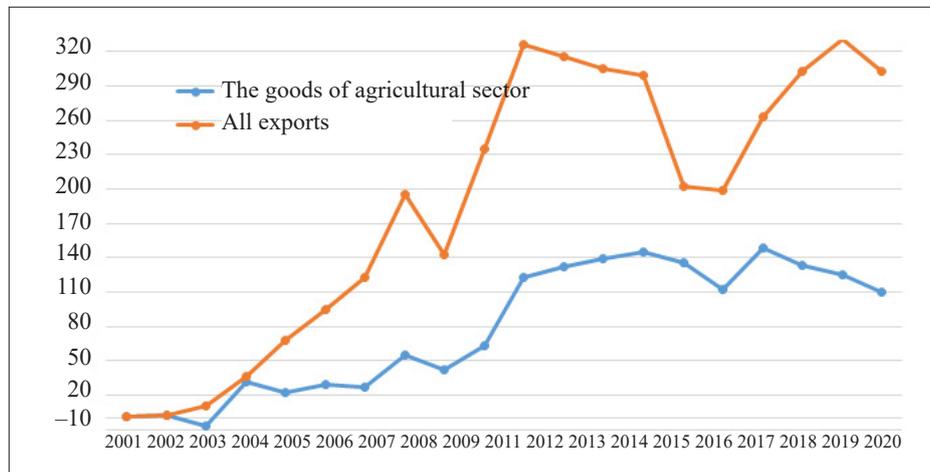


Figure 3. Comparison of growth rate of total export of Australia with growth of export of products of agrarian sector, % growth

Source: compiled by author based on TradeMap data

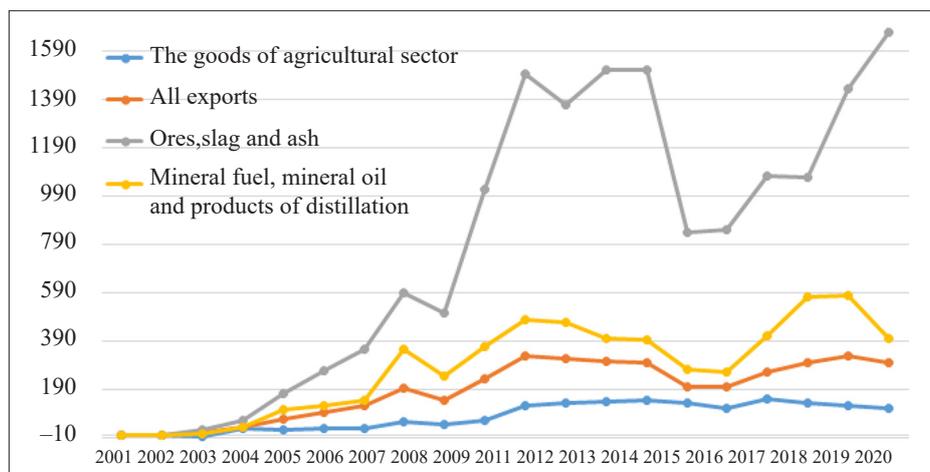


Figure 4. Export of certain types of Australian products from 2001 to 2020, % growth

Source: compiled by author based on TradeMap data

According to the graphs, we see that the export of ore, slag, and ash has increased more than 17 times over the last 20 years. This is a significant increase in the concentration of the country's exports. In TradeMap this group is recorded as "Ores, slag and ash", therefore it is difficult to say, what was the reason for such a sharp increase. Nevertheless, there is a considerable likelihood that this is due to the growth of iron ore production in Australia: According to USGS (United States Geological Survey), Australia is the largest exporter of

iron ore in the world (USGS, 2022). New iron-ore mines are being opened in the country every year, the extraction of this type of resources is increasing; the so-called "boom" of mining of minerals (Helleiner, 2021) is taking place. Because of this, it is not surprising that the income of Australia will depend on the price of this kind of raw material.

It is also worth considering the export of agricultural products in terms of its separate components. They are shown in Table 4 below.

Table 4. Exports of major agricultural products from 2001 to 2020, % of the share of agricultural exports

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Meat and edible meat products	27.19	25.96	30.31	30.15	35.25	34.14	36.07	32.40	30.21	31.31
Cereals	24.72	23.77	17.99	26.17	19.98	22.39	14.74	23.73	25.99	24.15
Fruits and nuts; citrus peels or melon	2.60	3.01	3.27	2.64	3.24	2.98	3.21	2.63	3.52	2.78
Animal wool, fine or coarse wool; yarn of horsehair and fabric	15.42	16.06	15.00	12.17	12.21	11.66	15.26	10.47	8.53	10.55
Seeds of oil and oil fruits; different seeds and fruits	5.69	5.68	4.54	5.67	4.37	4.08	2.90	4.92	7.12	5.37
Animals	4.45	5.16	5.63	3.88	4.28	4.32	5.14	5.10	5.31	5.40
Wood and its products; charcoal	4.63	5.24	6.64	5.92	6.52	6.55	7.85	7.00	5.74	6.45
Export of other agricultural products	15.31	15.13	16.62	13.41	14.15	13.88	14.83	13.74	13.58	13.99
Age	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Meat and edible meat products	27.40	26.97	29.60	35.89	35.38	32.58	30.60	36.74	42.93	41.54
Cereals	30.28	31.25	28.41	25.47	23.00	20.08	22.13	17.40	12.77	15.19
Fruits and nuts; citrus peels or melon	2.08	2.57	3.57	3.72	4.96	5.48	4.91	5.69	7.00	6.80
Animal wool, fine or coarse wool; yarn of horsehair and fabric	11.06	9.54	8.96	7.50	7.89	8.96	9.65	10.72	8.38	6.37
Seeds of oil and oil fruits; different seeds and fruits	7.52	9.13	10.62	6.66	6.17	5.88	6.46	5.43	4.66	5.59
Animals	4.15	3.95	3.59	5.05	4.81	5.64	4.16	4.92	5.52	5.41
Wood and its products; charcoal	4.68	3.70	3.60	4.23	4.46	5.55	5.56	6.47	6.31	5.40
Export of other agricultural products	12.84	12.89	11.66	11.49	13.33	15.84	16.53	12.62	12.43	13.71

Source: compiled by author based on TradeMap data

Evidently, in 2020 the main share of agricultural exports began to occupy the category "Meat and edible meat products" (increased by 52%), although in 2001 the share of this position was equal to the fate of "cereals" (the category "cereals" decreased by 38.5%). Furthermore, the share of "fruits and nuts; citrus peel or melon" increased by 2.5 times, from 2.6% to 6.8%. Exports of wool, yarn, and horsehair (about 2.5 times) decreased significantly. Other main types of export products of this type are at the same level.

Thus, the country was oriented toward the production of both cereals and meat, now it is specialised in the production of meat products. This is due to the specific features of the Australian climate and soils, under which it is more effective to export livestock products.

Australian agriculture has a brief history compared to most large agricultural countries. From the beginning of the settlement on the mainland it developed slowly, and from 1788 to 1900 reached only the volume of 2 million ha. In modern times this figure exceeded 23.5 million ha (Ibn-Mohammed *et al.*, 2021). At present, Australia is a significant exporter of agricultural products, including beef, wheat, sugar, wool, barley, dairy products, and wine. About 60-70% of production is exported, the reason being a low internal market of only 25.72 million people (Statista, 2022). Therefore, the complex climate situation has led to the existence of an

interesting system of functioning of agriculture, which since the beginning of the 20th century forms farmers as beneficiaries of innovations (Pruntseva *et al.*, 2021; Ritter *et al.*, 2020). These conditions also contributed to the formation of resource-saving agriculture, aimed at reducing soil cultivation and increasing crops by improving their fertility (zero or minimum soil treatment, harvesting of grain, oil, and legumes, etc.).

J. Freebairn (2021) notes that Australia is currently experiencing climate change. This may lead to lower returns from land, and thus reduce the effectiveness of the agricultural sector of the country. The country is preparing for this, and therefore conducts several types of procedures that ensure land adaptation. According to E.-M. Meemken & M.F. Bellemare (2020), these procedures differ from territory to territory because of differences in soil types, but one thing is to preserve the efficiency of agriculture. The government supports farmers, provides them with information on climate change, weather forecasts, supports the development of innovative technologies, and provides social support to those who are unable to adapt. The peculiarities of investment in agriculture in Australia are that the main investors in the country have always been foreigners. Local investors were more inclined to invest in mining. In turn, E. Hel-leiner (2021) believes that the reason for this is that local managers of Australian funds had very short-term

views on agriculture and investment in it, while foreign governments and funds bought Australian farms and food assets.

Since the year 2025, demand for agricultural products in the country is expected to increase, especially among foreigners (companies from New Zealand, China, the USA, and others). Because of this, Australia must prepare to make more investments and produce more products in this sector in the country (Bourman *et al.*, 2022). Currently, a large part of the farms in the country is family-based. Nevertheless, they show good stability indicators even in adverse climatic conditions, such as drought, flooding, increased salt content, etc. (Drecer *et al.*, 2018). Nevertheless, commercial, non-family farms stay the most productive; therefore, one of the most important goals of the country is to turn family farms into more efficient ones. The Australian authorities believe that this model is outdated, and the state should form a strategy for agricultural development based on European models (Allen *et al.*, 2019).

There is some concern among the local population about significant volumes of foreign investment in the country, which the state authorities are also paying considerable attention to. This concern is caused by the fact that foreigners do not adhere to the environmental standards of the country, thus jeopardising the productivity of the sector in the future. Because of this, the country needs to create a more attractive investment climate for local investors. According to J.-O. Hesse (2021), the methods that can help to encourage investments among the local population are reduction of the rate of income tax on investment activity (or provision of other financial benefits), simplification of the investment process (filling of some documents in particular), provision of guarantees on the preservation of investments in case of emergencies and others. Until such measures are taken, foreign investment will prevail in this sector.

Having analysed Australia's agriculture over the past few years and its state in the country, some features of the country's agricultural sector and lessons for Ukraine can be found. Under the entry into force of the Law of Ukraine "On Amendments to Certain Legislative Acts of Ukraine Concerning the Circulation of Agricultural Land", the country has approached to a considerable extent the European model of functioning of the "land market" (Litvinova & Chuenko, 2021). Since the collapse of the Soviet Union, politicians have often discussed the possibility of buying all land by foreigners, which, according to their beliefs, would lead to total poverty in the population. I. Arto *et al.* (2022) explained this by the fact that the new owners of the land will force the local population to work for small money and at the same time make huge profits. Nevertheless, the authors of this article do not agree with this statement: new foreign investments will lead to added tax revenues to

the budget, creation of new jobs, and development of local infrastructure. M. Frattaroli (2020) agrees with the fact that national investors should also own state land and conduct business on it. The situation that has existed in Ukraine in recent years, under which the land market did not exist, has enabled local government officials or politicians to carry out various corrupt operations related to the sale or lease of land. S. Hsiang *et al.* (2019) are convinced that the opening of the land market and the establishment of a fair price will in turn reduce the opportunities for the authorities to carry out such operations.

As Tables 1, 2, and 4 clearly demonstrated, Australia is strengthening the processes of specialisation, which are reflected in the increase in export. O. Anysenko & K. Vakar (2018) confirm that in Ukraine, they are also happening: the share of steel and iron in exports decreases over time, and the share of agricultural products (in particular, cereals and oils) increases; there was a considerable increase in the country's agricultural sector, although in the future the development of this sector in the future, according to some scientists, there is uncertainty. Although both countries specialise in agricultural production, they have quite diverse cultures in their exports. This shows once again that Ukraine should choose its own path, which will differ in many respects from the Australian development of this sector.

CONCLUSIONS

The study showed that the basic agricultural sector of the economy of Australia is family farms, which produce the absolute majority of the industry's products. They are also the main initiators of innovation change, which should be constantly carried out, in connection with the special climatic conditions. Another feature is that foreign investment prevails in Australia's agriculture. This raises some concerns among the local population. That is why the country aims to increase the investments of local investors in the industry.

In export countries, the resources of diverse types predominate, mainly – "ore, slag and ash", and in particular – iron ore (due to a considerable amount of this resource in the country and the rise in prices for it in recent years). However, agricultural products also occupy a significant part of exports. The foreign trade in agricultural products is also marked by significant changes. Previously, the share of exported meat and cereals was the same, while the current meat exports almost tripled over the cereal exports. Thus, we can talk not only about increasing the specialisation of Australia as a whole (which was also shown in the study based on export concentration) but also in certain sectors. In the future, this could pose a threat to the country in case of a crisis in the world markets, as well as bring benefits during the economic upturn. Therefore, the country needs to strike a balance between these two indicators.

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Динаміка розвитку виробництва і експорту продукції сільського господарства в контексті зовнішньої торгівлі Австралії

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Анотація. В Австралії аграрний сектор є одним із основних в економіці та, зокрема, експорті країни. Сприяє цьому значний рівень розвитку сільського господарства в країні та її ресурсна спеціалізація в міжнародній торгівлі в цілому. Україна в цьому аспекті є подібною до Австралії, що робить актуальним розгляд сучасного стану аграрного сектору в обох країнах. Метою статті є детальний аналіз аграрного сектору в Австралії та знаходження елементів розвитку, що допомогли б модифікувати українське сільське господарство. Основними методами при написанні роботи стали статистичні методи, такі як графічний і статистичний аналіз. Це пов'язано із формування висновків в більшості на основі статистичної інформації, графіків та таблиць, показаних в роботі, та побудованих за допомогою статистичного TradeMap. У ході дослідження автори дійшли висновку щодо зменшення долі експорту аграрного сектору в країні, що пов'язано з сучасною орієнтацією країни на експорт ресурсів, зокрема заліза. У середині структури експорту продукції сільського господарства відбуваються значні зміни, найважливішою з яких є перехід до виробництва продукції тваринництва. Україна може перейняти деякі особливості функціонування даного сектору в Австралії, зокрема те, як у країні ведеться інвестиційна політика в галузі. Тим не менш, було з'ясовано, що в сучасному сільськогосподарському секторі обох країн існують значні відмінності. Через це повністю перейняти план функціонування австралійського сільського господарства неможливо. Перспективними можуть стати дослідження в питанні майбутнього розвитку галузі в Австралії з урахуванням сучасних тенденцій, та їхній вплив на зовнішню політику та торгівлю країни. Стаття стане корисною для вивчення функціонування економіки Австралії та України, а зокрема їхніх сільськогосподарських галузей; для формування державної політики аграрного сектору та зовнішньої торгівлі; студентам – для вивчення економічних дисциплін та написанні відповідних робіт

Ключові слова: аграрний сектор, економіка, ресурси, населення