

MARKET EVALUATION OF RAPESEED IN UKRAINE: PERSPECTIVES AND CHALLENGES

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Abstract

This paper aims to provide analysis of rapeseed market in Ukraine, perspectives and challenges that could appear due to internal and external factors. To conduct purposes in the article, the world and Ukrainian rapeseed markets were evaluated to show the importance of domestic rapeseed market development and growing demand on this crop at external markets. Analysing the rapeseed market during last years in Ukraine, it was noticed that rapeseed production has insignificantly suffered compared to other crops under the actual conditions. During the period of 2022-2023, the following trends were occurred: rapeseed area is expanding, even despite the import ban in neighbouring countries; production reached a volume of 3.5 million tons; rapeseed crushing increased to 21% inside the country compared to 6-10% in previous years; rapeseed oil and meal production and their further exports also increased. Ukrainian rapeseed is oriented to export, of which about 60% goes to the EU countries. The EU demand for rapeseed will grow due to the higher share of energy from renewable sources in gross final energy consumption accounting for 45% by 2030 in the frame of the REPowerEU plan, where demand for biodiesel fuel is projected to upward. In this regard, in the article the rapeseed prices were forecasted to evaluate their change in a short term period under a favourable external rapeseed market conjuncture. Getting results showed the domestic price decrease and at the end of 2024 it could reach 306 US dollar per tonne. The analysis showed that the Ukrainian prices are lower than the EU prices, but Ukrainian price volatility trend follows the EU price trend. However, despite of the uncertainty of country environment at present, it is expected an upward trend in rapeseed prices because of the decline in rapeseed production in the EU countries caused by unfavourable weather conditions and growing demand on rapeseed in biodiesel industry.

Key words: rapeseed market, forecast, export, prices, Ukraine

INTRODUCTION

The world rapeseed market has been developing dynamically over the last decades. The increase of supply level on the rapeseed market is due to high-intensity production and productivity growth of the crop in accordance with the steadily growing demand. At the same time, the volumes of rapeseed processing into oil and its consumption in the food, livestock and other industries are also growing. It is worth noting that the demand for biodiesel in EU countries has become an important factor in increasing interest in rapeseed as a raw material for biodiesel; as a result, rapeseed became a significant part of

the export potential of many countries of the world, including Ukraine.

Considering the importance of the rapeseed market in Ukraine, many questions regarding the functioning of the rapeseed industry and market trends are highlighted in scientific papers, in particular, Chekhov (2016) and Hoisiuk (2018) researched indicators of rapeseed production in the natural and climatic zones of Ukraine, regions and categories of Ukrainian farms; Makarchuk and Skudlarski (2018) used a SWOT analysis for evaluation the development of the rapeseed market in Ukraine; Kuts (2011) substantiated competitiveness factors of rapeseed production; Kuzmenko et al. (2016)

evaluated market trends for oilseeds production in Ukraine; Kaletnik et al. (2021) proposed scenarios for the rapeseed sector development in Ukraine [4, 9, 11, 12, 13, 14]. Prerequisites for the further successful development of rapeseed production, i.e. increasing the organization efficiency of rapeseed production and harvesting, expanding sales markets was investigated by Parkhomets et al. (2023) [15]. At the same time, the European countries, like Romania became a significant player on EU rapeseed market, where Beciu and Arghiroiu (2023) emphasized in their article that in the last years many Romanian farmers focused on rapeseed production due to high imports demand on international markets and favourable internal production conditions [2]. The significant demand on the global market caused a rapid increase in the production of rapeseed in Ukraine due to both the sown areas expansion and the productivity growth. At the same time, most of the grown rapeseed is export oriented. Taking into account this fact, the price situation on this market is determined by the conjuncture of interdependent world oilseeds markets, their processing products and mineral diesel fuel, as well as the dynamics of the development of the biodiesel industry in the world [13]. Hamulczuk M. et al. (2019) confirmed direct and indirect integration of the Ukrainian and European Union rapeseed markets via physical trade flows of rapeseeds, rapeseed cake, and rapeseed oil, providing evidence that rapeseed prices in Ukraine and European Union are cointegrated and that adjustments to the long-run equilibrium relationship are asymmetric and seasonal [7, 8].

The novelty of conducting research on the current state of the rapeseed market and substantiating forecasts of its further development is enhanced by the need to solve a number of problems, in particular, the optimization of rapeseed production in Ukraine, the analysis of export or processing possibilities in Ukraine, taking into account the consequences and challenges that have appeared due to the hostilities in the region.

MATERIALS AND METHODS

The purpose of the article is to evaluate the state of Ukrainian rapeseed market, considering the main factors regarding the development and challenges of this market that faced nowadays.

The methodical basis of the paper is the provision of statistical data on rapeseed market. On the basis of statistical data on rapeseed, the place of Ukrainian rapeseed among other oil crops was assessed, the percentages in world production and export were determined, and the world and Ukrainian balances were analysed. Herewith the domestic self-sufficiency ratio is calculated.

Based on this, Hypothesis 1 is to establish whether Ukraine will remain an important player in the world markets, or will lose its position and will be forced to reduce the cultivated areas and actively develop internal processing.

One of important factor for rapeseed market profitability and growth are prices that are formed on domestic and world markets. In these circumstances, the forecast for Ukrainian rapeseed prices was done taking into account the hypothesis that world rapeseed prices influence on domestic rapeseed market (Hypothesis 2). Prices data were taken for the period from January 2021 until March 2024 from the APK inform source [1]. To establish a relationship tightness between Ukrainian rapeseed prices and European, regression analysis was done. There is European prices were taken into account since approximately 60% of rapeseed export belong to the EU countries. According to the received regression, the forecast of rapeseed prices in Ukraine was made. To forecast the factor sign value, i.e. EU rapeseed prices, the Holt's method was implied. The forecast reliability of the factor characteristics was evaluated using indicators such as: MAE (Mean Absolute Error), MAPE (Mean Absolute Percent Error), MASE (Mean Absolute Scaled Error), and RMSE (Root Mean Squared Error). Then the predicted values of the factor sign were added to the regression equation and the predicted values of Ukrainian rapeseed prices were determined.

RESULTS AND DISCUSSIONS

The rapeseed market is noted for its dynamic development in the world among agricultural markets. World rapeseed production is growing as it could be observed in Table 1. According to USDA forecast data, in 2023/2024 MY rapeseed production will reach more than 85 million tons; its export

volumes have almost doubled over the past decade [19].

The EU countries, Canada, China and India remain the largest producers of rapeseed. Their share in the global rapeseed production in 2022/2023 MY was 73.4 %. At the same time, Ukraine's share in world production in 2022/2023 MY was equalled to 4 %.

Table 1. Sown area, yield and production of rapeseed in certain countries of the world

Country/ Region	Area, million ha			Yield, t/ha			Production, million tons		
	2021/ 2022	2022/ 2023	2023/ 2024*	2021/ 2022	2022/ 2023	2023/ 2024*	2021/ 2022	2022/ 2023	2023/ 2024*
World	38.46	41.91	42.39	1.97	2.12	2.02	75.79	88.81	85.58
USA	0.85	0.88	0.94	1.46	1.98	1.95	1.24	1.74	1.83
EU countries	5.39	5.94	6.30	3.22	3.31	3.18	17.39	19.62	20.10
Canada	8.95	8.60	8.80	1.59	2.17	2.02	14.25	18.70	17.80
China	6.99	7.27	7.35	2.10	2.14	2.10	14.71	15.53	15.40
India	7.99	8.85	9.20	1.39	1.28	1.27	11.10	11.30	11.70
Ukraine	1.04	1.23	1.50	2.91	2.85	2.87	3.02	3.50	4.30

Source: author's calculations based on the USDA, 2023 [19].

* USDA forecast data, 2023

In 2023/24 MY USDA forecasts of rapeseed consumption increase by 0.4 % to 85.9 million tons. Rapeseed producing countries and Japan are traditional consumers, in particular EU countries consumed 24.9 million tons (29.2 % of total consumption), China – 19.3 million tons (22.7 %), India – 11.4 million tons (13.4 %), Canada – 10.7

million tons (12.6 %) and Japan – 2.01 million tons (2.3 %). Other countries account for 19.8 % of the market, in which there is an increase in processing of this crop by 5-15 %. The balance of demand and supply of rapeseed on the global market are presented in Table 2.

Table 2. The balance of demand and supply of rapeseed in the world (million tons)

MY	Area, million ha	Initial stocks	Production	Imports	General proposal	Export	Internal consumption	Total demand	Ending stocks
2010/11	33.84	8.70	60.85	10.18	79.73	10.93	60.55	71.48	8.71
2011/12	33.55	8.71	61.55	13.24	83.51	12.99	64.19	77.18	6.79
2012/13	36.07	6.79	63.67	12.83	83.29	12.57	65.68	78.25	5.52
2013/14	36.07	5.52	71.11	15.55	92.18	15.10	69.78	84.88	7.80
2014/15	35.43	7.80	70.99	14.32	93.11	15.11	71.19	86.30	7.37
2015/16	33.75	7.37	69.40	14.13	90.90	14.40	70.80	85.20	6.37
2016/17	33.80	6.42	70.17	15.80	92.38	16.15	71.59	87.74	5.31
2017/18	36.17	5.31	75.80	15.73	96.83	16.60	72.76	89.36	8.14
2018/19	36.23	8.14	73.48	14.64	96.26	14.68	72.01	86.69	9.74
2019/20	35.15	9.74	70.32	15.82	95.89	16.01	72.50	88.51	7.64
2020/21	35.33	7.64	74.72	16.66	99.02	18.14	75.19	93.33	6.36
2021/22	38.46	6.36	75.79	13.84	95.99	15.32	76.85	92.17	4.49
2022/23	41.91	4.49	88.81	19.97	113.28	20.21	85.96	106.17	7.83
2023/24	42.39	7.83	85.58	15.76	109.17	16.89	85.99	102.88	6.54
Relative deviation of 2023/24 MY to 2010/11, %	125.3	90.0	140.6	154.8	136.9	154.5	142.0	143.9	75.1

Source: author's calculations based on the USDA, 2023 [19].

Rapeseed production has grown associated with the expanding biofuel policies to ensure energy safety. Similar to the forecast before Russia's invasion of Ukraine, IEA (International Energy Agency) updated forecast expects at 11% (18,000 million litres) of new demand by 2024 that is supported by policies with energy security objectives [10]. However, as it was in 2022, only a few markets are actively trying to accelerate deployment by 2024. In advanced markets, new policies are not likely to influence production until and after 2024, and high prices, feedstock concerns and technical constraints limit additional growth beyond 2021 forecast of IAE. Based on this fact and relaying on IAE report in 2023, we come to conclusion that the demand for biodiesel will continue that consequently will contribute to further growth of the rapeseed and rapeseed oil markets. During the Covid-19 pandemic and after it, the production of liquid biofuel for road transport in the EU countries was almost at a constant level. At the same time, the share of biodiesel was the largest and consist of 74 % among the types of renewable energy in transport in the EU in 2020 (Fig. 1).

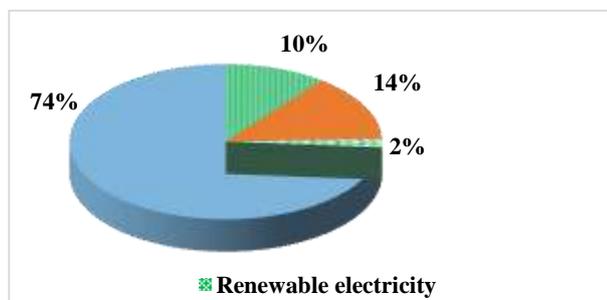


Fig. 1. Types of renewable energy in transport in the EU, 2020
 Source: [10].

At the same time, rapeseed oil remained the dominant raw material for the production of biodiesel in EU countries in 2020, i.e. 38 % of the total use of raw materials. The popularity of rapeseed oil is due to internal availability, as well as better technical characteristics, in particular, higher winter stability of the obtained rapeseed methyl ester (RME). In the period from January to August 2023, in Germany, which is the leader in the production and consumption of biodiesel fuel

among the EU countries, according to the data of the BAFA, more than 1.7 million tons of biodiesel and hydrogenated vegetable oil was added to diesel fuel. According to the forecast of the German Association for the Promotion of Oil and Grain Crops (UFOP), the total consumption of biodiesel in Germany in 2023 was expected at the level of 2.5 million tons. At the same time, the association notes that the increase in the quota for greenhouse gas emissions from 7 % to 8 % compared to 2022 helped to stabilize the demand for biodiesel fuel [18].

Fig. 2 shows the consumption of biodiesel and the proportion of its mixture in diesel fuel in Germany.

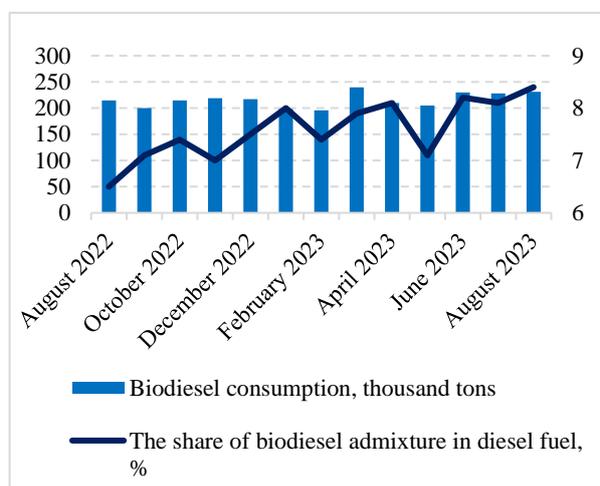


Fig. 2. Biodiesel consumption and its mixture proportion in diesel fuel in Germany
 Source: author's calculations based on UFOP, 2023 [18].

The growth of global demand for rapeseed and its processing products, along with geopolitical instability in the world, significantly affects price volatility. In 2022, in some months, the price of rapeseed in the world rose to 1,101 USD/t. At the same time, from the beginning of 2023, it decreased to 600 USD/t and at the end of 2023 stabilized at the level approximately 500 USD/t (Fig. 3). The same price fluctuations could be observed in the rapeseed oil market, where from the beginning of 2022 the price of rapeseed oil reached the level of 2,200 USD/t and to the end of 2023 fluctuated in the frame of 1,000 USD/t.

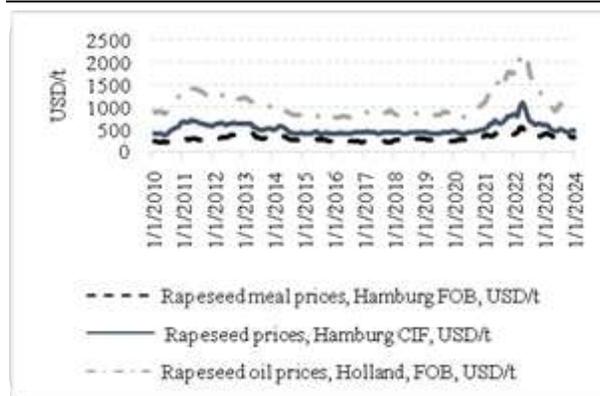


Fig. 3. Dynamics of global prices for rapeseed, rapeseed oil and rapeseed meal
 Source: author's calculations based on APK inform data, 2024; FAO data, 2024 [1, 6].

Since Russia has irrupted to Ukraine in 2022, rapeseed market was suffered insignificantly compare to crops markets. Main trends that were occurred at this market during 2022-2023 years were following:

- (1) rapeseed area is expanding, even despite the import ban in neighbouring countries;
- (2) record high rapeseed area and production in 2023;
- (3) increase in domestic rapeseed crushing to 21% from 6-10% previously;
- (4) sharp growth in rapeseed oil and meal production and their exports.

As a result of significant demand from the foreign market, during 2000-2022, rapeseed production increased in 7 times in Ukraine both due to the expansion of sown areas and the productivity growth (Table 3).

Rapeseed is cultivated in all natural and climatic zones of Ukraine, while the production of winter rapeseed dominates due to higher levels of productivity and economic efficiency, i.e. 97.9 % of the total gross harvest in 2022.

The rapeseed market in Ukraine before the war was balanced (Table 4).

Table 3. Dynamics of sown areas, yield and gross production of rapeseed in Ukraine

Indices	2000	2005	2010	2015	2020	2021	2022	2022 to 2000, %
Winter and spring rapeseed area, thousands of ha, including:								
- winter rapeseed	156.7	195.2	862.5	671.1	1,112.5	1,004.5	1,156.2	737.8
- spring rapeseed	98.4	116.5	760.9	651.2	1,082	971.8	1,131.6	1,150.0
The average yield of winter and spring rapeseed, t/ha, including:								
- winter rapeseed	53.8	78.7	101.6	19.9	30.5	32.7	24.6	45.7
- spring rapeseed	8.4	14.6	17	25.9	23	29.3	28.7	341.7
- winter rapeseed	10.3	17	17.5	26.2	23	29.4	28.7	278.6
- spring rapeseed	5.3	11	13.6	15.9	21.3	24.3	27.3	515.1
Total gross production of winter and spring rapeseed, thousand tons, including:								
- winter rapeseed	131.8	284.8	1,469.7	1,737.6	2,557.2	2,938.9	3,318.0	2,517.5
- winter rapeseed	100.8	198.4	1331.2	1,705.9	2,492	2,859	3,250.3	3,224.5
- spring rapeseed	31	86.4	138.5	31.7	65.2	79.9	67.7	218.4

Source: author's calculations based on the State Statistics Service of Ukraine, 2023 [17].

The level of rapeseed import was insignificant and limited to the supply of seed material mainly from Germany (31%), Poland (25%), France (22%) and other countries (22%). Export remains the main item of demand in the rapeseed market balance in Ukraine (Table 4); in 2010/2011 MY almost the entire crop of rapeseed (96%) was exported mainly to EU countries as raw material for the production of biodiesel. Then during 2015/2016 - 2020/2021 MY exports decreased to 82-87 %. This is explained by the increase in the

volume of internal processing of rapeseed by oil and fat enterprises, which considered rapeseed as an alternative raw material to load their capacities in case of a shortage of sunflower seeds. However, in 2022, as a result of the war, market operators considered export as the only channel for selling seeds. According to the State Customs Service of Ukraine, in 2022 rapeseed was exported mainly by EU countries, in particular Poland – 24%, Romania – 22%, Germany – 13 % and other countries – 40% [16].

Table 4. Balance of demand and supply of rapeseed production in Ukraine (thousands tons)

Indicators	2010/ 2011	2015/ 2016	2020/ 2021	2022/ 2023	2023/ 2024 MY to 2010/2011 MY, %
Initial stocks	2.0	18.0	29.0	70.0	100.0
Production	1,470.0	1,744.0	2,750.0	3,500.0	292.5
Import	2.0	2.0	72.0	40.0	2,000.0
General proposal	1,474.0	1,764.0	2,851.0	3,610.0	294.6
Export	1,416.0	1,437.0	2,396.0	3,421.0	257.8
Processing	55.0	325.0	300.0	183.0	1,227.3
Internal consumption	57.0	327.0	304.0	187.0	1,193.0
Ending stocks	1.0	0.0	151.0	2.0	1,200.0
Total demand	1,474.0	1,764.0	2,851.0	3,610.0	294.6
Coefficient of self-sufficiency	25.8	5.3	9.0	18.7	X

Source: author's calculations based on the USDA, 2023 [19].

In the conditions of the isolation of the sea ports, the export of rapeseed to a number of countries (Pakistan, Bangladesh, the United Arab Emirates) was practically impossible and sharply reduced.

Canola from Australia and Canada became the main substitute for Ukrainian rapeseed on the markets of Middle Eastern countries.

Main part of rapeseed in 2022/2023 MY was exported by railway and road.

At the same time, the disruption of supply chains due to the war and the temporary measures of European countries, in particular Poland, Bulgaria, Hungary, Romania and Slovakia regarding the ban on the import of rapeseed, are the main threats that may further reduce sown area under rapeseed and, accordingly, gross harvests.

Further interests to increase rapeseed production in Ukraine will depend on conjuncture on internal and external markets. Indeed, the main factor on both markets remain favourable price to produce rapeseed. In this regard, it is important to analyse price trend and make forecast of Ukrainian rapeseed prices for shortcoming period.

Taking into account the fact that approximately 60% of rapeseed exported to EU countries, there is expected the impact of the EU prices on Ukrainian.

Thus, the regression model between Ukrainian rapeseed prices ($R_{\text{rapeseed prices_Ukraine}}$) and EU rapeseed prices ($R_{\text{rapeseed prices_EU}}$) was done. Regression results are presented in Table 5.

Table 5. Regression model between Ukrainian and EU rapeseed prices

Specification	Regression equation: $R_{\text{rapeseed prices_Ukraine}} = -139.45 + 1.06 * R_{\text{rapeseed prices_EU}}$
R	0.89
R ²	0.80
P-value for parameter a_0	0.0227
P-value for parameter a_1	0.0000

Source: author's calculations.

The obtained results confirmed the linkage between rapeseed prices in Ukraine and rapeseed prices in the EU, where an increase in rapeseed prices in the EU by 1 USD leads to an increase in rapeseed prices in Ukraine by 1.06 USD. Indeed, the regression analysis indicates a strong closeness among the studied factors, in particular, the coefficient of multiple correlation $R=0.89$, which means a close relationship. In turn, the model is significant, which is confirmed by the P-value for parameter a_1 , which is lower than the critical value of 0.05. Based on the reliability of obtaining regression model, a price forecast for Ukrainian rapeseed was built. Holt's method was applied to predict the value of the factor sign, i.e. rapeseed prices in the EU. The forecast substantiality of the factor sign was checked using forecast errors, where their results are following: MAE is 41.9, MAPE is 6.04, and RMSE is 2.5.

To determine the forecasted values of the Ukrainian rapeseed prices, there were substitute of the predicted value of EU rapeseed prices into the regression equation (Fig. 4).

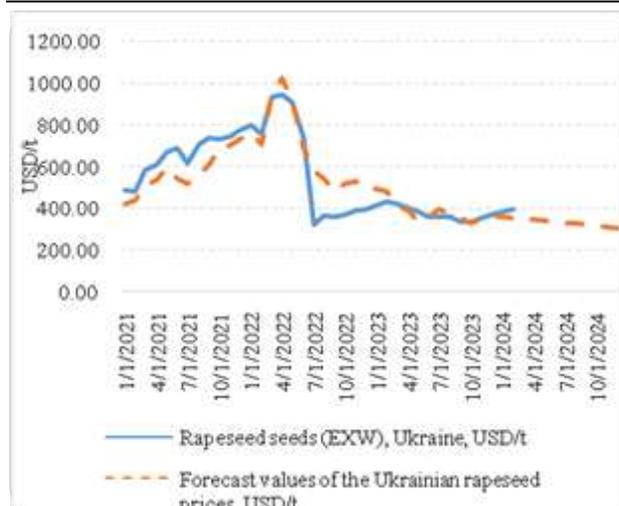


Fig. 4. Actual and forecasted values of Ukrainian rapeseed prices, USD/t
Source: author's calculations based on APK inform data, 2024; FAO data, 2024 [1, 6].

The forecast of Ukrainian rapeseed prices is showed that prices will decrease and at the end of 2024 it could be equalled to 306 US dollar/t. Such a decrease can be explained as follow: (1) the limitation of supply due to the blocking of borders, which has a negative effect on the domestic price; (2) seasonal factor; (3) decrease in prices for Canadian rapeseed, which will influence on its supply intensification to the European market and, in turn, increase competition for Ukrainian rapeseed in the corresponding market.

However, the situation on the rapeseed market could be change significantly even in 2024 due to the growing interest of European buyers in Ukrainian rapeseed [1]. The EU countries anticipate a decrease in rapeseed production that was influenced by unfavourable weather conditions. In this regard, it is forecasted the reduction on 12% in the European oilseed crop. This decrease poses a risk for European processors, who might face shortages in raw materials. Thus, this could lead to increase EU rapeseed prices and as a result Ukrainian.

Scrutinized global trends at rapeseed oil market, there is expected that this market will continue to grow, where in 2023 there are was evaluated 25.06 USD billion at a compound annual growth rate (CAGR) of 6.7% compare to 2022 with the volume of 23.49 billion USD. However, it is important to note that the war in Ukraine has undermined the chances of

global economic recovery after the COVID-19 pandemic, particularly in the short-term period. Indeed, the war led to a growth in food prices and disruptions in supply chains, which in turn caused inflation in goods and services and affected different markets worldwide. Despite on it, the rapeseed oil market is expected to reach 31.52 billion US dollar in 2027 at a CAGR of 5.9% [3].

One of the main driver of the growth of the rapeseed oil market in the future will remain demand for biodiesel fuel production. In March 2023, the EU agreed a further increase in the share of energy from renewable sources in gross final energy consumption to 45% by 2030 in the frame of the REPowerEU plan [5]. Therefore, increasing demand for biodiesel fuel will contribute to the growth of the rapeseed oil market and consequently rapeseed.

CONCLUSIONS

The global rapeseed market is growing and there is could be noted its dynamic development among agricultural markets. Indeed, according to USDA forecast in 2023/2024 MY it is expected more than 85 million tons; rapeseed export volumes increased almost twofold in the past decade. Herewith EU countries, Canada, China and India remain the largest producers of rapeseed. Ukraine's share in the global production accounted to 4% in 2022/2023 MY.

Ukrainian rapeseed market is export oriented, where in different years approximately 90% of produced rapeseed goes for export. With the beginning of the war in Ukraine, one of the important problems became the violation of export channels, accordingly to it, there were evaluated possible scenarios for the development of rapeseed, i.e. (1) rapeseed production should become more active; (2) reduction of sown areas; (3) domestic increasing the volume of seed processing into oil or biodiesel.

The global demand for rapeseed and rapeseed oil is constantly growing due to necessity of biodiesel production that ensure domestic agricultural enterprises benefits at the local

market. Based on the Hypothesis 1 that was stated in the article, we came to conclusions that Ukraine will enhance rapeseed production mainly for export purposes. However, the presence of unfilled capacities at oil and fat factories in Ukraine may contribute to the further increase of domestic processing rapeseed into rapeseed oil in the frame of approximately 20% with its further export.

Evaluation of the influence global rapeseed prices on Ukrainian was done within the regression model between Ukrainian and EU rapeseed prices, where the increase of 1 USD of rapeseed prices in EU will lead to growth by 1.06 USD of rapeseed prices in Ukraine. Linkage tightness of the domestic rapeseed market and the EU market confirmed by the multiple correlation coefficient $R=0.89$. Further growth of the domestic rapeseed market mostly defined by prices development on global market. In this regard, based on getting regression model, there was forecasted Ukrainian rapeseed prices that showed domestic prices decrease for short-term period and fluctuate between 300-400 USD/t during the current year. This situation could be explained by such factors as the limitation of supply due to the blocking of borders, which has a negative effect on the domestic price; seasonal factor; prices decrease for Canadian rapeseed that consequently will influence on its supply activation to the European market and, in turn, increase competition for Ukrainian rapeseed. In contrary to such statement, the development of domestic rapeseed market could have positive trend in 2024 due to the growth demand for rapeseed of European enterprises in the frame to fulfil obligatory to increase renewable energy sources, in particular, biodiesel.

High demand for rapeseed and rapeseed oil will remain for both food and energy purposes. However, it is necessary to take into account the economic changes in the market for the production and distribution of biofuels of the first and second generation, which will take place in the future, in particular in the EU countries.

Our further research may concern the assessment of the market integration of Ukrainian rapeseed market with European, as

well as the study of European principles of sustainable development of rapeseed in the context to get economic, social and ecological benefits.

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