KSE | Центр досліджень продовольства та землекористування

Agricultural Outlook Ukraine 2024-2033

Report-summary

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1. Introduction

Ukraine is the second largest country in Europe after the Russian Federation, with about 42.2 million ha of agricultural land comprising 70% of the country's total area. The agricultural sector plays a major role in the Ukrainian economy, and Ukraine has become an important player on several agricultural markets, aided by its huge agricultural potential and a favourable geographical position, with access to the Black Sea and direct access to key markets in the EU, the Middle East and North Africa. The full-scale Russian invasion, which started in February 2022, has caused an extensive shock on the Ukrainian economy, and agricultural sector in particular. Direct damages from occupation, artillery shells and airstrikes, disruption of logistics routes, increased costs for production inputs and decreased prices for agricultural commodities on the domestic market have put Ukrainian farmers in a difficult situation. Market situation has somewhat stabilized in 2023, but a long road to recovery is just beginning.

The study aims at providing an overview of the current situation of the agri-food sector in Ukraine and a market outlook until 2033. It explores potential future trends in the Ukrainian agri-food markets amid war and post-war recovery scenarios, and identifies the driving forces behind these trends.

For the outlook, the AGMEMOD model for Ukraine has been updated, further developed, and applied. AGMEMOD is a complex system of partial equilibrium, medium-term, multi-product and multi-country econometric models. It includes all EU Member States, Ukraine, some EU neighbouring and African countries, and other nations, while taking into account their respective domestic agricultural, trade and environmental policies.

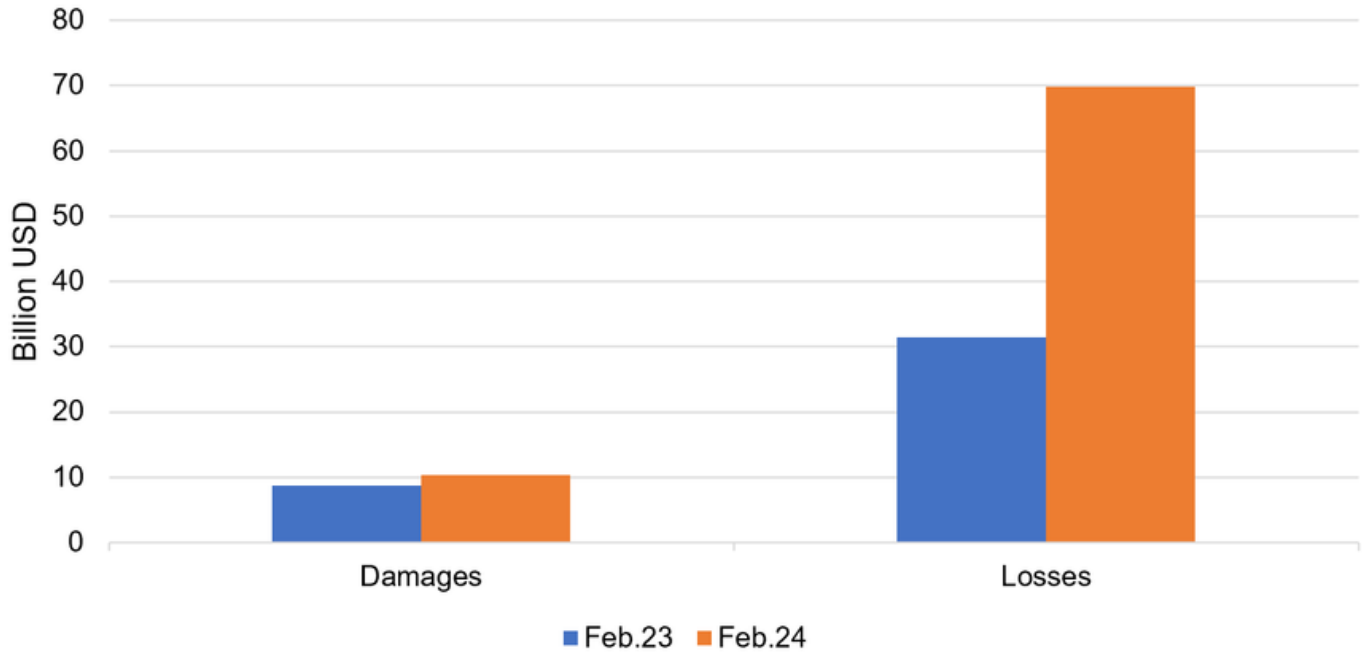
In previous years, three agricultural market Outlooks for Ukraine have been developed based on AGMEMOD (Nykolyuk et al., 2021; Bogonos and Stepaniuk, 2017; van Leeuwen et al., 2012). Building upon the previous model developments, the current work provides results based on more recent data and new assumptions, taking into consideration impacts of the war. Specifically, the following updates and improvements have been done for this study: (i) the database of the Ukraine country model in AGMEMOD was updated to 2023, (ii) the assumptions about production costs have been updated based on the producer interviews and macroeconomic projections of MDTU, (iii) assumptions about changes in agricultrual land area during the war were introduced into the model, and (iv) an endogenous sunflower oil price function was implemented in the model, based on the study of Ukrainian market power on global markets of main Ukrainian agricultural commodities.

The report consists of five sections. Section 2 reviews recent events and sector developments, which impacted Ukrainian agriculture in mid-late 2023. Section 3 describes Ukraine model of AGMEMOD and the updates that have been made. The projections for the Ukrainian agricultural markets until 2033 are presented in section 4. Section 5 provides summary and final conclusions of the report. For complete detailed projections, see UA **Outlook presentations:** UA version / ENG version.

2. Ukrainian agriculture in 2023

The ongoing war has emerged as the primary factor impacting Ukrainian agriculture, not only through direct damages and losses to the sector but also by severely limiting export capabilities. According to research previously published by KSE Agrocenter, as of February 2024, the total damages amount to $10.3 billion, indicating an 18% increase from the previous year. The relatively moderate pace of this increase can be attributed to two main factors: a significant portion of assets in regions with ongoing ground battles were already destroyed in the initial year of the invasion, and there has been a relative stability of the frontline thereafter[1]. Damaged machinery continues to constitute the single largest category of damages, a total of 5.8 billion USD, with 1.1 billion USD if this amount is attributed to 2023. The next largest category is damaged and destroyed storage facilities, which has seen the highest rate of increase. As of February 2024, damages in this category reached 1.8 billion USD, approximately 139% of the February 2023 value.

Figure 1. War damages and losses to Ukrainian agriculture in February 2023 and February 2024, billion USD



On the other hand, economic losses to the agricultural sector continue to accumulate at a relatively unchanged rate. As of February 2024, they increased by 122%, as compared to the February 2023 value. Most of the losses come from decreased production amount and lower production prices, which is a direct consequence of the export disruption.

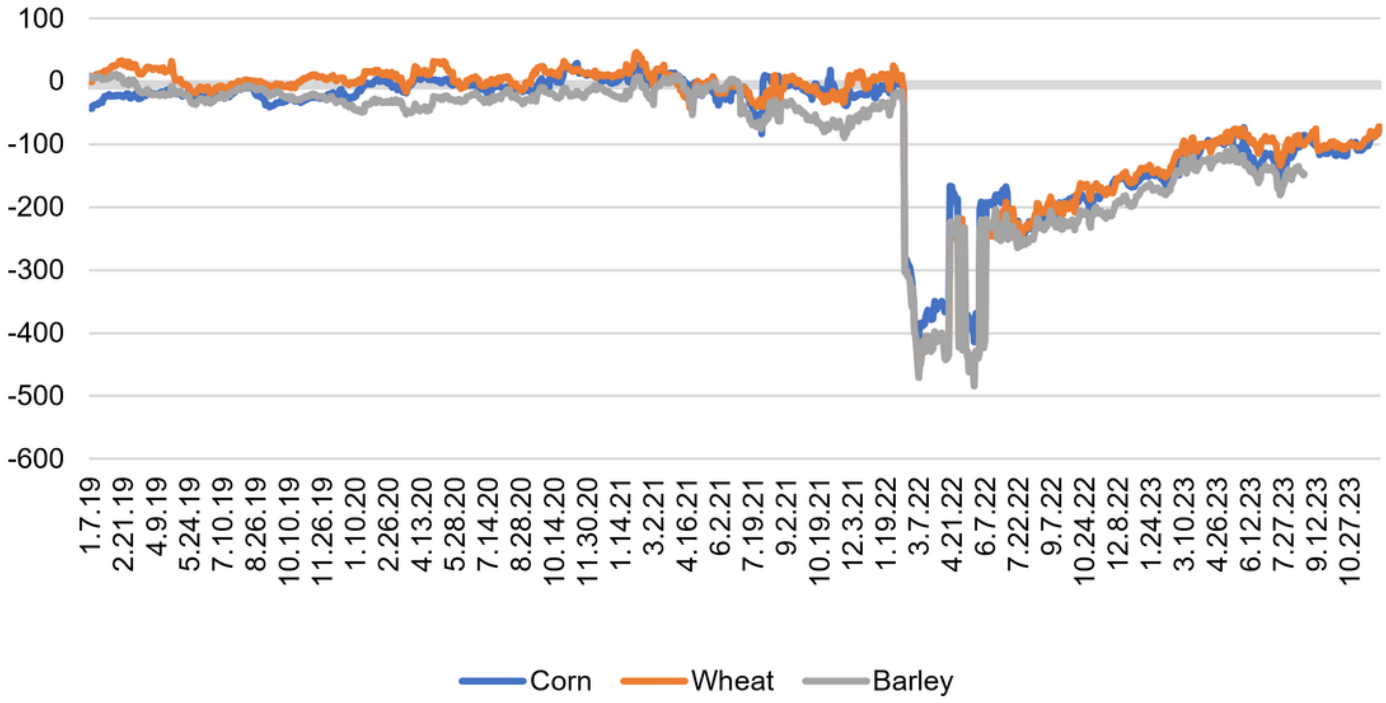
The most significant category of losses is caused by lower annual crops production, which forms the backbone of the Ukrainian agricultural sector. Lower production of annual crops constitutes 49.2% of all sector losses, amounting to $34.3 billion. This category has seen

[1] Neyter R., Zorya S., Muliar O. Agricultural War Damages, Losses, and Needs Review. February 2024. KSE Agrocenter

one of the most substantial increases over the 2023, as both occupation of territories and decreased output prices continue to contribute to lower overall production.

Losses resulting from decreased output prices due to export disruptions constituted approx imately 35% of all losses as of February 2024, totaling 24.1 billion USD. This represents a 66% increase, as compared to the February 2023 value. The maritime corridor opened by Ukraine, which will be discussed further, has noticeably increased Ukrainian export capacity, but the basis between domestic and world prices remains well above the pre-invasion level, indicating that the invasion's effect on domestic prices persists. (Figure 2).

Figure 2. Price basis of main export grains, USD



Source: UkrAgroConsult

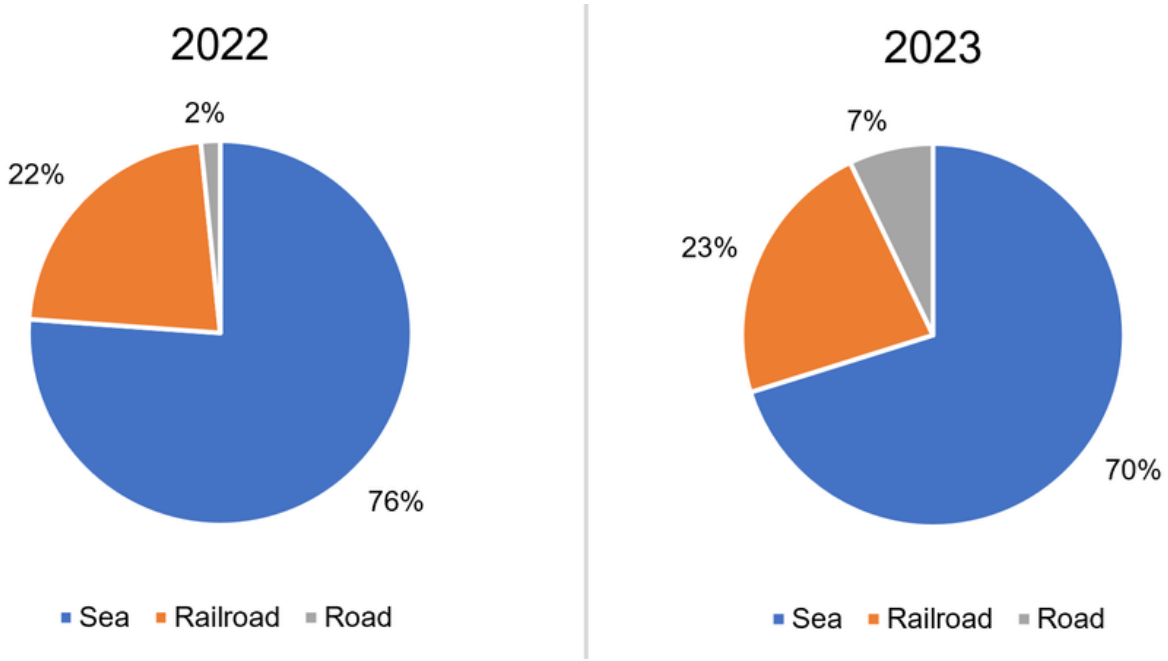
Main aspect that affected Ukrainian technical export capabilities, was the termination of the Grain Deal and consequent opening of the “grain corridor”. Grain Deal has been established in the August 2022. Lifting of the Russian naval blockade allowed Ukraine to re-open its maritime export of agricultural production. Importance of the grain deal comes from the fact that capacities of alternative export routes are limited at the much lower level, than the amount covered by maritime transport, which greatly affected farmers’ incomes, as expensive logistics drove the farm-gate prices down.

In July 2023 Russia withdrew from the Grain Deal, just on the eve of its expiration, which meant removal of safety guarantees for the ships carrying agricultural products from Ukrainian ports on the Black Sea.

The termination of the Grain Deal brought severe complications and uncertainty about possibilities of the future maritime export of agricultural commodities. However, due to

Ukrainian military efforts on the Black Sea against the Russian fleet, which was threatening the trade, Ukraine was able to provide security guarantees to the exporters. Over the course of August-November 2023, share of grains and oilseeds exported through the sea ports returned to the pre-Grain Deal termination level. According to State Customs Service of Ukraine (SCSU) data, structure of export in terms of transport did not change significantly after July 2023, as it could be seen on the Figure 3[2]. Share of grains and oilseeds exported through the sea ports decreased by only 7.8% on average in July-December 2023, as compared to July-December 2022 value (76%), with the most of this change being re-routed through the railroad (railroad share changed from 2% in 2022 to 7% in 2023). Recovery of the domestic prices, which started after the Grain Deal was established, stagnated in June-September 2023, and returned to positive trend in the autumn, as the latest available data suggests. It is expected to recover further, as no additional export constraints appear.

Figure 3. Structure of grains and oilseeds export by transport means in Q3-Q4 of 2022 and 2023, in monetary terms



Source: State Customs Service of Ukraine

[2] State Customs Service of Ukraine – BI Foreign Trade Indicators of Ukraine. https://bi.customs.gov.ua/uk/trade/dimensions

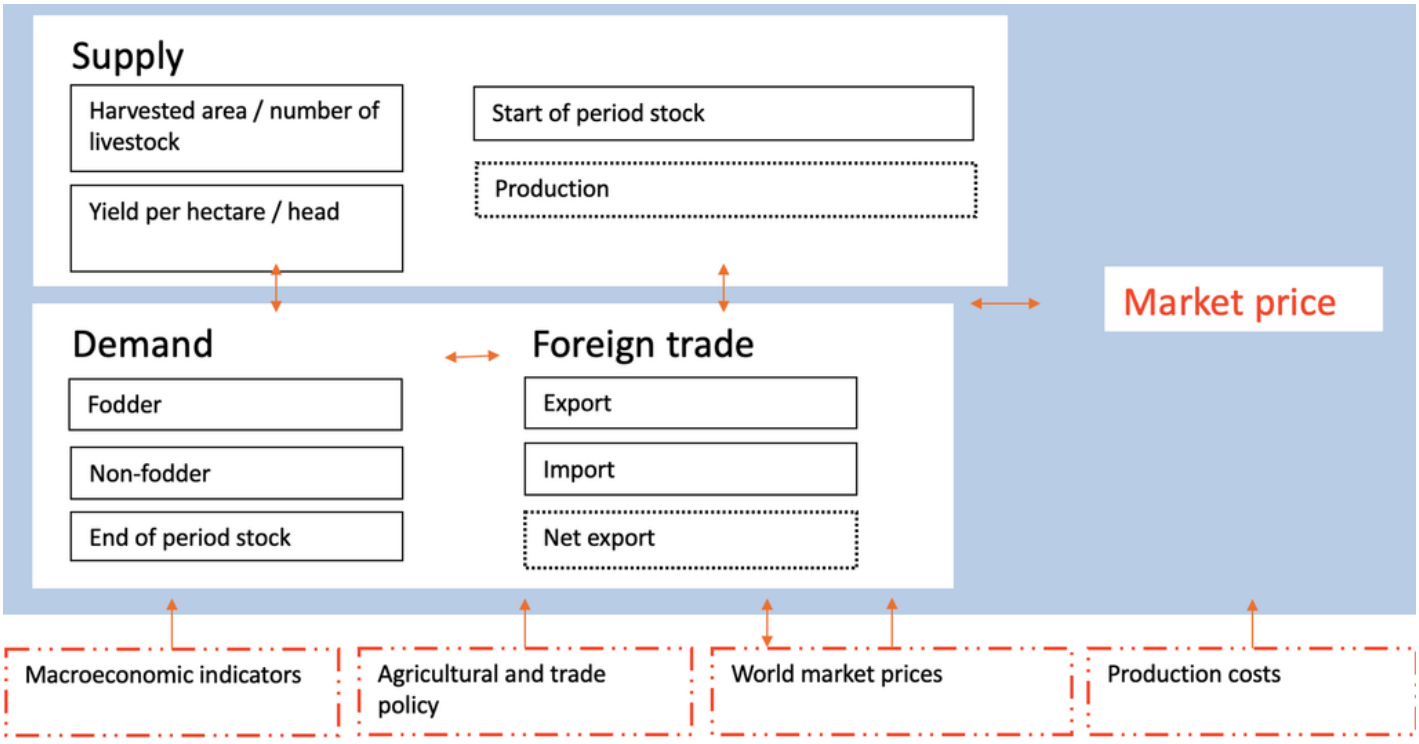
3. The Ukraine country model in AGMEMOD

This chapter first provides a brief general overview on the AGMEMOD model and the updates that have been made to the Ukraine country model in AGMEMOD. In particular, it discusses the updated database, production costs data, revised assumptions about agricultural land area change during the war, and introduction of the endogenous sunflower price function into the model.

3.1.The AGMEMOD Model

AGMEMOD is an econometric, dynamic, partial-equilibrium, multi-country, multi-market model. It covers all EU Members States, some non-EU countries (including Ukraine) and a stylised version of the rest of the world (RoW). The model provides annual projections (currently) until the year 2033 for markets of the main agricultural commodities at national and aggregated EU levels. AGMEMOD is based on a set of commodity-specific model templates and country-specific models. The template approach facilitates aggregation of the simulation results, analytical consistency across countries and comparison of policy impacts. The model does not only provide baseline projections but also enables the analysis of the impacts of countries' agricultural policies (e.g., CAP) and macroeconomic changes on the agricultural markets. Figure 4 illustrates the structure of the AGMEMOD model.

Figure 4. Structure of the AGMEMOD model



3.2. Database and baseline assumptions update

The database of the Ukraine country-model starts from 1992 and has been updated until 2023 for this study. The series include observations on production (e.g., crops yields and area harvested, livestock number and crop, slaughter weight, production of oilseed oils and meals), domestic use (e.g., use for feed, human consumption and processing, losses), prices, change in stocks, import and export. Most of the variables were obtained from the State Statistics Service of Ukraine, FAOSTAT, International Trade Center, UN COMTRADE database, USDA, and Ministry of Agrarian Policy and Food of Ukraine.

Additionally, a survey of agricultural producers was conducted in November-December 2023 to obtain updated data on production costs. The total number of respondents was 197, who reported producing the following crops: wheat (winter) – 130, corn – 97, barley (winter) – 59, rye – 5, oats – 5, soybeans – 77, rapeseed – 27, sunflower – 116. Up-to-date data of production costs is important for the precision of the model, as this parameter is one of the key production characteristics influencing gross margin, and, thus, choice of crops to produce. Based on the obtained data, production costs assumptions for 2024-2033 were updated. It was assumed, that costs will remaine unchanged in the real terms over the projected period, only increasing in nominal terms, according to projected inflation rates by the MDTU (up to 2026) and own extrapolation of MDTU trend for 2027-2033.

As of the observed changes in production costs, in 2022 the per-unit expenditures increase for all of the agricultural commodities included in the model, with rapeseed being the only exception. Primary cause for the per-unit costs increase is the high inflation rate in 2023 and additional production inputs price increase caused by the logistics and supply chains disruption. Along with the drop in farm-gate prices, it caused farmers' gross margin to shrink substantially. As situation in Ukraine stabilized in 2023, the 2022-2023 growth of per-unit production costs have slowed down, due to decreased inflation rate and market adaptation to the new conditions.

The main change observed in the cost structure is the increase of the fuel share. The second expenditures category that is increasing for all crops are the other indirect costs, which includes logistics, handling, product losses, storage, machinery and equipment maintenance, etc. Fertilizer share remains unchanged for most crops, and decreases for sunflower, rapeseed and oats.

3.3. Agricultural land area changes during the war

A study was conducted, the purpose of which is to clarify the area of the land fund of Ukraine as a whole and in terms of its individual components (namely: forests and other wooded lands, agricultural lands, including arable land (with fallows), hayfields and pastures) taking into account the consequences of occupation, mining and conducting active combat operations. Based on the obtained estimates, assumptions about amount of land available for cultivation and other agricultural purposes in 2023, 2024, and 2025 were added to the model.

The research used data from the ecological passports of the administrative regions of Ukraine[3] and the results of joint research by the World Bank, the Government of Ukraine, the European Commission, and the United Nations regarding the assessment of damage and losses suffered by Ukraine in the period from February 2022 to February 2023 as a result of the full-scale invasion of the Russian Federation[4]. The relevant calculations are based on the assumption that the specified types of land are evenly distributed within the territories of the administrative regions of Ukraine.

The share of the territory of Ukraine affected by occupation, mining and hostilities in the total area of the country was 31.74%. The area of affected agricultural land in 2022 was 10.5million ha, and the area of land that could be used for agricultural activities that year was 33 million ha, which is 26.04% less compared to the area before the beginning the full-scale invasion. The area of arable land and fallow land, which did not undergo changes during the RF military aggression, was 22.3 million ha, which is 31.93% less than before the start of the invasion. The area of hayfields and pastures decreased by 43.45%, primarily due to the fact that the largest share of these lands is concentrated in the regions most affected by military actions - from 17.5% in Chernihiv Oblast to 21.88% in Luhansk Oblast. As of forests and other wooded lands, their area compared to the pre-war period decreased by 26.05% from 10.7 to 7.9million ha.

As a result of the successful actions of the Armed Forces of Ukraine in 2022 and at the beginning of 2023, the territories of Kyiv, Zhytomyr, and Chernihiv oblasts were liberated; part of the lands of the Mykolaiv and Sumy regions were also returned, however, 3 and 15% remained under occupation, respectively. As a result, in 2023, the total area of Ukraine's land resources, excluding occupied territories, zones of active combat operations, zones along the Ukrainian-Russian border and other territories where economic activity is impossible, increased by 13.58% to 46,8 million ha, compared to 2022. In particular, the area of agricultural land increased by 13.19% (including due to the increase of arable land and fallow land by 12.31%), and the area of forests and wooded land - by 16.73%

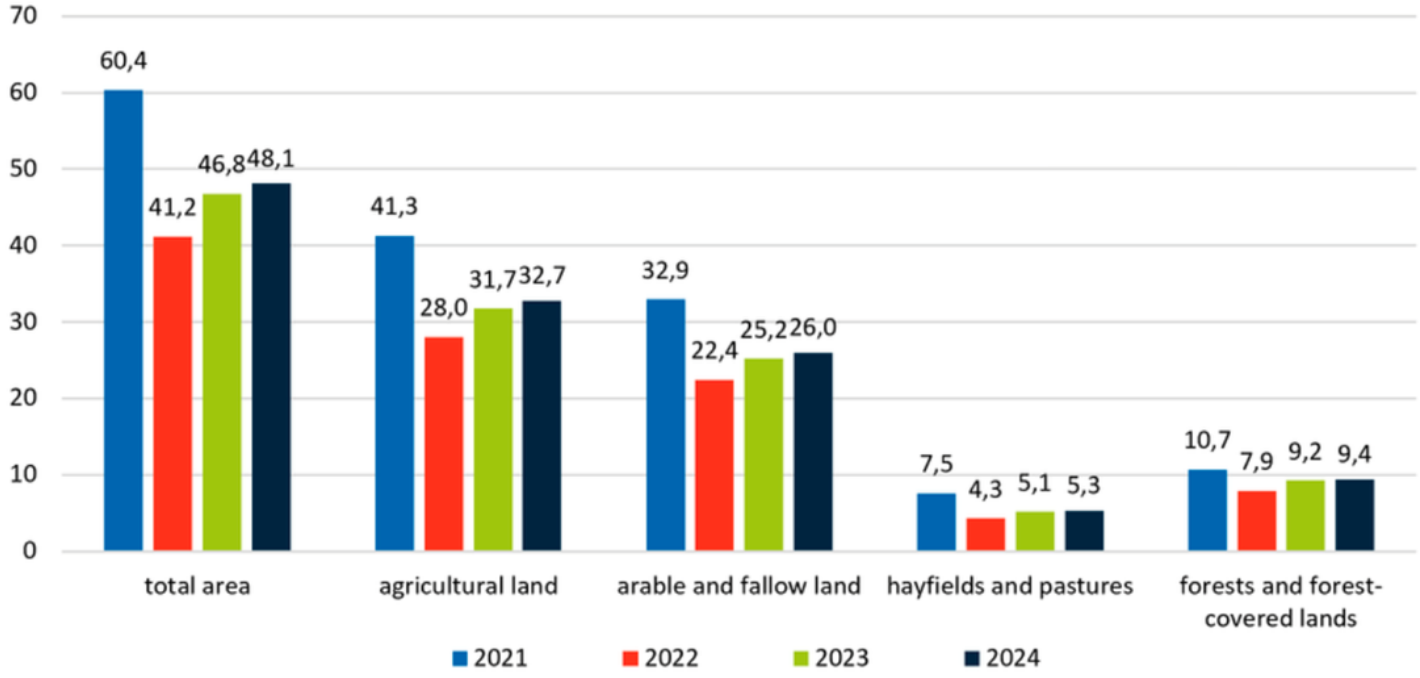
As of the beginning of 2024, the area of the territories of Ukraine suitable for conducting economic activity amounted to 48,1 million ha, that is, it increased by 16.78% compared to 2022 and by 2.83% compared to 2023 due to the liberation of parts of Kharkiv and Kherson regions. The area of forests on wooded lands increased by 18.53% compared to 2022, agricultural land – by 16.69%, in particular arable land and fallow land - by 15.31%, hayfields and pastures - by 24.07%.

The obtained estimates are presented on the Figure 5.

[3] https://mepr.gov.ua/diyalnist/napryamky/ekologichnyj-monitoryng/ekologichni-pasporty/

[4] Ukraine Rapid Damage and Needs Assessment February 2022 – February 2023. March 2023, the World Bank, the Government of Ukraine, the European Union, the United Nations. https://ukraine.un.org/sites/default/files/2023-03/P1801740d1177f03c0ab180057556615497.pdf

Figure 5. Dynamics of the land resources in Ukraine in 2021-2024.



3.4. Endogenous sunflower price function

A study of Ukraine's influence on global pricing for its key markets—sunflower oil, wheat, corn, and barley was conducted. Residual Demand Elasticity (RDE) approach, based on the methodology developed by Baker and Bresnahan (1988), which was later refined by Goldberg and Knetter (1999), was applied using a dataset of Ukrainian export quantity and price, competing countries' exchange rates and export prices, and a set of demand shifters. RDE model allows to measure the residual demand elasticity to ascertain a country's market power in a specific market.

The study affirmed Ukraine's statistically significant impact on global sunflower oil prices, highlighting the influence of Ukrainian exports on international price levels.,
Consequently, the Ukraine model in AGMEMOD was adjusted to treat sunflower oil world prices as endogenous, incorporating the influence of Ukrainian exports. This new function took a form of:

$$(1)\ UOPFNMUA = -18.66743 - 0.02302*UOUXTUA + 1.05741*ROWMPWW + 0.03954*UOPFNMUA(-1) + 1.53782*TREND95,$$

where UOPFNMUA is domestic sunflower oil price in Ukraine, UOUXTUA is amount of export of sunflower oil from Ukraine, ROWMPWW is a global market price of rapeseed oil (one of substitutes for the sunflower oil on the world market), UOPFNMUA(-1) is domestic sunflower oil price in Ukraine in a previous period, and TREND95 is a linear trend variable.

3.5. Key baseline scenario assumptions

Table 1 summarizes key assumptions of the baseline scenario, results of which are presented in the section 4.

Table 1. Key baseline scenario assumptions

Assumptions	Values
End of war	December 2024
Production costs	Remain constant in real terms at the 2023 level. In nominal terms increase due to inflation
Technical export capacities	Not limited
Amount of agricultural land	2024 – according to calculations, provided in section 3.3. Since 2025 – all lands are de-occupied and demined, and are used in production
Inflation	MDTU projections until 2026, and own extrapolation of MDTU trends for 2027-2033
Population	MDTU projections until 2026, and own extrapolation of MDTU trends for 2027-2033
Real GDP	MDTU projections until 2026, and own extrapolation of MDTU trends for 2027-2033
Exchange rate (UAH per USD)	MDTU projections until 2026, and own extrapolation of MDTU trends for 2027-2033

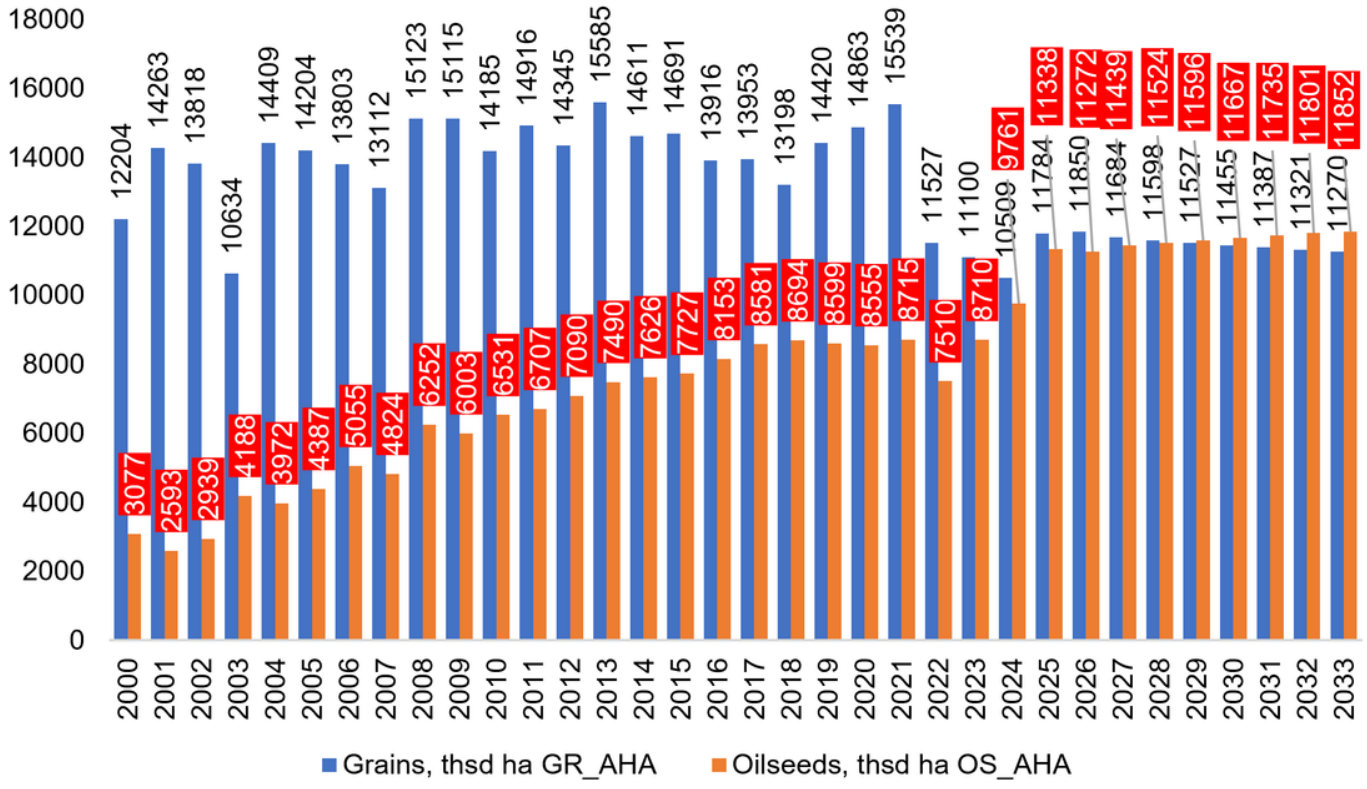
4. Market outlook for Ukraine

The current section presents the outlook for the major agricultural commodity markets in Ukraine until 2033. The cereal markets include wheat, corn, barley, rye and oats, and the oilseed markets refer to the seeds, oils and meals of sunflower, rapeseed and soya beans. Livestock commodities analysed are beef, pork, cow milk, poultry meat and eggs. The outlook rests upon a set of assumptions described in section 3.

4.1. Crops

By 2033 total harvested area of grains is projected to slowly decrease after a rapid drop in 2022, and a modest recovery in 2024-2026 down to a value of 11.3 million ha in 2023. Total oilseeds area, however, is expected to grow. The latter may reach 11.9 million ha, which is rougly 59% more compared to the respective average of the last observed value in 2023. The increase will mainly be driven by deoccupation of land and a gradual shift towards oilseeds production from the cereal crops. Although sunflower will partially be substituted by rapeseed and soya beans, it will continue to be produced on the largest share of the total oilseeds area: approx. 7.4 million ha in 2033. Higher profitability of oilseeds, as compared to cereals, combined with growth of demand for feed from the poultry sector, will significantly contribute to these trends.

Figure 6. Observed and projected areas harvested of grains and oilseeds, thousand ha



Despite relative stability of the total cereals area, the areas of specific cereals will change. The most significant change is projected for the area harvested of corn: from 37% of the grains area in 2023 to 46% in 2033. Corn will substitute wheat, area of which is projected to decline by 27% (to 5.3 million ha), compared to the 2023 value. As presented in Figure 7, the share of wheat in the total cereals area will decline from 47% in 2023 to 34% in 2033. Barley is another grain, area share of which is expected to grow, up to 16% of the grains area, as compared to 13% in 2023. The increase in corn area follows, among other reasons, climate change adaptation. Compared to two decades ago, corn can now be successfully integrated into the crop rotation and cultivated in more regions due to expansion of warmer average weather conditions to the north. Besides that, higher profitability of corn, as compared to wheat, contributes to this growth. However, despite the growth of barley and corn areas, their values will not return to the pre-war level due to decrease in total grains area caused by the shift towards oilseeds.

By 2033, the share of sunflower in the total oilseeds area is expected to decline from 65% in 2023 to 62%. Conversely, the share of rapeseed and area is projected to increase from 15% in 2023 up to 20% in 2033. Soybeans, similar to sunflower, will experience a slight decrease in its area share, from 20% in 2023 to 18% in 2033. In absolute terms, areas of all oilseeds are expected to grow above the pre-war levels, with rapeseed almost doubling in area, as compared to 2023 (+85%).

Figures 7-8 present the observed and projected changes in the areas harvested of the main arable cereal and oilseed crops in Ukraine.

Figure 7. Shares of crops in the total cereals area

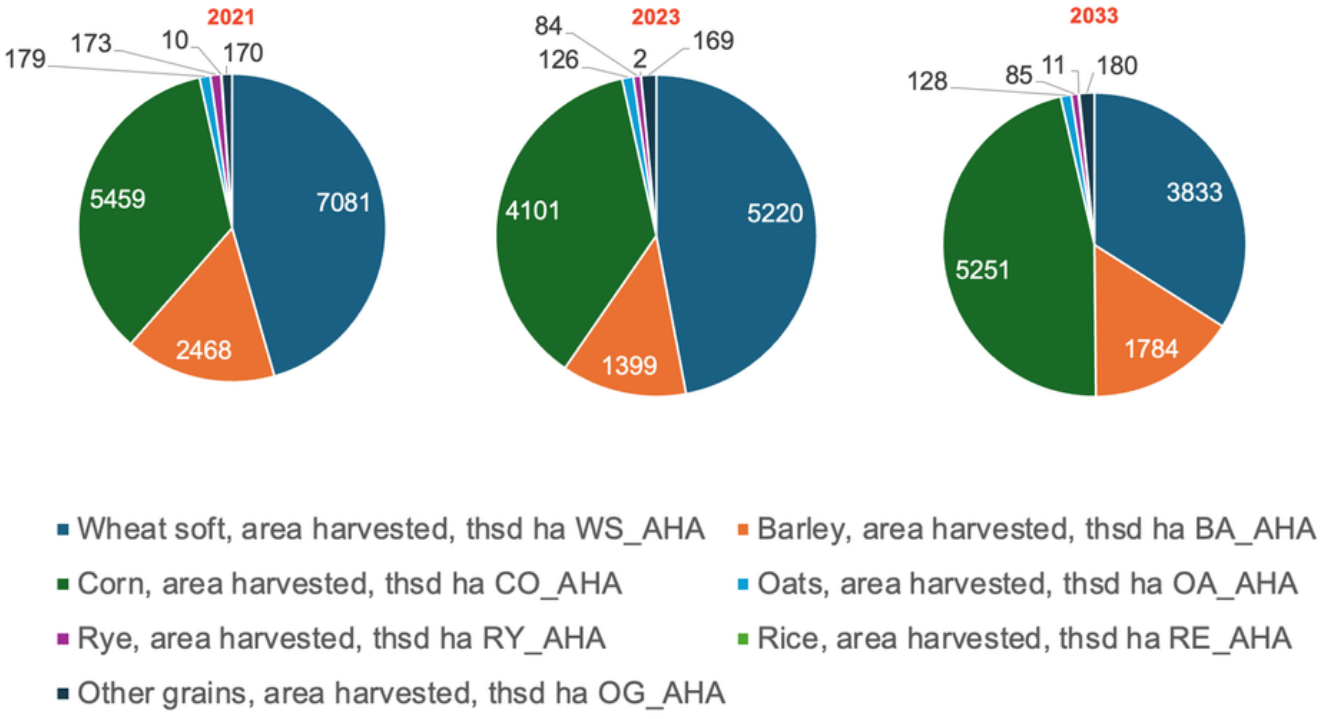


Figure 8. Shares of crops in the total oilseeds area



4.1.1. Cereals

By 2033, total cereals production in Ukraine is projected to increase by 41.6% (to 76.4 million tonnes) compared to the 2023 level. This increase is attributed mainly to the growth of corn production (from 27 million tonnes in 2023 to 48.9 million tonnes in 2034) which results from a significant expansion of the area harvested and growing yield,as economy recovers from the war-induced shocks. Yield is expected to rise due to technology improvement, e.g., availability of better-quality seeding materials, application of advanced practices and increase in affordability of fertilizers.

Along with corn, production of barley, rye and oats is expected to increase as well. In particular, barley production will grow to 7.3 million tonnes (+50.5% as compared to 2023), rye production to 400 thousand tonnes (+44.4% as compared to 2023) and oats production to 366 thousand tonnes (+11.9% as compared to 2023). Such growth will result primarily from increase in areas and improvement of the yields.

Compared to the change in area harvested of wheat (-27%), the change in production of wheat will be less severe, decreasing from 21.5 in 2016-2019 to 19.4 million tonnes in 2030 (-9.7%) due the growth in yield. Thus, by 2030 the yield is expected to increase to 5.1 tonnes per hectare, i.e., by 24.4% as compared to the 2023 value (4.1 tonnes per hectare).

Despite the growth of total cereals production, it will not return to the pre-war (2021) level, reaching only approx. 90% of 2021 production. The only cereal crop, which will exceed the 2021 level is corn, with 16.2% increase in production, as compared to the 2021 level.

Figures 9-10 demonstrates observed and projected changes in yield and production of the main cereals in 2000- 2033 in Ukraine.

Figure 9. Observed and projected changes in yield of the main cereals in 2000- 2033 in Ukraine.

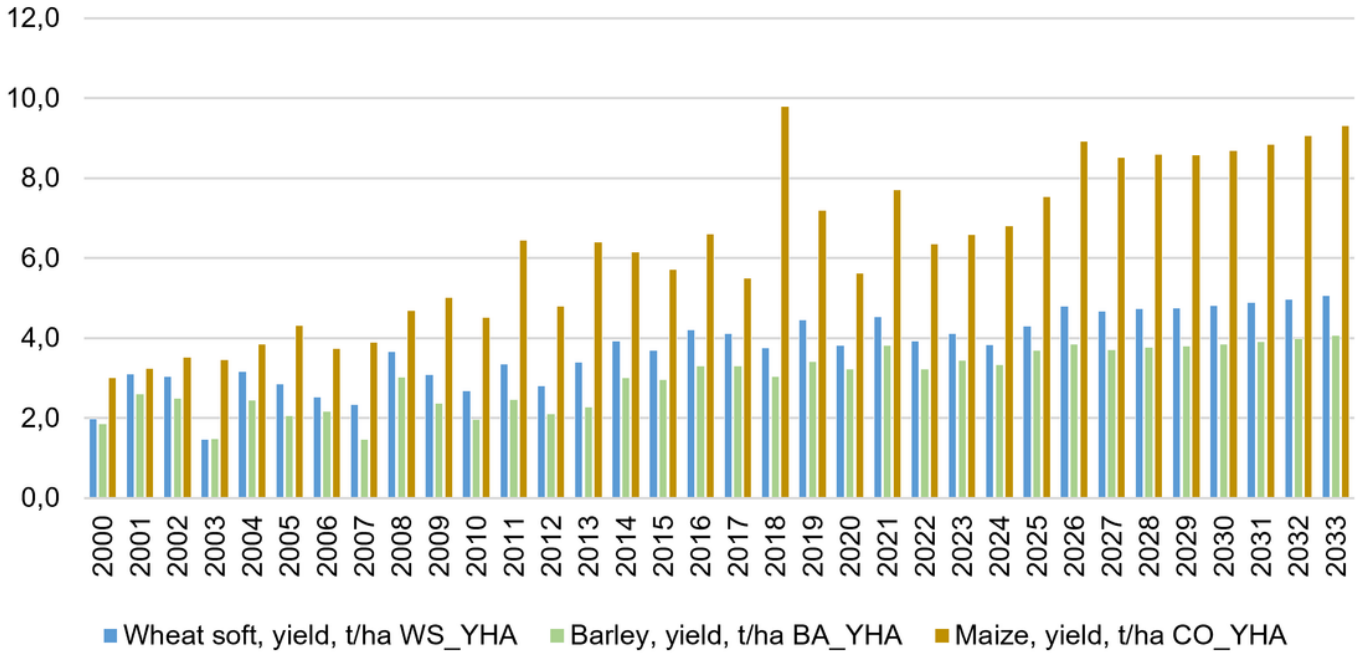
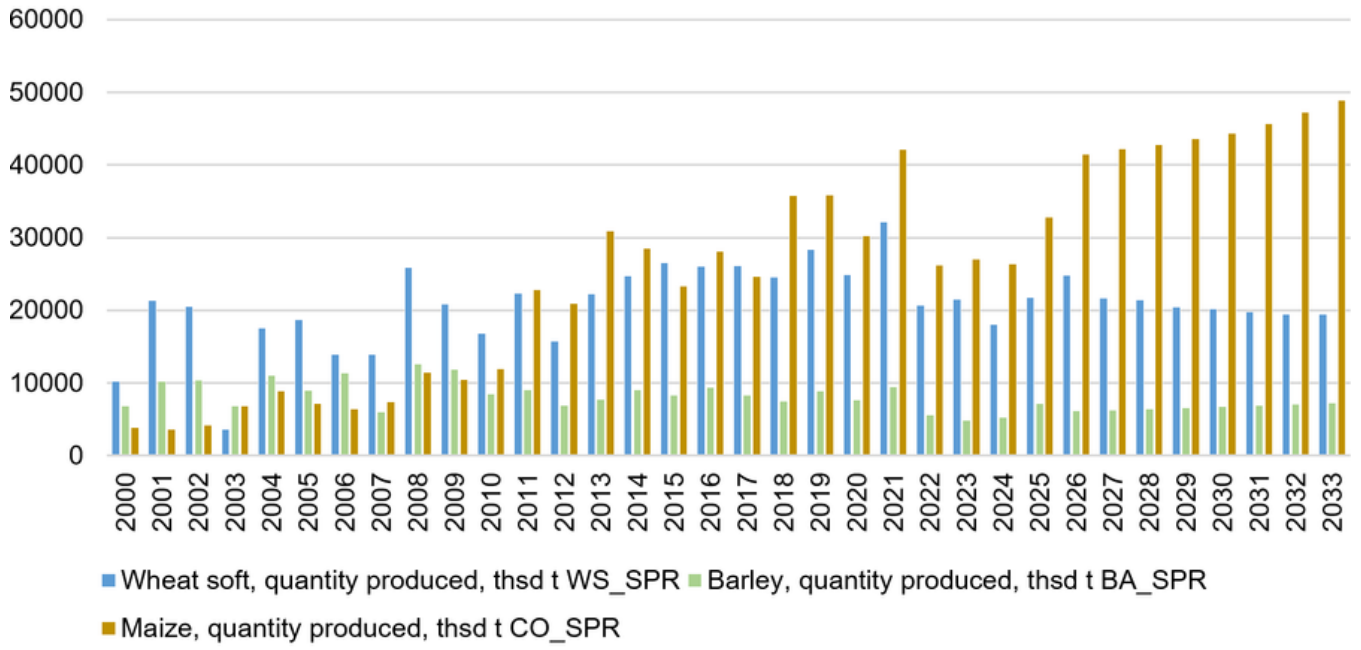


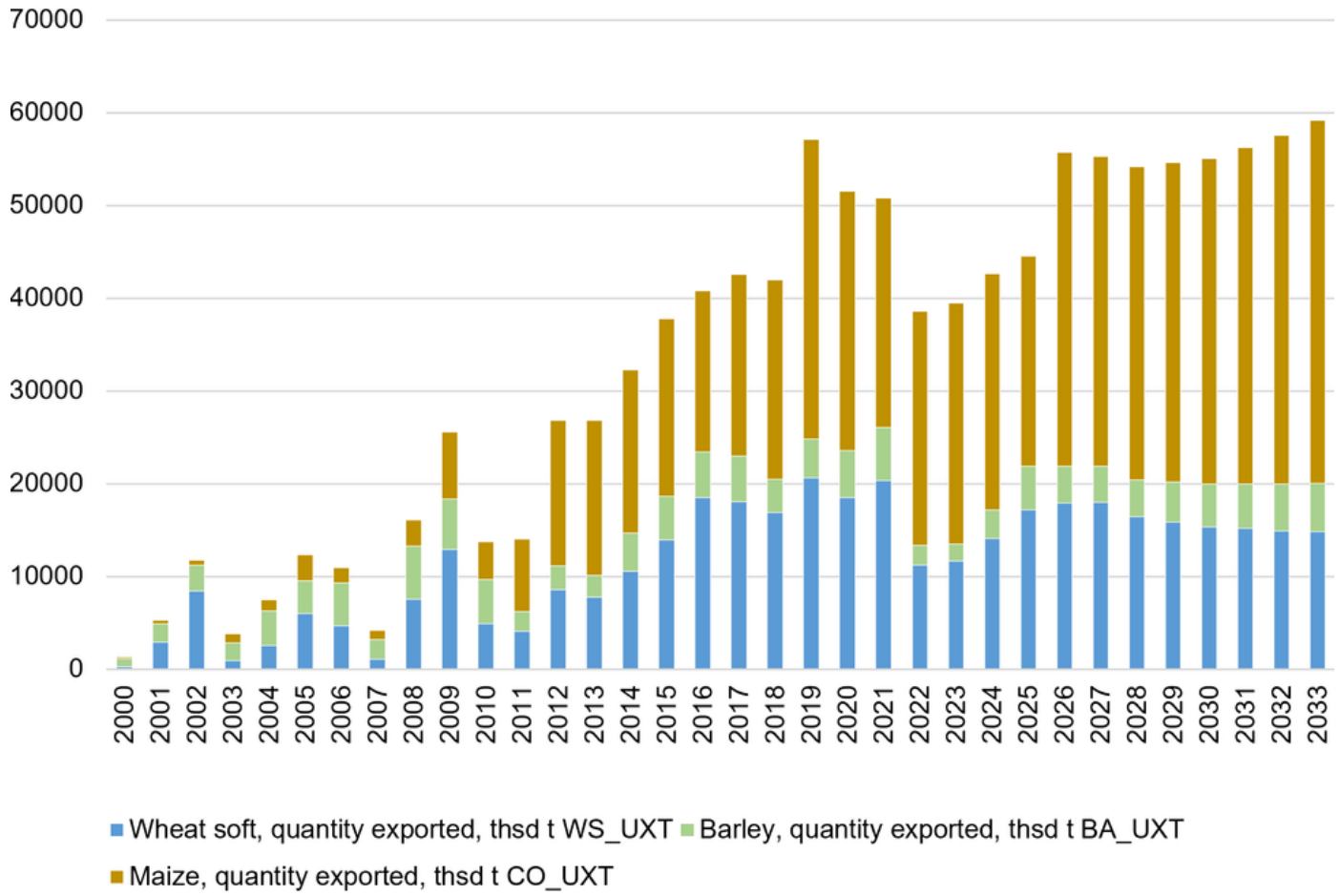
Figure 10. Observed and projected changes in production of the main cereals in 2000- 2033 in Ukraine.



Export of cereals will follow the post-war recovery of production and grow from 44.4 million tonnes in 2023 to 59.4 million tonnes in 2033. In particular, exports of the main cereals, i.e., wheat and corn, are expected to increase, respectively, by 27.2% and 50.7%. Despite the fact that production will not return to pre-war level by 2033, export volume will exceed 2021 level of 51.0 million tonnes by 16.5%, due to lower domestic demand, resulting from negative population trend. This growth is driven primarily by corn, as it is the only crop, export of which is expected to outgrow the pre-war level.

The share of corn in the total cereals export quantity is projected to reach 66.0%, while shares of wheat and barley are expected to decline gradually. Figure 11 illustrates the changes in export quantities and export structure of grains. Import of cereals is projected to remain negligeable over the period of 2024-2033.

Figure 11. Export quantities and export structure of main grains in 2000-2033, thsd tonnes



4.1.2. Oilseeds

Oilseeds production in Ukraine is projected to increase from 20.2 in 2023 to 33.2 million tonnes in 2032. Production of all three major oilseed crops is expected to grow: sunflower seeds up to 19.4, soya beans up to 5.9 and rapeseed seeds up to 7.9 million tonnes (i.e., by +53.2%, +129.2% and +43.1%, respectively, as compared to 2023 level). The growth of production of all three crops can be attributed to increased areas, as farmers gradually shift from cereals towards oilseeds. Advancements in yields will further elevate production.

Since domestic and export demand for sunflower oil are expected to remain high, intensification of sunflower seeds production, which has already been observed in the last two decades, is projected to continue, however, at somehow lower rate, as more land is getting devoted to rapeseed cultivation. Thus, despite the decline in area harvested, the improvement in yield which is projected to reach 2.6 tonnes per hectare by 2033 (+16.6% as compared to the 2023 value, and +5.7%, as compared to the pre-war value of 2021), will result in greater production volumes.

Along with the area, the yield of rapeseed will grow. By 2033 it is projected to reach 3.4 tonnes per hectare, and thus, support the increase in production. Soya beans production growth along with other oilseeds, primarily due to increase in area. Its yield, on the other hand, remaines relatively unchanged after the brief recovery from war impacts in 2024-2026. In particular, in 2030 yield is expected to reach 2.78 tonnes per hectare (+4.9%, as compared to the pre-war 2021 level, and +18.8%, as compared to 2023 level) and growth in area harvested is projected to be +65.6%, as compared to the pre-war level in 2021.

Primary cause for the high rate of rapeseed production growth is its higher relative profitability. Secondly, in contrast to sunflower production, which exhausts the soil, rapeseed is also being planted as a cover crop, for the purposes of soil health improvement.

Total oilseeds production is expected to reach the pre-war level by 2025-2026 and continue to grow throughout the projected period. Primary reason for this quick recovery is the shift of sown areas from cereals to oilseeds due to higher profitability.

Figures 12-13 shows observed and projected changes in yield and production of the main oilseed crops in Ukraine in 2000-2033.

Figure 12. Projected changes in yield of the main oilseed crops in Ukraine in 2000-2033.

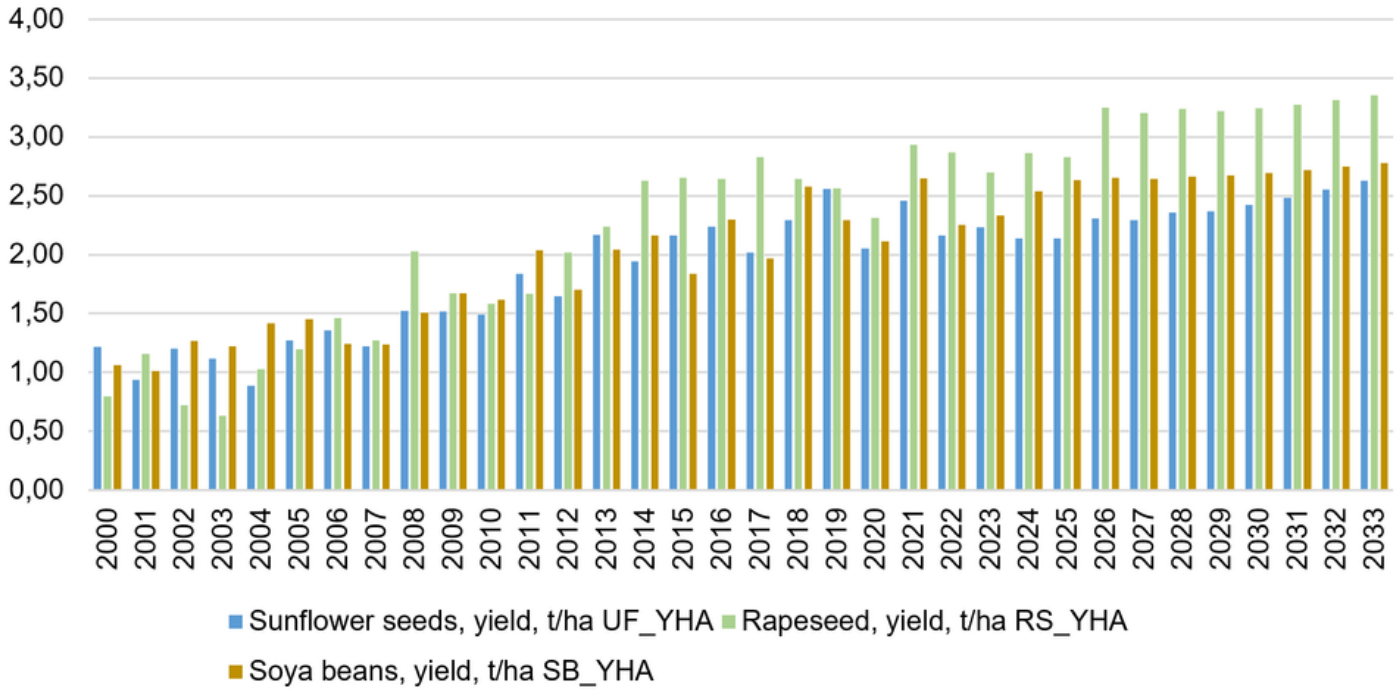
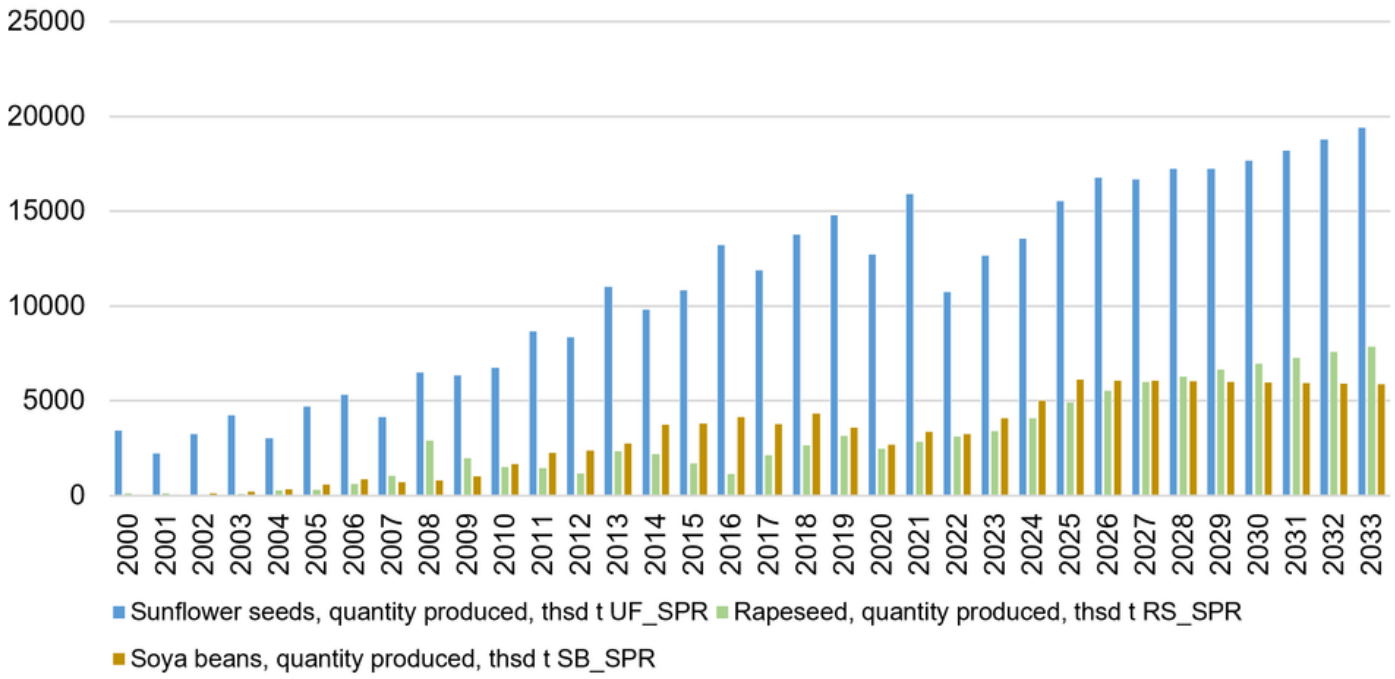
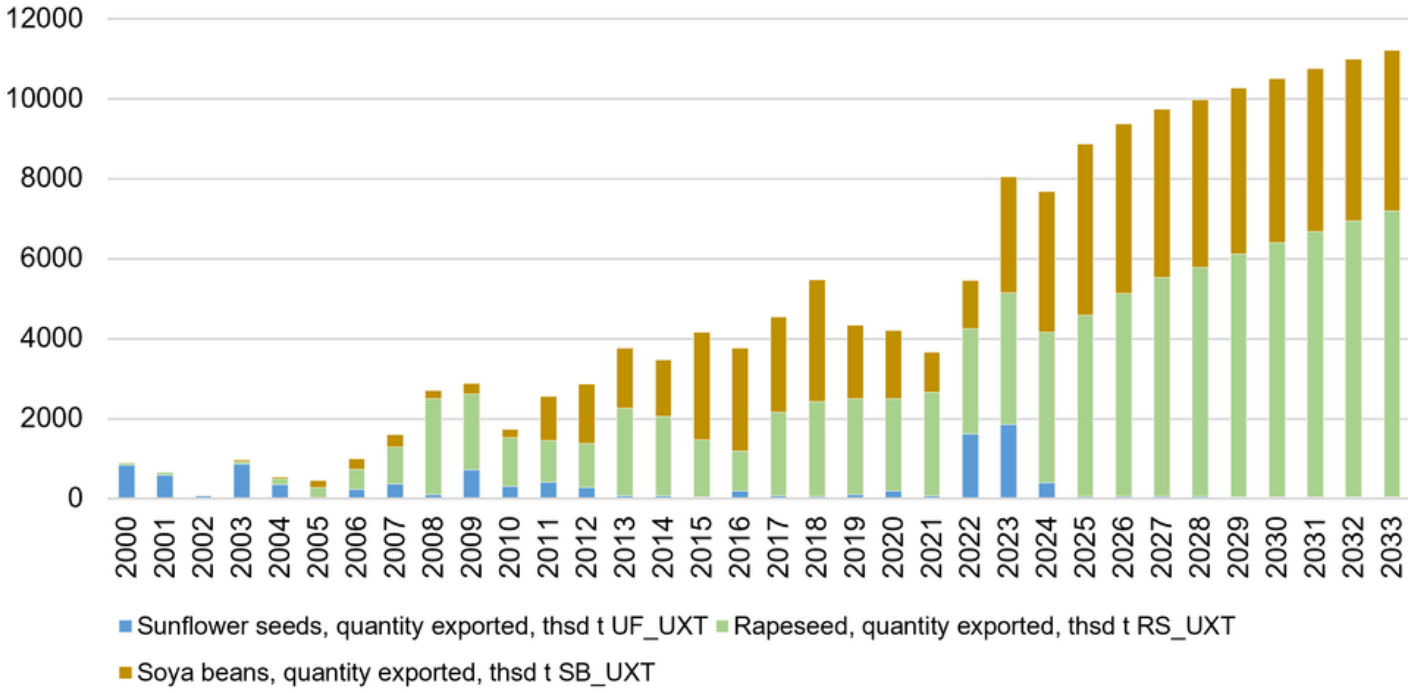


Figure 13. Projected changes in production of the main oilseed crops in Ukraine in 2000-2033.



Sunflower seeds are expected to remain to be mostly processed domestically, with oil being exported rather than seeds themselves. Amount of sunflower seeds exported will return to the pre-war trend and remain quite low throughout 2025-2033, at the level of approx. 50 thousand tonnes, not exceeding 0.4% of the total production. Imports of sunflower seeds to Ukraine will remain rather low as well, i.e., 27 thousand tonnes in 2033. Conversely, export quantities of rapeseed seeds and soya beans are projected to grow (Figure 14). Following the increase in production, export of rapeseed seeds is expected to grow to 7.2 million tonnes and of soya beans to approx. 4 million tonnes (i.e., an increase by 117.3% and 38.5%, respectively, as compared to the values of 2023). Despite higher quantities exported, the shares of oilseed crops export in their respective total production volumes will drop slightly by 2033, as compared to the values of 2023: from appox. 95.8% to 90.8% for rapeseed seeds and from 70.4% to 68.2% for soya beans. This decrease is observed mainly due to increased demand for poultry feed at the domestic market. Imports of sunflower and soya beans are expected remain less than 0.2% of the domestic consumption. In contrast, share of imports in domestic consumption of rapeseed is projected to decrease from approximately 10% in 2024 down to 5.3% in 2033.

Figure 14. Export quantities and export structure of main oilseeds in 2000-2033, thsd tonnes



4.1.3. Oilseed meals and oils

Production and exports of oilseed oils and meals are projected to continue growing until 2033 (Figure 15), following the production trends of the respective feedstocks. In particular, by 2033 production of oils of sunflower seeds, rapeseed and soya beans show growth rates of 45.8%, 347.6% and 5.8%, respectively, as compared to 2033. Thus, sunflower oil production is projected to be 8.4 million tonnes, rapeseed oil 282 thousand tonnes, and soya bean oil 293 thousand tonnes. The exports will follow the production increase. By 2033, exports of sunflower, rapeseed seeds will increase by, respectively, 47.6% (to 7.9 million tonnes), 382.5% (to 275 thousand tonnes) as compared to the values of 2023. Amount of soybean oil export will remain relatively unchanged (-0.4%, 276 thousand tonnes), with all of the production increase staying on the domestic market. Shares of quantities exported in the total production volumes will remain beyond 90%. Import quantities of oilseed oils are not expected to exceed one thousand tonnes each.

Figure 15. Projections of production amounts of sunflower, rapesed, and soya bean oils in 2000-2033

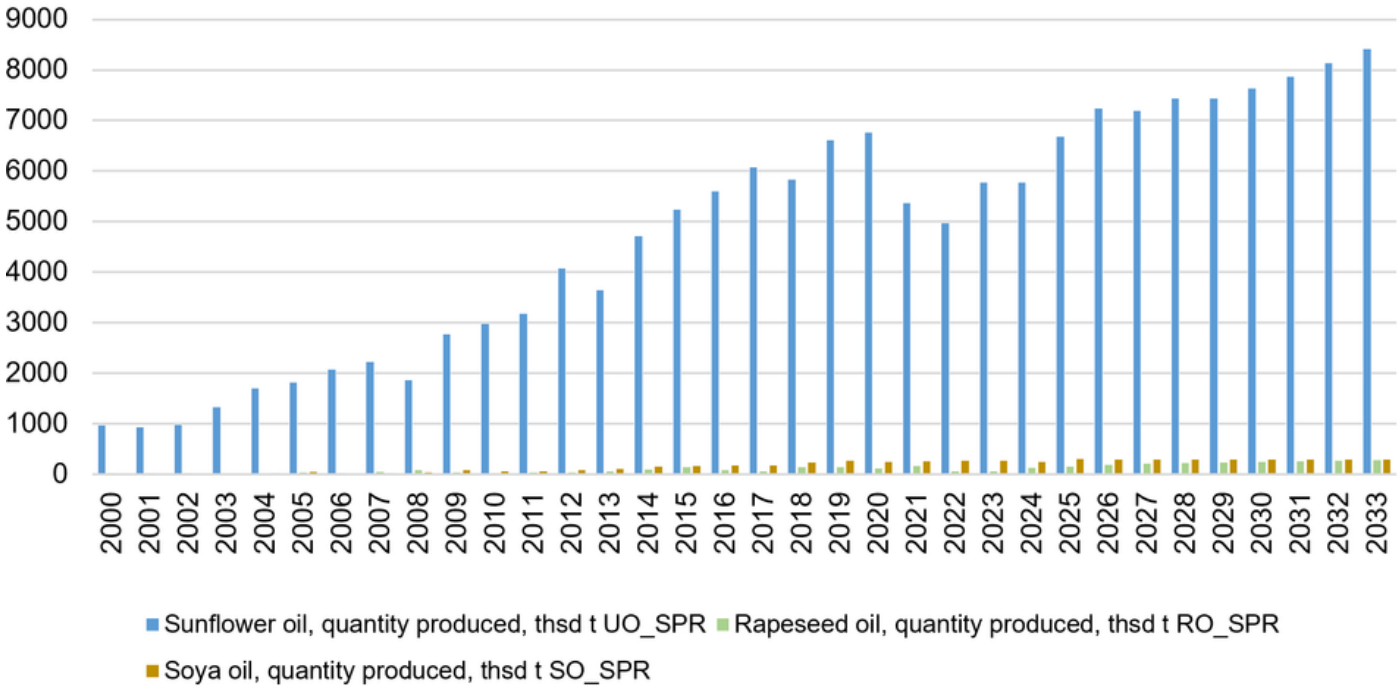
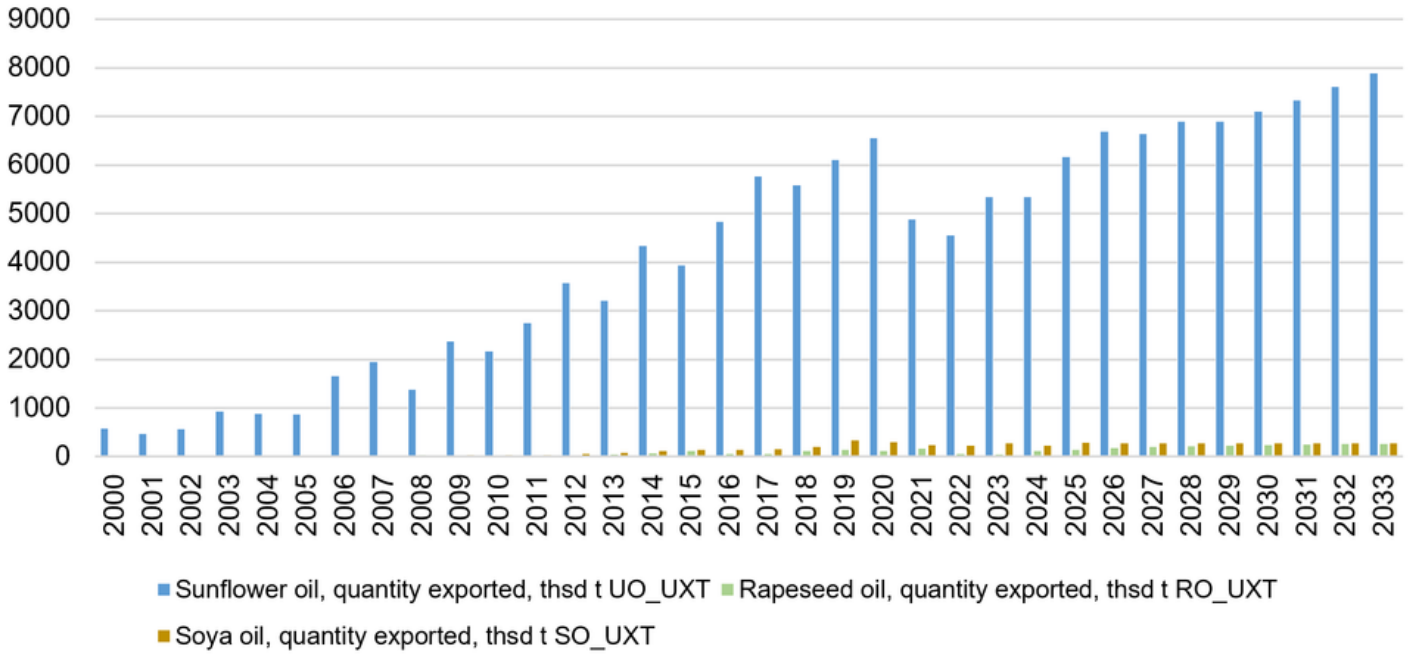


Figure 16. Projections of production amounts of sunflower, rapesed, and soya bean oils in 2000-2033



Reflecting the growth in oils production, production of oilseed meals will grow as well. In particular, in 2033 sunflower seeds meal production is projected to increase by 45.9% (to 7.1 million tonnes), rapeseed seeds meal by 348% (to 354 thousand tonnes) and soya beans meal by 5.8% (to 1.3 million tonnes) compared to the respective values in 2023. Exports of meals will increase as well, with export quantities of sunflower seed and rapeseed meals projected to increase to, respectively, 6.3 million tonnes (+145.8%, as compared the value 2023) and 315 thousand tonnes (+494.3%, as compared to the value in 2023). Despite

export quantity of soya beans meal will be limited by the growing domestic demand, due to the development of the poultry sector (see the livestock section), soya beans meal exports still demonstrate a growth from 331 thousand tonnes in 2023 to 450 thousand tonnes in 2033. Quantities imported of the meals of sunflower seeds, rapeseed seeds and soya beans are expected to remain less than 1% of the domestic consumption, with the only exception being rapeseed oil, import of which constitutes 4.3% (300 tonnes) of the domestic consumption. Figures 17 and 18 show the changes in the production and export of oilseed meals in 2000-2033.

Figure 17. Projections of production amounts of sunflower, rapesed, and soya bean oils in 2000-2033

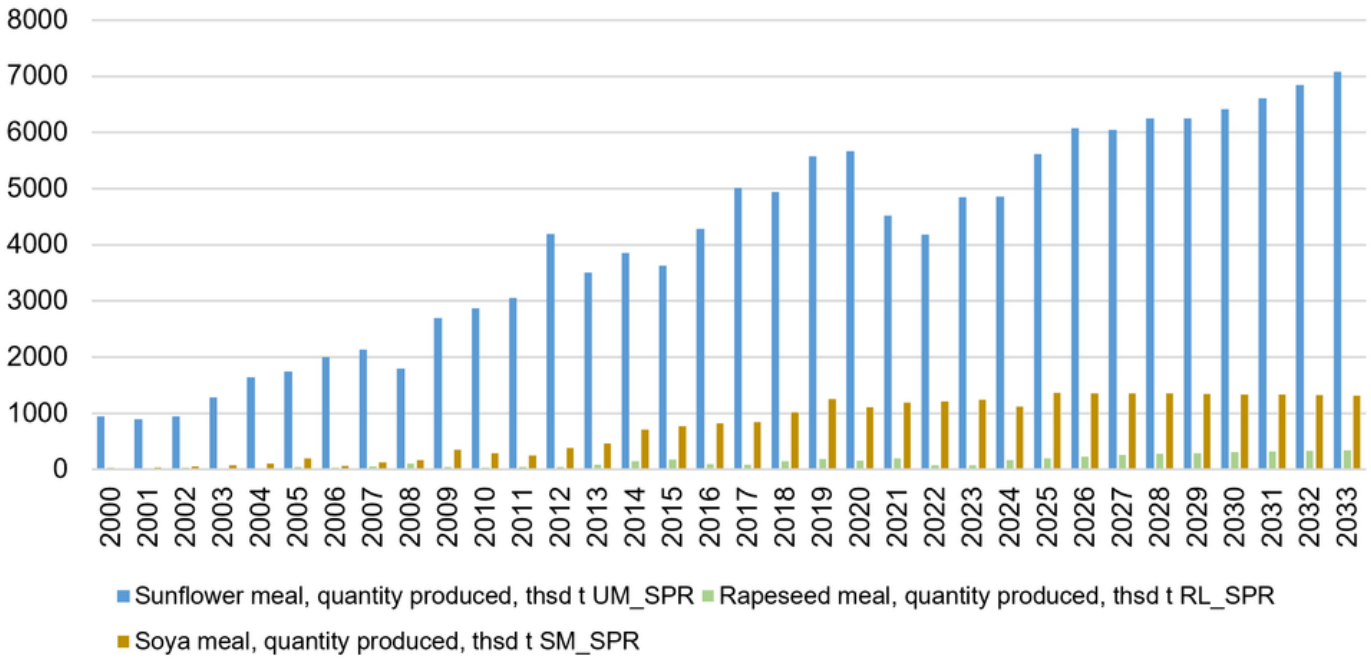
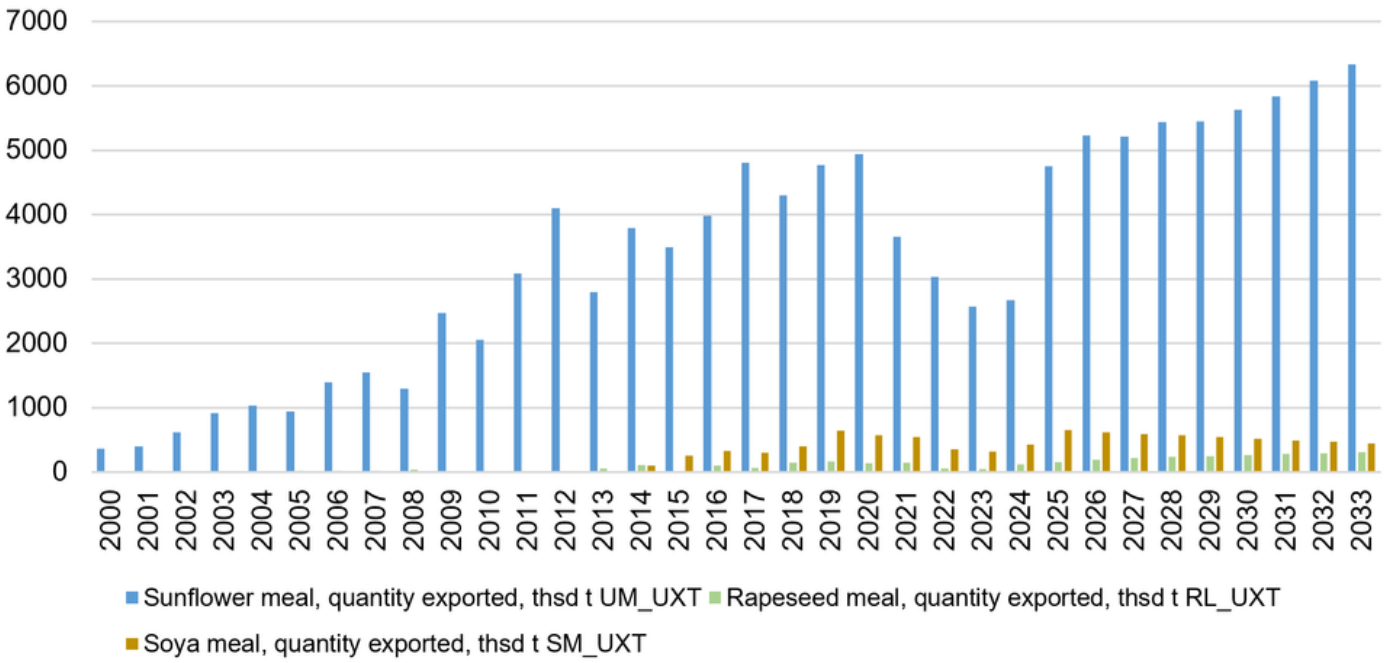


Figure 18. Projections of export amounts of sunflower, rapesed, and soya bean oils in 2000-2033



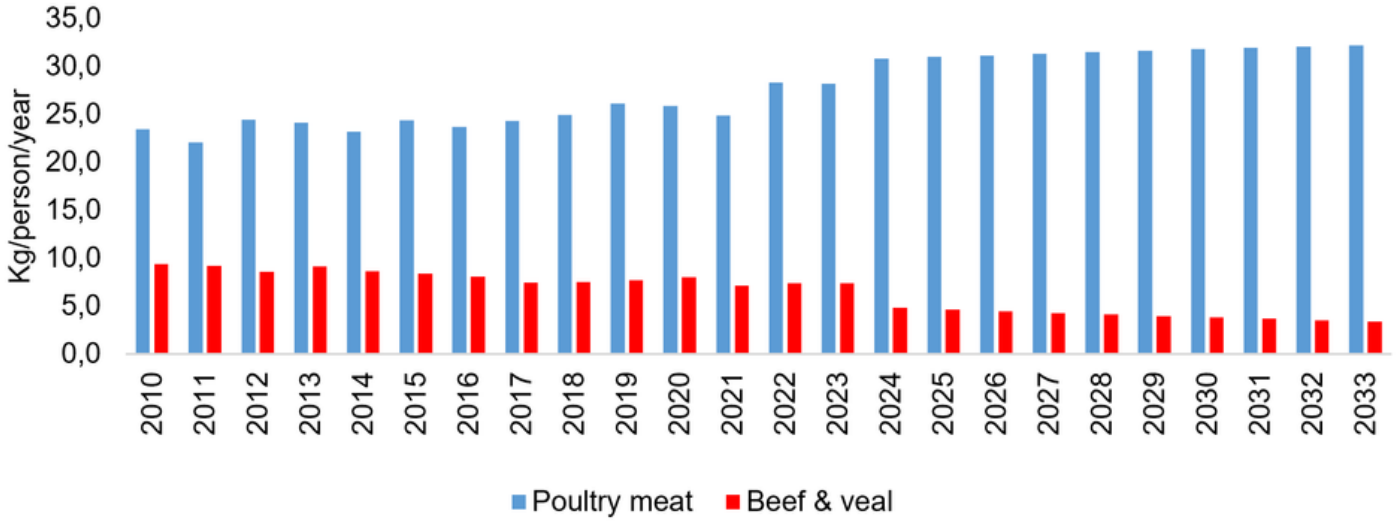
4.2. Livestock

The projections show that production of cow milk, beef and pork will continue declining, whereas production of poultry meat and eggs are further growing. The former mainly reflects structural changes, and the latter benefits from economies of scale.

4.2.1.Poultry and eggs

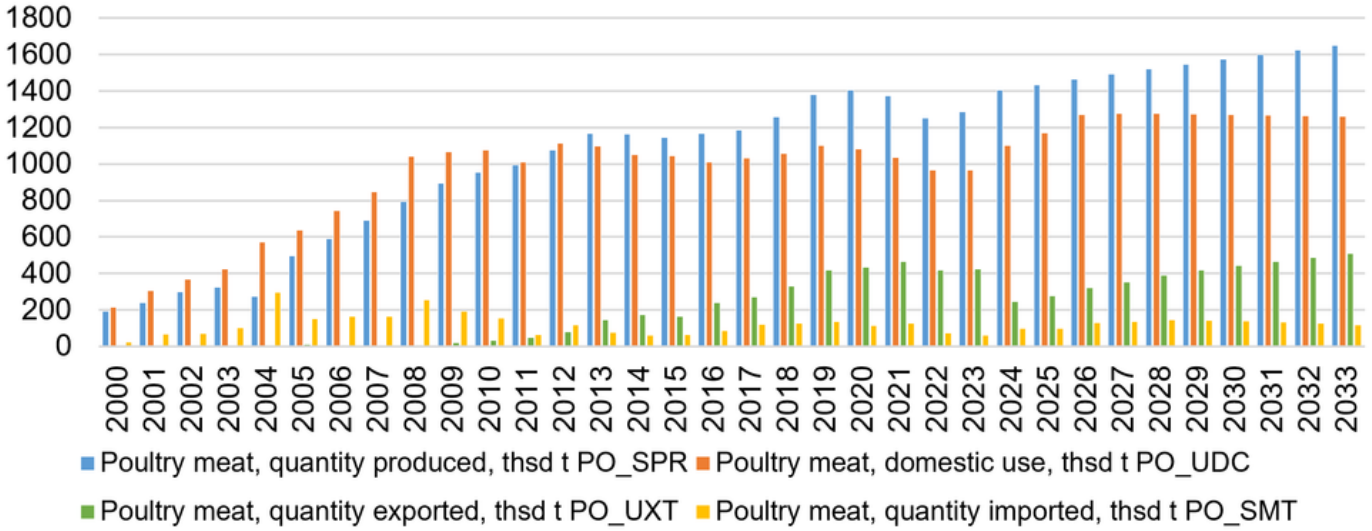
After the stagnation period of 2013-2016, the trend of increasing poultry (mostly chicken) meat production has resumed. The projections show, that after the war this trend intensifies further, showing a growth up to 1.7 million tonnes, i.e., an increase by 28.4%, as compared to the value of 2023, and 20.0%, as compared to the pre-war value of 2021. The main factor contributing to this increase are positive gross margins and increasing prices for beef, which lead to change in consumption patterns. Poultry meat producers in Ukraine are usually large enterprises which as well produce poultry feed. This allows them to benefit from economies of scale. This effect is expected to get stronger, as trend of shift of production from households to enterprises will persis. At the same time, per capita consumption of poultry meat is expected to continue growing and is projected to reach 32.3 kg per year by 2033 (an increase of 15.9%, as compared to the value of 2023), thus replacing beef as the main source of dietary protein. Total poultry consumption will, however, stagnate after 2026, at the level of approx. 1.3 million tonnes, because of the expected negative population trend.

Figure 19. Projections of per capita consumption of poultry meat and beef in 2000-2033



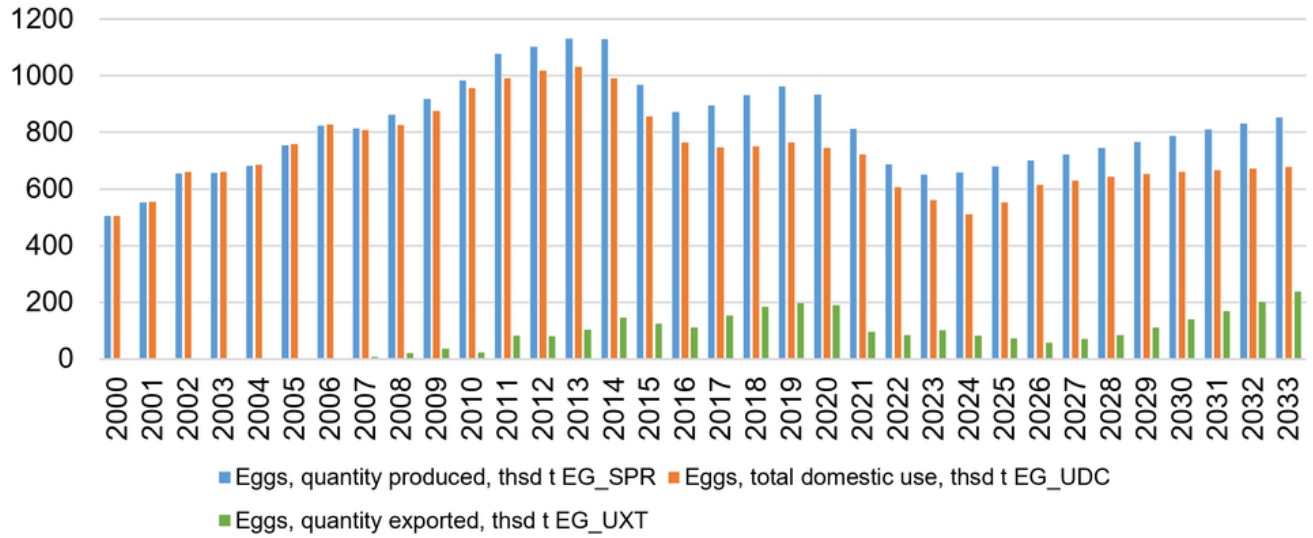
It is expected, that by 2033 Ukraine will remain a net exporter of poultry meat. Exports are projected to grow from 32.9% of total production in 2023 to 37.0% in 2033, and will reach 508 thousand tonnes. Poultry meat imports play an important role in Ukraine's export expansion. While the internal market is supplied with cheaper poultry meat offal imported and produced domestically, more of poultry carcasses and premium cuts are available to be exported. As of 2023, cuts and offal of chicken accounted for 79.7% of the total poultry meat imports to Ukraine. Figure 20 shows the market balances of poultry meat in 2000-2033.

Figure 20. Market balances for poultry meat, 2000-2033



The development of large-scale enterprises in the poultry (i.e., chicken) sector has also driven the growth of chicken eggs production. The latter was observed in 2005-2013. In 2014-2022 the sector stagnated due to the socio-economic crisis in the country, Covid-19 pandemic, and full-scale Russian invasion in 2023, but starting from 2025, the positive development is expected to resume. The projections indicate growth of eggs production up to 855 thousand tonnes by 2033, which is an increase by 30.9%, as compared to the value of 2023. Per capita eggs consumption will grow to 15.7 kg per year, thus only reaching the pre-war level in 2033. Total domestic consumption will grow by 20.8%, as compared to the value of 2023, up to 678 thousand tonnes. However, neither production, nor domestic consumption will recover to the pre-war level by 2033, primarily due to negative population trend and destruction of the large egg producing facilities in the south of Ukraine during the russian invasion. The export share in the total production quantity is projected to grow from 15.5% in 2023 to 28.0% in 2033. This will enhance the status of Ukraine as net eggs exporter. Quantities imported will remain below 2% of quantities exported. Figure 21 displays the market balances of poultry eggs in 2000-2033.

Figure 21. Market balances for poultry eggs, 2000-2033



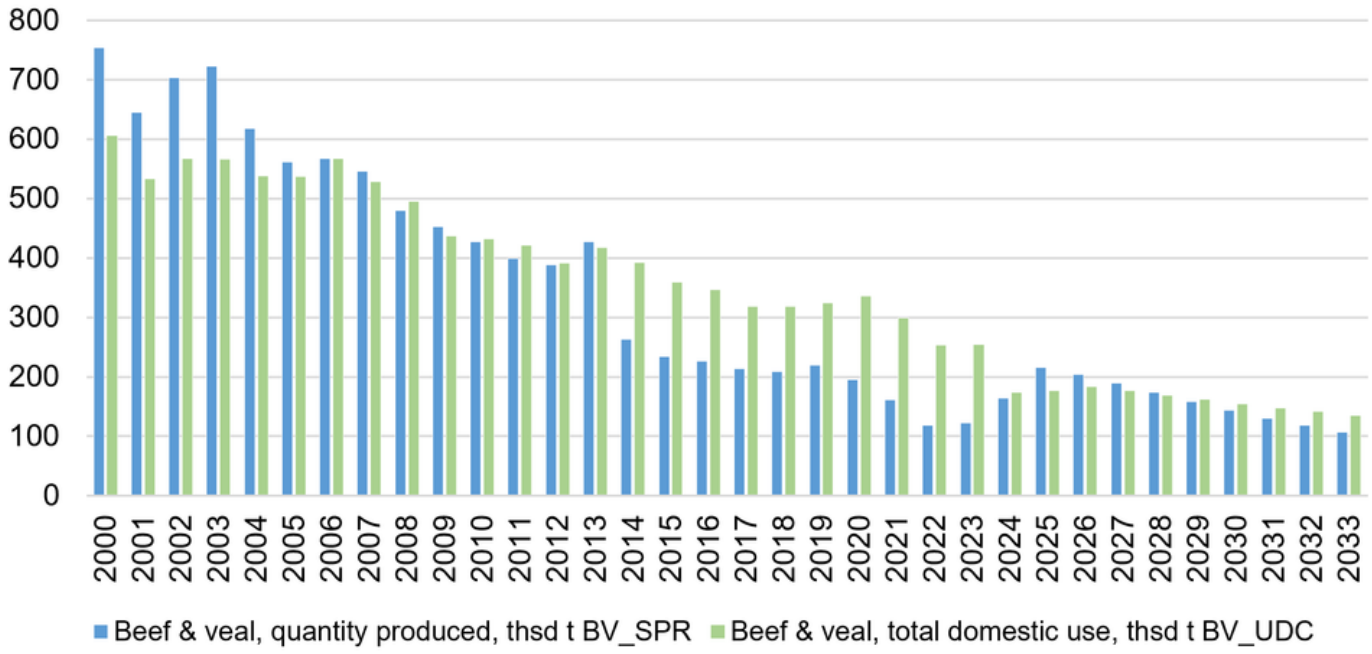
4.2.2. Beef and milk

Currently, cow milk and beef production in Ukraine are strongly connected. Therefore, the developments of both industries can be explained by the same underlying reasons decreasing profitability and domestic demand. Low gross margins, experienced by beef and milk producers over the past two decades, are not expected to increase.

The projections show that the total cattle herd (including dairy cows), as well as number of cattle slaughtered will continue to decline, by 49.1% and 36.1%, respectively, by 2033 compared to the 2023 level. As cattle slaughter weight will remain relatively unchanged at the level of approx. 170 kg per head, total quantity of beef production is expected to gradually decrease after a slight growth of 2024-2026 (coming from the increased slaughter) from 122 thousand tonnes in 2013 to 106 thousand tonnes in 2033. Since the quantity of beef consumed is expected to exceed the quantity produced, Ukraine will remain a net importer of beef. However, as the per capita consumption will decrease in 2024-2033, net volume of trade will shrink substantially.

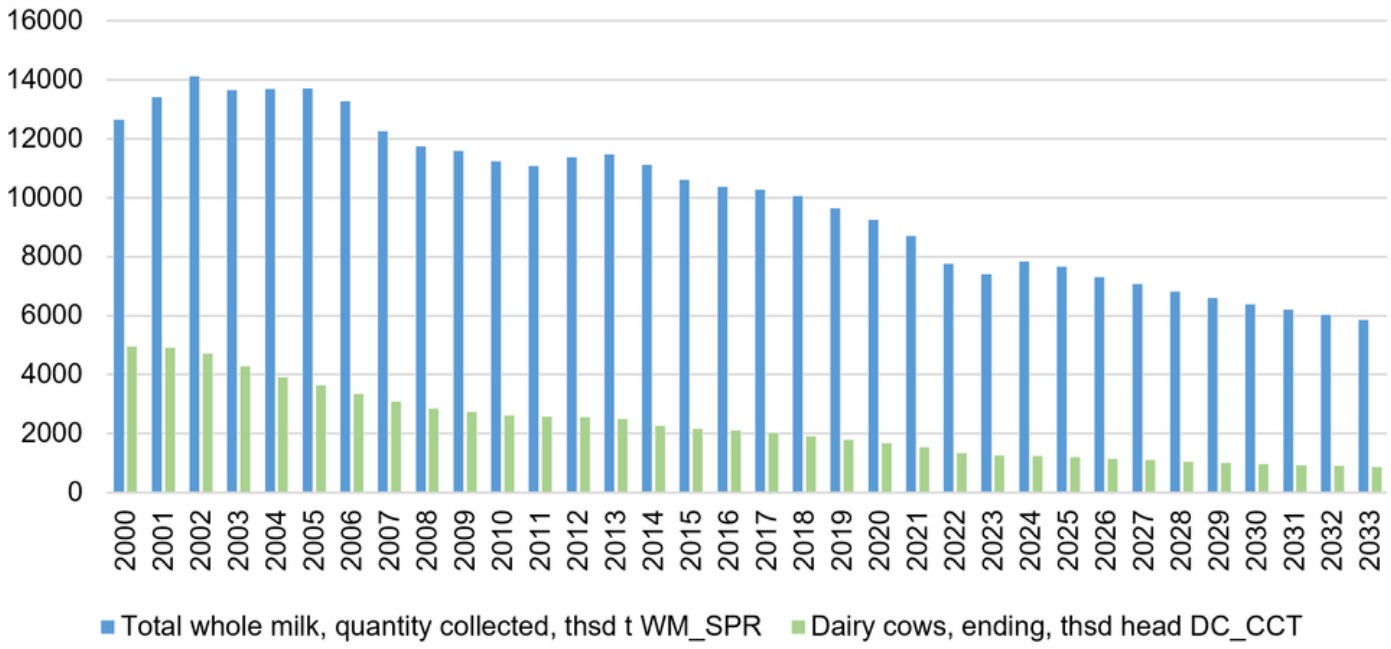
Primary cause of the negative trend in the beef and dairy are low efficiency and high operational costs, which drag down the gross marging of producers. In addition to this, a shift from household production to enterprises is further exaggerating decline of the sector. Households leaving the market cause a shortfall in beef and milk production, as the capacity of emerging and existing enterprises fails to fully offset their output. Additionally, it is important to note, that in 2020-2023, a significant drop in average slaughter weight was observed. It decreased from 166-174 kg/head in 2016-2019 to 102-114 kg/head in 2020-2023 It is explained by the fact, that in face of crisis, uncertainty, and worsening economic conditions caused by Covid-19 pandemic and Russian invasion in February 2022, rural households slaughtered their cattle before it reached the optimal slaughter weight. Thus, the declining trend in the sector was exaggerated even further.

Figure 22. Projected quantity of beef and veal production and domestic consumption in 2000-2033



Although milk yield per cow and year is expected to grow from 5.7 to 6.4 tonnes by 2033, milk production is projected to decline from 7.4 million tonnes in 2023 to 5.9 million tonnes in 2033. Primary reason for it is the fact that the yield increase will not compensate for the further decline in the number of dairy cows by 30.7% in 2033, as compared to the 2023 level.

Figure 23. Projected quantity of milk collected and number of dairy cows in 2000-2033



The positive development in milk yields reflects the trend of an increasing number of specialised enterprises, as they apply more efficient production technologies and rear more productive breeds of dairy cows than households.

5. Summary and discussion

According to the projections for 2033, cereals production is expected to stagnate after the 2026 due to gradual shift of sown areas towards oilseeds. However, this change in areas is compensated by yield improvements. Oilseeds production will grow due to both area expansion and yield improvements, as a result of higher profitability, relative to other crops. The largest growth is expected for corn and rapeseed. Wheat is the only crop among the studied, production of which is expected to decline, as compared to 2023 level. Despite the assumed deoccupation of land and yield improvements, wheat harvest is expected to drop by 9.7% by 2033, mostly due to shift of areas towards corn within the structure of grains sown areas. Production of barley, oats and rye will grow slowly after the 2026 due to positive changes in yields. It is worth noting, that share of rye and oats in a structure of grains production will remain low, each not exceeding 1% of the total grains harvest.

For oilseeds, production of rapeseed seeds is projected to grow the most, with a 129.2% increase over the period of 2023-2033. Growth is mainly attributed to increase in sown area – both expansion of oilseeds in general, and change in structure of sown areas within the oilseeds category. Reason for this changes is that the marginal returns per unit of land is being the highest among the oilseed crops, and beneficial effects on soil quality. Both shares of soya beans and sunflower in structure of oilseeds sown areas are projected to decline by 2033, with the latter decreasing at a relatively lower rate. Nevertheless, production of sunflower seeds will continue dominating oilseeds production in Ukraine and is projected to reach 19.4 million tonnes. Soya beans production is expected to reach 5.9 million tonnes and rapeseed 7.9 million tonnes. Production of oilseed oils and meals will follow the production of the respective oilseeds. Majority of sunflower harvest will remain to be processed domestically, and exported in a form of oil or meal. In contrast, rapeseed and soya beans are projected to be exported mostly as raw commodities, with a much lower share of harvest being processed domestically.

Production of grains, except for corn, is not expected to recover to pre-war (2021) level by 2033, mostly due to change in sown areas structure mentioned previously, with yield reaching the pre-war levels by 2026-2027. Recovery of oilseeds production is projected to be much quicker, once again, due to change in sown areas structure. It is expected that, as the all Ukrainian agricultural land is returned to production by 2026, all three major oilseeds production will reach the pre-war level and continue to grow further.
Cow milk and beef production are projected to decline, following the long-term pre-war trend. One of the reasons is the restructuring of the livestock sector, with rural households as smallholder producers exiting, and larger specialised milk, beef and swine farms entering the sector, which do not compensate for the livestock slaughtered by the exiting market actors. This trend is further powered by low profitability of cattle products and the declining trend in domestic consumption. Per-capita consumption of beef is projected to steadily decrease down to 3.5 kg per person per year by 2033. Poultry meat is expected to be the primary dietary protein substitute, with its per capita consumption growing up to 32.3 kg per person per year by 2033. Negative trend is further exaggerated by decreasing population.

Thus, Ukraine is projected to be a net importer of beef, however the net volume of trade is projected to shrink substantially.

In contrast, developments in the poultry meat and eggs sectors are rather positive. In Ukraine, producers of these commodities are usually large enterprises thatalso manufacture chicken feed. It allows the producers to benefit from economies of scale, achieving lower production costs. Until 2030, Ukraine's chicken meat production is projected to grow by 28.4% and chicken eggs production - by 30.9%. Despite the positive trend, neither poultry meat nor eggs production will recover to the pre-war level by 2023. Growth is mostly being held back by the significant war damages suffered over the course of 2022-2023. Domestic per capita consumption of chicken meat and eggs is expected to increase as well, as it was mentioned above. However, growth of total domestic consumption will be limited by decreasing population. Ukraine will further improve its net exporting position for these two commodities.

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