Review

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Dynamics of export potential of sunflower oil in Ukraine

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Abstract: The analysis of the production and yield of sunflower seeds in Ukraine for the period from 2000 to 2019 was conducted in the article. The comparative analysis of the gross harvest of sunflower seeds and the export of sunflower oil for the years under research was carried out. The dependence of exports on gross harvest was revealed and its share was calculated. It was determined that the export of sunflower oil has increased over the years under research, which indicates a significant Ukraine's export potential. It was found that the increase in the share of exports by 15.9% was made possible by a qualitative change in yield, that was ensured by the changes in the cultivation technology and by the selection of sunflower hybrids that are better adapted to climate changes. The recommendations for further improvement of cultivation technology in connection with climate change in order to further increase yields and the export potential of Ukraine were given.

Keywords: crop area; export; gross harvest; sunflower; sunflower oil; yield.

Introduction

The consumption of food is a basic human need, therefore, the food security is the basis for improving the quality of life of the world's population. The main indicator that describes the state of food security in Ukraine and the world is the daily energy

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intake, i.e. providing the human diet with basic products and stocking of food resources (Barrera 2011; Vasylkovska and Malakhovska 2019).

The favorable natural and climatic conditions for growing the vast majority of crops and strong human potential allow Ukraine not only to ensure its own food security, but also to become an active player on the global food market (Ulianchenko and Prozorova 2014).

Nowadays, due to the significant increase in prices for fossil energy resources and the threat of their depletion, the growing attention is paid to the use of energy accumulated by plants through photosynthesis that may be used for the purposes food security and technical needs.

Many researchers have dealt with this issue. In particular, Esfahani et al. (2019), Sánchez-Muniz et al. (2016), Barrera (2011), Nakonechna and Yakubovska (2018), Savina (2020), Ulianchenko and Prozorova 2014, Kernasiuk (2020) and many others.

Esfahani et al. (2019) in his studies aimed to draw public attention to the food crisis and various strategies to achieve food security in the world. An important element of food security is the provision of people with food. The sunflower products, fats and vitamins of group E play the important role in the food balance.

The changes of climatic conditions and, as a consequence, the changes in the technology of growing crops, according to Barrera (2011), namely the use of precision farming, improving the quality of seed, the use of technological processes to preserve soil moisture are the parts of the same chain of food production and constitute the strategy used to achieve food security.

At the current stage of development of Ukraine's economy, the issue of foreign trade transformation arises. It is primarily related to the EU integration. Nakonechna and Yakubovska (2018) argues that the Ukrainian agricultural sector with production potential that far exceeds the needs of the domestic market can become a driving force for the national economy. However, it is impossible without moving to international quality standards and liberalization of customs regimes for Ukraine.

Kernasiuk (2020) claims that reducing of economic losses from unfavorable market conditions is possible by intensifying sunflower production that will allow us to reduce the production costs and compete more effectively not on the basis of price, but on the basis of production costs. Therefore, the increasing of the economic efficiency and competitiveness of sunflower production requires the introduction of modern intensive and innovative technologies (Sánchez-Muniz et al. 2016; Savina 2020).

At the same time, in connection with the expansion of the free trade zone between the EU and Ukraine, market reorientation after the annexation of Crimea and the outbreak of the war in the eastern part of the country, there is an urgent

need to analyze the Ukraine's sunflower oil exports, to determine the export efficiency and capacity and the possibilities of its increasing.

Thus, the determination of the efficiency of Ukraine's exports of sunflower seeds and sunflower oil in the context of modern integration processes is an urgent problem.

Material and methods

The purpose of this article is to analyze the export potential of sunflower seeds and sunflower oil in Ukraine, to determine the correlation between gross harvest, sunflower yield and sunflower oil exports, as well as to formulate recommendations for the determination of the efficiency of Ukraine's export, its capacity and opportunities for growth in connection with the transition to the latest technologies of growing sunflowers in the context of climate change.

The study was started in 2000 and finished in 2019. It has covered the period of 20 years. The data for the study was taken from the State Statistics Service of Ukraine (the Official site of the State Statistics Service of Ukraine) and the Official website of the European Union https://ec.europa.eu/eurostat/web/main/home (Eurostat).

The research and comparative analysis of the crop area of sunflower seeds, of the gross harvest and productivity for the years under research were carried out. The increase in crop areas and, as a consequence, in the yields was revealed. The reasons that caused the increase in the gross harvest of sunflower seeds were analyzed. The comparative analysis of the gross harvest of sunflower seeds and the export of sunflower oil as the product of seed processing over the years under research was carried out. The increase not only in gross harvest, but also in rapid export growth was revealed.

The statistical and mathematical models and the computer program Excel by Microsoft Office were used to calculate the dynamics and to make graphs (Vasylkovskyi et al. 2016).

Results and discussion

The analysis of crop area, gross harvest and sunflower yield

Sunflower is the main oil crop in Ukraine. The seeds of its locally-adapted varieties and hybrids contain 50–52% of oil, and the seeds of breeding varieties contain up to 60%. Sunflower gives the highest yield of oil per crop area unit compared to other oilseeds (Andriienko et al. 2020).

The increasing of the production of oilseeds is based on the increasing of their average yield. With the introduction of high-yielding hybrids, it has become possible to increase the yields and oil content (Santos et al. 2018).

The main sunflower growing regions are Ukraine, Russia, the EU, Argentina and China. Argentina is the only one that is not a Eurasian producer and has

recently decided to increase soybean and maize crop areas (Andriienko and Andriienko 2020; Andriienko et al. 2020). Thus, we can assert that the leading role in the market of sunflower oil belongs to European producers. In terms of crop areas of sunflower, Ukraine ranks 2nd in the world (5.93 million hectares in 2019). The first place belongs to Russia that has eight million hectares (Kernasiuk 2020).

Due to the high demand for oilseed derived products and the level of marginal returns from growing these crops, there is a gradual and constant expansion of crop areas. Thus, the crop area of oilseeds amounted to 3.26 million hectares in 2000 (2.94 million hectares for sunflower only), and in 2019 it reached 8.89 million hectares (5.93 million hectares for sunflower only) (Figure 1). That is, in general, the crop area of oilseeds was increased by 2.73 times during the period of 2000–2019. At the same time, the crop area of sunflower was increased by 2.02 times (the Official site of the State Statistics Service of Ukraine).

The rapid growth in consumption and demand for vegetable fats led to a sharp redistribution of crop areas in the agricultural sector of Ukraine during the first decade of the 21st century in favor of the oilseeds, dominated by sunflower being one of the most cost-effective and highly liquid crops (Andriienko and Andriienko 2020; Andriienko et al. 2020; Spitzer et al. 2018).

The gross harvest of sunflower for the years under research had different values, but the general trend remained unchanged. With each passing year there

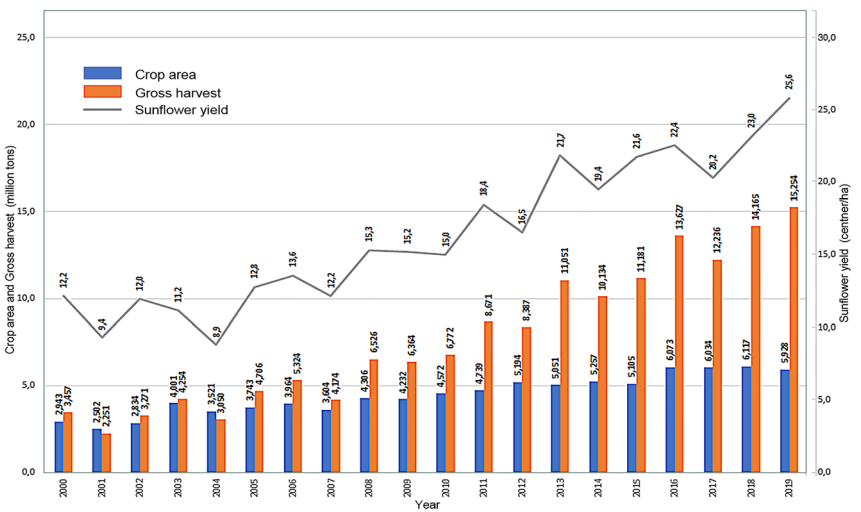

Figure 1: Dynamics of crop area, gross harvest and sunflower yield in Ukraine for the period of 2000–2019.

was an increase in gross harvest, except for the bad harvest years of 2001, 2004 and 2007. Thus, during the years under research from 2000 to 2019, the value of gross harvest increased from 3.457 million tons in 2000 to 15.254 million tons in 2019. Therefore, there was a significant increase in gross harvest, namely 4.4 times.

A significant increase in gross harvest became possible, primarily due to the increase in the yields of sunflower. During these years there was a gradual increase in yield of the crop under research. The yield increased from 12.2 centner/ha in 2000 to 25.6 centner/ha in 2019, i.e. by 2.09 times. The average yield of sunflower over the years under research was 15.84 centner/ha. The obtained result was achieved due to the change of cultivation technology, the choice of better quality seed material and the improvement of the approach to agriculture. However, without the use of a more reasonable method of choosing drought and disease resistant hybrids in adverse moisture conditions and possibly even the use of irrigation, the further significant increases in sunflower yields are unlikely to happen.

Analysis of sunflower oil exports

Sunflower is exported in the form of processed product, that is sunflower oil. It is well known that sunflower oil is widely used as a food product in its natural form. It has high nutritional value due to the high content of polyunsaturated fatty linoleic acid (55–60%) that has significant biological activity and accelerates the metabolism of cholesterol esters in the body, and therefore has a positive effect on health. Sunflower oil is used in cooking, baking and for manufacturing of various confectionery and canned food (Andriienko et al. 2020).

The analysis of the dynamics of gross harvest of sunflower and export of sunflower oil (Figure 2) in Ukraine for the period of 2000–2019 shows that 33.9% of the harvest is exported in the form of oil. If we take into account that during the period under research the gross harvest of sunflower averaged to 7.347 million tons, it becomes clear that at least 2.726 million tons annually form a potential share of sunflower oil exports (the Official site of the State Statistics Service of Ukraine).

The export of sunflower oil was gradually increasing every year starting from 0.55 million tons in 2000 to 6.5 million tons in 2019. If we compare the data for each year and find the share of exports in the gross harvest, we'll get a directly proportional ratio between the export of sunflower oil and the gross harvest of sunflower seeds. Thus, the increase occurs not only in the gross harvest in numerical value, but also in the share of exports in the gross harvest. Therefore, we see the

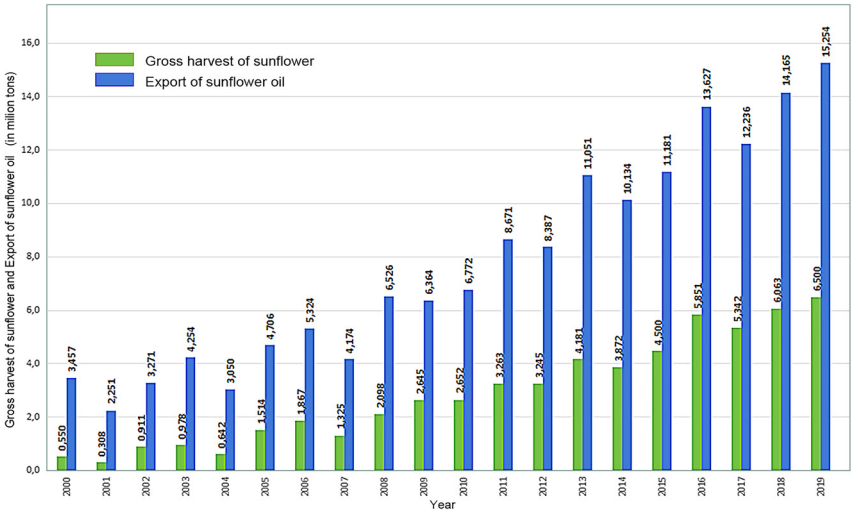

Figure 2: Dynamics of gross harvest of sunflower and export of sunflower oil in Ukraine for the period of 2000–2019.

increase in the share of sunflower oil exports from 15.9% in 2000 to 42.6% in 2019. The average share of exports amounts to 33.9% (Table 1).

Nowadays, the development of the domestic oil industry is marked by a certain amount of instability of production in some years, by the insignificant use of mineral fertilizers, soil depletion and the gradual loss of their fertility. In order to stabilize the situation, it is necessary to implement measures aimed at changing the existing development strategy of the industry focusing on increasing mainly the competitiveness of products by intensifying the production (Andriienko et al. 2020).

The further increase of the world's population leads to the increase in consumption of food and sunflower oil in particular. Therefore, the changes occurring in the economy of Ukraine increase the importance of agro-industrial sector, processing industry and the share of foreign exchange earnings from exports of agricultural products from their processing and determine the possibility of the further growth of the share of exports.

Despite the unstable situation in the country, processing enterprises continue to actively enter foreign markets (Vasylkovska and Malakhovska 2019).

Ukraine is a world leader in the production and export of sunflower oil. Sunflower oil is one of the five products that occupy the largest share in the commodity structure of Ukrainian exports. The total share of oils and seeds of oilseeds reached 15% in 2019 (Savina 2020).

Table 1: Gross harvest of sunflower, exports of sunflower oil and the ratio between exports and gross harvest in Ukraine.

Year	Gross harvest of sunflower seeds, million tons	Exports of sunflower oil, million tons	Ratio between exports and gross harvest, %
2000	3.457	0.550	15.9%
2001	2.251	0.308	13.7%
2002	3.271	0.911	27.9%
2003	4.254	0.978	23.0%
2004	3.050	0.642	21.0%
2005	4.706	1.514	32.2%
2006	5.324	1.867	35.1%
2007	4.174	1.325	31.7%
2008	6.526	2.098	32.1%
2009	6.364	2.645	41.6%
2010	6.772	2.652	39.2%
2011	8.671	3.263	37.6%
2012	8.387	3.245	38.7%
2013	11.051	4.181	37.8%
2014	10.134	3.872	38.2%
2015	11.181	4.500	40.2%
2016	13.627	5.851	42.9%
2017	12.236	5.342	43.7%
2018	14.165	6.063	42.8%
2019	15.254	6.500	42.6%
Average	7.347	2.727	33.9%

The biggest buyer of Ukrainian oil is India that imports 33.1% of Ukrainian sunflower oil and remains the undisputed leader. The EU ranks second in this list accounting for about 30% of all exports. The third biggest buyer of Ukrainian sunflower oil is China with 17% of the Ukraine's exports (Andriienko and Andriienko 2020; Andriienko et al. 2020).

Thus, the increase of the economic efficiency and competitiveness of sunflower production requires the introduction of modern intensive and innovative technologies together with using high-quality seed material, reasonable crop rotations, fertilizers, agricultural machinery.

The climate change has fostered the search for new approaches to growing crops. The example of the climate change influence on the sunflower cultivation in Ukraine is the expansion of its crop areas from the southeast to the northwest. The search for new methods of mechanization and automation of technological processes of cultivation pushes us to choose the latest approaches to resource-saving

technologies, namely the use of seed tolerant to long-term lack of moisture in the soil and the use of moisture-retaining technologies (the technologies for the protection of soil surface from overheating, No-till system) (Mostipan et al. 2017; Nedealcov et al. 2017; Semerci 2012). The transition to the latest, scientifically-credible systems of growing oilseeds will enable Ukraine to continue maintaining a high export potential and increase foreign exchange earnings from sunflower oil exports.

Conclusion

Therefore, due to the high demand for sunflower oil and the level of marginal returns from growing this crop, there is a gradual and constant expansion of its crop areas. Thus, the crop area for sunflower amounted to 2.94 million hectares in 2020, and in 2019 it reached 5.93 million hectares. It means that is has doubled during the period of 2000–2019.

The export of sunflower oil was also gradually increasing every year starting from 0.55 million tons in 2000 and ending with 6.5 million tons in 2019. The increase was seen not only in the gross harvest in numerical value, but also the directly proportional increase was observed in the share of exports in the gross harvest. Thus, the share of sunflower oil in the exports increased from 15.9% in 2000 to 42.6% in 2019. The average share of exports for the period under research is 33.9%.

The research shows that Ukraine has all the prerequisites to increase the exports of sunflower oil. It is facilitated by such external factors as WTO accession, integration processes, focus on the EU market. Nowadays, the Ukrainian sunflower oil is bought by India, EU countries and China. The countries of Western and South Asia are interested in the imports of Ukrainian sunflower oil as well.

However, due to the changes in climatic conditions, there is a gradual change in the technology of growing oilseeds. The change in cultivation technology involves the transition to new climate-adapted sunflower hybrids, the use of tillage units that will ensure the accumulation and retention of moisture in the soil. The transition to the latest cultivation technologies is the key to increasing the Ukraine's oilseeds yields and, as a consequence, its export potential.

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