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## **TRENDS OF CHANGES AND THE POTENTIAL FOR DEVELOPMENT OF THE PRODUCTION OF THE MAIN FIELDS CROPS IN UKRAINE<sup>1</sup>**

Key words: Ukraine, plant production, trends, potential, short-term prediction

**ABSTRACT.** Agriculture has been historically one of the main sectors of the Ukrainian economy. Considered for centuries as a “bread basket of Europe”. In recent years Ukraine’s agriculture has been consistently improving and has been the only part of the country’s economy to buck the recession, but Ukraine is still a country with relatively large untapped agricultural potentials. The study concerns the production of the main crops in Ukraine in the years 1992-2020 with a short-term prediction until 2027. The analysis covered the following variables: area harvested, share in arable land, yield and production. The analysis showed that plant production in Ukraine in 1992-2020 was characterized by a significant growth dynamics. This was especially true for yields of wheat and potato and cultivation area, yields and production of grain maize, rape, sunflower and soybean. On the other hand, the cultivation area and production of sugar beet, barley, buckwheat, rye and oats were decreased. Moreover, the tendencies of changes taking place in the discussed years allowed us to conclude that the importance of Ukraine in this respect will increase. However, the war in this country will reduce the production of the species in question.

## **INTRODUCTION**

Agriculture has been historically one of the main sectors of the Ukrainian economy. Considered for centuries as a “bread basket of Europe”. Ukraine today possesses arable land area which equals to 30% of arable land of the European Union and 2.1% of the global arable land bank [Graubner, Ostapchuk 2017, NICU 2018, Zaburanna et al. 2020].

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Ukraine has favourable climatic conditions and quality of land resources, the presence of which indicates the possibility of effective development of agricultural production [Keyzer et al. 2013, Khalatur 2017].

After gaining independence in 1991, Ukraine entered a long-term agricultural crisis. The crisis was caused by the collapse of the centrally planned economy that had previously bankrolled a system of large and expensive programmes across the Soviet Union, but more broadly, also by the failure of the sector to adapt to the new economic reality. Agricultural reform proved exceptionally difficult due to the lack of adequate market experience, insufficient capital investment, and the lack of a coherent vision for reform among the ruling elite. However, [Sarna 2014]. But Ukraine is still a country with relatively large untapped agricultural potentials, both in terms of abandoned agricultural land and substantial yield gaps [Ryabchenko, Nonhebel 2016, Deppermann et al. 2018].

The aim of the article is to analyse trends and assess the potential for the development of the production of major plants in Ukraine.

## MATERIAL AND METHODS

The study concerns the production of the main crops in Ukraine within the pre-war borders, as of January 2014. The material for analysis was statistical data from the Food and Agriculture Organization of the United Nations and U.S. Department of Agriculture database for the years 1992-2020 [CSO 2022, FAO 2022]. The collected data was processed dynamically by using trend analyses, on the basis of which a short-term (5 years) prediction was prepared until 2027. The criterion for selecting the type of the trend equation was the highest value of the determination index ( $R^2$ ), which determines the degree of adjustment of the statistical model.

The following plant species were included in the study: wheat, barley, oats, rye, maize, rapeseed, sunflower, soybean, buckwheat, sugar beet and potatoes. The total cultivation area of these species in 2020 accounted for 77% of the sown area in Ukraine. The analysis covered the following variables: area harvested (million ha), share in arable land (%), yield (Mg/ha) and production (million Mg).

## RESULTS

According to FAO data, the area of arable land (AL) in Ukraine was 32.9 million ha in 2020 and decreased by 0.5 million ha compared to 1992. However, the total area of main crops (wheat, barley, oats, rye, maize, rapeseed, sunflower, soybean, buckwheat, sugar beet and potatoes) increased from 17.3 million ha in 1992 to 25.3 million ha in 2020. Thus, the share of these plants in the sown area increased from 52% up to 77%.

Among the analyzed plants, one of the most important species is wheat, the cultivation area of which in the years 1992-2020 was relatively stable and amounted to approx. 6.5 million ha, which accounted for approx. 20% of the arable area (Figure 1). The coefficient of determination for the equation of the trend of yield and production of wheat grain indicates a weak upward trend. This is mainly due to the increase in yields from about 3 to 4 Mg/ha in 2014-2020. Taking into account the above data, it could be assumed that there will be a further slight increase in the production of wheat grain in Ukraine. However, according to USDA data, approximately 50% of the cultivated area of this species in 2016-2020 was located in the area currently affected by armed conflict, which may significantly reduce the prospects for production growth [USDA 2022].

An important species of cereals cultivated in Ukraine is also barley (Figure 1). However, its cultivation area decreased significantly in the analyzed period from about 4 to 2.5 million ha, and its share in the sown area decreased from 10-15% to 8-7%. On the other hand, a weak tendency of increasing barley yields was noted. The tendency to reduce the production of this species, as in the case of wheat, may be strengthened due to the fact that about 49% of the area is located in the area where it is war [USDA 2022].

Oats and rye were the species for which a significant decrease in the cultivation area and, consequently, the grain production was recorded. The cultivation area of these species decreased from 0.5 million ha to 0.2 million ha in the case of oats and 0.14 million ha for rye. It can therefore be concluded that these species have lost their economic importance in recent years.

Maize cultivated for grain was characterized by a very strong growth dynamics in the years 1992-2020. In the analyzed period, the cultivation area of this species increased from approx. 1 to 5 million ha, and the share in the sown area from approx. 3% to 15%. The yields also increased significantly, which in recent years fluctuated within the range of 5.5-7.8 Mg/ha in relation to 2.5-2.7 Mg/ha in the initial years covered by the analysis. It should be assumed that in the short term, the growing tendencies for this species would be maintained. This is also because the vast majority (88%) of the species' cultivation area is outside the war area [USDA 2022].

In the analyzed period, Ukraine significantly increased the production of the main oilseeds, i.e. rape and sunflower (Figure 1). The sunflower cultivation area increased from approx. 1.6 to 6 million. ha, and the share in the sown area from 5% to about 19%. On the other hand, the yields increased from 1.0-1.4 Mg/ha to 2.0-2.6 Mg/ha. As a result, the production of sunflower in the years 1992-2020 increased from about 2 million tons to 13-15 million tons. Rapeseed is characterized by an even stronger dynamics of changes, the area of which increased from approx. 0.05 to 1 million ha, and the share in the sown area from 0.1% to 3%. There was also a clear upward trend in the yields, which doubled in the analyzed period and in recent years amounted to about 2.6 Mg/ha. However, it should

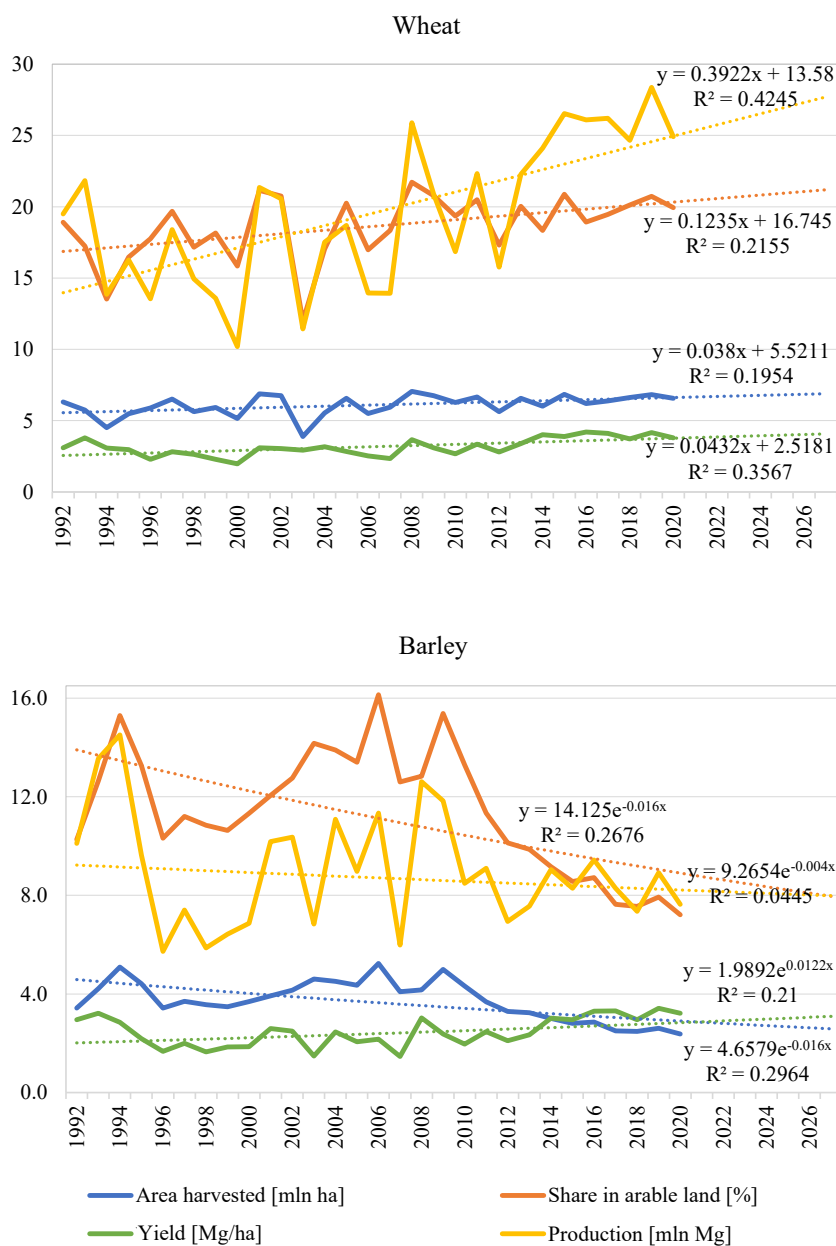


Figure 1. Trends of changes in the area harvested, share in arable land, yields and production of the main crops in Ukraine

Source: own study based on FAO data

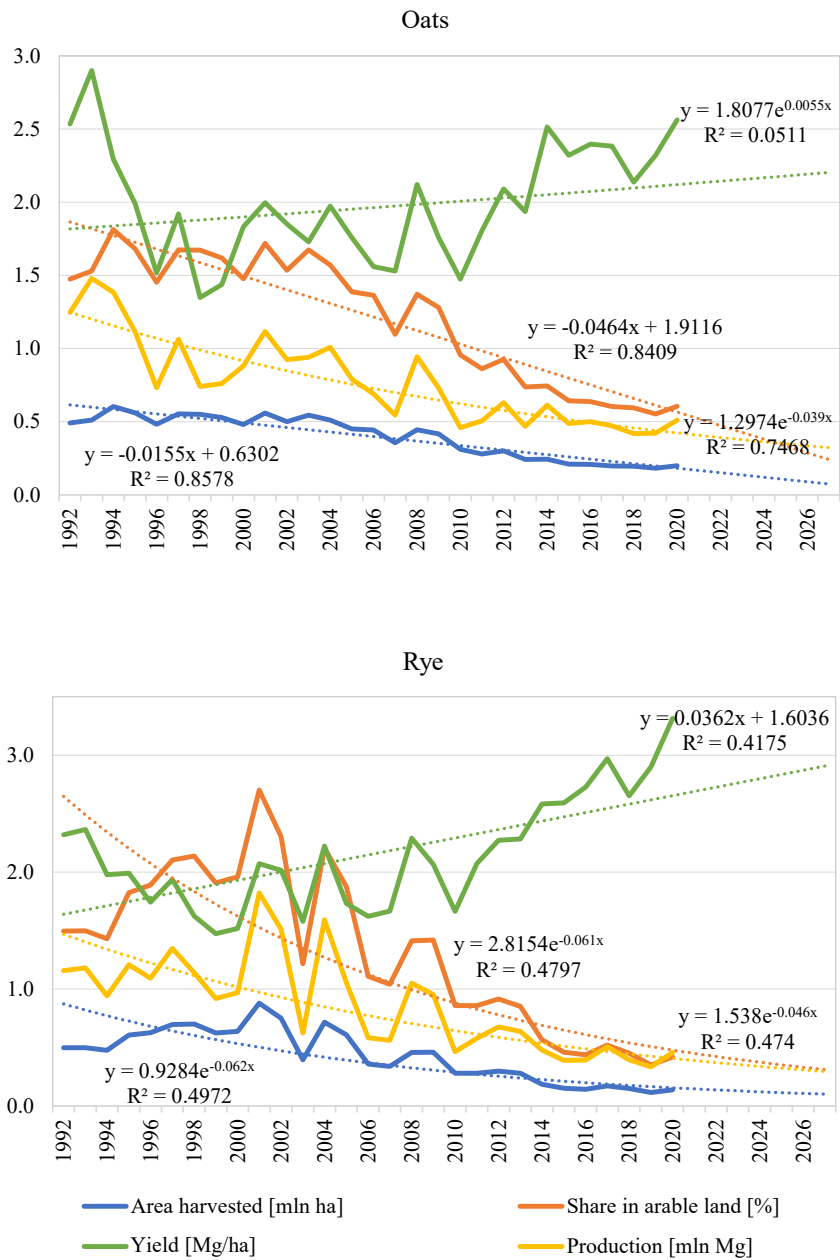


Figure 1. Cont.  
Source: own study based on FAO data

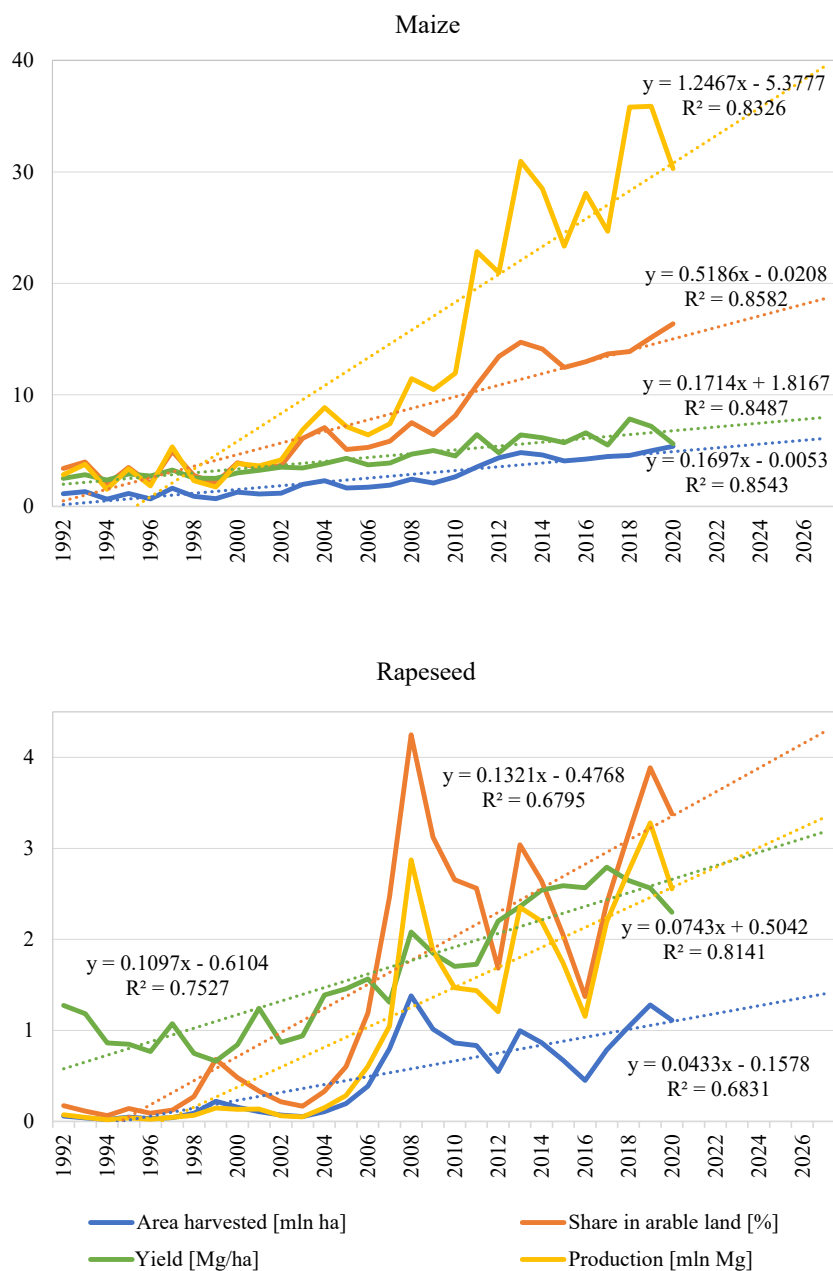


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Source: own study based on FAO data

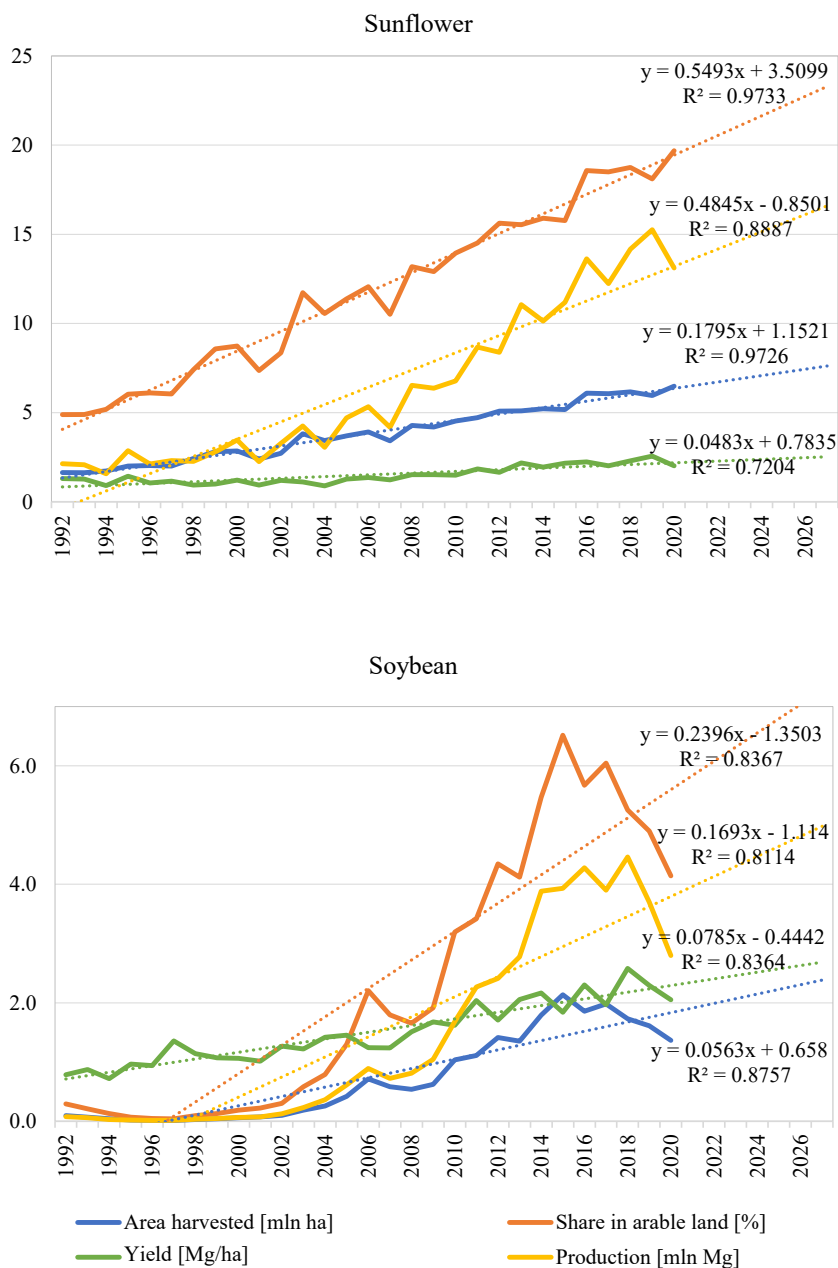


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Source: own study based on FAO data



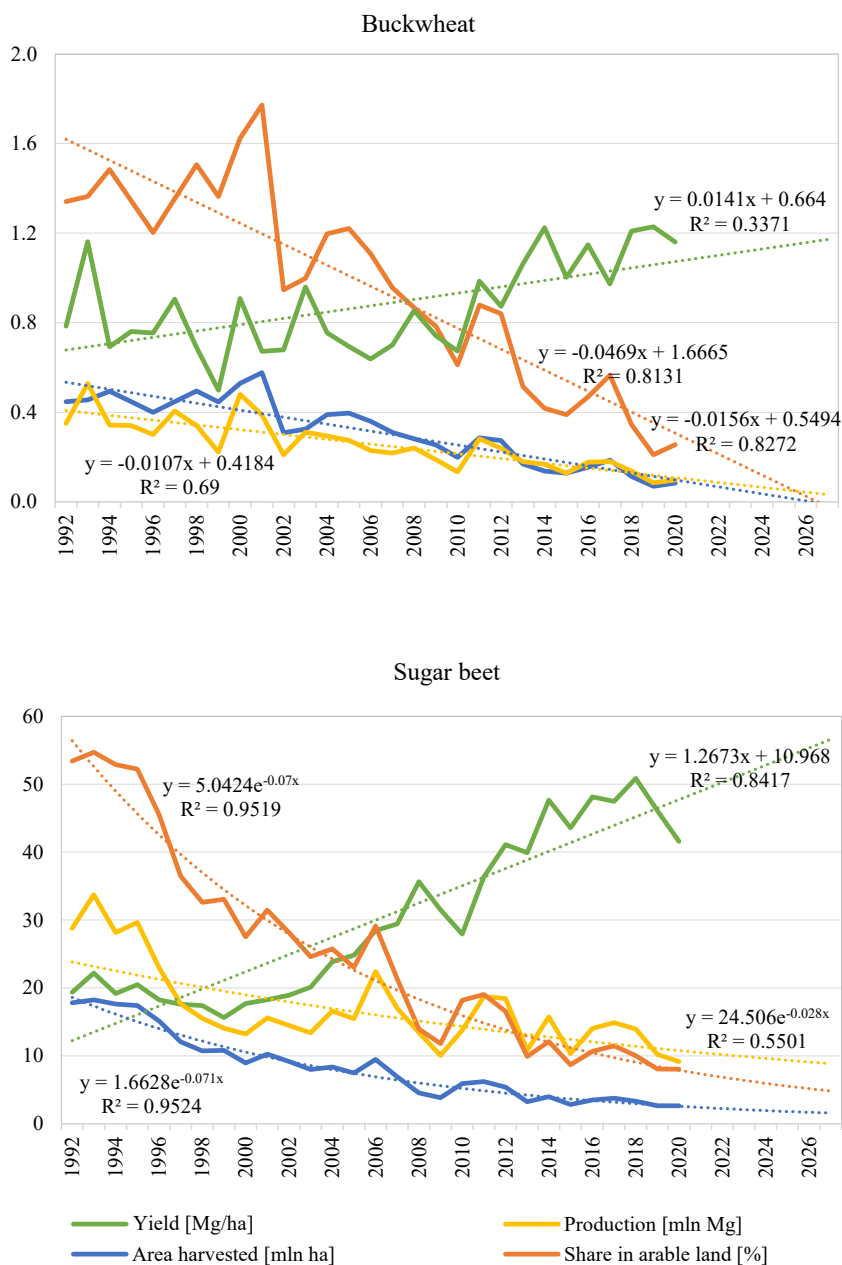


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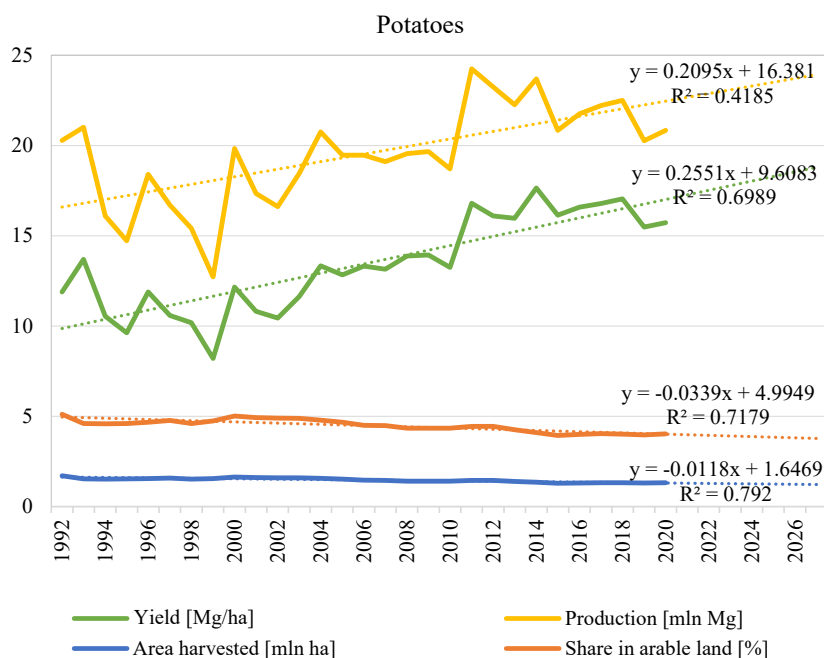


Figure 1.Cont.

Source: own study based on FAO data

be emphasized that the current geopolitical situation may weaken the upward trends in the case of these two species, as 46% of the rapeseed cultivation area and 35% of the sunflower cultivation area is located in the area directly affected by the war.

The soybean cultivation area in Ukraine has also increased significantly, now reaching 1.4-2 million. ha in relation to about 0.04-0.1 million ha in the initial years covered by the analysis. A significant increase in yields was also shown from 0.7-1 to 2-2.6 Mg/ha. As in the case of maize, it can be assumed that in the short term, the upward trend in soybean production will be maintained. This is mainly due to the fact that the vast majority of the area (87%) of this species' cultivation is outside the war zone [USDA 2022].

Ukraine was a major producer of buckwheat, but in the years 1992-2020 the cultivation area of this species decreased from approx. 0.45 to 0.1 million ha. As a result, despite a slight increase in the level of yields from about 0.8 to 1.2 Mg/ha, the production of this species is characterized by a strong downward trend.

Also, the cultivation area of sugar beet decreased in the analyzed period from approx. 1.5 to 0.2 million ha. Despite a significant increase in yields from about 20 to 45-50 Mg/ha, the sugar beet harvest in Ukraine decreased by about three times in 1992-2020.

The potato cultivation area slightly decreased, from about 1.5 to 1.3 million ha. The share of this species in the sown area decreased from 5 to 4%. The coefficient of determination for the potato yield trend equation indicates a significant upward trend in this respect.

## CONCLUSIONS

The analysis showed that plant production in Ukraine in 1992-2020 was characterized by a significant growth dynamics. This was especially true for yields of wheat and potato and cultivation area, yields and production of grain maize, rape, sunflower and soybean. On the other hand, the cultivation area and production of sugar beet, barley, buckwheat, rye and oats were decreased. Taking into account the production volume and high dynamics of development, it should be stated that Ukraine is a significant producer of the discussed plant species. Moreover, the tendencies of changes taking place in 1992-2020 led to the conclusion that the importance of Ukraine in this area will increase. However, the war initiated in 2014 and significantly intensified at the beginning of 2022 will reduce the production of the analyzed species. This is especially true of wheat, barley, rape and sunflower, for which 35-50% of the cultivated area is located in an area currently under intense war. This applies to a lesser extent to maize and soybeans, the cultivation area of which in the war area accounts for 12% and 13%, respectively. Of course, it should be taken into account that the possibility of continuing the production of the main crops in Ukraine, in addition to the availability of agricultural land, is also influenced by the possibility of purchasing means of production, as well as transport, storage and the possibility of exporting.

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## TENDENCJE ZMIAN ORAZ POTENCJAŁ ROZWOJU PRODUKCJI GŁÓWNYCH ROŚLIN UPRAWNYCH W UKRAINIE

Słowa kluczowe: Ukraina, produkcja roślinna, trendy, potencjał,  
krótkoterminowe prognozy

### ABSTRAKT

Rolnictwo jest historycznie jednym z głównych sektorów ukraińskiej gospodarki, a kraj ten często określany jest jako zagłębienie żywnościowe Europy. W ostatnich latach ukraińskie rolnictwo stale się rozwija i jest jedyną częścią gospodarki, która oparła się recesji. Jednak Ukraina jest nadal krajem o stosunkowo dużym niewykorzystanym potencjale rolniczym. Analizowano dane dotyczące produkcji głównych roślin uprawnych w Ukrainie w latach 1992-2020, wraz z krótkookresową prognozą do roku 2027. Analizie poddano następujące zmienne: powierzchnia upraw, udział w gruntach ornych, plon i produkcja. Z badań wynika, że produkcja roślinna w Ukrainie w latach 1992-2020 cechowała się znaczną dynamiką wzrostu. Dotyczyło to przede wszystkim plonów pszenicy i ziemniaków oraz powierzchni uprawy, plonów i produkcji kukurydzy na ziarno, rzepaku, słonecznika i soi. Natomiast zmniejszeniu uległy powierzchnia uprawy i produkcja buraka cukrowego, jęczmienia, gryki oraz żyta i owsa. Ponadto, tendencje zmian zachodzących w latach 1992-2020 pozwalały wnioskować, że znaczenie Ukrainy w tym zakresie będzie się zwiększało. Natomiast działania wojenne na obszarze kraju wpłyną na obniżenie produkcji omawianych gatunków.

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