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FEATURES OF REGIONAL PRODUCTION OF SUNFLOWER SEEDS IN THE PERIOD 1990-2021 IN UKRAINE

Oksana MAKARCHUK, Tetyana KUTS

National University of Life and Environmental Sciences of Ukraine – NULES of Ukraine, 11 Heroyiv Oborony Street, Kyiv 03041 Ukraine, Phone/Fax:+38(096)2382548; Phone/Fax:+38(098)4781163; E-mails: makarchuk.o.g@nubip.edu.ua, tetyana_kuts@nubip.edu.ua

Corresponding author: makarchuk.o.g@nubip.edu.ua

Abstract

This paper aims to provide analysis of the main features of regional production of sunflower seeds in Ukraine. To realize aims in the article, the importance of agriculture was pointed and evaluation of sunflower seeds productions in accordance with natural and climatic zones were done. Results showed that areas under sunflower have increased significant and in 2021 there was observed the share of 52% of the harvest collected by agricultural enterprises in the Steppe zone, 39% in the Forest-steppe zone, and 9% in the Polissya zone. Grouping enterprises under the area size of sunflower growing confirmed the fact that the bigger arable land of sunflower has the enterprise, the more productive will be sunflower production, in particular, enterprises that have arable land under sunflower more than 2000 ha get yield more than 24 centners per hectare. These enterprises have possibilities to use new technologies to achieve the desired effect during production. The area and introduced pesticides factors was taken into account in regression analysis due to the importance of both them in increasing sunflower seeds production. Results showed close dependence between mentioned factors. In the article discussed a few aspects regarding the sunflower seeds market in Ukraine under the condition of the hostilities in the region. There are evaluated experts opinions regarding production capacities, processing, export and prices on the domestic and world market.

Key words**:** *regional production, sunflower seeds, sunflower oil, war, logistics, regression*

INTRODUCTION

Sunflower is one of the main oilseed crops in Ukraine. Production is concentrated mainly in the Southern and Eastern regions. Due to favourable combination of high price, relatively low cost of production, and traditionally high demand, sunflower seed has become one of the most profitable crops. Its high profitability growing furthered a significant expansion in planted area beginning in the late 1990's [18]. Many Ukrainian farmers and enterprises rejected the traditional crop-rotation practices that were recommended by agricultural officials. Such tendency takes place due to technological progress in sunflower growing and its high profitability. In terms of economic efficiency indicators, oilseeds exceed other agricultural crops. According to the Oilseed Institute, the new challenges that have appeared to agriculture are connected with the hostilities in the region [9].

Thus, the underachieved harvest of agricultural crops is estimated at 9.6 billion dollars. The most significant declines in the projected 2022 harvest are for wheat production (a 33% decline compared to the baseline scenario), sunflower (32%) and barley (31%), as a large part of the production of these crops is located directly in the regions affected by hostilities.

One of the consequences of the hostilities in the region is the decline in producer prices for export-oriented goods. Due to the blockade of ports, Ukraine faced oversaturation of the domestic market and an almost four-fold increase in the cost of export logistics. This led to a 30% drop in prices within the country, as a result of which agricultural enterprises lost 11.9 billion dollars [4, 19].

Research on sunflower seeds in view of economic, social and environmental dimensions over the last decade has been widely reflected in the Ukrainian and foreign literature.

Economic issues of sunflower seeds production were researched by Chekhov and Chekhova (2018), where was evaluated the efficiency of sunflower seeds production [3]. There was concluded that sunflower seeds growing in Ukraine is economically beneficial for enterprises. Herewith lower cost prices at the highest price compared to other oil products crops explain the popularity of sunflower seeds and its annual production growth.

Market research of this culture was analyzed in view of the growing linkage of Ukrainian and world markets of sunflower oil [7]. There was stated that high price transmission between the Ukrainian and European markets, however opposite to it lower price transmission was observed among the Ukrainian and United States markets.

Hamulczuk et al (2021) in their publication evaluated the closeness of integration of the Ukrainian sunflower oil market with the European market in the frame of the time varying [5].

Pricing mechanism, pricing analysis conjuncture are presented in the studies of Shpychak (2012), Bodnar (2015), Makarchuk and Kuts (2022) [1, 14, 8].

Mykhailov et al (2020) researched production of sunflower seeds in Ukraine and its economic and technical efficiency, in particular, the technical means of post-harvest processing of sunflower seeds; theoretical issues of the separation of airborne impurities; methodological aspects in research of experimental devices; laboratory and field results of experimental devices and practical application and evaluation of their efficiency [10].

A linkage of technological processes with natural biological processes was studied by Rotaru and Nastase (2014) [12]. They considered that the effectiveness of implication of intensive technology should be based on technical, economic, energy and environmental criteria's.

Soare and Chiurciu (2018) evaluated the main tendencies worldwide regarding the production and marketing of sunflower seeds [15]. There were analyzed indicators that related to the production and marketing of sunflower seeds, i.e. planted areas with sunflower; overall rate of production of sunflower seeds; quantity of fertilizer used for the sunflower production; average yield per hectare of sunflower seeds; its consumption; imports and world exports. They suggested that in the future is expected as planted area to grow worldwide and also to increase sunflower seeds production.

Nowadays new challenges for agriculture crops come due to the war in Ukraine. Many domestic and foreign organizations evaluate the influences and future consequences in agriculture crops growing, production and realization in Ukraine. On evaluation of some agricultural experts, many enterprises in these conditions, i.e. Cyngent Agrocompany, wheat crops will not growing because of low grain price and expensive logistics and instead of it will increase the part of oilseeds due to their higher prices and lower influence of logistic factor.

In these circumstances, our research is actual because of its regional evaluation of sunflower seeds production.

The paper is organized as follows: Section 2 discusses described the data and methods of empirical investigation; Section 4 reports getting results; and Section 5 ends with conclusions of obtained results.

MATERIALS AND METHODS

The purpose of the article is to analyze features of regional production of sunflower seeds in Ukraine; evaluate factors influencing production growth; forecast further production capacity.

The methodical basis of the research is the provision of statistical data on agricultural crops production, in particular, sunflower seeds. Based on statistical observation about sunflower seeds there were analyzed sown area, yield and production. To achieve the goal in the paper was evaluated Ukrainian sunflower production in accordance with natural and climatic zones. At the same time there was used data on agricultural enterprises grouping by harvested area size under sunflower seeds to see changes in gross

harvest and yield depending on the arable land of the enterprise.

Many factors are influencing on sunflower seeds production in each regions of Ukraine. To evaluate the dependence of sunflower seeds production in regions in Ukraine two factors were taken into account, i.e. area under sunflower seeds and introducing pesticides. The source of data was the State Statistics Service of Ukraine for the period 2020 across regions of Ukraine. In the paper was done regression analysis between mentioned signs. There is should be executed the condition that withthe increasing of arable land for sunflower seeds production and growth of pesticides implication, could be got additional sunflower seeds production.

Due to the uncertainty regarding the harvest in the conditions of the war in Ukraine and, accordingly, gross production, the article used a descriptive analysis of production forecasting based on expert assessments and official statements of government.

RESULTS AND DISCUSSIONS

Ukraine has always been known as an agrarian county with its rich natural potential, i.e. more than 55% of Ukrainian territory consists of arable land, where 66% of this is covered "chornozem" that means black earth that is the most fertile soils in the world and profits from favourable climatic conditions for planting [6]. Agricultural crops grown in Ukraine are represented by the following main groups: grain and leguminous crops; industrial crops; potatoes, vegetables and cucurbitaceous crops and fodder crops. From 1990 to 2020, it is possible to observe a change in the size of the sown areas of the crops and their structure (Table 1). Agricultural producers of all forms of ownership increased the sowing of grain and industrial crops, while reducing the areas under potatoes, vegetables and fodder crops.

At the same time, the cultivated areas under industrial crops expanded most significantly, i.e. from 3,751 thousand ha (12% of the total sown area) in 1990 to 9,224 thousand ha (33%) in 2020.

Table 1. Sown area under agricultural crops and its structure in Ukraine, thousand ha

Crops area	**1990**	**2000**	**2010**	**2020**	**2020 in % to 1990**
All sown area	32,406	27,173	26,952	28,147	86.9
Grain and leguminous crops	14,583	13,646	15,090	15,392	105.6
Industrial crops	3,751	4,187	7,296	9,224	245.9
Potatoes, vegetables and cucurbitaceous crops	2,073	2,277	1,967	1,854	89.4
Fodder crops	11,999	7,063	2,599	1,677	13.9

Source: Statistical Services of Ukraine, 2022 [16].

In turn, the dynamics of changes in the structure of sown areas of industrial crops have it sown characteristics, in particular, expansion of sunflower, soybean and rapeseed and reduction of fields under sugarbeet and other technical crops (flax, hemp, tobacco, hop); sunflower has remained the main crop in the structure of industrial plants sown area in Ukraine and its share increased from 44% in 1990 to 70% in 2020 (Table 2).

Table 2. Sown area under industrial crops and its structure in Ukraine, thousand ha

Crops area	**1990**	**2000**	**2010**	**2020**	**2020 in % to 1990**
All sown area	3,751	4,187	7,296	9,224	245.9
Sugar beet	1,607	856	501	220	13.7
Sunflower	1,636	2,943	4,572	6,457	394.7
Soya	93	65	1,076	1,351	1,452.7
Rapeseed	90	214	907	1,127	1,252.2
Othercrops	325	109	240	69	21.2

Source: Statistical Services of Ukraine, 2022 [16].

At the producer level, the choice of crops was determined by various factors. As our research shows, such a change in the ratio of industrial crops sowing is primarily due to economic factors, namely the growing demand for sunflower, soybean and rapeseed both in the domestic and foreign markets, and the sufficiently high level of prices for products during the analyzed period.

As a result of active development of agricultural production, now Ukraine is one of the world's top agricultural producers and exporters of oilseeds to the global market. In the rank among global exporters, Ukraine has taken first place for sunflower oil and sunflower meal. In the percentages expression

Ukrainian export of sunflower oil is amounted to 34.7%, sunflower meal – 39.8%. Ukrainian rapeseed goes mostly for export (more than 90%) and in global export it is amounted to 16.6%. Last decade the arable land under soybean production was grown. Herewith Ukraine's soybean production and export account for less than 1% of global output and trade.

The growth of sunflower cultivation requires further analysis of sunflower seed production trends in different regions of Ukraine, taking into account seed sales channels and available capacities for its storage and processing. It is also important to evaluate the consequences of sunflower seed production not only from the point of view of economic results, but also agrotechnical requirements and principles of sustainable development of agriculture.

In Fig. 1 is analyzed the dynamics of sunflower seeds production and the yield level over the past thirty years, 1990-2020.

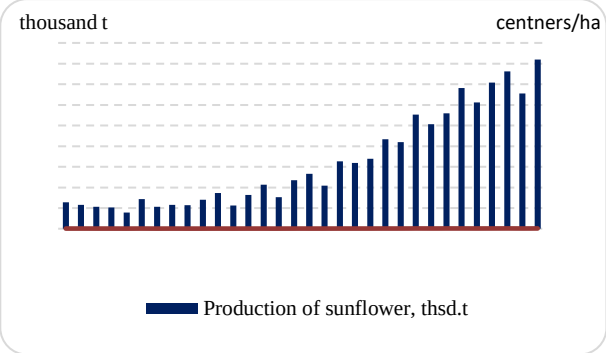

Fig. 1. Dynamics of sunflower seed production and yield in Ukraine in the period of 1990-2020
Source: Presented based on the Statistical Services of Ukraine data, 2022 [16].

From Fig. 1, we can distinguish two conditional periods: the first is the period of post-Soviet development, which lasted until 2000, when a fall in gross revenue or its fluctuations were observed.

The level of production was determined mainly by natural and climatic conditions, since the enterprises had a certain deficit of material and technical support of production and financial resources.

The second period since 2000 has become the stage of active increase in production volumes. The total production of sunflower increased 4.7 times (from 3,457 thousand t in 2000 to 16,392 thousand t in 2021) with an increase in average yield by 42% [16]. Over the last years, the business model has changed, which was aimed at increasing the intensity of technologies and their efficiency, i.e. quality seeds, fertilizers, pesticides, modern technologies, machinery and equipment began to play an increasingly important role.

Ukraine is characterized by regional specialization in the cultivation of oil crops. The farms in the Steppe zone traditionally specialized in growing sunflower as shown in Fig. 2.

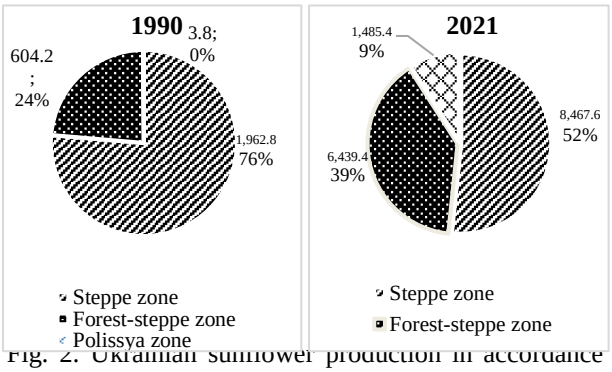

Fig. 2. Ukrainian sunflower production in accordance with natural and climatic zones
Source: Presented based on the Statistical Services of Ukraine data, 2022 [16].

As it is shown in Fig. 2, their share in the total harvest in 1990 was 76%, in particular the agricultural enterprises of Dnipropetrovsk region (12%), Donetsk (11.8%), Zaporizhya (11.1%), Kirovograd (9.8%), Odesa (9.2%), Mykolaiv (8.6%) and Luhansk (8.5%). Among farms in the Forest-steppe zone, the most sunflowers were grown in Kharkiv (9.6%) and Poltava (6.8%) regions.

During the analyzed period we can observe that sunflower production areas have expanded significantly. In 2021, 52% of the harvest was collected by agricultural enterprises of the Steppe zone, 39% of the Forest-steppe zone, and 9% of the Polissya zone. The share of the Kirovograd region in the formation of the gross sunflower harvest in 2021 was amounted to 9.7%, respectively, Dnipropetrovsk 8.6%; Mykolaiv 7.1%; Zaporizhya 6.5%; Odesa 5.9%; Luhansk 4.9%; Donetsk 4.8% and Kherson 4.1%.

Among the regions of the Forest-steppe zone, the most sunflowers were harvested in the

following regions: Kharkiv (8.7%); Poltava (6.1%), Vinnytsya (6%); Cherkasy (4.9%); Sumy (4.8%).

The promotion of sunflower cultivation in the central and northern regions of Ukraine is to some extent explained by climate change, namely, the farms of the east and south, due to the arid weather conditions of the last decade, observe a negative impact not only on the yield, but also on the oil content of seeds [13].

Considering the importance of production growth, there was analyzed groupings of enterprises by harvested area size of sunflower seeds (Table 3).

The results of grouping give information that the share of enterprises that are growing sunflower on the area, which no more than 100 ha is amounted to 58.1% and those enterprises that have more than 1,000 ha equal to 5.2%. However, in contrast to this fact the yield in enterprises with land lower than 100 have yield 21.4 centner/ha, where enterprises with land more than 1,000 ha have a greater yield accounting for 24.6 centner/ha. It could be explained that enterprises with lager land have potential to increase yield using modern technologies by growing sunflower.

Table 3. Groupings of enterprises by harvested area size under sunflower seeds in Ukraine in 2020

Groups	**Number of enterprises**		**Gross harvest**		**Yield, centners per ha**
	Units	percentage to total number	thousand t	percentage to total gross harvest	
Enterprises of which with area, ha	21,856	100.0	11,492.9	100.0	21.4
no more than 100.00	12,692	58.1	771.2	6.7	16.4
100.01–200.00	2,894	13.2	829.3	7.2	19.6
200.01–500.00	3,424	15.7	2,267.4	19.8	20.7
500.01–1,000.00	1,704	7.8	2,496.8	21.7	20.8
1,000.01–2,000.00	824	3.8	2,458.9	21.4	22.1
2,000.01–3,000.00	181	0.8	1,070.9	9.3	24.7
more than 3,000.00	137	0.6	1,598.4	13.9	24.6

Source: Statistical Services of Ukraine, 2022 [16].

The modern production of competitive sunflower seeds products is possible only on the basis of a growing culture of farming; increasing soil fertility is a necessary condition for the introduction of advanced agricultural technologies with the rational use of local soil and climate resources, means of intensification and the crop rotation system. According to the Methodological recommendations on the optimal ratio of agricultural crops in crop rotations of different soil and climatic zones of Ukraine, the area of sunflower seeds in the Steppe zone should be optimized [20]. Besides that, sunflower should be grown no more than once every seven years on the same field. The positive effects of this method are the prevention of soil-borne fungal diseases and the reduction of moisture and soil fertility depletion. However, nowadays sunflower production can be observed in all regions of Ukraine, despite non-traditional cultivation by region and non-observance of crop rotation.

Due to the significant variability of weather conditions in recent years, the main place in sunflower production should be occupied by highly adaptive hybrids, resistant to drought and stressful temperature increases, as well as resistant to significant fluctuations in temperature and moisture supply during the growing season. The modern level of selection ensures the creation of hybrids with a potential yield of 4.5–5 t/ha. However, realizing the potential of hybrids is impossible without ensuring disease resistance through the use of pesticides and appropriate fertilizes.

To see how sunflower seeds (SSeeds) production depends on two factors harvested area (h_area) and pesticides use (p_use) regression analysis was made (Table 4). The importance of these two factors was mentioned above.

Getting results confirmed the dependence of sunflower seeds production from factors that were included in the model, i.e. with increasing of 1 thousand hectare arable land of sunflower in the region, sunflower seeds production will increase by 1.26 thousand t; implication of pesticides in the quantity of 1 t in the region will lead to sunflower seeds production growth by 0.28 thousand t.

The regression analysis describes close connection between these two factors, where the index R=0.97 indicates a tight linkage.

The model is significant that is confirmed by P-value for the parameter a_1 and a_2, which are lower than critical value 0.05.

Table 4. Regression analysis results of main factors influence on sunflower seeds production in Ukraine

Specification	**Regression equation: SSeeds_production= -87.69+1.26 *h_area+0.28 p_use**
R	0.97
R^2	0.95
P-value for parameter a_1	0.00
P-value for parameter a_2	0.00

Source: author's calculations.

A produced sunflower seed goes mostly to domestic oil and fat plants. According to the regions of sunflower cultivation, the main oil and fat plants are located in the Dnipropetrovsk, Zaporizhi, Odesa and Mykolaiv regions.

A feature of the domestic oil and fat industry is a high level of production concentration. More than half of the production capacity of the industry belongs to large industrial groups, the specific weigh to which in the total volume of production is constantly increasing. The industry is characterized by the use of resource-saving technologies, a high level of competition, the investment attractiveness of enterprises, their export orientation and participation in the country's food security.

The largest share in the total production of unrefined oil in 2019 was occupied by Dnipropetrovsk OEZ (16.1%), Delta Wilmar Ukraine (13.6%), POEZ-Kernel Group (11.8%), PP "Oliyar" (7.7%), Prikolotnyanskiy OEZ (6.7%) [2].

Indeed, created oilseed processing facilities in Ukraine make it possible to process the entire harvest (soybean, rapeseed, sunflower). Over the past five years, the average annual production capacity for oilseed processing has increased by 8,256.4 thousand t and as of April 1, 2020 was amounted to 18,813.2 thousand to sunflower processing and 2,762.8 thousand t of soybeans processing [2].

The hostilities in the region started in February 2022 will affect the forecast of sunflower seeds production and its processing. According to official data of the Ministry of Agrarian Policy and Food of Ukraine, the projected sowing area of the main spring agricultural crops for the 2022 harvest in the territory controlled by Ukraine amounted to 14,163.4 thousand hectares, which is 2,752.9 thousand hectares less than in the last year. During the 2022 sowing campaign, a high change in the structure of crops concerned wheat, corn, sunflower and soybeans has been noticed. The planted area with sunflower decreased compared to last years and was equalled to 4.7 million hectares, representing 72% of last year's level. The reduction in cultivated areas will lead to a decrease in production volumes to 9-10 million t, meaning by 40% less than in the previous years [9].

As a result, we can highlight the following possible situations on the market in Ukraine that require further research and development:

(1) the domestic level of sunflower oils consumption will be stable and national food safety will be guarantee in the near term;

(2) at the level of the agricultural producer and processing enterprises, the priority of the channel of sunflower seeds sale to processing enterprises will be preserved; herewith in country could appear a disbalance between the processing capacities that are working and able to work and the amount of sunflower grown. Nowadays several oil extraction plants are partially or completely out of business. Some of them are in the war zone or in the occupied territories.

(3) at the level of the processing enterprises, the market for finished oil products will be a major problem, as logistics and supply chains are significantly disrupted in the conditions of blocked ports. The actual export of sunflower oil amounted to 628,807 t and export of meal was 262,306 t during March-June 2022. It is significantly less than the indicators of the same period of last years [9];

(4) on the vegetable oil market it could be observed certain price fluctuations; however the priority problems for this market participants will be the ability to manufacture products and, most importantly, the ability to sell them.

CONCLUSIONS

Agriculture in Ukraine plays a crucial role in national economy. Indeed, agriculture is the third most important sector of the Ukrainian economy, with a gross domestic product share of 10.5% in 2020 [7].

It is important to note that Ukraine is one of the world's top agricultural producers and exporters and plays a critical role in supplying oilseeds and grains to the global market.

Scrutinized the production of sunflower seeds in the last thirty years, the interval could be divided into two periods:

(1) the period of post-Soviet development that continued until 2000, which stood out in gross revenue fall and its fluctuations due to significant shortage of material and technical assist of production and financial resources;

(2) the period since 2000 which is distinguished by increase in production volumes, aimed by using the intensity growing technologies, in particular, quality seeds, fertilizers, pesticides, machinery and equipment etc.

Due to favorable natural and climatic conditions for sunflower growing, its production was widespread all over the country. However, the productivity is different from a region to another due to natural and climatic conditions, and that's why in this research work the regions were divided into three groups (i.e. the Steppe, the Forest-steppe and the Polissya) and scrutinized each of them.

The results showed that in 2021, 52% of the sunflower harvest was collected by agricultural enterprises in the Steppe zone, 39% in the Forest-steppe zone, and 9% in the Polissya zone. Sunflower growing in nontraditional zones, i.e. the central and northern regions, could be explained by changes of climate change, where for sunflower growing the conditions are more appropriate in last year's compare to traditional zones (the east and the south), where it could be observed a negative consequence of climate change on yield and the oil content in seeds.

Grouping agricultural enterprises by area size, sunflower production was higher in the enterprises with larger land cultivated with sunflower, productivity is better and vice versa in the enterprises with a smaller area cultivated with this crop, sunflower yield is lower.

Indeed, enterprises cultivating more than 2,000 ha got a yield by 24 centners per hectare higher, while the enterprises having less than 1,000 ha arable land cultivated registered a sunflower yield ranging between 16.4 and 20.8 centners per hectare. These could be explained by the fact that big enterprises have possibilities to invest in new technologies to achieve better productivity results.

Besides of availability of land that influences productivity, pesticides are another the significant factor for increasing production. Both factors were taken into account in regression analysis. The obtained results confirmed a close dependence between sunflower seeds production and the two factors, i.e. arable land cultivated with sunflower and the use of pesticides. These two factors are responsible of 95% of sunflower seeds production.

The war in Ukraine has negative consequences on agriculture sector, in particular in crop growing due to occupied territory, closeness or partially work of fat and oil factories, ports blockade, not possibility to predict harvest etc.

However, according to USDA forecast in 2022/2023 MY, Ukraine will become the world's third-largest sunflower seeds producer after Russia and the European Union. This is due to the fact that production is expected to go down sharply reflecting challenges that appears due to the hostilities in the region. Ukraine remains the third producer of sunflower seeds, oil and meal among the global producers in 2022/2023 MY [17].

REFERENCES

[1]Bodnar, O.V., 2015, Funktsionuvannia mekhanizmu tsinoutvorennia na produktsiiu roslynnytstva v umovakh nevyznachenosti ta ryzyku (Functioning of the pricing mechanism for crop production in conditions of uncertainty and risk). [In Ukrainian]. Economics and management of agriculture; collection of science proceedings of the BNAU, No. 1 (119), 33-35.

[2]Boyko, O.S., Geiko, L. M., 2020, Cuchasnyi stan pidpryiemstv oliino-zhyrovoi promyslovosti Ukraini (The current state of enterprises of the oil and fat industry in Ukraine). [In Ukrainian]. Economic scope, (157), 32-37, https://doi.org/10.32782/2224-6282/157-6, Accessed on July 28, 2022.

[3]Chekhov, S.A., Chekhova, I.V., 2018, Otsinka efektyvnosti vyrobnytstva soniashnyku v Ukraini (Evaluation of the efficiency of sunflower production in Ukraine). [In Ukrainian]. Economic space, No.136, 119-130, http://nbuv.gov.ua/UJRN/ecpros_2018_136_14, Accessed on July 22, 2022.

[4]Gordiychuk, D., 2022, Nepriami vtraty ahrosektoru vid viiny perevyshchuiut $20 miliardiv (Indirect losses of the agricultural sector from the war exceed $20 billion), [In Ukrainian]. https://www.epravda.com.ua/news/2022/06/22/688428/ Accessed on July 23, 2022.

[5]Hamulczuk, M. Makarchuk, O., Kuts, T., 2021, Time-Varying Integration of Ukrainian Sunflower Oil Market with the EU Market. Agris on-line (Papers in Economics and Informatics), XIII, 3. https://online.agris.cz/archive/2021/03/04, Accessed on July 5, 2022.

[6]Horovetska, Y., Rudloff, B., Stewart, S., 2017, Agriculture in Ukraine: Economic and Political Frameworks. Research Division Eastern Europe and Eurasia, 2017/No. 01 and Research Division EU/Europe, 2017/No. 04. https://apd-ukraine.de/images/Waldgesetze_in_Deutschland/Agriculture_in_Ukraine.pdf, Accessed on July 2, 2022.

[7]Kuts, T., Makarchuk, O., 2020, Ukrainian Sunflower Market on the Background of EU and US Markets. Zeszyty Naukowe SGGW w Warszawie - Problemy Rolnictwa Światowego, 20 (35) (3), 4-15.

[8]Makarchuk, O., Kuts, T., 2022, Factors evaluation affecting sunflower oil prices in Ukraine, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 22(2), 481-488.

[9]Ministry of Agrarian Policy and Food of Ukraine (Minagro), https://minagro.gov.ua/en, Accessed on August 2, 2022.

[10]Mykhailov, Ye., Golebiewski, J., Kiurchev, S., Hutsol, T., Kolodii, O., Nurek, T., Glowacki, Sz., Zadosna, N., Verkholantseva, V., Palianychka, N., Kucher, O., 2020, Economic and technical efficiency of sunflower seed processing. Monograph. Warszawa. 158, DOI:10.22630/SGGW.WE.9788375839340, Accessed on August 1, 2022.

[11]Propozitsiya, 2021, Profitability of oilseed crops in 2021, https://propozitsiya.com/ru/rentabelnost-maslichnyh-kultur-v-2021-godu, Accessed on August 1, 2022.

[12]Rotaru, G., Nastase, M., 2014, Analysis of sunflower production, at macro and microeconomic level, https://mpra.ub.uni-muenchen.de/61736/1/MPRA_paper_61736.pdf, Accessed on July 24, 2022.

[13]Rozhko, V., 2021, Urozhai soniashnyku v Ukraini: trudnoshchi 2020 r. ta pozytyvni perspektyvy 2021 r. [Sunflower harvest in Ukraine: difficulties in 2020 and positive prospects in 2021], [In Ukrainian] https://www.apk-inform.com/uk/exclusive/topic/1519449, Accessed on July 24, 2022.

[14]Shpychak, O.M., 2012, Teoretyko-metodolohichni aspekty tsinoutvorennia na silskohospodarsku produktsiiu [Theoretical and methodological aspects of pricing of agricultural products]. [In Ukrainian]. Economy of agricultural industry, No. 8, 3-10.

[15]Soare, E., Chiurciu, I.-A., 2018, Considerations concerning worldwide production and marketing of sunflower seeds, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 18(3), 421-427.

[16]State Statistics Service of Ukraine (Ukrstat), http://www.ukrstat.gov.ua/, Accessed on July 29, 2022.

[17]USDA-FAS, 2022, Ukraine agricultural production and trade, https://www.fas.usda.gov/sites/default/files/2022-06/Ukraine-Factsheet-June2022.pdf, Accessed on July 20, 2022.

[18]WDC-Ukraine, 2004, Ukraine: Agricultural Overview, http://wdc.org.ua/uk/node/29, Accessed on July 22, 2022.

[19]World Bank, 2022, The Impact of the War in Ukraine on Global Trade and Investment. https://openknowledge.worldbank.org/handle/10986/37359, Accessed on July 22, 2022.

[20]Zubets, M., 2008, Teoretyko-metodolohichniaspektytsinoutvorennianasilskohospodarskuproduktsiiu (Methodological recommendations on the optimal ratio of agricultural crops in crop rotations of different soiland climatic zones of Ukraine), [In Ukrainian]. Ukrainian Academy of Agrarian Sciences, 48 p., https://zakon.rada.gov.ua/rada/show/v0440555-08#Text, Accessed on August 02, 2022.