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Soy Production in Ukraine: Growth Dynamics and its Role in Times of War

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Soy Production in Ukraine
Growth Dynamics and its Role in Times of War

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Summary

Soybeans were first intorduced in Ukraine in the 1870s, after initial trials had been conducted in Europe to test their cultivation potential. Although soybeans continued to be cultivated in Ukraine during the Soviet era, their role remained minor. Alongside main crops such as wheat, maize and sunflowers, soy merely represented a niche crop. It was not until the early 2000s, when large agricultural enterprises and agricultural holdings emerged from collectively managed structures, remaining from the Soviet era, that soy production increased significantly. Today, Ukraine cultivates around three million hectares of soybeans, placing it as the largest soybean producer in Europe and the eighth largest producer worldwide. Thereby, due to particularly favorable natural and climatic conditions, the most prominent cultivation regions are primarily located in the central and north-western parts of the country — in the so-called 'soya belt'. What is particularly remarkable is that soybean production increased significantly during the war between Russia and Ukraine: In 2025, 7.6 million tons were produced, doubling the 2021 output of around 3.8 million tons.

The theoretical framework for this work is provided by literature on the third 'corporate' food regime and the surrounding debate regarding the global land rush. The empirical part of this thesis is mainly based on semi-structured expert interviews, complemented by a qualitative text corpus as well as quantitative data related to the production and trade of soy and other Ukrainian agricultural commodities. The aim of the empirical part is to identify the key factors that contributed to the increase in soybean production in Ukraine, particularly in the context of recent geopolitical challenges.

The research has revealed that Ukraine's agricultural sector is primarily characterized by a bimodal structure consisting of small-scale farmers as well as large agricultural enterprises and so-called agro-holdings. Especially the latter — with their highly industrial structure based on scale, efficiency, and managerial practices, oriented towards the export of the most profitable and globally demanded agricultural crops — have contributed to a significant increase in soybean production over the past two decades. The significant increase during the war is predominantly attributable to the fact that many producers switched to soy due to favorable market conditions as well as an adaptation strategy to manage several war-related challenges, including scarce storage capacities, complicated and expensive transport and logistics as well as a limited access to agricultural inputs.

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1 Introduction

> *"Whether praised as the most efficient means to 'feed the world' or condemned for the manner in which it erases entire ecosystems beneath its seemingly endless green rows, soy has indubitably become one of the most important agroindustrial commodities in the world" (Oliveira & Hecht, 2016, p. 251).*

Soy or soya is an annual crop plant from the legume family, which has become one of the most widely cultivated plants in the world, ranking just behind wheat, maize and rice (Norberg & Deutsch, 2023). Over the past 60 years, the global acreage for soybeans has literally exploded, rising from 23.8 million hectares (Mha) in 1961 to 136.9 Mha in 2023 (FAO, 2025), representing the highest proportional increase when compared to other major crops (Hartman et al., 2011). Today, "soy is ubiquitous" (Norberg & Deutsch, 2023, p. 1). Cultivated mainly for its edible beans, soybean components are reportedly found in around 30'000 different food products, according to Drews (2004). This is mainly attributable to its almost ideal composition from a nutritional point of view, with an outstandingly high protein content of 40%, as well as 25% of carbohydrates, 20% of fat and 5% of minerals. In addition, it is also rich in vitamins and lecithin (Drews, 2004; Hartman et al., 2011; Voora et al., 2024). Yet only a very small proportion (6%) is consumed directly by humans in the form of whole-bean products, tofu or fermented whole-soy foods, with the remaining 94% crushed into soybean meal and oil for further processing (Oliveira & Schneider, 2016), mainly in order to produce animal feed, oils, biofuels and other industrial products (Heron et al., 2018; Oliveira & Hecht, 2016). However, the enormous increase in soybean cultivation also entails certain environmental and social consequences. Soybean cultivation has expanded onto existing agricultural land and pasturelands, where it has replaced other crops and grass-fed livestock systems, and has further continued to spread into marginal areas, contributing to the conversion of forests, wetlands, natural grasslands and savannahs (Heron et al., 2018; Norberg & Deutsch, 2023; WWF, 2014). Thereby, this problem is probably most evident in the Amazon, where according to WWF (2014), around 3.6 Mha of forest was lost per year in the period of 2000-2010, with soy as a major contributor.

Indeed, in 2025, Brazil, the United States (US) and Argentina represent the biggest producers and exporters of soybean, responsible for 80% of world production (USDA, 2025). The European Union (EU), on the other hand, is facing a major deficit in soy production. With only 8% of soybean meal consumption covered by domestic production, the EU is strongly dependent on soybean imports (cf. De Visser et al., 2014; Ritter & Pugachov, 2023). However, the import of soy mostly entails genetically modified organisms (GMO), which for food purposes in particular, is viewed rather controversially by the society and therefore not really accepted (Roman et al., 2016). The first commercially successful GM soybean was introduced in the United States in 1995. Marketed as Roundup Ready (RR), this herbicide-tolerant variety was developed and patented by Monsato (Norberg & Deutsch, 2023). According to Norberg and Deutsch (2023), more than 75% of the global soy production is based on GMO. In the aforementioned countries, this number is even higher. While in the US and Brazil, 94% respectively 97%

of the produced soybeans have been genetically modified, in Argentina 100% of production is considered to consist of GM soy (Leguizamón, 2014; Soja Netzwerk Schweiz, 2025). Hence, as a response, since 2013, the Common Agricultural Policy of the EU has prioritized increasing the domestic production of plant proteins, including non-GM soy. Within this context, especially the Donau Soja organization plays an important role in promoting the sustainable production of non-GM soy in the Danube region, including in Ukraine (Roman et al., 2016).

Ukraine is known for its excellent agricultural conditions. In addition to the favorable climatic conditions, large-scale cultivation possibilities and beneficial geographical location with access to the Black Sea, the Ukraine possesses approximately one third of the world's most fertile land (Nivievskyi & Neyter, 2024), also referred to as 'black soil' (Nasir et al., 2022). All of these factors have contributed to Ukraine evolving into an increasingly significant global supplier of grains and oilseeds over the past 20 years. Thereby, three products in particular dominate the agricultural production of the country: wheat, corn and sunflower (Albaladejo, 2024; Matuszak, 2021). For instance, between 2018 and 2020, Ukraine was responsible for an average of 10% of global wheat exports, 16% of corn exports, and half of the world's sunflower oil exports (Nivievskyi & Neyter, 2024) — hence, Ukraine's reputation as the 'breadbasket of the world' (Matuszak, 2021).

Historically though, the Ukraine had to overcome many obstacles on its way to becoming a prosperous rural economy. In addition to the post-Soviet transition and the global financial crisis in 2008, Russia's aggressions against Ukraine in particular have been incisive in the recent past (KSE, 2023; Matuszak, 2021). In 2014, following Russia's illegal annexation of Crimea and its military aggression in eastern Ukraine, a major disruption occurred in Ukrainian agriculture, affecting both production and distribution. However, the aggression ultimately resulted in an Association Agreement, including a Deep and Comprehensive Free Trade Area (DCFTA) between the EU and Ukraine, which in turn led to a partial liberalization of Ukrainian exports to the EU (Albaladejo, 2024). The DCFTA subsequently replaced Russia as Ukraine's most important trading partner and led to a significant increase in agricultural exports. By 2021, the competitive agricultural sector accounted for 41% of Ukraine's total exports, a notable increase from 27% in 2013 (Albaladejo, 2024; Alsaawi, 2014). Then came the second cut on 24 February 2022 with the Russian aggression against Ukraine, which has evolved into the ongoing full-scale war. The damage of this war is immense and has of course, also had a major impact on agriculture. According to Neyter et al. (2024), as per 31 December 2023, a total of 80 billion USD in damages and losses have accumulated in the agricultural sector in Ukraine. In the first year following Russia's invasion, Ukraine experienced a 30% reduction in grain and oilseed production, accompanied by a 45% decline in farm-gate prices for corn and wheat, in spite of a rise in global prices (Albaladejo, 2024).

Nevertheless, the aforementioned statement that oilseed production also declined is only partly accurate. While sunflower production — which plays a particularly important role in Ukrainian agriculture — did decrease significantly, the output of rapeseed and especially soybeans increased substantially. In fact, new production records for soybeans were set in

2023, 2024, and 2025. The 2025 harvest even reached 7.6 million tonnes (mln t), doubling the pre-war yield of 3.8 mln t in 2021 (USDA, 2025). The fact that soybean production has increased as significantly in spite of these adverse circumstances, whereas the production of other crops has decreased dramatically, has inspired me to focus my master's thesis on the Ukrainian soybean production. Therein I intend to examine various elements surrounding the Ukrainian soy production and its development as well as the extent to which these circumstances have contributed to the enormous expansion in soybean production despite current challenges.

In order to pursue this question, the master's thesis is structured in the following manner: The succeeding Chapter 2 presents important literature regarding the topic of soy — in a global, but also Ukrainian context, followed by the formulation of the research question(s) of this thesis. Chapter 3 introduces the theoretical approach within the background of this thesis, by expanding on ideas about the 'Third Food Regime' and its related components and consequences. Chapter 4, subsequently offers a short overview of existing literature surrounding the global 'soy-complex', in order to be able to draw comparisons to Ukraine's soy production and further identify similarities and differences. In Chapter 5, the methodological details of this thesis as well as the empirical research methods utilized are demonstrated. Thereby, the process of data collection and its analysis will be described in more detail. Afterwards, follows the empirical part of the thesis. Chapter 6, introduces the Ukrainian agricultural sector and its history, touching upon topics of land tenure and structural changes. This is followed by Chapter 7 and Chapter 8 addressing the soybean sector, including its advantages, challenges and socio-economic context. In Chapter 9, the last Chapter of the main part, different challenges and subsequent adaptation strategies of agricultural producers surrounding the wartime and soy's role therein, will be emphasized. Eventually, the last Chapter 10 provides a concluding discussion.

2 State of Research

As Norberg and Deutsch (2023, p. 1) mention in their book 'The Soybean Through World History', "soy is ubiquitous". Consequently, it is impossible to ignore them in the academic discourse. The body of literature on soy is remarkably broad, covering topics ranging from its domestication and further history, its cultivation and versatile usages as well as the various consequences associated with it (Da Silva & De Majo, 2022; Norberg & Deutsch, 2023). Those who believe that these texts are confined solely to the field of agriculture are mistaken, for the soybean has become so deeply integrated into our everyday lives that it intersects with a wide range of disciplines and fields of study. Thereby, the vast majority of academic literature has primarily focused on the world's major soybean producers throughout history beginning with China (Hymowitz, 1970; Lander & DuBois, 2022), the United States, Brazil and Argentina (Berndt & Bernhold, 2018; Berndt et al., 2020; Goldsmith & Hirsch, 2006; Norberg, 2022; Oliveira, 2016; Oliveira & Hecht, 2016; Oliveira & Schneider, 2016; Turzi, 2019). While these countries remain responsible for the overwhelming share of global soybean production, in other contexts, for instance within a European perspective, other countries have also gained significance over the last years, notably Ukraine.

Russia's invasion of Ukraine and its subsequent war has had a significant impact on various levels of global affairs. Accordingly, a lot has been written and reported on the topic in an academic context. Especially in relation to Ukraine's role as the 'breadbasket of the world' (Matuszak, 2021). Thereby, several authors and institutions have analyzed and estimated the damages and losses in the agricultural sector of Ukraine (Andrienko et al., 2024; KSE, 2023; Neyter et al., 2024; Nivievskyi & Neyter, 2024) as well as its impact and influence on 'food security' — both in a local context (Deininger et al., 2024; Kiforenko & Szczepaniak, 2024; Skydan et al., 2023; Teixeira Da Silva et al., 2023) and on a global scale (Ben Hassen & El Bilali, 2022; Glauber & Laborde, 2023; Leal Filho et al., 2023; Legrand, 2023; Nasir et al., 2022; Shubravska & Prokopenko, 2022; Suárez & Dreger, 2022; Teixeira Da Silva et al., 2023). Soy, to a certain extend, is also mentioned in some of theses analyses, whereby the crop itself is never at the center of attention. This, however, does not mean that nothing has been written on the subject of soy in Ukraine in the academic sphere.

Korobko (2021), for instance, analyzes the strategic importance of soybeans as a key protein crop on a global scale and further describes how Ukraine has established itself as a major producer and how production has increased over the past 20 years through the expansion of cultivated areas and higher yields. Similarly, Pantsyreva (2024) and Petrychenko et al. (2024) take a comparable approach, though with a stronger regional focus on Europe and Ukraine's role within it. In the course of their analysis, they also discuss soybean production in Ukraine and its regional differences, highlighting the main production areas — the so-called 'soybean belt'. In addition to offering a general overview of the current situation, Petrychenko et al. (2024) also discuss the advantages and significance of organic soybean production, which — especially with regard to the sustainable use of soil resources — is expected to play an important role in Ukraine's future agriculture, specifically in the aforementioned 'soybean-belt'. Chekhov (2015)

is also devoted to analyzing the soybean market in Ukraine following the development of a growing soybean sector. The aim of the study is to analyze production and consumption of soybeans, as well as the price situation on the domestic soybean market, in order to identify current market trends. The study concludes that the Ukrainian soybean market is the fastest growing market among oilseeds and is considered promising in the long term (Chekhov, 2015).

As Peretiatko and Rudik (2021) claim, the yield potential has not yet been fully exploited though, which is why the authors call for future development to be based on more intensive methods, which — with regard to changing climatic conditions — according to them, primarily requires the development of irrigation technologies in southern Ukraine in order to achieve stable high yields. Indeed, as Tsekhmeistruk et al. (2021) have examined, weather and climate conditions, particularly average daily temperatures and precipitation levels, strongly affect soybean yields in Ukraine, suggesting required adjustments in future cultivation technology. According to Korobko (2021) and Zhuikov et al. (2020), besides the aforementioned development of infrastructure, this primarily involves the introduction of adaptive, high-yielding soybean varieties, particularly suitable for cultivation under difficult irrigation conditions. Hence, recent Ukrainian studies have increasingly examined soybean cultivation under varying environmental and technological conditions. While O. Mazur (2023), for instance, evaluated the adaptability of different soybean varieties across diverse soil and climatic settings, V. Mazur et al. (2023) and Tkachuk et al. (2024) additionally explored the development of ecologically and economically efficient cultivation technologies, by focusing on diverse pre-sowing treatments of seeds. Complementing these findings, Grabovskyi et al. (2023) conducted a comparative assessment of soybean varieties under both conventional and organic production systems, analyzing differences in yield and grain quality. Together, these studies contribute to a better understanding of how environmental and technological factors shape soybean productivity and sustainability in Ukraine.

Regardless, according to my research, there still remain certain gaps in the academic literature concerning the soy production in Ukraine, particularly with regard to its historical development, its main drivers, established value chains as well as current trends in relation to the ongoing war between Russia and Ukraine. The literature on soy production in Ukraine therefore cannot be compared to the far more extensive and visible discussions surrounding the 'soy-complex' of major global producers, such as the US or countries in South America. Therefore, by taking a closer look at the evolution of Ukraine's agricultural structure (Lerman et al., 2007) and subsequent issues of land ownership (Hartvigsen, 2013) — also encompassing debates around the topic of 'land grabbing' (Cochet & Merlet, 2011; Plank, 2013; Visser & Spoor, 2011) and the ways in which people (primarily small-scale farmers) adapted to it or resisted it (Mamonova, 2017) — this thesis explores the multifaceted dynamics of soy production in Ukraine and in a further step seeks to investigate the specific role of soy for Ukraine and its producers during wartime.[1]

[1]Compare, for instance, a similar approach 'Queen of the fields in wartime: What can Ukrainian corn tell us about the resilience of the global food system?' by Mamonova et al. (2023).

Thus, based on the described scientific literature gaps, I intend to address the following research question and sub-questions in my master thesis:

RQ: What are the key factors driving the increase in soybean production in Ukraine, particularly in the context of recent geopolitical challenges?

(a) Land: How has land allocation following the Soviet Union's collapse supported the expansion of soy production in Ukraine?

(b) Adaptation and Resilience: What does the case of soybean production reveal about the dynamics of adaptation and resilience within Ukraine's agricultural sector during the war?

3 Theory

3.1 Food Regimes and their Transformations

> *"The 'food regime' concept situates the global ordering of international food production, circulation and consumption relations within specific institutionalized world-historical conjunctures" (McMichael, 2012, p. 682).*

With their essay 'Agriculture and the State System. The rise and decline of national agricultures, 1870 to the present' Friedmann and McMichael (1989) are regarded to have established the foundational statement of food regime analysis (Bernstein, 2015, 2016). With the essay, the authors examine "the role of agriculture in the development of the capitalist world economy, and in the trajectory of the state system" in order to contribute to a "world-historical perspective" (Friedmann & McMichael, 1989, p. 93). Thereby, the concept of food regime "links international relations of food production and consumption to forms of accumulation broadly distinguishing periods of capitalist transformation since 1870" (Friedmann & McMichael, 1989, p. 95). The thematic framework of food system analysis has further been expanded by Friedmann (2005) by firstly including social movements as actors in the emergence and functioning of food systems, as well as in their tensions and crises, and secondly by considering environmental change as a pivotal factor in the dynamism of food systems and their contradictions. Hence, food regime analysis links transformations in global agriculture, particularly those driven by technological and environmental change, to the evolution of the state system, the international division of labor, patterns of trade, and the powerful institutions that regulate these flows of food commodities. It also considers the 'rules' and discursive frameworks that legitimize these processes, as well as their interaction with social movements and contestation (Bernstein, 2016; Jakobsen, 2021; Magnan, 2012). Thereby, it is illustrating how food is embedded in the complex structure of political, economic and social entanglements (McMichael, 2013a). In simpler terms, according to Bernstein (2016, p. 613), the focus of the food regime analysis lies on the following questions:

1. Where and how is (what) food produced in the international economy of capitalism?
2. Where and how is food consumed, and by whom? What types of food?
3. What are the social and ecological effects of international relations of food production and consumption in different food regimes?

The food regime literature identifies a series of global food regimes since the late 19th century. Although presented in sequence, they do not unfold in a simple linear order but in overlapping and multi-layered patterns (Jakobsen, 2021). "While each regime has its institutional profile, it is the case that elements of former regimes carry over into successor regimes, in reformulated fashion" (McMichael, 2013a, p. 6). In the aforementioned essay, Friedmann and McMichael (1989) distinguished two food regimes: a first during the period of British hegemony (1870-1914) and a second under US hegemony in the postwar world economy (1945-1973).

The first international food regime (1870–1914) evolved from the colonial organization of trade in staple food commodities "from the periphery to the center" (Jakobsen, 2021, p. 2). This linked the colonial settler-states of North America and Australasia with the European imperial powers, especially the British Empire, which stood at the center of international trade through the London-based gold standard. The developments of the first food regime laid the groundwork for the first 'truly international division of labour' (Bernstein, 2016, p. 615). It was characterized firstly, by the emergence of specialized grain and meat production in the temperate settler-states, especially North America, that exported to Europe. Secondly, by an agricultural crisis in Europe, particularly in large-scale grain farming, triggered by cheap wheat imports of the aforementioned settler-states. This not only accelerated rural out-migration, including migration to these very settler-states, where agricultural frontiers continued to expand, but in turn also prompted the introduction of protectionist measures by European states. And lastly, a growing specialization in tropical export crops (e.g. sugar, cocoa, tobacco, coffee, etc.) in Asia and Africa (Bernstein, 2016; Friedmann & McMichael, 1989; Magnan, 2012; McMichael, 2009a). The events described during the first food regime were fundamental "to the creation of a system of national economies governed by independent states" (Friedmann & McMichael, 1989, p. 96).[2]

The second food regime (1945–1973) was characterized by the hegemony of the United States in the capitalist world economy and the US-Dollar as the international leading currency. During this period, the international state system was completed through the independence of former colonies in Asia and Africa (Friedmann & McMichael, 1989). The development of the emerging second food regime was by no means uniform across the Global North and the Global South though. In the Global North, US agricultural policy was mainly dealing with massive overproduction of wheat and maize for animal feed, mainly attributable to price subsidies and advances in technology which led to significant growth in production and productivity (Bernstein, 2016; Friedmann & McMichael, 1989; Magnan, 2012). Food aid, such as the Marshall Plan to facilitate postwar reconstruction in Europe and foreign policy towards the 'Third World' under the Public Law 480 (PL480), served to deal with these large agricultural surpluses (Bernstein, 2016; Friedmann & McMichael, 1989; Jakobsen, 2021). Another key development in the second food regime was the "transnational restructuring of agricultural sectors" (Friedmann & McMichael, 1989, p. 105) by globally operating agribusiness corporations, which created agro-food complexes (e.g. the 'meat/soy/maize complex'), characterized by "increasing separation and mediation by capital of each stage between raw material inputs and final consumption" (Friedmann & McMichael, 1989, p. 113). Subsequently agriculture in the Global North underwent complete industrialization, with increased mechanization and 'chemicalization'. In the Global South, US wheat and soybean oil exports under PL480 provided cheap food to promote industrialization and proletarianization, at the same time, however, created dependency on food imports at the expense of domestic food production (Bernstein, 2016; Friedmann & McMichael, 1989).

[2] At this stage, it is important to recognize that exchanges occurred mainly between national economies, not yet transcending political borders to become transnational or 'global' (Bernstein, 2016).

3.2 The Third 'Corporate' Food Regime

In further elaborations, a third food regime has been proposed from the 1980s onward (and still prevailing as for today), reflecting a product of its time — a time of "declining national regulation and rising globalization" (McMichael, 2013a, p. 1). Friedmann (2005) initially proposed the term 'corporate-environmental food regime' in order to capture both the demands arising from environmental movements and their appropriation by corporations (cf. Section 3.1). In contrast, McMichael (2009b) refers to it as the 'corporate food regime', characterized by its strong embedding in the "general dynamic of liberalization (of markets) and privatization (of formerly public functions and services) at the core of neoliberal globalization" (Bernstein, 2016, p. 626).[3] Thereby, states are subordinate to (global) capital and follow the rules of the market — "a set of rules institutionalising corporate power in the world food system" (McMichael, 2009a, p. 153).

Thereby, the international trade of key agricultural commodities is largely mediated by global value chains (GVC) in which corporate agribusiness plays a dominant role, exercising control both upstream and downstream of production (Bernstein, 2016; McMichael, 2013a). According to Gereffi and Fernandez-Stark (2011, p. 4) a value chain represents "the full range of activities that firms and workers perform to bring a product from its conception to end use and beyond". Thereby, the activities comprising a value chain, from the design, production, marketing, distribution, and customer support, can be restrained to a single firm or distributed across multiple firms (Gereffi & Fernandez-Stark, 2011). Within this context, the 'supermarket revolution', respectively 'supermarketization', constitutes a key dimension of the transformation of global food systems. Supermarketization refers to the process by which supermarkets have become increasingly dominant and widespread within the global food system. It encompasses the shift from small, local food retailers to large national and international chains that centrally organize and control food distribution (Burch et al., 2013; Dixon, 2007; Lawrence & Dixon, 2015).[4] Yet the implications extend even further. The most recent phase of expansion illustrates the transformation of supermarkets from single retail enterprises into diversified conglomerates whose activities extend well beyond food retailing. Today, supermarket chains are also operating farms and logistics hubs, and are even engaging in food processing either in-house or through contracted suppliers. In addition, they manage food laboratories and fulfill the role of quality assurance providers (Dixon, 2007). Thus, supermarketization not only reshaped retail and consumption patterns but also exemplifies the broader dynamics of corporate concentration and globalization that are central to the analysis of the contemporary food regime.

[3] McMichael (2013a) now uses the term 'The Food Regime Project' and thus refers to the first food regime as 'The Colonial Project', followed by 'The Development Project' describing the second and the third (current) regime as 'The Globalization Project'.

[4] The origins of supermarketisation date back to 1916, when the first self-service grocery store opened in Memphis, Tennessee. In the 1930s, the trend continued with the establishment of the first King Kullen stores in New York, which operated on the principle of "pile it high: sell it low" (Lawrence & Dixon, 2015, p. 214). After the Second World War, factors such as suburbanization, the rise in car ownership and growing customer welfare accelerated this process. Expansion progressed rapidly, reaching the stage of global diffusion in the 1990s, particularly in Central and South America and Asia, with global retailers such as Walmart, Tesco and Carrefour playing a major role (Lawrence & Dixon, 2015).

The division of labor, as already observed in the first and second regimes, is also maintained in the third food regime. Thus, staple grains from the Global North are exchanged for products from the Global South (e.g. meat, fruit, or vegetables). However, to these agricultural products from the South one must also add what McMichael (2013a, p. 118) terms the 'land grab express', respectively the appropriation of vast areas of land in the Global South for the production of bulk staples. These though, are not (only) intended for direct human consumption, but are instead mainly used as industrial inputs for animal feed and increasingly biofuels, i.e. in the form of 'flex-crops' (Bernstein, 2016). According to Borras et al. (2016) flex crops are agricultural plants characterized by their 'multipleness' and 'flexibility'. Thereby multipleness refers to their ability to provide diverse products from a single crop whereas flexibility means the economic and practical possibility to switch between these uses depending on market conditions. To qualify as a flex crop though, three conditions must be met: the plant's composition must allow multiple uses ('material basis'), the necessary processing technologies must be available ('technological basis') and switching between uses must be economically viable ('profit viability'). The strength of flex crops lies in their ability to reduce risks in volatile markets and to exploit changing opportunities. They offer producers the chance to maximize profits by shifting between uses, while investors benefit from diversified demand across food, energy, and industry (Borras et al., 2016). Flex crops create new value chains linking different sectors and are often promoted politically as solutions to global challenges like food security, energy supply, and climate change, making them attractive both economically and strategically, but also intensify competition among producers and generate incentives for changes in the land tenure arrangements (Borras et al., 2016).[5]

The aforementioned dynamics are not isolated developments but are closely tied to what Heynen and Robbins (2005) term 'neoliberalization of nature'. As already evident in the second food regime, this process — as part of the Green Revolution — also involves increasing mechanization and chemicalization, which in the third food regime has reached a new frontier — that of the Gene Revolution, involving genetically modified organisms (GMOs). Here, existing plant species are (re-)engineered, often through practices of 'biopiracy', and subsequently subjected to patenting under the Trade Related Intellectual Property Rights (TRIPS) framework (Bernstein, 2016; McMichael, 2009b). GMOs thus embody contemporary neoliberal enclosure, whereby genetic codes are converted into patentable property, enabling agribusinesses to secure rent and profits from farmers through restrictive licensing and technology utilization agreements. This dynamic is central to the third food regime, as the commodification of genetic material (reinforced by TRIPS) has intensified farmer dependency on corporate inputs and further accelerated corporate concentration, thus helped to restructure agricultural production, and reshape power relations within the global food system (Bernstein, 2016; Carroll, 2016). The intense industrialization of agriculture has profound environmental consequences though: It relies heavily on fossil fuels, accounts for roughly one-third of global greenhouse gas emissions (GHG), accelerates soil degradation, thereby again reinforcing dependence on petro-fertilizers, and drives the destruction of biodiversity (Bernstein, 2016).

[5]The most prominent examples of flex-crops include: soy, sugarcane, palm oil and corn (Borras et al., 2016).

3.3 Accumulation by Dispossession and the Case of Land Grabbing

> *"Conceptions of the modern world order ... focus on industrial development, and ... military capacity, as the key determinant of state power in the state system. But this relation omits the significance of agriculture as the source of food and raw materials upon which industry and its labor force depends, as well as the power associated with control over the supply of agricultural products "(McMichael, 2013b, p. 47).*

In recent years, the intersection of crises in food, energy, finance, and the environment, especially increasing in the aftermath of the food crisis of 2007-2008 (McMichael, 2012; Zoomers, 2010), has led to a profound revaluation of land as a strategic resource and has "turned agricultural land into a strategic asset that is seen as a new source of profit" (Zoomers, 2010, p. 435). In this context, powerful transnational and national actors have increasingly searched for so-called 'empty' lands, often located in distant countries, as potential sites for food and fuel production in anticipation of future price spikes (Borras & Franco, 2013; Borras et al., 2011; Margulis et al., 2013). This has resulted in a global land rush, also referred to as 'land grabbing'. Land grabbing is characterized by "transnational and domestic corporate investors, governments, and local elites taking control over large quantities of land (and its minerals and water) to produce food, feed, biofuel, and other industrial commodities for the international or domestic markets" (Margulis et al., 2013, p. 2). Thereby, 'control' refers to mechanisms, described in Peluso and Lund (2011, p. 668), as "practices that fix or consolidate forms of access and exclusion for some time". These primarily consist of leases (often for 30–99 years), concessions or the direct purchase of large areas of land (Borras et al., 2011). These deals, however, are often associated with a lack of transparency, limited consultation, and insufficient respect for the rights of local communities whose livelihoods depend on agriculture (Zoomers, 2010).

While land grabbing is not a new phenomenon (e.g. era of colonialism and imperialism) the character, pace and scale of the recent wave of land grabs represents a distinct historical development, as the current wave of land grabs occurs in a time, where sovereign states (at least formally) exercise territorial control (Sassen, 2014). According to Zoomers (2010), these are mainly driven by a combination of globalization, liberalization of land markets as well as a worldwide rise in foreign direct investment (FDI), thus closely connected to broader shifts "towards a more polycentric configuration of power and production" within the global political economy (Margulis et al., 2013, p. 18). In her paper Zoomers (2010) further went on to identify seven processes contributing to land grabs, or what she refers to as 'foreignisation of space or land'. In the context of food regimes, particularly the first two regarding offshore farming for (1) food and (2) non-food agricultural commodities are of particular interest.

In this context, McMichael (2013b, p. 48) uses the term 'agro-security mercantilism', by which he perceives the way "by which certain states seek to guarantee access to food and biofuels via sponsoring direct acquisition of lands offshore" aimed as an "innovative, long-term strategy to feed their populations at a good price and with greater security than hitherto" (Zoomers, 2010, p. 434). Thereby by mercantilism, McMichael (2013b) refers to land grabbing that bypasses multilateral trade rules. Because, rather than relying on open markets and free trade, powerful actors increasingly seek direct control over land by advancing its privatization. Although such privatization aligns with neoliberal principles, land grabbing simultaneously undermines neoliberal trade ideals by prioritizing security through mercantilist logic. McMichael (2013b) addresses this paradox by using the terms 're-territorialisation' to describe the acquisition of land by states for the agro-export of food, fuel and bio-economic products, and 'de-territorialisation' to refer to the process whereby host countries surrender land for export to countries that are classified as food-dependent.

Thereby, the list of countries acquiring agricultural land abroad for food security reasons or as strategic asset is a long one. While a certain North-South dynamic is still persisting today, echoing land grabs during colonialism and imperialism, there is also an emerging 'South-South' dynamic, with economically non-Northern countries becoming quite involved (Borras et al., 2011).[6] Thus, "the land grab opens a new chapter in the redistribution of power across an increasingly multi-centric global food system, with rising agro-export powers in middle-income countries" (McMichael, 2013b, p. 48). According to Borras et al. (2011), land grabbing occurred primarily in regions where corrupt or indebted governments offered little resistance, as they lacked the capacity to regulate such transactions or to protect vulnerable rural communities. These are particularly focused on regions such as Sub-Saharan Africa — the location with the highest number of speculative large-scale land deals — as well as regions in South America, Central America, Southeast Asia, and the former USSR, including Ukraine (Borras et al., 2011; Cotula et al., 2009; GRAIN, 2008; Visser & Spoor, 2011; Zoomers, 2010).

As mentioned at the beginning of this Section, such land deals are often associated with a lack of transparency, limited consultation, and insufficient respect for the rights of local communities depending on agriculture (Zoomers, 2010). Therefore, the land grabbing discourse shared by many scholars and NGOs often suggests that "world peasants are against land grabbing" and thus these land deals are subject to strong resistance and protests by local communities (Mamonova, 2017, p. 1). However, as Borras and Franco (2013) argue, large-scale land deals do not always lead to people losing their land, and people facing expulsion are not necessarily responding with the sort of resistance so often assumed from them. According to them, this 'expulsion–resistance scenario' is assumed more often than actually demonstrated. Ukraine, in this sense, represents a relatively appropriate example. As stated by Visser and Spoor (2011), private companies — domestic and foreign — as well as foreign states are acquiring vast areas of land in post-Soviet regions. Thus, land grabbing is certainly an occurrence.

[6] In addition to China and the Gulf states, the biggest players in the search for land include countries such as Saudi Arabia, Japan, Malaysia, India, South Korea, Libya and Egypt (Borras et al., 2011; Margulis et al., 2013; Zoomers, 2010).

However, similar to Borras and Franco (2013), Mamonova (2012, 2017) argues that land grabs impact rural communities in different forms, creating various reactions — from opposition to appreciation. Analyzing Ukraine's situation she argues a.o. that "the politics of dispossessed groups depend on terms of inclusion in land deals" (Mamonova, 2012, p. 1). Thereby, she uses the terms 'illusive inclusion', 'subordinate inclusion' and 'competitive exclusion'. 'Illusive inclusion' refers to the formal integration of rural residents into the land market by means of land deeds, which often leads to positive reactions towards large agricultural companies due to the resulting lease payments, despite the residents' inability to cultivate the land themselves. 'Subordinate inclusion' describes the integration of rural residents as wage workers in the large agricultural companies. While the amount of jobs available decreased, as large-scale producers were mainly focused on the monoculture production by using more labor-saving technologies, employees typically receive significantly higher wages, which is why they see large-scale land acquisitions as a great opportunity for wage work. The third term — 'competitive exclusion' — on the other hand, is associated to a negative attitude among private family farmers towards large-scale land acquisitions, as those farmers have to compete against large-scale agricultural enterprises for leased land, which in regard to their financial capacities presents major challenges (Mamonova, 2012, 2017).

3.4 Crisis and Resilience in the Food Regimes

> *"There is widespread realization that, despite significant and technological achievement resulting in our ability to increase agricultural productivity to meet growing demand, there have been unintended social and ecological consequences of theses achievements" (Watson, 2012, p. XI).*

The historical transformation of food regimes demonstrates how agricultural production, trade, and consumption have continually been reorganized under successive phases of capitalist expansion (Friedmann & McMichael, 1989; McMichael, 2009a). Each regime has been defined by specific structures of power and resource control. Nevertheless, these structures are never stable, but are rather subject to crises and restructuring (Bernstein, 2016). The first food regime unraveled as World War I and intensifying imperial rivalries disrupted global trade and weakened Britain's gold-standard economy. In the interwar years, falling grain prices, agrarian crises, and mass unemployment fostered protectionism and economic nationalism, while ecological disasters such as the 1930s 'Dust Bowl' exposed the limits of the expansionist settler-agriculture model (Bernstein, 2016). The second food regime went into crisis as two linked tensions emerged. First, U.S. farm surpluses spilled into global markets, triggering 'competing dumping', trade tensions with the European Economic Community, and a weakening dollar. At the same time, transnational corporations outgrew national regulations, creating barriers to global integration and exposing deep rifts that ultimately destabilized the regime (Bernstein, 2016).

How about the third food regime though, is it also in crisis? As already mentioned, the intense industrialization of agriculture in the corporate food regime, including increasing mechanization, chemicalization and the use of GMO, has led to severe ecological disruptions such as soil depletion, the destruction of biodiversity and increasing CO2 emissions (Bernstein, 2016; Magnan, 2012). The intensification of agricultural practices is further exacerbated by climate change, which threatens agriculture's natural resources and reduces productivity. While certain crops in mid- and high-latitude regions may experience short-term gains, even modest temperature increases are expected to cause severe losses in low-latitude areas. Increasing water scarcity and shifts in water availability will further constrain production, while extreme events such as floods and droughts are likely to become more frequent. Moreover, climate change is projected to accelerate the spread of invasive species, pests and diseases (Watson, 2012). In addition to ecological pressures, the corporate food regime also faces social disruptions, including the displacement and marginalization of peasant farmers, rising global hunger, hence growing concerns about food security (Bernstein, 2016; Magnan, 2012). The latter is particularly evident in the food price spikes of 2007–08 and the resulting 'food riots' in various countries, thus explaining why it is viewed by the public domain as the crisis of the corporate food system (McMichael, 2009a, 2013a). Inadequate political responses to the 2007–08 food crisis are partly responsible for the growing vulnerability of the global food system and the still persisting crises in today's food regime, triggered by the COVID-19 pandemic and further exacerbated by Russia's war against Ukraine (Clapp, 2023; Stephens & Hinton, 2025).

As dependence on the global corporate food system increases, so does vulnerability to global shocks. This has been demonstrated by aforementioned past food crises, when financial speculation on commodity markets exacerbated price increases, limiting access to food for hundreds of millions of people. These crises, although triggered by different factors, have exposed the structural deficiencies that make the system inherently volatile at the global level (Clapp, 2023). In her paper Clapp (2023) highlighted three features relevant for the current and past crises. First, since the global corporate food system depends on a limited number of staple crops produced using heavily industrialized farming methods, the system is prone to disruptions affecting even a small fraction of crops, as well as to increasing costs of industrial inputs. Second, while there are only a small number of countries currently specializing in the production of staple crops for export, a large number of countries depend on them, including some of the poorest and food-insecure countries. And lastly, the worldwide grain trade is controlled and influenced by a relatively small number of companies in commodity markets that are highly financialized and sensitive to price fluctuations. She further argues that these three points are interrelated dimensions of the same problem: concentration. In the field level it appears through reliance on few crops, seeds and inputs, at the national level through the limited number of staple-crop producers, and at the global level through the dominance of a few corporations and financial actors in grain and input markets (Clapp, 2023).

The growing ecological and social crises of the third food regime thus are not merely unintended side effects, but manifestations of its fundamental logic of commodification and

concentration.[7] As corporate agribusiness expands, land, labour and money are reorganized and concentrated under increasingly global agro-industrial forms of control, displacing smallholders and weakening local food systems (Bernstein, 2006; McMichael, 2012, 2013a), thus in the words of McMichael (2013a, p. 130): "constructing new frontiers of accumulation". However, as markets continue to advance further into society, they not only commodify nature and livelihoods, but also trigger counter-movements for environmental protection and social justice.[8] Thereby, these counter-movements are quite diverse and take many forms, with probably the most prominent strand being the push for 'food sovereignty', exemplified by 'La Via Campesina' (McMichael, 2013a; Pimbert, 2009). These movements prioritize farmers' rights to a decent livelihood and to control over agricultural resources (Magnan, 2012, p. 382), over the profit imperatives of corporate agriculture. According to Pimbert (2009), the food sovereignty movement represents the core of a modern alternative, emphasizing an agriculture and food system that is geared more towards small-scale farming producing for the local market, while being socially and ecologically embedded. Hence, depicting a clear perception of 'food from somewhere' vs. 'food from nowhere' (McMichael, 2009b, p. 147). However, according to Bernstein (2016), there are also some critiques regarding this idea, as the peasantry is always depicted as being the 'good' ones, whereas the large-scale corporations are described as the 'bad' ones, whereby complex agricultural economic realities within the agricultural environment often are not sufficiently considered.

[7] cf. Polanyi's concept of 'ficticious commodities': land, labor and money (Ebner, 2017).
[8] cf. Polanyi's concept of the 'double-movement' (Ebner, 2017).

4 Global Soy Production

This Chapter provides an overview of the global development of soybean production, including a brief outline of the historical background of soybean production before addressing more recent trends, the current situation, and related environmental and social challenges. The aim of this Chapter is to provide a contextual framework for soybean production in Ukraine in order to draw comparisons to global developments.

4.1 History of Global Soy Production

4.1.1 From Domestication to 1950

The word 'soy' or 'soja' is attributed to the early Chinese word 'shu' (Drews, 2004), thus reflecting the fact that the soybean was an integral part of the Asian diet long before it was 'discovered' by the West in the late 17th century (Norberg & Deutsch, 2023, p. 4). In fact, early records in Chinese literature suggest that the soybean was already being cultivated under the Shang Dynasty around 1100 BC (Hymowitz, 1970; Hymowitz & Shurtleff, 2005). However, recent molecular discoveries indicate that the cultivated soybean seems likely to have been domesticated considerably earlier, between 6'000 and 9'000 years ago (Kim et al., 2012; Moretto et al., 2022). Even though the exact place of origin is still uncertain and highly contested, the most probable site for the domestication of soybeans seems to be in East Asia, more exactly in the Yellow River basin in Northern China (Kim et al., 2012; Lander & DuBois, 2022; Moretto et al., 2022; Norberg & Deutsch, 2023; Sedivy et al., 2017).

With time, the development of improved varieties became one of the reasons why farmers increasingly turned to soybean cultivation. Another reason was its favorable effect on soil fertility. With increasing human populations, farmers realized they could no longer let their fields fallow for years before cultivating them again, and planting beans helped them keep their fields productive despite more intensive use (Lander & DuBois, 2022). Simultaneously, as populations expanded in core farming regions, the space available for domestic and wild animals declined, reducing the prevalence of meat in people's diets. The consequent shortage of animal protein was probably another major aspect driving the increased cultivation of soybeans (Lander & DuBois, 2022). Indeed, soy-based foods had been known for millennia, yet they only became a staple of everyday eating habits in the mid-Ming Dynasty (1368–1644). During the early modern period, China's regional dominance fostered a stronger exchange and diffusion of cultivation as well as consuming practices among neighboring countries (Norberg & Deutsch, 2023). For most Chinese people throughout history, diets remained largely plant-based, with soy — either domestically cultivated or self-produced — regarded as a very important dietary complement, serving as a vital source of protein (Norberg & Deutsch, 2023; Oliveira & Schneider, 2016). Even though people probably did not know about protein and its benefits, people could surely tell that eating beans regularly made them feel healthier than relying only on millet and vegetables. So as people learned to turn soybeans into sprouts, tofu and different sauces which were easier to digest than the raw bean, soy's popularity increased (Lander & DuBois, 2022). For this reason, the terms 'queen of beans' and 'meat of the earth' originating from this

period are allegedly still being used by people in China today (Drews, 2004, p. 28).[9] Besides its high protein content, advantageous for human consumption, residues from oil extraction and tofu production (including soybean cake and meal) also served as fertilizer and animal feed, while soy oil became increasingly important in cooking (Norberg & Deutsch, 2023).

However, the historical evolution of soy in Asia did by no means remain static. By the mid-19th century, the Sinocentric soybean story had come to an end (Norberg & Deutsch, 2023). Manchuria replaced it and eventually became the leading global supplier of soybeans and the first place to shift to large-scale soybean monoculture production — albeit under the control of Japanese and to some lesser extent Russian traders (Lander & DuBois, 2022; Norberg & Deutsch, 2023). In contrast to the earlier marginal cultivation of soybeans on millions of family farms across China, production in Manchuria was focused primarily on export. Thereby, the reasons explaining why Manchuria emerged as the focal point of soybean production are manifold: the region offered vast spaces of 'empty' land, fertile 'black soils', and an almost ideal climate for large-scale cultivation (Lander & DuBois, 2022). What followed was very much a product of its time. "The forces of colonization, capitalism and occupation eventually restructured the social and economic landscape of the region" (Norberg & Deutsch, 2023, p. 126). The growing infrastructure and trade in soybeans and other commodities drew millions of people and substantial investment to the Manchurian frontier. This wave of migration and frontier settlement profoundly reshaped the region's social-ecological system. Between the 1850s and 1914, Manchuria transformed from a sparsely populated region of about three million people engaged in hunting, extensive animal husbandry, and small-scale farming into a land of over nineteen million inhabitants, the majority of whom practiced intensive agriculture (cf. first food regime in Section 3.1). In addition to Japan and Russia, also firms and public officials from Britain, the United States, Germany, and France tried, to varying degrees, to gain access to the region's resources (Norberg & Deutsch, 2023). These factors, combined with the decline in transport costs for bulky goods toward the end of the 19th century, made soybean imports increasingly important for the West, particularly as a key raw material for the emerging margarine and dairy industries in Europe, North America, and Japan (Drews, 2004; Hartman et al., 2011; Norberg & Deutsch, 2023).

However, this situation persisted only until the mid-1940s, after which World War II ultimately cut off trade with Asia and the center of both production and export shifted to the United States (Drews, 2004; Norberg & Deutsch, 2023; WWF, 2014). This transformation signaled the rise of a new regime that consolidated after 1945 — the so-called era of the 'Great Acceleration' (Da Silva & De Majo, 2022).

4.1.2 The Great Acceleration

During the era of the Great Acceleration, soybeans rapidly took on their contemporary role as a central component of animal feed, supplying the protein that enabled the mass production of cheap meat under conditions of US hegemony and multilateralism (cf. second food regime

[9] Original transl. in Drews (2004, p. 28): 'Königin der Bohnen' and 'Fleisch der Erde'.

in Section 3.1). When soybean farming started to spread across the Midwest, soybean production entered a new phase — a phase of rapid growth and technological innovation, laying the foundation for large-scale industrial cultivation. This is mainly the result of the US farmers of that time, who were already quite mechanized and capitalized, employing tractors and combines, silos and mills, fertilizers, and improved seeds. While China and Manchuria remained significant sites of soybean production, it was the commonly referred 'US soy model' that ultimately proved the most dynamic and successful. Within just a few decades, it enabled the United States to surpass China (including Manchuria) as the world's leading soybean producer, processor and exporter. It was also the US model of both production as well as consumption of soybeans, that was exported and reshaped food systems across the globe during this regime (Norberg & Deutsch, 2023; Oliveira & Schneider, 2016). By 1970, the United States accounted for nearly three-quarters of global soybean production. Nonetheless, after years of continuous expansion, the availability of new land for cultivation became increasingly limited (WWF, 2014). As a result, from the 1970s onward, the geographic expansion of soybean production shifted primarily to Latin America (Norberg & Deutsch, 2023; Oliveira & Hecht, 2016).

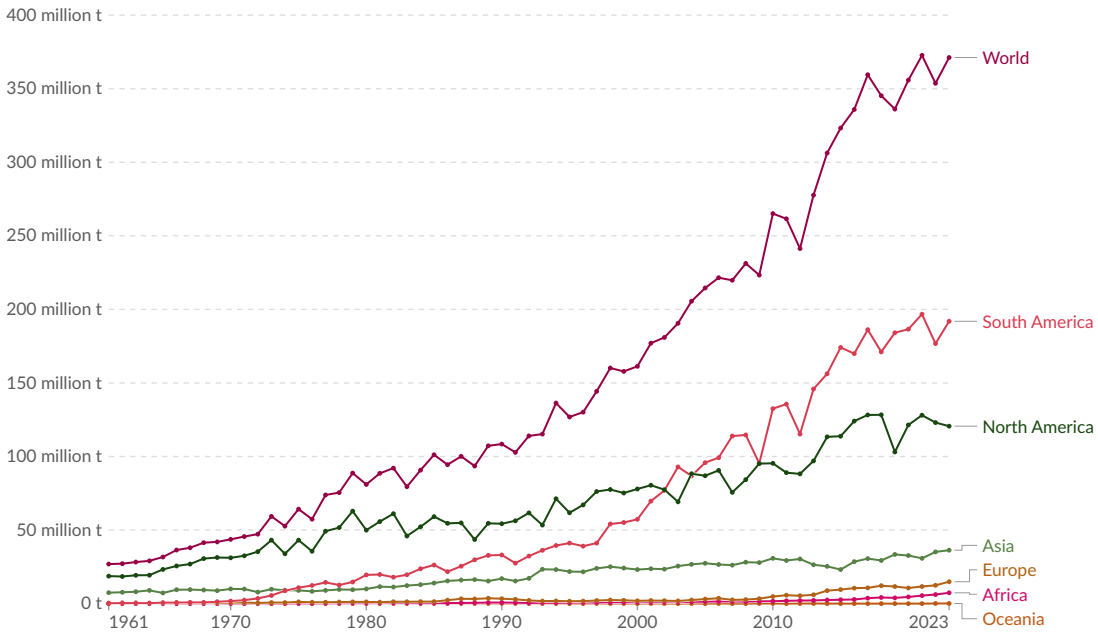
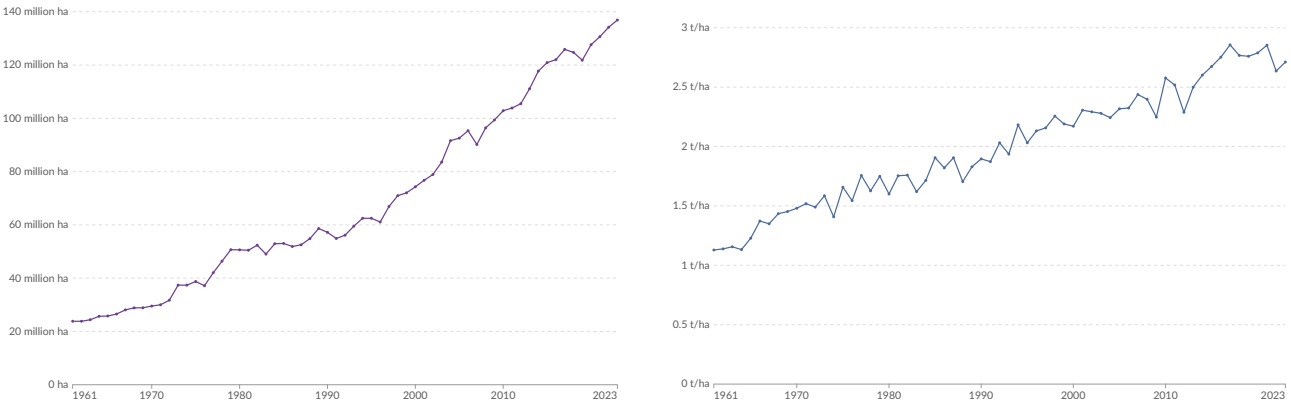


Figure 1: Global soybean production 1961-2023. Source: FAO (2025) with major processing by Our World in Data (Ritchie et al., 2023).

The subsequent soybean boom in South America — driven by neoliberal reforms and referred to as *sojización* (Norberg, 2022) — began in the 1970s and further accelerated during the 1990s. While the restructuring reforms differed in scope, timing and form, all countries pursued trade liberalization, encouraged foreign direct investment, implemented fiscal austerity, and promoted decentralization. At the same time, land markets were opened through the relaxation of ownership and rental restrictions, the strengthening of private property rights, and the privatization of public land (cf. third food regime in Section 3.2 and Section 3.3). Soon foreign investments started to flow into the region, particularly into land deals and agricultural production, including post-harvest infrastructure such as warehouses, processing facilities, and

ports (Berndt & Bernhold, 2018; Norberg, 2022; Oliveira & Hecht, 2016). Thus, the tremendous growth of soy, as states by Voora et al. (2024), is mainly attributable to an expansion in cultivated area, but also improved yields (cf. Figure 2). These dynamics enabled South America to overtake North America in 2003 as the world's largest soybean producer, a position the region has maintained as both the leading producer and exporter (Hartman et al., 2011; Heron et al., 2018; Oliveira & Hecht, 2016; WWF, 2014). At the same time, rising demand for animal products and the liberalization of soybean imports in China transformed the crop's original birthplace into the world's largest soybean importer and consumer (Hartman et al., 2011; Norberg & Deutsch, 2023).



(a) Land use (b) Yield

Figure 2: Global soybean land use and yields 1961-2023. Source: FAO (2025) with major processing by Our World in Data (Ritchie et al., 2023).

4.1.3 Today's Soybean Situation

As already mentioned in the last part, since the 1990s, there has been a clear shift in soy's political geography. South America's Southern Cone, including Brazil, Argentina, Paraguay, Bolivia and Uruguay, where soy has emerged as 'the monoculture "starlet" of the agro-export model' (Oliveira & Schneider, 2016, p. 168), is responsible for 51.6% of soybean production (cf. Table 1) and 62.3% of soybean export (cf. Figure 3). It should be emphasized though that this concerns the unprocessed soybean. By contrast, when considering the production and export of processed soy products, such as soybean meal or oil, the picture looks somewhat different. China represents the biggest soybean oil producer, followed by the US, Brazil and Argentina. When looking at oil exports, however, South America still leads with just over 50%, although it is Argentina rather than Brazil that plays the dominant role. In addition to South America, several European countries (a.o. Netherlands, Russia, Spain, and Ukraine), as well as the United States, Canada, and Turkey, are also significant exporters of soybean oil. Regarding soybean meal, the same ranking applies according to production volumes as for soybean oil. Nonetheless, South America here accounts for only about 7% of exports, which is mainly attributable to the high domestic demand for soybean meal as feed for the large livestock sector (USDA, 2025). The US is far more prominent, with a share of 46%, alongside African countries, especially South Africa and Nigeria and certain European countries, most notably the Netherlands (OEC, 2025).

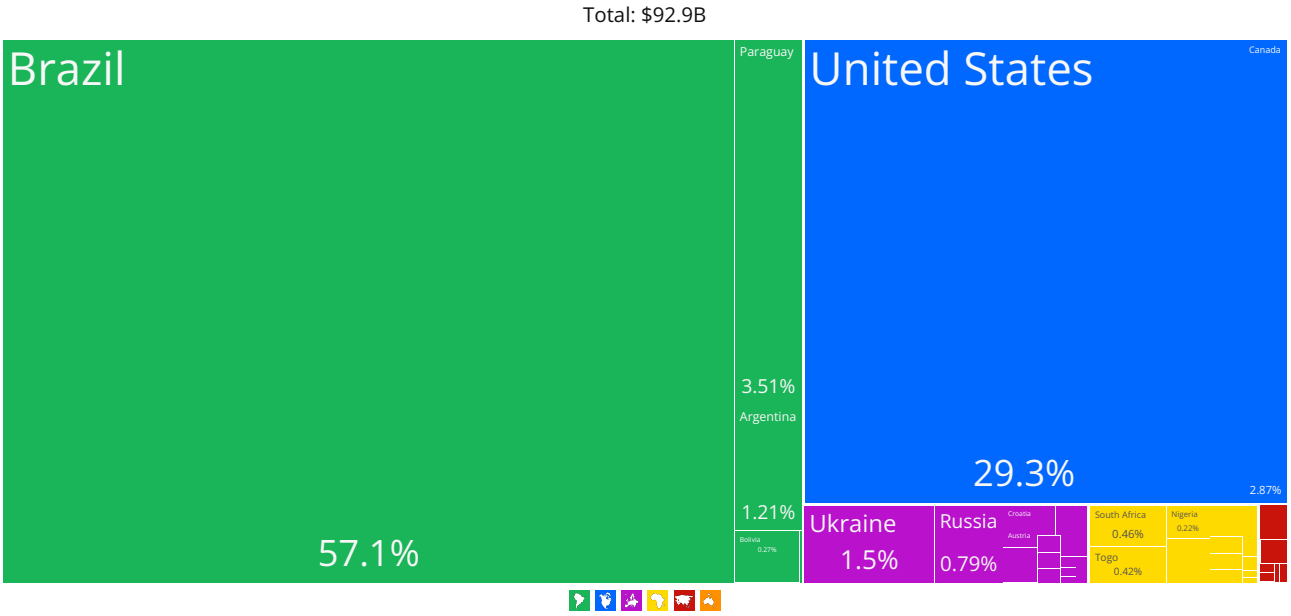


Figure 3: Top export nations of soybean in 2023. Source: OEC (2025).

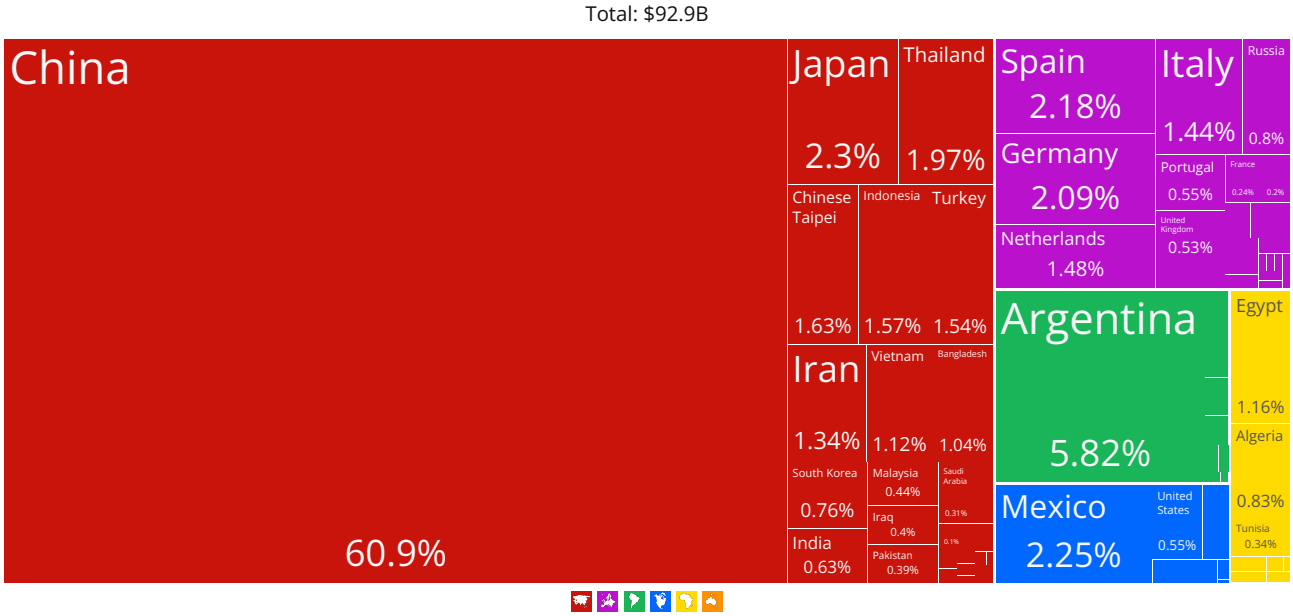


Figure 4: Top import nations of soybean in 2023. Source: OEC (2025).

At the same time, Asia and in particularly China represents the leading consumer respectively importer of soybeans, surpassing Europe since the year 2000 and presently accounting for the majority of overall imports (Oliveira & Schneider, 2016). Today, China consumes more soy than any other country in the world, and at volumes unprecedented in history. However, despite tofu and soy sauce continue to feature prominently in Chinese diets, the bulk of soy consumption today occurs indirectly, through industrially produced pork and chicken fed with imported soybeans, as well as through the growing use of soy oil in cooking (Lander & DuBois, 2022; Oliveira & Schneider, 2016).[10] Thus the "plant has been transformed from a protein-rich food for human consumption, and a nitrogen-rich crop in domestic agroecosystems, into the

[10]This also explains, why China, in spite being the biggest producer of soybean meal and oil, does not play a major role in the export of these commodities.

country's most important agricultural import, primarily to fuel the industrial livestock industry" (Oliveira & Schneider, 2016, p. 177). This new agro-industrial geography highlights the multiple and flexible uses and roles of soy, while also underscoring its significant economic importance for certain countries.[11] "Yet the US dollar and North Atlantic transnational companies still control global soybean markets and production technologies" (Oliveira, 2016, p. 349).

Table 1: Soybean production, land use, yield and production shares as well as the share of soybeans in each country's total exports (Top 20 Countries in 2023). Source: own table with data from FAO (2025) and OEC (2025).

Rank	Country	Production (Mio t)	Land Use (Mio ha)	Yield (t/ha)	Global Production Share (%)	Soybean Export / Total Export (%)
	World	371.17	136.90	2.71		
1	Brazil	152.14	44.45	3.42	40.99%	14.90%
2	United States	113.34	33.35	3.40	30.54%	1.46%
3	Argentina	25.04	14.36	1.74	6.75%	1.64%
4	China	19.49	9.98	1.95	5.25%	<0.01%
5	India	14.98	13.08	1.15	4.04%	<0.01%
6	Paraguay	10.20	3.61	2.83	2.75%	26.70%
7	Canada	6.98	2.26	3.09	1.88%	0.46%
8	Russia	6.60	3.50	1.89	1.78%	0.19%
9	**Ukraine**	**4.74**	**1.83**	**2.59**	**1.28%**	**3.45%**
10	Bolivia	3.67	1.82	2.01	0.99%	2.35%
11	South Africa	2.77	1.15	2.41	0.75%	0.28%
12	Nigeria	1.35	1.20	1.13	0.36%	0.33%
13	Italy	1.10	0.31	3.53	0.30%	<0.01%
14	Zambia	0.76	0.60	1.26	0.20%	0.26%
15	Uruguay	0.65	1.01	0.64	0.17%	1.86%
16	Serbia	0.60	0.21	2.84	0.16%	0.01%
17	Benin	0.52	0.52	1.00	0.14%	5.86%
18	France	0.39	0.16	2.46	0.10%	0.01%
19	Malawi	0.35	0.26	1.37	0.09%	1.49%
20	Indonesia	0.33	0.22	1.49	0.09%	<0.01%

Note: Soybean Export / Total Export (%) represent the percentage share of Soybeans in each country's total exports. For example, Ukraine's value of 3.45% indicates that 3.45% of the country's total exports consist of Soybeans.

[11] This is evident, for instance, in the high share of soy exports relative to total exports in countries such as Paraguay, Brazil, Benin, and Ukraine (see Table 1).

4.2 Main Actors in the Soy-Complex

> *"A relatively small number of big companies control large volumes of the soy value chain" (WWF, 2014, p. 27).*

In 1990, half of the world's soybean production was concentrated in the US. Together with Europe, which until then represented the major export destination, they controlled 51% of the global soybean crushing industry. Thereby, transnational corporations based in the US and Europe were the dominant actors in the international soybean processing and trade, with the four largest corporations Archer Daniels Midland (ADM), Bunge, Cargill and Louis Dreyfus (also referred to as the ABCDs) standing out among them (Heron et al., 2018; Norberg & Deutsch, 2023; Oliveira, 2016; Oliveira & Schneider, 2016). Through vertical integration of the entire soy value chain from harvesting, to the control over local warehouses and its storage capacity, to almost the entire processing facilities as well as transportation logistics, the ABCDs managed to establish a global oligopoly (Goldsmith & Hirsch, 2006; Oliveira & Schneider, 2016). The pursued strategy of 'verticalization' served as the foundation of these companies' power, enabling them to strengthen their control over the soybean value chain and its pricing mechanisms (Oliveira & Schneider, 2016, pp. 170–171).[12] Through further strategic partnerships with transnational seed and agrochemical corporations such as Monsanto, Syngenta, Bayer, or DuPont, these companies further strengthened their position of power, extending their control of the value chain beyond the post-harvest stage of soybeans to encompass upstream production processes as well (Oliveira & Schneider, 2016; Turzi, 2019). Together they control the majority of the global soy seed market, global pesticide market and global soybean trade (Berne Declaration & EcoNexus, 2013). This naturally also influences the production sector. Consequently, soybean farms "increasingly looked the same, operated in the same manner, employed the same technologies and ultimately purchased from and sold to the same markets controlled by these few major North Atlantic agribusiness companies" (Oliveira & Schneider, 2016, p. 171).

The massive boom in soybean production in South America for instance, goes hand in hand with the rapid expansion and consolidation of the soybean crushing industry conducted by the ABCDs. Up until 1995, Bunge, Cargill and Dreyfus operated less than 10% of the crushing capacity in Argentina and Brazil, whilst ADM was not operating at all in either country. Through neoliberal reforms, which allowed for substantial inflows of transnational capital into both Brazil and Argentina, the ABCDs engaged in numerous mergers and acquisitions of small- and medium-sized local soybean crushing companies, increased the capacities of their own processing facilities, and built new plants in key port regions, where their worldwide network of operations provided them key market advantages (Oliveira & Hecht, 2016; Oliveira & Schneider, 2016). Amid the global spread of neoliberal reforms, soybean agribusinesses even appeared to move beyond national boundaries, creating what has been described as a 'United Soybean Republic' across South America's southern cone (Oliveira & Schneider, 2016).

[12] For example, by raising profits, lowering production and transaction costs, reducing risks, using privileged information for hedging and speculation in futures markets as well as creating complementarities and synergies across the different segments of soybean production and processing (Oliveira & Schneider, 2016, pp. 170–171).

Over the years, ABCD has been able to expand through further mergers and acquisitions, controlling about 50% of the crushing capacity and 85% of soybean exports from South America (Oliveira, 2016). Nevertheless, by 2012, its market share in South America started to stagnate slightly. The reason for this stagnation has been the emergence of new large-scale actors emerging from South America itself.[13] This development has by no means been consistent across all countries though. In Argentina, for instance, crushing capacity has been developed considerably more than in Brazil, where the emphasis was primarily set on the unprocessed form of the soybean. The contrast arose from distinct policy choices. Argentina encouraged local soybean processing through steep export taxes on the raw commodity, while Brazil decided to eliminate such taxes in order to strengthen its position in the export of unprocessed soybeans in global markets (Goldsmith & Hirsch, 2006; Oliveira & Schneider, 2016). Accordingly, the vast majority of Brazilian soybeans were shipped to major consumption and processing regions. Up until 2004, this was primarily Europe. However, policy changes meant that it became more profitable for Europe to outsource crushing to other countries (e.g. Argentina) and then import the already processed products. Simultaneously, the opposite was happening in China, providing fiscal incentives for investments in China's domestic soybean crushing industry based in their major ports, which led to a shift in Brazil's main export destination from Europe to China. By contrast, in Argentina these developments have made the country the leading global exporter of processed meal and oil soybean products (Goldsmith & Hirsch, 2006; Oliveira & Schneider, 2016).

Beyond emerging actors from South America, new trading companies from China, Japan, Singapore, South Korea as well as the Gulf States are increasingly challenging the supremacy of the ABCDs in international trade (Oliveira & Schneider, 2016; WWF, 2014). Due to the lack of the same vertical integration as the ABCDs, these new players have started to engage in mergers, acquisitions and joint-ventures to expand their international trading operations. Instead of engaging in capital-intensive vertical integration within a single company, these firms pursue strategic partnerships with actors possessing privileged knowledge and access to production and processing markets in Brazil and China (Oliveira & Schneider, 2016).[14] Thus, although North Atlantic–based transnational corporations continue to command a substantial share of the global soybean crushing and trade "they must now compete with Argentinean crushers that supply Europe, and a much larger flow of soybeans from large-scale Brazilian producers and cooperatives to be crushed directly in China by their own companies" (Oliveira & Schneider, 2016, p. 172).

[13] Particularly noteworthy are Argentina's three largest domestic crushers Molinos Rio de la Plata (MRP), Vicentin, and AGD, which together account for 39 percent of the country's soybean crushing capacity. In Brazil, new influential actors include the Amaggi conglomerate and cooperatives such as Comigo.

[14] The example of COFCO illustrates how Chinese state-owned enterprises strategically establish complementary roles across the global agri-food value chain. COFCO is a Chinese state-owned agribusiness that has expanded internationally since the 1990s and today operates a global network in production, trade, and infrastructure (storage, processing, transport, ports). With the acquisitions of Nidera and Noble Agri (agricultural trading and seed companies) in 2014, COFCO became a key player in world agribusiness. In 2018, it sold Nidera's seed business to Syngenta, which is owned by ChemChina — another state-owned enterprise that has emerged as a global giant in agrochemicals and seeds (Norberg & Deutsch, 2023, pp. 188–189).

4.3 Challenges with Soy Production

As mentioned in the Introduction, over the past 60 years, the global area under soybean cultivation has expanded rapidly, rising from 23.8 Mha in 1961 to 136.9 Mha in 2023 (FAO, 2025). Although this helped to increase the production of highly demanded meat and brought economic benefits to the countries involved in its production and trade, it also led (and is still leading) to enormous environmental, social and economic concerns (Jia et al., 2020; WWF, 2014).

The greatest issue regarding the environment probably lies in the conversion of various vital ecosystems such as forests, grasslands and savannahs to agriculture (Voora et al., 2024; WWF, 2014).[15] With the demand of soy continuing to rise, more natural ecosystems are at risk to be lost, also captivating a decline in biodiversity as well as a loss in many ecological services we are relying on, ranging from clean water and fertile soils to natural pollination and the control of pests (Jia et al., 2020; Soja Netzwerk Schweiz, 2025; WWF, 2014). Yet preserving such systems would be of great importance, particularly in the fight against climate change, which also has a significant impact on soy production.[16] Rising temperatures, increasingly unpredictable and unreliable rainfall patterns, and rising incidents of pests and diseases caused by climate change, already have an impact on soybean production systems (Hartman et al., 2011; Voora et al., 2024). According to Lesk et al. (2021), the majority of global soybean growing areas are expected to be more vulnerable to warmer and more humid weather between 2050 and 2100, potentially leading to a decline of yields. However, the effect of climate change on soybean production is expected to vary depending on the location and varying conditions. India, China, Japan, and eastern Canada, for instance, might also experience improved growing conditions, whereas in the US, or Eastern Europe, climate change is expected to negatively impact soy production (Lesk et al., 2021; Voora et al., 2024).

A critical factor that has enabled the large-scale expansion of soybean cultivation in this magnitude is the use of GM soy varieties. As already mentioned, the first commercially successful GM soybean was the Roundup Ready (RR) introduced in the United States in 1995 by Monsato. Once developed, RR soybeans became central to the broader 'technological package' consisting of no-tillage cultivation, transgenic seeds, and the weed-control agrochemical, Glyphosate. First adopted in the US, this model rapidly expanded to Argentina, from where it subsequently spread to other South American countries (Berndt & Bernhold, 2018; Leguizamón, 2014). Although this GM biotech package has become integrated into South American agriculture — as yet another manifestation of the broader neoliberal transformation described earlier — nowhere has this integration been as pronounced as in Argentina, which has literally developed into an 'open-air laboratory' of GMO biotechnology (Berndt & Bernhold, 2018, p. 37). The application of this 'technological package' promised dramatic cost savings in production, as it

[15] Most notably in the Amazon, Cerrado, Atlantic Forest, Gran Chaco, Chiquitano Forest as well as North American Prairies (Voora et al., 2024; WWF, 2014).

[16] In fact, recent evidence shows that the Amazon, which contains roughly 33% of the world's forested area, has transitioned from a net greenhouse gas (GHG) sink to a net source, now emitting more carbon than it absorbs (Voora et al., 2024).

requires fewer inputs and less labor than conventional crop production. Indeed, in the case of Argentina, the switch to the GM biotech package saw a 15% increase in profits in comparison to conventional techniques in soy-maize rotation (Leguizamón, 2014).

In general, in terms of economic growth, the incorporation of the 'technical package' in the Argentinean agricultural model (*'modelo sojero'*) has been remarkable. Overall, however, the consequences of the GM soy model are less favorable and entailed radical changes in the socio-ecological and socio-economical dynamic of the Argentinean agricultural sector. For instance, this has resulted in a transition from labor-intensive agriculture to a production model which is increasingly dependent on machinery, agrochemicals, and fossil fuels. "Energy and petrochemicals displace labor and increase environmental degradation" (Leguizamón, 2014, p. 152). Work within these agribusiness structures became increasingly specialized and concentrated, requiring less labor but more and more specialized knowledge to operate. As a consequence, many rural households migrated to either the nearest large town or to the urban center. The depopulation of rural areas is accompanied by a decline in the number of farms, alongside increasing farm sizes and a growing concentration of land ownership, driven in part by so-called *'pools de siembra'* — agribusiness entities that operate through the pooling of capital from external investors and typically operate on the basis of short-term contracts (Leguizamón, 2014; Norberg, 2022). In addition to these structural changes, these developments also led to a declining food security, and health risks from agrochemical exposure, the emergence of glyphosate-resistant 'superweeds', as well as the intensification of already noted effects such as deforestation, biodiversity loss, and soil depletion (Leguizamón, 2014, 2016; WWF, 2014).

As seen in this section, the rapid growth of global soy production and consumption in recent decades, has exerted considerable pressure on natural ecosystems. With demand even expected to rise further, continuing current production patterns would accelerate the loss of critical habitats (WWF, 2014). However, a combination of demand- and supply-side initiatives offer viable alternatives. The post-2006 Soy Moratorium in the Amazon, the Cerrado Manifesto Statement of Support, and the EU Deforestation Regulation (EUDR)[17], aim to limit the expansion of soy into natural areas and ensure that supply chains are deforestation-free, by directing new plantations towards already degraded rather than intact ecosystems (Heron et al., 2018; Voora et al., 2024; World Resources Institute, 2025). International agreements, along with public and private commitment, further reinforce this shift. Initiatives such as the Collaborative Soy Initiative (CSI), the UK Roundtable on Responsible Soya (RTRs), REDD+, ProTerra, and Cert-ID illustrate how coordinated efforts to create more sustainable supply chains can help protect biodiversity and rural livelihoods while effectively meeting global soy demand (Heron et al., 2018; Voora et al., 2024; WWF, 2014).

[17]The EUDR supports the commitment made by 144 countries that signed the Glasgow Leaders' Declaration in 2021 to stop and reverse deforestation and land degradation by 2030. Even though the regulation is legally in place, companies are not yet required to comply with it. The regulations will apply to large companies from 30 December 2025 and to small and medium-sized enterprises from December 2026, provided that the European Commission's proposal is adopted by the EU institutions (World Resources Institute, 2025).

5 Methodology

5.1 Mixed-Method-Approach

Scientific research seeks to uncover certain 'truths about the world', by applying both new and existing theories, and test their empirical validity. It is a systematic process designed to conduct in-depth investigations, aiming to uncover facts embedded in reality and interpret them accordingly (Queirós et al., 2017, p. 370). There are different approaches to scientific research — qualitative and quantitative methods. While quantitative methods focus on providing precise and reliable measurements for statistical analysis, qualitative methods emphasize on understanding the complexity and meaning behind specific outcomes (Kitchin & Tate, 2014; Queirós et al., 2017). Both methodologies have their own strengths and offer distinct advantages. According to Choy (2014) and Zadrozny et al. (2016), a combined approach that integrates both methods within the same research topic can yield more comprehensive results and thus allows for a more complete understanding of a given question than either approach could achieve independently. This strategy is known as the so-called 'mixed-methods approach' (Leech & Onwuegbuzie, 2009). "[M]ixed methods research represents research that involves collecting, analyzing, and interpreting quantitative and qualitative data in a single study or in a series of studies that investigate the same underlying phenomenon" (Leech & Onwuegbuzie, 2009, p. 265).

For this reason, a combination of qualitative and quantitative methods is applied in the empirical part of this thesis to analyze and interpret the collected data, ultimately addressing the research question(s). However, it should be noted, that this thesis is mainly grounded in qualitative analysis, with quantitative data serving to complement particular aspects of the findings. This is also the reason why the following section focuses primarily on the qualitative aspects of the methodology and approaches of this thesis.

5.1.1 Qualitative Data

Qualitative data is generally understood to be nonnumerical data that consists of words, images or even sounds and is usually rather unstructured in its form (Helfferich, 2011; Kitchin & Tate, 2014; Kuckartz & Rädiker, 2019). Unlike quantitative data, qualitative research is not concerned with numerical representativity, but rather with obtaining an in-depth understanding of a specific 'problem' and its various related dimensions (Queirós et al., 2017) or on reconstructing subjective views of an 'issue' (Helfferich, 2011, p. 21). This is particularly the case for 'problems' that cannot be operationalized merely by the means of simple variables, but actually require further analysis (Helfferich, 2011). Hence, qualitative research "seeks to provide the most detailed and complete picture possible of the segments of reality to be explored" (von Kardoff, 1995, p. 4).[18]

[18] Original German transl.: *"Qualitative Forschung ... bemüht sich dabei, ein möglichst detailliertes und vollständiges Bild der zu erschließenden Wirklichkeitsausschnitte zu liefern"* (von Kardoff, 1995, p. 4).

When working with qualitative data, a consideration is to determine whether to work with self-generated data (primary data) or existing data (secondary data). Whilst the use of secondary data is a very valid approach in certain circumstances, Kitchin and Tate (2014) recommend to use self-generated data where possible. This has several advantages. Data generated by the author is aligned more closely with the actual topic at hand and therefore offers more context and added value. Moreover, the origin of the data is well known, including the potential benefits and challenges of gathering the data. Nevertheless, Kitchin and Tate (2014) emphasize that secondary data should complement primary data if available. Thus, within the scope of my qualitative analysis, I decided to conduct expert interviews (primary data) and supplement them with a corpus of different articles and reports (secondary data) concerning the scope of my thesis.

5.1.2 Quantitative Data

In contrast to qualitative data, quantitative data is generally structured and consists of numerical or empirical information that can easily be 'quantified' and analyzed using numeric respectively statistical techniques (Kitchin & Tate, 2014; Queirós et al., 2017). Quantitative research focuses on objectivity and relies on systematic procedures and formal instruments to collect data that allow for measurable comparisons and statistical inference. Therefore, it is particularly suitable when relationships or correlations between variables are to be identified (Choy, 2014; Queirós et al., 2017).

The quantitative data I will be using for my analysis is already available which means I am conducting a so-called 'secondary data analysis' (Kitchin & Tate, 2014). This data can be collected by different actors, some might be collected by official government agencies others by independent actors across different scales (more specific information about sources used for the quantitative data are shown in Section 5.2.3). Thereby, according to Kitchin and Tate (2014), there are major justifications for the usage of secondary data. Firstly, from a conceptual standpoint, it is important to recognize that the data one intends to use may simply not exist in any other form. Secondly, methodologically, the use of secondary data offers several advantages, as it allows for the replication of analyses, enables other researchers to verify previous findings, and facilitates both longitudinal and trend analyses (Kitchin & Tate, 2014), which is of particular interest in the context of this thesis, especially with regard to the various developments of agricultural products, above all soybeans.

5.2 Data Collection

5.2.1 Expert-Interviews

Interviews are regarded as the most widely used method in qualitative research for the collection of information (Alsaawi, 2014). A number of reasons can explain as to why this is the case. Firstly, interviews are considerably more flexible than any other qualitative method (Alsaawi, 2014), allowing for more in-depth examinations of opinions, experiences or feelings than can be captured through methods based on closed questions (Kitchin & Tate, 2014). However, "there

is more to interviewing than just talking to people" (Kitchin & Tate, 2014, p. 215). Interviews often represent a complex social encounter, hence researchers should get familiar with the basic fundamentals of interviewing such as communication, openness or reflexivity (Helfferich, 2011, pp. 23–24) and should be aware of the different forms, dynamics and strategies of an interview as well as their strengths and limitations (Kitchin & Tate, 2014).

Interviews can be conducted in many forms, from highly structured to completely open variants. In general, it is advised that the methodological strategies are adapted to the object of research. For expert interviews, as conducted in this thesis with various actors in the soy sector in Ukraine, Helfferich (2011) generally recommends a stronger structuring, whereby the degree of structuring also depends on whether the interview is aimed more at collecting specific facts or providing interpretative knowledge. Narrative interviews without any structure are not considered suitable for 'experts'. This suggests the creation of a guideline with some room for flexibility, enabling the interview to explore more open-ended, in-depth issues as the interview progresses (Helfferich, 2011; Trinczek, 2002). For this reason, I used the form of 'semi-structured' interviews (Gläser & Laudel, 2010) for my thesis. These represent a mixture between 'structured' and 'unstructured' interviews (Alsaawi, 2014). Essentially, semi-structured interviews are structured with pre-planned questions from the interviewer, while also offering the participants space for personal, more extensive explanations arising during the dialog through the use of more open-ended questions. Thus, allowing certain thoughts to be further elaborated on (Alsaawi, 2014; Longhurst & Johnston, 2023; Queirós et al., 2017). Such interviews are particularly suitable for researchers who already have an overview of the topic. This allows them to respond to given answers and ask follow-up questions. In contrast, a highly structured format might limit in-depth and varied responses (Alsaawi, 2014).

Following the selection of the semi-structured interview format, the next step involved developing an 'instrument', in this case, a guideline, that specified both the content and phrasing of the questions. According to Helfferich (2011, p. 180) and Alsaawi (2014, p. 153), such a guideline must meet various requirements. The guideline should...

... comply with the basic principles of qualitative research.

... not contain too many questions, as this leaves too little time for open, in-depth questions.

... be formal and clearly structured.

... follow a 'natural' structure based on thematic blocks.

... not contain overly long questions so that the respondent is not overwhelmed.

... not contain any questions that steer the interview too much in a particular direction.

The interview guideline was structured according to specifications provided by Alsaawi (2014). It begins with the 'Introduction', where the interviewer presents themselves and explains the purpose of the interview. The 'Warm-Up Phase' includes simple questions to ease the interviewee into the conversation. The 'Main Body' focuses on key questions of interest, followed by the 'Cool-Off Phase', which includes lighter questions to conclude the discussion smoothly. Finally, the 'Closure' marks the end, where the interviewer thanks the participant. Thereby, the development of the interview guideline in regards to question selection followed the SPSS-Principle (Helfferich, 2011, p. 182). In a first step, relevant questions are collected ('Sammeln') without initial restrictions. Next, they are reviewed ('Prüfen') in order to eliminate irrelevant or already known information. The remaining questions are then sorted ('Sortieren') into thematic blocks. Finally, during subsuming ('Subsummieren'), the guide is refined by formulating open-ended prompts with minimal presuppositions, structuring the key aspects accordingly.[19]

In order to find suitable experts for my interviews, the 'purposeful sampling' approach (Alsaawi, 2014, p. 152) was used, in which the specific participants were selected and contacted on the basis of their knowledge and expertise in the area under investigation because the "individuals' stories ... are of worth" (Seidman, 2006, p. 9). While some, especially the first interviews, were arranged through purposeful sampling, some additional participants were also contacted during the interview process using a 'snowball approach'. Thus, at the end of interviews, the interviewees were asked for additional contacts who could be considered for participation. An advantage of this procedure is the possibility of establishing certain criteria in order to narrow down the selection process of suitable interview partners. However, according to Helfferich (2011), there is also the disadvantage that the recruiting circle may remain too homogeneous. Overall, 13 interviews were conducted with various actors in the field of soy production in Ukraine (see Table 2), whereby two participants took part in written interviews, where they provided detailed written responses to prepared questions. The remaining 11 interviews were conducted online via Microsoft Teams — ten in English and one in German.

Before starting the interview, the most important thing according to Alsaawi (2014) and Seidman (2006) is to use a 'recorder'. Especially in the case of conducting semi-structured or unstructured interviews, as note-taking most of times is not enough to deal with the huge amount of data, leading to gaps in the data. Moreover, recording allows the interviewer to focus completely on the discussion, rather than balancing between note-taking and the conversation (Kitchin & Tate, 2014). In my case, this was done using the recording feature available in Microsoft Teams, whereby in each case, the participants were asked for their consent to record the interview in advance.

While conducting an interview, it is essential to remember that it is not merely a "passive means of gathering information" (Kitchin & Tate, 2014, p. 215) but a social interaction that requires interpersonal skills. This includes creating a welcoming and open atmosphere by phrasing questions in an engaging and personalized manner and responding attentively to

[19]The various guidelines can be found in the Appendix A.4.

answers to maintain a natural conversational flow. Responses should not be interrupted, and the interviewer should adopt a supportive, yet neutral stance to avoid introducing bias, ensuring an objective analysis (Alsaawi, 2014; Kitchin & Tate, 2014). Naturally, I sought to implement all of this to the best of my ability.

Table 2: Summary of conducted interviews

Ref.	**Function**	**Focus**	**Date**	**Time**
R1	Researcher/Expert	Food Markets, Value added Supply Chains	01.04.2025	00:59:13
R2	Researcher	Resilience Food Systems	03.04.2025	01:02:01
R3	Researcher	Food Markets and Marketing	25.04.2025	01:35:37
R4	Researcher/Expert	Operational and Structural Development of Agriculture	21.05.2025	01:11:56
R5	Researcher/Expert	Food Markets and Marketing	05.06.2025	01:41:46
R6	Researcher/Expert	War and Food Security Ukraine	18.06.2025	01:19:02
P1	Producer: Commercial Director	Organic Production. [Land area: 10'000 ha]	04.06.2025	00:58:01
P2	Producer: Deputy CEO, Chief Commercial Officer	Sustainable Crop Production [Land area: 60'000 ha]	12.06.2025	01:45:20
P3	Producer: Director of Organic Plant Production	Organic Production [Land area: 2'500 ha]	10.07.2025	01:23:40
P4 *	Producer	Organic Production [Land area: 10'000 ha]	—	—
OS	General Manager CEO	Sustainable Production Certification	24.04.2025	00:55:55
CP	Consultant	Organic Production, Soybean	02.05.2025	01:43:34
PS *	Ukrainian Pulse and Soybean Association	Establishing Pulse and Soybean Markets and Value Chains	—	—

Note: Time indicates the total duration of each interview. The * indicates that these were written responses to the interview questions.

5.2.2 Textcorpus

As already mentioned, in addition to the expert interviews, a text corpus was created as part of the empirical part of the thesis, which focuses on qualitative data. As suggested by Kitchin and Tate (2014), this corpus serves to fill certain gaps in the primary data, to complement it more generally, and to strengthen the overall findings. The corpus consists of several types of sources, including various news articles from different journals, agricultural reports, third-party interviews, as well as presentations by different actors involved in the soybean sector in Ukraine (see corpus in the Appendix Table 8 and 9).

5.2.3 Trade and Production Data

For the quantitative data of this thesis, complementing findings of the qualitative research from the conducted expert-interviews and the complementary text corpus, datasets from various institutions were used. For the analysis of trade data, datasets from the United Nations (UN Comtrade, 2025a, 2025b, 2025c) and data visualizations from the Observatory of Economic Complexity (OEC, 2025) were employed. For more specific analysis about Ukraine's agricultural production and the sector in general, data from the Food and Agriculture Organization of the United Nations (FAO, 2025), the United States Department of Agriculture, Foreign Agricultural Service (USDA, 2025), as well as the State Statistics Service of Ukraine (Ukrstat, 2025) was utilized.

5.3 Data Analysis

5.3.1 Qualitative Content Analysis

In the context of this master's thesis, the most significant and extensive part of the analysis involved the evaluation of the interviews conducted. This was carried out using a qualitative content analysis (QCA) according to Kuckartz (2019). A QCA is a methodological approach that enables researchers to draw systematic and meaningful conclusions from the empirical data, with the purpose of providing a contextual understanding of the findings (Gläser & Laudel, 2010; Kohlbacher, 2006; Kuckartz & Rädiker, 2019; Mayring, 2014). Furthermore, the QCA of the interviews enables me to further understand trends and findings from the text corpus as well as from the quantitative analysis (see later in Section 5.3.2) and also assess these in a further step. Thereby, the QCA was executed by using the data analysis software MAXQDA (Kuckartz & Rädiker, 2019). In MAXQDA the data was coded into categories which were subsequently analyzed and form the main components of this thesis.

The general workflow of a QCA, according to (Kuckartz, 2019, p. 186), contains five phases: (1) reading the data intensively, (2) building the coding frame, (3) coding the data, (4) analyzing the coded data, and finally (5) presenting the results. Thereby, the categories (codes) and their elaboration are the main focus of QCA (Kuckartz, 2019). As Berelson already noted in 1957: "Content analysis stands or falls by its categories (...) since the categories contain the substance of the investigation, a content analysis can be no better than its system of categories" (Kuckartz, 2019, p. 183). There are three main approaches to developing categories. Firstly, in a concept-driven ('deductive') approach, categories are derived in advance from theory, existing literature or the research question. Secondly, in a data-driven ('inductive') approach, categories are developed directly from the data through step-by-step open coding, continuous refinement and the formation of hierarchical code structures. In a combined approach, a deductively created coding framework is used initially, which is then expanded inductively during the analysis (Kuckartz, 2019). Within the scope of my thesis, I primarily employed a deductive approach, although for certain words, sentences, or paragraphs, I also utilized an inductive approach through so-called 'in-situ' coding (Kuckartz & Rädiker, 2019). In this process, it is common for certain phases of the coding to be carried out on a circular basis or iteratively

(Vaismoradi & Snelgrove, 2019). By the time all the data has been coded using the final category framework, all relevant information relating to the research questions was systematized and structured (Kuckartz, 2019). In total, the QCA of the 13 interviews conducted generated 1'529 codes in MAXQDA.

5.3.2 Descriptive, Comparative and Spatial Analysis

In terms of quantitative data analysis, the datasets presented in Section 5.2.3 were analyzed by using the programming environment R as well as the open-source-software for geographic information systems QGIS. While R is a flexible programming language for statistical data analysis that allows to execute statistical calculations, graphical representations and professional reportings, QGIS allows users to display, and analyze spatial data (Cooksey, 2020; Menke et al., 2016). Using R and QGIS, graphical visualization methods were applied to display data in the form of bar-, pie-, and line-charts or maps. These were used to summarize, display and compare certain trends in the data (Cooksey, 2020). In case of this thesis, they were mainly used to summarize, display and compare certain trends in the data regarding soybean production and trade within Ukraine.

Graphical visualization methods offer an easily accessible means to summarize and visually display important features of data, which often allows patterns to be interpreted more easily than in tables for instance In combination with numerical statistics, graphs can provide a more comprehensive picture of a dataset (Cooksey, 2020). However, one must also proceed with some caution, as with many variables, graphs may become impractical. Further, inappropriate scaling or design may result in misleading interpretations. Therefore, visualizations must be constructed carefully to prevent misinterpretation and bias. Despite their limitations, however, graphical representations are valuable communication tools and, when used appropriately, can improve understanding of quantitative results (Cooksey, 2020). Maps are powerful visual tools that summarize complex spatial information in an easily understandable form, making large or complex environments comprehensible. Well-designed maps improve communication by helping users quickly recognize patterns and spatial relationships that might otherwise go unnoticed (Cooksey, 2020).

Additonally, the thesis also contains two Figures (11 and 16), representing so-called 'word clouds'. These are commonly used in order to visualize the words in a given source, whereby the most frequently occuring words are displayed in larger font size (Kuckartz & Rädiker, 2019). The word clouds were created individually using the 'Word cloud' tool in MAXQDA, whereby the interviews conducted served as sources. Thus, meaning its a quantitative analysis of my qualitative data, or what Mayring (2014) describes as a 'quantitative content analysis'. The analysis, only included coded segments that were relevant to the respective section. To prevent certain interviews from having an overly significant impact on the analysis, entries were classified not only according to frequency but also according to the number of references in different interviews (Kuckartz & Rädiker, 2019).

6 Structure and Land Tenure of Ukraine's Agriculture

In the year 2020, Ukraine's agricultural land comprised 41.3 million hectares (Mha), representing 68.5% of Ukraine's total area. Of this surface, 32.7 Mha were arable lands. By comparison, in the same year, France and Spain utilized 27.4 Mha respectively 23.9 Mha — the largest share of the EU's total 157 Mha used for agricultural production (Albaladejo, 2024). In addition to its large agricultural area, Ukraine also benefits from its favorable geographical location with access to the Black Sea and excellent natural conditions (Nivievskyi & Neyter, 2024). On the one hand, the country — with the exception of the Carpathian Mountains in the west and the Crimean Mountains in the south — is predominantly flat. Furthermore, most of the territory enjoys a temperate continental climate with mild temperatures, sufficient sunlight, and adequate rainfall, which allows for long growing seasons. Thanks to an extensive river network and over 3'000 lakes and 1'100 artificial water reservoirs, Ukraine also possesses abundant water resources to support regions that tend to suffer from water shortages (e.g. southern regions) through irrigation systems (Albaladejo, 2024; Matuszak, 2021; Wengle et al., 2024). These factors provide highly favorable conditions for agriculture, but it is above all the exceptionally fertile chernozem soils, also referred to as 'black soils' or 'black earth' (Nasir et al., 2022), that underpin Ukraine's reputation as the 'breadbasket of the world' (Matuszak, 2021). High in organic matter, these soils are among the most productive worldwide and cover 28.3 Mha of the soils across the country (Albaladejo, 2024; Matuszak, 2021).

Due to the favorable natural conditions, agriculture plays a very important role in Ukraine. In 2021, it was the country's fastest-growing sector, accounting for 17% of domestic employment, responsible for 41% of export revenues and approximately 20% of gross domestic product (GDP).[20] By 2022, following the decline of other sectors of the economy during the war, agriculture's share of Ukraine's GDP even expanded to 53% (Wengle et al., 2024). Thereby, since 1992, crop production for export has clearly dominated Ukrainian agriculture, following a generally positive growth trend with only minor interruptions (cf. Figure 5). In 2021, cereals (mainly wheat, maize, and barley) were grown on 56% of the country's arable land, while another 32.3% was devoted to industrial crops (primarily sunflowers, followed by rapeseed and soybeans). By contrast, the livestock sector is relatively small and has not shown a comparable upward trend. Instead, with the exception of poultry production, the sector is rather stagnating. In 2022, poultry accounted for 56.8% of total meat production, while pork, beef and veal represented 42% (Albaladejo, 2024; KSE, 2023). Since the majority of Ukraine's production is intended for export — a constantly growing market — changes in the acreage and production of certain crops are mainly related to the economic situation of foreign markets (Matuszak, 2021). Today, the Ukraine represents the world's leading exporter of sunflower oil, while also cultivating a substantial share of the global supply of corn, wheat, barley, and rapeseed (see Table 3). This is a key reason why Ukraine is considered a vital contributor to global food security, with millions of people in Asia, Africa, and the Middle East relying on affordable grain imports from Ukraine (Wengle et al., 2024).

[20] This represents much higher figures than Western Europe countries or the United States (Albaladejo, 2024; Wengle et al., 2024).

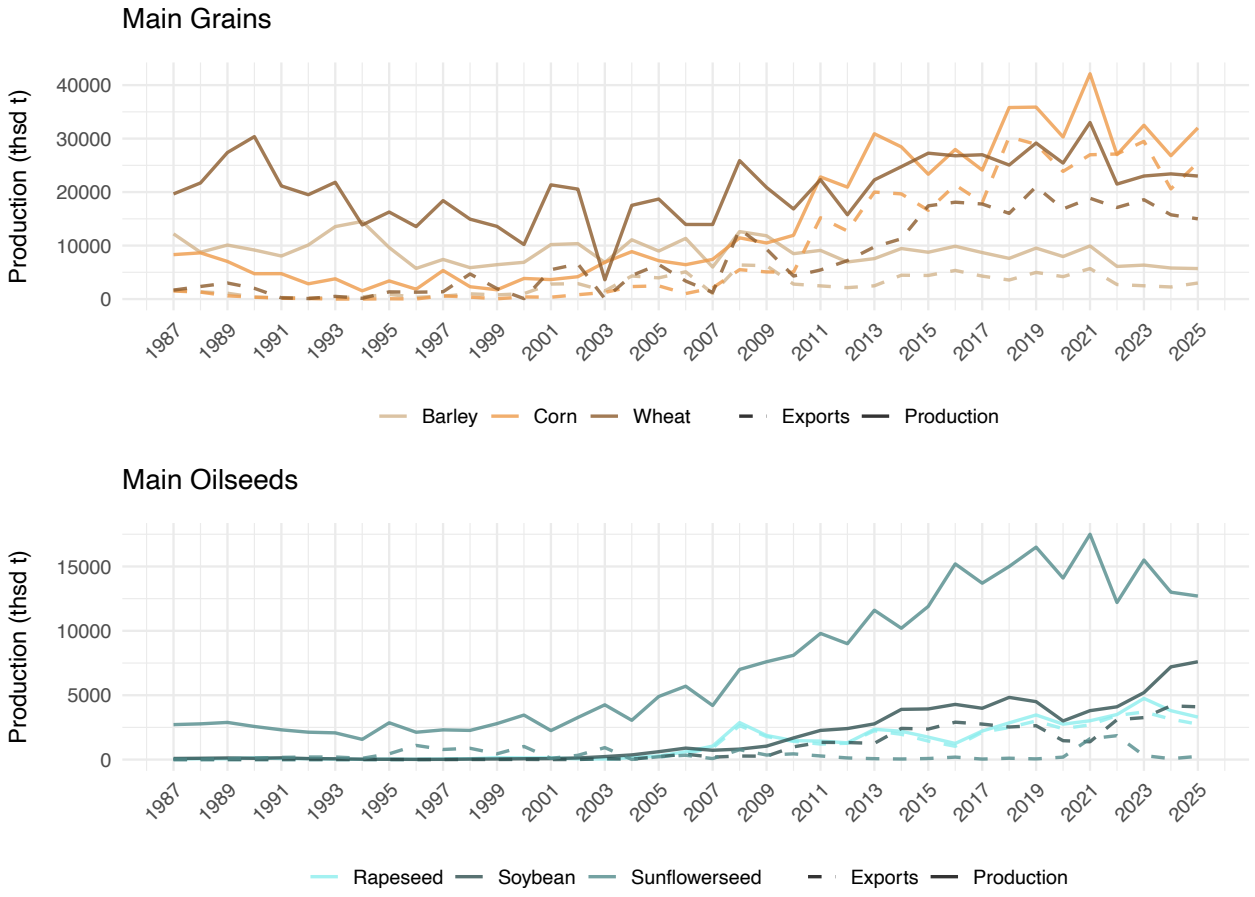


Figure 5: Comparison of production and export of different grains and oilseeds in Ukraine 1987-2025. Source: own representation with data from USDA (2025).

Table 3: Ukraine's main agricultural production and export commodities in 2024. Source: UCAB (2025).

Product	**Export, mln USD**	**Production**	**Export**
Sunflower oil	5'117	#2	#1
Corn	5'071	#7	#4
Wheat	3'735	#9	#6
Rapeseed	1'850	#7	#3
Soybeans	**1'340**	**#9**	**#6**
Sunflower meal	1'029	#2	#1
Poultry	960	#19	#6
Barley	557	#7	#5
White sugar	420	#18	#11
Soybean oil	**316**	**#19**	**#8**
Soybean meal	**304**	**#19**	**#11**
Rapeseed oil	239	#15	#7
Walnuts	185	#5	#4
Powdered milk, cream	74	#13	#10
Beef	73	#20	#18

Note: The # indicates the respective position in the global comparison (e.g. Ukraine is the world's number 2 producer and number 1 exporter of sunflower oil).

6.1 Historic Development of Agricultural Sector

To understand the current structure of agriculture in Ukraine, it is necessary to look at the country's history, because *"there is some path dependency from Soviet times"* (R4, Pos. 102). A key aspect in this context is the collectivization during the Soviet era (R5). With Stalin's collectivization drive in the 1930s, Soviet peasants were dispossessed and forced to join state-owned collective farms — a top-down push for modernization, followed by decades of centralized economic planning (Wengle et al., 2024).[21] Thereby, regarding these collective farms, it can be differentiated between two primary Soviet agricultural enterprises, the so-called *kolkhozes* (agrarian production cooperatives) and *sovkhozes* (state-run enterprises) (Albaladejo, 2024; Cochet & Merlet, 2011; Matuszak, 2021). By the year 1990 there were approximately 8'000 *kolkhozes* and about 3.8 million *kolkhoz* workers (Matuszak, 2021). Hence, agricultural reforms have been at the very center of Ukraine's agricultural policy for quite a considerable time with further significance following Ukraine's declaration of independence from the Soviet Union in October 1991 (Lerman et al., 2007).

In order to build a sustainable, competitive agriculture that raises rural incomes, land and agricultural reforms following Ukraine's declaration of independence pursued two fundamental, interrelated objectives: (1) allocation of land use rights to individuals and (2) adequate restructuring of previous collective (and state) farms consistent with the principles of market-oriented agriculture (Lerman et al., 2007). This process though, proved to be a lengthy and difficult one and can be divided into two main stages of land reforms and farm restructurings. A first stage from 1990 to 1999 and a second stage from 2000 onward (Hartvigsen, 2013).

In 1990 (still before independence) the Ukrainian Soviet Republic adopted the first resolution *On Land Reform*, which subjected the entire land of the country to reform. In 1991, independent Ukraine enacted its first *Law on Peasant Farms*, defining such farms as individual entrepreneurship for commercial agriculture based primarily on own labor. As land at this time was still state-owned, aspiring farmers could obtain up to 50 ha in lifelong, inheritable possession (Lerman et al., 2007, p. 17). A year later, in 1992, a new *Land Code* — meant to abolish the state's monopoly on land ownership and laying the foundation for the privatization of state-owned land to rural residents and former collective farm workers (Wengle et al., 2024) — was adopted by the *Verkhovna Rada* (the Ukrainian Parliament) (Hartvigsen, 2013; Lerman et al., 2007). Accordingly, between 1992 and 1993, 12'000 *kolkhozes* and *sovkhozes* were transformed into so-called collective agricultural enterprises (CAE). In the next step, these CAEs were privatized, by granting each of the employees and pensioners paper certificates of entitlement ('land shares') to the privatized land that continued to be held in collective ownership by farm enterprises (Hartvigsen, 2013; Lerman et al., 2007). This meant that, although the foundation for agricultural and land reform had been laid, the existing form of collective farming was not immediately abolished. Instead, privatization into collective ownership of farming corporations became an intermediate stage of reform (Lerman et al., 2007; Matuszak, 2021).

[21] The forced collectivization of agriculture Ukrainian and Kazakh Socialist Soviet Republics as well as in Russian Federation's Volga region, not only caused a drastic shift in the agricultural structure but also led to a genocidal famine and millions of deaths in the 1930s (Applebaum, 2017).

This situation only ended in 1995, following the publication of a *Presidential Decree* that allowed new land shareholders to withdraw from large agricultural enterprises, and convert their paper land shares into 'real', respectively physical parcels (a so-called 'pai'), and either establish private family farms or lease the land to other farmers (Hartvigsen, 2013; Matuszak, 2021). During the 1990s though, few land-share owners chose to leave CAEs, as the process was often complicated (Wengle et al., 2024). First and foremost, people didn't know the location of their land shares. Further, there was a clear lack of sufficient (private) technical equipment and — most notably — a lack of financial resources among rural workers to establish independent commercial farms (Plank, 2013; Wengle et al., 2024). Hence, they did not have the means to productively develop it (Cochet & Merlet, 2011).[22] And so, by the end of 1999, even though more than six million of the rural population had received land shares for the ownership of agricultural land plus non-land assets from the former collective and state farms, the land reform did not have a major impact on the actual agricultural structure. In other words, throughout the 1990s large-scale state farms were not really transformed into smaller, more productive units (Hartvigsen, 2013; Wengle et al., 2024).

In response to the failed attempts during the first phase of the agricultural reform, another *Presidential Decree* was emitted in December 1999, ultimately marking the decisive break with the collective structures of the Soviet era. The *Presidential Decree* declared CAEs to be incompatible with market conditions, and mandated their reorganization into more efficient and market-compliant structures based on private land ownership (e.g. family farms, private enterprises, farming cooperatives or agricultural corporations). More importantly, CAE members were granted the unrestricted right to withdraw their land and asset shares, which could be used to establish private farms or leased out under formal contracts requiring minimum payments. Subsequent legislation in 2000–2001 also provided debt relief, removing major obstacles to individual withdrawal of their land from former collective frameworks (Lerman et al., 2007). While the immediate effect was dramatic, it depicted a largely cosmetic adjustment: Within just three months, the consisting 8'000 CAEs disappeared from official statistics, transforming into other corporate entities (including about 3'000 cooperatives). At the same time, a new category of 'private' corporate farms emerged, organized around individual entrepreneurs and based mainly on agriculture on leased land. Their number grew from 470 to 2'900 in early 2000, and by 2005 nearly 5'000 such farms accounted for about 30% of all corporate farms in Ukraine (Lerman et al., 2007).[23]

Beyond these formal changes, the reform also had profound long-term consequences for the population. Nearly 7 million rural residents became private landowners, holding on average 4.2 ha each, with around 70% of agricultural land (and 80% of arable land) *now* in individual ownership. Aside of that, the leasing out of land also provided (and still is providing) a crucial income source for the rural population (Hartvigsen, 2013; Lerman et al., 2007).

[22] *"... They [the people] didn't know what to do with it"* (R3, Pos. 188). *"...[People] didn't know what it meant to run a business privately"* (R5, Pos. 68).

[23] Thus why cosmetic adjustment? Because the Ukrainian agriculture remained dominated by large agricultural structures with the difference being that instead of being collectively owned, they are now privatized.

> *"[The landowners] are mostly population. Because after the reforming of so-called kolkhozes the workers of this collective enterprises received some land plots. For example, my grandparents had the standard land plot in the central part of Ukraine. It's about four hectares. We still receive the payments from the tenant farmer every year" (R1, Pos. 66-68).*

The new *Land Code of 2001* consolidated these reforms by legally recognizing private ownership and permitting limited land transactions, while maintaining a moratorium on land sales until 2008 and prohibiting the use of land as equity in new businesses to protect smallholders.[24]

6.2 Structure of Agricultural Sector

> *"When we speak about Ukrainian agricultural business, we would like you to understand that this is not [comparable to farmers] in the European Union. Our agricultural sector, it's like an agricultural business: Big investors, big size of farms, big money and big big profits or big waste" (CP, Pos. 18).*

As mentioned in Section 6.1, the reforms fundamentally reshaped Ukraine's agrarian structure, eliminating collective landownership, creating a dual structure of state and private ownership, and generating considerable regional variation, reflecting local economic and political conditions (Lerman et al., 2007). However, as already mentioned, there is still a clear path dependency from Soviet times, which also reflects in today's agricultural structure in Ukraine (see R2; R3; R4; R5). As pointed out in R4 (Pos. 98): *"Ukraine has no culture of family farmers as it is the case in the EU. 70 years of Soviet Union led to the situation".* Thereby, the reasons are manifold, and a "direct result of both the Soviet legacy and the unequal capital distribution measures of former Soviet structures" (Cochet & Merlet, 2011, p. 4):

> *"On the one hand, only an appointed head of the enterprise is responsible for everything. And that's how people, despite working in these enterprises for over 70 years, didn't know how to run it by themselves. [...] They didn't know how to establish connections on the markets or how to sell their products, because they produced exclusively for the state. Everything was delivered to the state and the state has distributed the products. And also on the other hand, this led to the prejudice that farms should be rather big" (R4, Pos. 98).*

Thus, today's agricultural sector in Ukraine is characterized by two key types of agricultural producers, also described as a 'bimodal agricultural structure' (Zamuruieva, 2024): Large-agribusiness, primarily oriented toward the production of grains and oilseeds for export as well as small-scale farms (family farms and rural households) mainly focused on production for the domestic market. According to Matuszak (2021), a substantial proportion of land

[24]The moratorium was repeatedly extended amid political debates over opening Ukraine's agricultural land market (Hartvigsen, 2013). On 31 March 2020, the *Verkhovna Rada* passed the law to establish an agricultural land market in Ukraine, lifting the moratorium on farmland sales as of 1 July 2021 (Matuszak, 2020).

is currently utilized by large agribusinesses, while smaller individual farmers cultivate only a small fraction of the land. These proportions though differ substantially depending upon the region and the crop being cultivated. In fact, only in some oblasts of western Ukraine, which are less developed agriculturally, individual farmers cultivate larger shares of land, and only in two (Zakarpatska and Chernivetska), they form the majority. This is likely due to the fact that collectivization in these regions did not take place until after World War II, allowing a larger share of the population to continue farming independently once the kolkhozes collapsed. Differently, large-agribusinesses are particularly prevalent in the central and northern regions of Ukraine (e.g. Khmelnytska, Chernihivska, and Sumska Oblasts). In addition to regional variation, the share of large-agribusinesses also varies depending on the crop cultivated. It is particularly high for oilseeds — rapeseed (99%), sunflower (86%) and soybean (90%). For cereals, the role of individual farmers is somewhat more significant, with enterprises accounting for 86% of maize, 80% of wheat and 60% of barley production. Nevertheless, the situation is different for vegetables, potatoes and fruits, where individual farmers clearly dominate (Matuszak, 2021).

According to this information, one could assume that Ukraine is merely *"oriented on that big companies that hold a lot of areas of land and are the main players on the market"* (CP, Pos. 82). In reality though, this perspective is only partly valid. Despite the fact that there is a group of agribusinesses that cultivate more than 100'000 ha of land, there are also enterprise farms cultivating a few hundred or thousand ha and a huge number of entities (mainly family farmers and households), cultivating areas significantly smaller than 100 ha (Matuszak, 2021; Wengle et al., 2024). Based on an analysis of Ukrainian agricultural producers, Stolnikovych (2024) suggests that significant differences in productivity, production patterns, and operational characteristics, allows them to be classified into four different groups: households, small farms (producers with a total area of up to 200 ha), larger agricultural enterprises (producers with a total area of more than 200 ha), and agricultural holdings (see specific characterization of each group in Table 4).

Thereby, according to Stolnikovych (2024), 3.85 million households were engaged in agricultural production in Ukraine, accounting for 28.7% of the total cultivated area, while smaller family farms constituted 17.1% and corporate farms (including private and public enterprises as well as agro-holdings) 54.2% of the total sown area. As already mentioned though, there are significant differences in production. Large agricultural enterprises and agro-holdings mainly cultivate export-oriented grains and oilseeds, while households and smaller family farms primarily focus on niche cereals and account for the vast majority of the domestic production for products such as vegetables, fruits, milk and meat (Matuszak, 2021; Stolnikovych, 2024; Wengle et al., 2024), thus representing important pillars for domestic food security (Wengle et al., 2024). Therefore, in terms of production output, it is hardly surprising that large scale agricultural enterprises produce more than other forms of farms (R2; CP). However, it is not the large agro-holdings that dominate, but in fact, *"medium sized enterprises [referencing 2000 ha] are the backbone of the [Ukrainian] agriculture. They produce... 60% of all crops in the country. 30% is produced by huge agro-holdings and 10% is produced by small farms"* (R4, Pos.

108). Thus, "Ukraine's agricultural landscape is marked by a diverse array of producers, each playing a crucial role in the sector's overall performance" (Stolnikovych, 2024, p. 4).

Table 4: Types of agricultural producers in Ukraine according to Stolnikovych (2024, pp. 2–3)

Households
Primarily subsistence farming, with surplus production sold in local markets. Farming activities are often conducted by family members.
Not considered entrepreneurial activity and exempt from income taxes on land up to 2 hectares.
Account for 28.73% of the total sown area of cereals and oilseeds in Ukraine.
More focused on production of niche cereals (barley, oats, rye); almost no production of oilseeds.
Yields are significantly lower than those of commercial farms.
Small Farms (under 200 ha)
Family-run farms; labor primarily comes from family members, with external labor used seasonally or for specific tasks.
Yields are higher than households but lower than enterprises.
Tend to cultivate fewer crops simultaneously, as compared to larger producers; mainly focused on cereals.
Higher per-unit expenditures on inputs like fuel and labor, which impacts overall competitiveness.
Face barriers in accessing formal financial services and modern technologies.
Large Agricultural Enterprises (over 200 ha)
Scale and Technology: Utilize economies of scale and advanced technologies, leading to the highest yields across most crops (e.g., wheat, corn, barley).
Crop Focus: Larger farms are more diversified and commercially oriented, producing a wider variety of crops compared to smaller farms.
Cost Structure: More efficient in managing input costs due to access to bulk purchasing and better technology, resulting in lower per-unit input costs.
Productivity: Higher overall productivity and efficiency compared to smaller producers, particularly in key cash crops like wheat and sunflower.
Agricultural Holdings
Consist of a parent company managing multiple agricultural enterprises, often controlling thousands of hectares of land.
Typically, part of vertically integrated structures, allowing for centralized management along the supply chain and access to external capital.
Achieve higher yields than independent farms, but also face higher operational costs due to extensive use of inputs.
Better positioned to absorb shocks and manage risks due to diversification, access to finance, and centralized management.

6.3 Ownership and Access to Agricultural Land

As seen in Section 6.1, just after the adoption of the *Land Code of 2001*, a moratorium on land sales was imposed, depriving around 6.92 million landowners of the right to sell the plots they had received during the land distribution of the 1990s. Since then, land relations in Ukraine have developed almost entirely on a rental basis (Kvartiuk et al., 2020). Thus, an increasing number of agricultural producers have depended on land leases (Wengle et al., 2024). The rent for both public and private land has been regulated by the *Law on Land Rental from 1998*. Under this legislation, agricultural land leases are limited to a duration of no more than 50 years (Kvartiuk et al., 2020).

As seen in the last Section, Ukrainian agricultural producers can be divided into four groups (cf. Stolnikovych, 2024). While households operate mainly on owned land, although growth is achieved by leasing additional land from other owners, the other three groups operate mainly on leased land (Lerman et al., 2007). This is a direct result of the *Land Code of 2001* and its introduction of the moratorium on land sales, through which "[s]elling the land was strictly prohibited, and the only legal way to assemble a larger plot was renting" (KSE, 2023, p. 13). This was also confirmed in several interviews (see R1; R3; R5; R6; CP; OS) and also by those directly involved in production, as the following statements demonstrate:

> *"Big companies? Mostly they rent land from people. People have usually 2-3 hectares and the big company rents it, pays rent annually and uses the land. Our company rents" (P1, Pos. 136-138).*

> *"We are considered [an] agro-holding, which operates, not owns, operates land" (P2, Pos. 22).*

> *"Most our lands (and this is over 10'000 ha) are used by long-term treaties rent" (P4, Pos. 15).*

In general, the lease market is described as quite beneficial, especially for agro-holdings (R4). The absence of a market for ownership stakes has further depressed rent prices for landowners (see Section 6.3.1)[25], allowing agro-holdings in particular to benefit from cheap leases and the comparatively low cost of land in Ukraine (OS; R5), providing them with a significant cost advantage over farmers in other Eastern European countries (Wengle et al., 2024).[26] Correspondingly, as agro-holdings expand, so do concentration and control of land (Plank, 2013). Hence, there are also some challenges regarding Ukraine's dealing with agricultural land following *Land Code of 2001*.

[25] A large proportion of the land that is not officially registered in the State Land Cadaster of the SGC is said to be illegally leased at very low prices (a.o due to corruption, etc.), which drives down prices for those who want to lease their land legally (Hetman, 2020).

[26] *"[People] gave this land for rent to the agriculture business for nothing. This was really like a big long term contract and it costed nothing, just almost ... $50 per year"* (R3, Pos. 156). Cochet and Merlet (2011) and Plank (2013) even speak of only 12-25 Euro/ha resp. 30 Euro/ha. However, according to Mamonova (2017) and also seen in R1 (Pos. 64), it is not always the case that the landowners only receive payments. In some instances, it is also agreed that they receive a certain percentage of the production revenues.

6.3.1 Competition and Concentration of Agricultural Land

> *"During the last 30 years, we have developed an efficient rent relationship. It's very competitive" (P2, Pos. 261).*

As mentioned several times in the interviews, the lease market is very competitive from a producers' point of view (P2; P4). Good access to land is indispensable for agriculture, which makes careful planning in advance critically important (P4). Consequently, various enterprises are seeking to consolidate their lands, trying to avoid chessboard like fields, where some plots belong to your own company and others belong to different companies, as this is very inefficient in terms of harvesting (R1; OS). Even though this represents a complex undertaking, with the potential of minor conflicts between the parties involved, certain actors have found their own ways to gain an advantage in this competition:

> *"[When] we speak about rental market and farmers starting to compete between each other for renting the land, they try to propose more attractive conditions to landowners. So they propose some additional payments just to proceed this contract with [a certain landowner], not with the neighboring farmer" (R1, Pos. 72-74).*

Although this may appear lucrative for landowners in the form of increased liquidity (R1), it can also ultimately entail consequences. Because, according to Wengle et al. (2024), over the last three decades, there has also evolved a significant shadow economy for land, resulting in the proliferation of informal respectivelly 'grey' lease agreements. Informal and illegal land use agreements could take on various forms and were inherently challenging to document. In general though, they involved the private use of land not officially registered in the State Land Cadaster of the SGC or the State Registry of Property Rights (Kvartiuk et al., 2020) in exchange for undisclosed payments. Even though the prevalence of such 'grey' rental agreements cannot be precisely quantified, they are particularly common in the case of short-term rental agreements (Wengle et al., 2024). According to some estimates, this could potentially concern a third of Ukrainian agricultural land (Hetman, 2020). Thereby, a high level of informality can be problematic in many ways, as it lowers prices and rents for landowners who register their leases legally, deprives the state of tax revenue, and can increase the vulnerability of both owners and producers to illegal enclosure (Hetman, 2020; Wengle et al., 2024).

The keyword 'enclosure' brings us straight to the next (although relative) topic, notably land grabbing in Ukraine. According to Peluso and Lund (2011), various transformative moments — including periods of collectivization and privatization — inspired and reignited debates about the control over land, which is why several authors (Cochet & Merlet, 2011; Mamonova, 2012, 2017; Plank, 2013; Visser & Spoor, 2011) have also engaged with the topic of land concentration in post-Soviet countries, specifically Ukraine. As already mentioned, investors were not permitted to buy land in Ukraine until 1 July 2021, due to the moratorium on land sales of agricultural land. However, according to Cochet and Merlet (2011), this obstacle has not hindered the process of land concentration. In fact, according to them, the very opposite has happened. By concluding lease agreements with the official landowners, investors (mainly

consisting of Ukrainian agro-holdings) are able to access a large number of plots — small in size but forming large contiguous blocks — of the most fertile land at very low cost (cf. OS), and without having to commit a significant amount of capital (Cochet & Merlet, 2011; Plank, 2013). This phenomenon was also mentioned in several of the conducted interviews (cf. R1; R3; R4; R5; R6; OS).[27] However, respondents noted that such cases occurred mainly in earlier times (meaning during the 1990s and early 2000s) and did not, in fact, lead to major conflicts respectively resistance within society.[28] The main reason given for the situation described as *"quite peaceful"* with regard to land distribution (R4, Pos. 98) lies on the one hand, in the fact that *"there is a lot of land here for both, small scale farmers and large agro-holdings"* (R1, Pos. 72) and on the other hand in the history and structure of Ukrainian agriculture. Because, as seen in Mamonova (2012, 2017), rural residents were involved, respectively included in land deals, for instance by receiving payments for the land they leased ('illusive inclusion'), or through employment in the leasing enterprises ('subordinate inclusion'), where their wages typically exceeded those of independent farmers. Furthermore, the country — shaped by 70 years of Soviet legacy — never developed a strong tradition of family farmers who could have been dispossessed or displaced during this process (cf. R4), unlike in more prominent cases of land grabbing observed in sub-Saharan Africa, Southeast Asia, or South America (Cotula et al., 2009; Margulis et al., 2013; Zoomers, 2010). Also, owing to their aversion to risk, many rural residents refrain from engaging in private farming ventures and, consistent with the post-Soviet legacy of industrialized agriculture, actually prefer employment in large agricultural enterprises (Mamonova, 2012). Thus, large agro-holdings are not viewed by rural society as inherently 'bad'. Quite the opposite in fact, since they also provide additional services for people living in villages, in some cases even taking over functions that would otherwise fall under the responsibility of the state (P2).

> *"Agro-holdings, they are adapted to the situation since many years, because they lease huge amounts of land from these smallholders in rural areas. [However], they do not only lease the land, but they also have various corporate social responsibility programs which aim to please the landowners. They build infrastructure in rural areas, support hospitals, schools, kindergartens, sport clubs, etc... yeah, just to make something useful for the village in which they rent land. So the the conflicts are not there"* (R4, Pos. 98).

Furthermore, R6 also noted that, in the case of Ukraine, it is rather difficult to speak of a legitimate 'land grab', suggesting instead that the term 'control grabbing' would be more appropriate, *"because the big companies were not able to buy the land and to own it, but they were able to control it"*, what ultimately contributed to the development of *"quite successful big business in Ukraine, but at the same time at the expense of the small scale development"*

[27] *"It's moderate. If we speak about land grabbing in renting land, it could be on some local levels. Maybe not monopolies, but local market power. A couple of months ago, we had some field visits to Chernihivska, and there the local community complained that there is some local monopolist in their community. This farmer is the only farmer that operates the land and they said that the rental payments are very low"* (R1, Pos. 70).

[28] This, however, could also be a result of the Soviet legacy, as the Soviet peasantry is often regarded as a politically apathetic group, unaccustomed to open forms of protest (Mamonova, 2012).

(R6, Pos. 68).[29] The process was largely driven by unfair contractual conditions, leaving landholders and rural residents with no real choice. Companies offered rental terms that could not be negotiated, and payments were far below the market value of the land. The contracts were long-term and difficult to terminate, preventing many from reclaiming their land even after the agreements had formally expired. There were even reported cases where those attempting to withdraw their land to establish their own farms were either denied permission on questionable grounds or received inferior plots in poor condition. Overall, this reflects a significant power imbalance between local landholders and the large companies leasing the land, amounting to a form of control grabbing, where companies effectively control land without necessarily owning it (R6, Pos. 68).[30]

> *"[However], it's not only about the land, but it's also about in the whole supply chain, that the [big] businesses are controlling. So even if farmers were able to get their land, they wouldn't have access to markets or access to storage facilities. So the big business are controlling land, controlling storage, controlling markets, and exports. In such conditions it's very difficult for smallholders to survive. They still manage to survive, as they found their own niches on local markets or they distribute food through more informal networks. Thus, this is a more a control grabbing, I would say rather than actually land grabbing because the control is more important than land"* (R6, Pos. 68).

6.3.2 Foreign Investment in Ukrainian Agriculture

In addition to domestic agro-holdings, according to Cochet and Merlet (2011), there are also foreign investors who are responsible for 'land grabs' in Ukraine. As Visser and Spoor (2011) state, the post-Soviet Eurasian region has become an attractive destination for foreign agricultural investment, with both states and private companies showing increasing interest in acquiring vast areas of agricultural land. Thereby, the main incentives are manifold, but mainly include the availability of land for extremely low prices — respectively lease payments in Ukraine, as mentioned in previous chapters. For instance, the cost for the fertile black soil are 10 to 15 times lower than in Argentina and even 60 times lower than in Sweden. In addition, the low wages of workers are mentioned. Together with low land costs, these lead to high returns on investment (Cochet & Merlet, 2011; Visser & Spoor, 2011). Investment in the region began in the early 2000s (R6), when Western investors, viewing agriculture as a form of portfolio diversification, entered the sector and further accelerated between 2006–2007. This trend was reinforced during the financial crisis of 2008. While most sectors suffered severe losses, agriculture was regarded as a safe asset (Cochet & Merlet, 2011; Visser & Spoor, 2011). Declining land prices and restricted credit access in Ukraine enabled capital-rich investors to purchase struggling farms and consolidate land assets. Most foreign investors pursued this opportunity by acquiring equity in existing Ukrainian agro-holdings, thereby gaining control over multiple

[29] This also corresponds with Plank (2013, p. 184): "In Ukraine, land grabbing is ... primarily ... about who has de facto control over land."

[30] This is probably partly also due to the fact that few landowners fully understand their legal rights (Visser & Spoor, 2011).

farms and their (mostly leased) land in a single transaction (Visser & Spoor, 2011). Thus, even though foreign investors by law are not permitted to own land, they *"can own the company that owns the land in Ukraine"* (OS, Pos. 227).[31] In recent years, besides Western investors, also investors from the Middle East have increased their engagement, driven by the 2007–2008 food price spikes and the desire to secure food supplies through outsourced agricultural production abroad, thus "bypassing the global market as an intermediary" (Cochet & Merlet, 2011, p. 1). In the case of soy, several countries are involved in 'land deals' in Ukraine (see Figure 6). In terms of hectares, Cyprus (545'418 ha) tops the list, followed by the US (359'305 ha), Luxembourg (316'937 ha), Canada (281'151 ha) and Saudi Arabia (112'744 ha). Many of the largest agricultural holdings are registered in these countries, which naturally strongly influences transnational land acquisitions.[32] In the case of Cyprus, there is a very specific reason. An old tax agreement made Cyprus a 'tax haven' for Ukrainian money. Ukrainian companies took advantage of this to bring their own capital back to Ukraine via Cyprus, free of tax. As a result, the small island became Ukraine's largest 'foreign investor' (Parusinski, 2012).

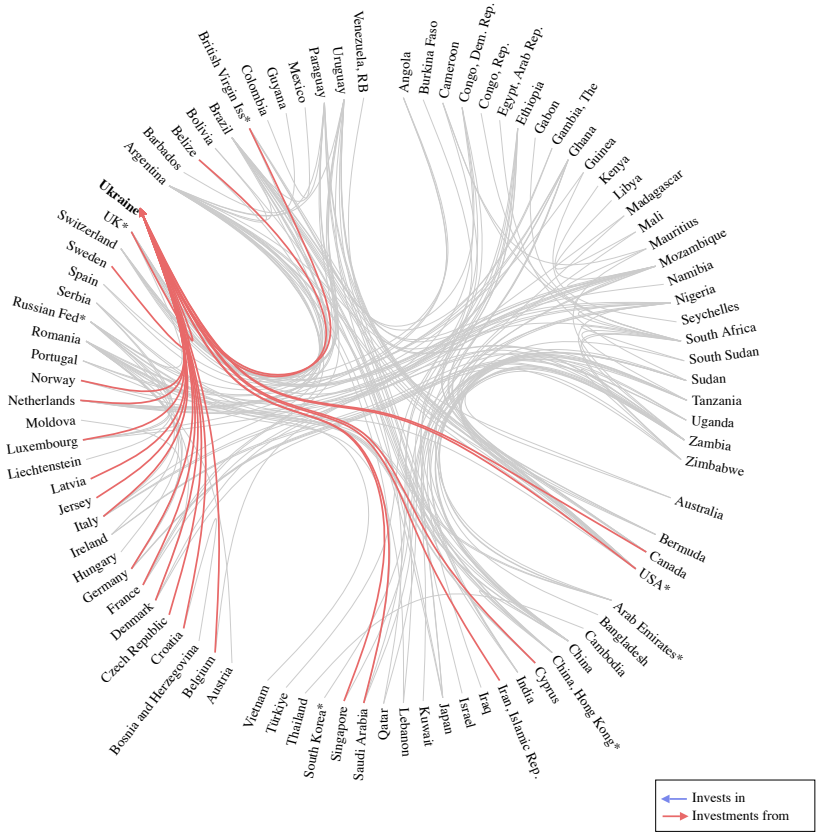


Figure 6: The flow of transnational land acquisitions regarding soybeans in Ukraine. Source: Land Matrix (2024).

[31] This is also the case with certain interviewed producers: *"Well, for example, our company is a company with foreign investments. The owners are German citizens"* (P1, Pos. 156). Another example: *"We have Swedish investors. [At first] they joined partially and then in 2014 they bought 100% of the company"* (P2, Pos. 56).

[32] Kernel, the largest agro-holding company with 510'000 ha, is registered in Luxembourg, while the second and third largest agro-holdings, UkrLandFarming (475'000 ha) and MHP (370'000 ha), are registered in Cyprus. Agroprosperis (300'000 ha) is registered in the US and Astarta-Kyiv (243'000 ha) in the Netherlands (IAMO, 2021).

According to R1, foreign investments are distributed quite unevenly across the agricultural sectors. They are mostly concentrated in the more profitable primary production of grains and oilseeds, and to a lesser extent in poultry meat production. In contrast, investors tend to avoid more risk-prone and less profitable sectors, such as milk production, for instance. And even though R1 admits that there are certain concerns or fears within Ukrainian society that foreign investments might lead to the dispossession of land, there are also many positive aspects to consider. Farms with foreign investments often introduce new, sustainable technologies, have a good approach to land and soil management, and bring certain European standards into Ukrainian farming — developments that are quite beneficial for Ukraine, especially with regard to the country's desired EU accession (R1; R3; R5; P1; P2; OS).

6.3.3 Soil Management in the Land Lease Market

Speaking of the renting system, the manner in dealing with the soil is also a challenge respectively factor that can affect land allocation. Although long-term leases can in practice function as equivalents to ownership rights, in Ukraine the average lease duration has been much shorter, often leading to reduced incentives for investments with longer pay-off periods (Kvartiuk et al., 2020; Wengle et al., 2024). According to Plank (2013), land is generally leased between four to ten years. Among other things, this also affects the soil, as was mentioned in various interviews:

> *"There is irresponsible land use by big companies, because if they don't own the land, they don't care whether this land will be fertile in the years to come. They don't do the rotation, even though ... they are obliged to do. They use the same land to plant corn or sunflower years in a row until the land becomes desert"* (R6, Pos. 84).[33]

However, as seen before in regard to foreign investors and also mentioned by R3 *"a lot of the Ukrainian large [agri]business try to be efficient and don't just waste the land"* (Pos. 156). It cannot be generally assumed that large agribusinesses inherently manage land in an unsustainable way. Notably in the lease market, this may offer such operating businesses a clear advantage:

> *"We sign contracts with people we rent the land from. We don't use chemicals. This is our advantage in working with people you know. People rather give their land to those farmers who don't use chemicals. [Because] of course a lot of fields are situated nearby houses and so on... So of course, it's a great advantage for them if we rent" (P1, Pos. 150).*[34]

[33] This opinion does not represent an isolated case but also occurs in Interviews Wetzels (2020) conducted with local farmers during a seminar organizes by Donau Soja and in other interviews conducted by myself: *"When you rent it, you are just interested to get as much of as possible out of there"* (OS, Pos. 221).
"If you don't own the land, you tend to not be really careful with it" (R3, Pos. 156).

[34] The fact, that the use of chemicals near villages can sometimes lead to conflicts between residents and agricultural businesses is is also addressed in R5.

6.3.4 Lifting of the Land Sale Moratorium

Since the introduction of the *Land Code of 2001*, the question of lifting the moratorium on land sales, has always been a central issue in the debate about land reforms in Ukraine (Kvartiuk et al., 2020). The moratorium was extended again and again. Between 2018 and 2020, the concept of creating an actual land market was further advanced, until the *Verkhovna Rada* on 31 March 2020 finally passed the Act on introducing an agricultural land market, thus lifting the moratorium on land sales. This was done by adopting the Law 552-IX, which enables the gradual introduction of the right to transfer ownership (Matuszak, 2020; Wengle et al., 2024). According to the new legislation, it is possible to sell agricultural land after 1 July 2021 (P4). However, as mentioned, this has been done gradually, so there was a transitional period lasting two years, during which only natural persons were allowed to buy land (a maximum of 100 ha per person).[35] From July 2023, corporate entities are also able to purchase land (up to 10'000 ha). Foreigners though, also including foreign owned corporations, have no right to purchase land until a referendum concerning this issue is held, although a positive outcome of this referendum is seen is very unlikely according to R6: *"No one in Ukraine wants that, according to the opinion pols. I don't know, 80 or 90% of population are against the foreign ownership of the land. So it's no way a referendum will allow this"* (Pos. 82). Furthermore, companies registered in tax havens (cf. Ukrainian Companies registered in Cyprus) or companies whose owners cannot be identified will not be able to purchase land (R1; R4; R6). In total, the law affects 41.5 Mha of land covered by the moratorium (Matuszak, 2020; Wengle et al., 2024).

The lifting of the land sale moratorium was also mentioned and discussed in various interviews (R1; R3; R4; R5; R6; P1; P4; CP; OS), whereby different issues and aspects were discussed in this regard.[36] What can be said so far is that there has been no massive sale of farmland. In fact, according to R1, only 1% of farmland was sold last year, which works against some of the narratives of critics of lifting the moratorium who warned of a major rush on land (R1; R6). It is indeed the case that critics within Ukrainian society believe that land sale markets can lead to the concentration of land, whereby certain actors — in the public debate primarily agro-holdings — can control and manage regions, and that this can lead to monopoly structures (OS; R5). This is particularly prevalent as the Act failed to incorporate restrictions on land, making certain regions vulnerable to such structures (Matuszak, 2020). Indeed, despite corporations being limited to purchasing 10'000 ha, it is thought that through shadow economics and 'illegal' deals, these corporations will still be capable of acquiring more land in some way or another (R5, R6).

> *"They're trying to secure their land banks. Big companies can't buy more than 10'000 hectares. So it's a matter of how they secure their land. There are different ways to do that. For example, establish mini companies or ask their management managers to buy the land and then rent it on a long term" (R6, Pos. 46).*[37]

[35] This excludes the 10.4 Mha of state-owned land, where the ban remains in place (Matuszak, 2020).

[36] It should be emphasized at this point that the information presented does not necessarily represent the personal opinions of the interviewees, but rather the general sentiment within Ukrainian society.

[37] However, it should be emphasized that one cannot simply assume that big businesses are necessarily in

Some critical voices have also questioned the timing of the land reform. Due to the ongoing war, many people have been displaced, and many others are fighting at the front. *"So how can we open land markets while, not all the land users are on their place?"* (R6, Pos. 38). Moreover, there has been widespread destruction of infrastructure and damage to farmland. At some point, about one third of the territory was under occupation, making it impossible to implement land reform in those areas. Despite these concerns, the government pushed ahead with the reform (R6).

However, in addition to the opponents, there are also those who see advantages in the land market. Firstly, it should become more transparent, especially with regard to land deals (R4; R5), if implemented correctly, and even more competitive (R3), which in turn should lead to greater efficiency (R4; R5). This is particularly important with regard to soil, because *"now it's yours and you should think twice what you want to put there"* (OS, Pos. 219). In fact, in several interviews (R1; R3; R4; R5; R6; OS) it is mentioned that actual ownership of the land should lead to greater responsibility and more sustainable use of the soil. Because, if they *"own the land it stimulates them to invest more in the land, it will make them more responsible towards the land. Because now they all think is short term. But it's important when you do agriculture to do it for the long term and take care of the land, invest in... infrastructure (e.g. irrigation systems)"* (R6, Pos. 82). P4 also addresses this point, explaining that the introduction of the land market opens up new opportunities for investment and facilitates more effective planning, thus likely enhancing their productivity of crops, especially soybeans (P4).

At the moment, *"the majority of players are not active in buying or selling the land, they prefer to rent the land"* (R1, Pos. 164). Indeed, the war also appears to be one of the reasons why there have been relatively few land sales so far. On the one hand, the rural population lacks financial resources, and, as noted by R1 and CP, purchasing land represents a major investment that is not an optimal strategy during wartime.[38] Incidentally, this does not only affect small businesses or private individuals, but also larger entities such as agro-holdings. According to CP, the open land market (at the moment) does not really stimulate them to buy land, as the high investments do not generate quick returns, which would of course be particularly important, especially in times of war. Therefore, *"when we speak about land market, we cannot say that big holdings want to buy lands"* (CP, Pos. 159). That is at least the current situation. However, as the majority of the interviews suggest, it is still too early to assess how the land market will ultimately affect Ukrainian agriculture. It remains to be seen.

favor of the land reform, while small farms are opposed to it (R6).

[38] However, as P1 points out, the fact that people have little money due to the war can also lead them to sell their land.

7 Soy Production in Ukraine

7.1 Development of Soy Production in Ukraine

"Soybean is not a crop that was traditionally grown in Ukraine like wheat or barley" (R2, Pos. 10). And even though it is quite difficult to elaborate exactly how soybean cultivation proceeded and developed in Ukraine, especially during the Soviet times, certain points regarding Ukraine's history with soybeans have been identified.

7.1.1 Introduction and Development of Soy until 1991

What is known, is that Europe's soybean pioneer Friedrich Haberlandt, of the Imperial-Royal College of Agriculture in Vienna, had a total of 128 trial sites scattered across Europe between 1875 and 1878 as part of his *'Studien und versuche über die Anbauwürdigkeit dieser neu einzuführenden Culturpflanze'*, of which some were also located in Ukraine (Korchahina, 2025). This means that the beginning of Ukrainian soybean history can be traced back to the 1870s (Korobko, 2021), more exactly to April 1876 (Shurtleff & Aoyagi, 2020). At that time, Friedrich Haberlandt sent soybean seeds to Dr. Nicolaus Dimitriewicz, a former student at the Royal College of Agriculture in Vienna, who later worked as a farmer in the Bukovina region (located in the north-east of the Carpathian Mountains in the border region between Ukraine and Romania). He received a total of 100 seeds, which he distributed among six farmers he knew in south-western Ukraine. While some of those planted seeds were killed by frost, others grew fairly well. A little later, in 1899, Ivan Yevhenovych Ovsinsky from Podolia also conducted experiments with soybeans. After numerous unsuccessful attempts, he succeeded in acclimatizing two varieties to the region of Podolia, which is characterized by a very hot and dry climate (ibid.).

How production in Ukraine developed afterwards, particularly following the country's incorporation into the USSR, is difficult to determine. However, it may be assumed that production in Ukraine increased steadily up until the outbreak of World War II, as suggested by Ryzhikov (1947), who noted that the war caused severe damage to the USSR and its agricultural output, including soybeans:

> *"The areas sown to soya in the Ukraine, North Caucasus and Moldavia decreased considerably as a result of the war and the temporary occupation. In the Ukranian SSR these plantations decreased by 80 percent, in the North Caucasus by 83 percent and in Moldavia by 77 percent" (in Shurtleff & Aoyagi, 2020, p. 7).*

Afterwards, production likely increased again until 1972, when the USSR suffered a very severe drought, which resulted in extremely poor harvests of grains and soybeans. Consequently, in 1973 the USSR made large purchases of soybeans from the United States. This among other things prompted President Richard Nixon to impose a worldwide embargo on soybeans and soybean products in order to maintain low domestic prices, which have risen sharply as a consequence of these massive exports. The event, referred to in Japan as the 'Nixon shock',

had both immediate and long-term effects, particularly for US soybean farmers. America's main trading partners were dismayed that a nation long regarded as a proponent of free trade would impose an embargo to safeguard its domestic interests. In response, Japan — which at that time was also heavily dependent on US soybean imports — encouraged Brazil to expand its soybean production and establish itself as a reliable trading partner (Shurtleff & Aoyagi, 2020).[39] However, out of fear of losing long-standing trading partners, which in some instances actually happened (e.g. Japan), the embargo was lifted respectively partially liberalized after a while. Soviet purchases of US goods subsequently rose again. In 1976, imports were 20 times higher than in 1970, whereby a large proportion of these purchases were attributable to soybeans and grains for feed. At this time, Romania was the leading soybean producer in Eastern Europe, with a production of 224'000 tons cultivated on 452'000 acres (around 183'000 ha), followed by Yugoslavia. Ukraine, was not yet a significant part of the discussion (Shurtleff & Aoyagi, 2020).

By 1986, while sunflower remained the leading oilseed crop cultivated in the USSR, soybean production was increasing at the fastest rate, rising from 471'000 tons in 1971 to 703'000 tons in 1986 (Shurtleff & Aoyagi, 2020). According to data from USDA (2025), we see a first entry of soybean production in Ukraine in the year 1987. According to the data, the harvested area contained 74'000 ha, while the production was 85'000 t. At this time soy was not yet exported, but Ukraine actually imported an additional 200'000 t, whereby most of it has been crushed for further usage, primarily feed, as seen earlier.

7.1.2 Development of Soy after 1991

In the years following the dissolution of the Soviet Union in late 1991, domestic soybean production rose notably. According to Shurtleff and Aoyagi (2020), this development was largely attributable to the inability of both Ukraine and Russia to import soybeans from the world market, owing to the severe economic constraints accompanying the transition from a centrally planned to a market-oriented economy. Moreover, the fact that millions of hectares of arable land remained uncultivated yet were well-suited for soybean production further reinforced this trend. Especially since soybeans require comparatively lower input levels than crops such as corn or wheat, particularly regarding fertilizers, agrochemicals, and seed costs. And finally, starting with this period, the European Union, which itself strongly depends on soy imports, faced a significant shortage of non-GM soy protein (De Visser et al., 2014; Ritter & Pugachov, 2023) and consequently turned to Eastern Europe to help bridge this deficit (Shurtleff & Aoyagi, 2020).

However, as can be seen in Figure 7 and as mentioned in OS, CP and R5, although soybean production in Ukraine existed before the 2000s, soybeans were neither a traditional nor a particularly popular crop, but rather represented a niche crop (OS). Consequently, production remained rather small and only limited land was used for its cultivation. The situation began to change in the 2000s, when large agricultural businesses started to emerge (cf. Section 6.1) and

[39] The rest is history... (see. Chapter 4).

attempted to establish themselves in the global agricultural market. They sought to introduce new agricultural technologies, diversify crop cultivation and develop post-harvest processing capacities (CP; R4; R5). Thus, as was confirmed in several interviews, a more intensive and industrial soy production began in the early/mid-2000s, i.e. around 2004/2005 (R1; R2; OS; P1; P2; P4).[40] Hence, soybeans represent a relatively new crop for Ukraine — a development largely driven by growing global demand (CP; P4).

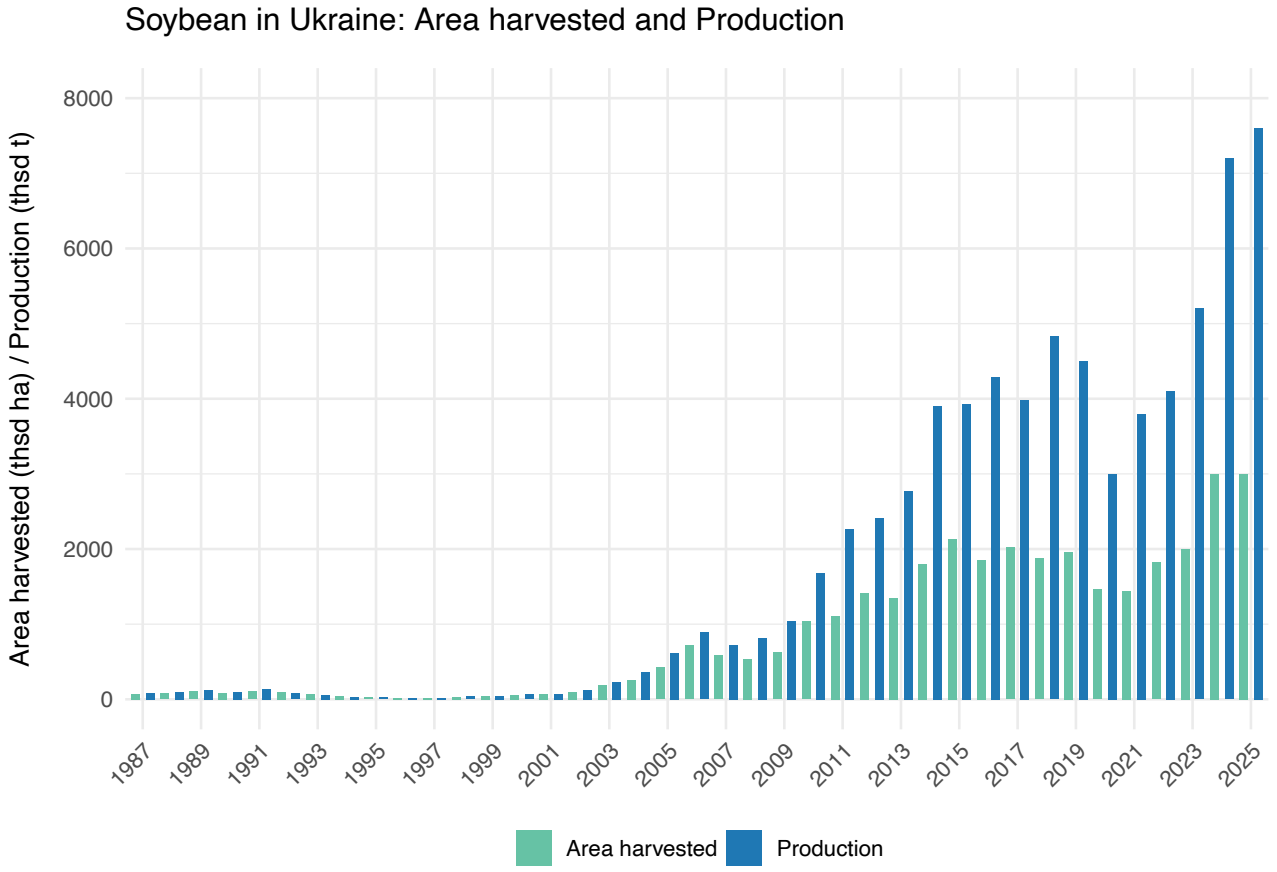


Figure 7: Area harvested and production of soybean in Ukraine 1987-2025. In the 2025 market year, a total of 3.0 mln ha were harvested, producing a new record of 7.6 mln t. Source: own representation with data from USDA (2025).

Nevertheless, in the period from 2000 to 2010 the development in soy production was comparatively slow, but started to drastically increase after 2010 (CP; R4; R5). This, in addition to the fact that soy is a commercially attractive crop, according to OS and CP, is mainly attributable to the introduction of new soy varieties — highly productive and more tolerant towards unfavorable environmental circumstances and diseases — and also an evident improvement respectively availability of agricultural technologies (also evident in yield improvements, see Figure 8).[41] It can therefore be seen that soy production, with some differences between years, increased significantly after 2010 and — with a few exceptions such as in the season of 2020, in which a scarcity of rainfalls led to harvest deficits of about 14% (Ritter & Pugachov,

[40] An example quote from a producer's side: *"So, [we began] roughly 20 years ago when everyone started"* (P2, Pos. 58).

[41] *"So maybe before it was also clear that soy is commercially attractive crop, but technologies were not available. Then technologies came to Ukraine and a lot of companies started to produce soy" (OS, Pos. 52)*

2023) — continues to rise (see Figure 7). Of course, there are regional differences in terms of production volumes. However, as OS claims, an increase in soybeans is evident throughout Ukraine: *"I think it's growing every year and even companies that didn't grow soy, they started to grow it and increase the areas under under soy"* (OS, Pos. 28). This ultimately also led to the fact that this year is *"the record year for soybean production"* (R2, Pos. 12). Today, Ukraine is self-sufficient regarding agricultural production of soybeans. And while there is some domestic demand, the self-sufficiency ratio according to Ritter and Pugachov (2023) and also R2 is exceeding internal consumption by 4 times. Which is why soybean, similarly to the general Ukrainian agricultural industry, is primarily export-oriented.

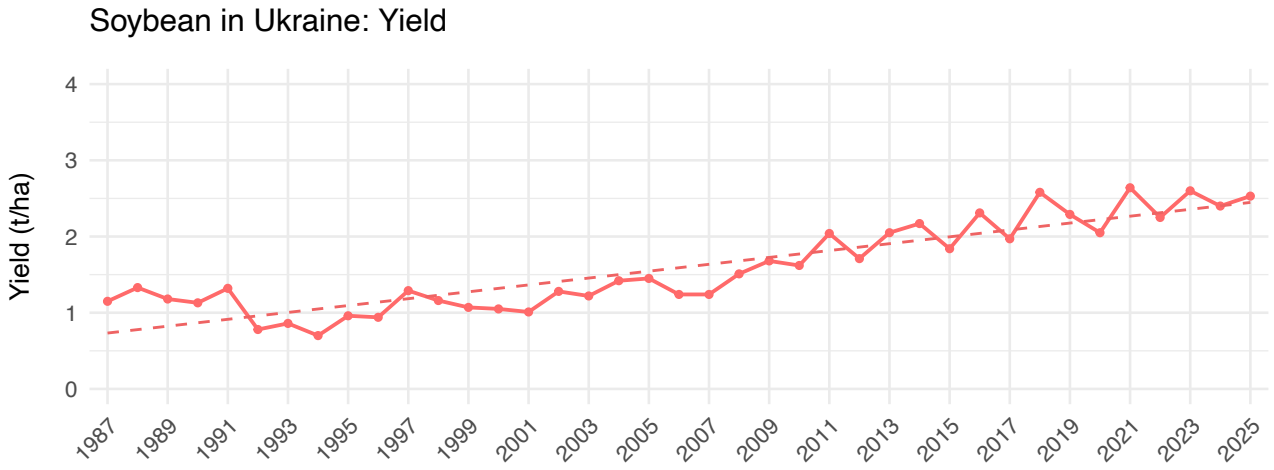


Figure 8: Yield of soybean in Ukraine 1987-2025. The yield for 2025 is 2.53 t/ha. Source: own representation with data from USDA (2025).

7.2 Ukraine's Suitability for Soy Production

There are many reasons explaining the sharp increase in soybean production in Ukraine following its more extensive introduction in the early 2000s. On the one hand, there are the natural circumstances and climatic conditions in Ukraine described in Chapter 6, which create an optimal environment for the agricultural production of different crops, including soybeans (R2; R4; P2; OS). Particularly in the central and north-western regions, where there is more precipitation, conditions are especially suitable for soybean cultivation (P2), which is also the reason this (climatic) region is representatively described as the 'soya belt' (Petrychenko et al., 2024). In addition to the described climatic conditions, Ukraine also possesses exceptionally fertile soils. More than 60% of its territory consists of nutrient-rich 'black soils' with high water-holding capacity (CP). These 'black soils' also overlap with the favorable climatic conditions for soybean production — that is, with the so-called 'soya belt' — which further reinforces the overall natural advantages for its cultivation (cf. Chekhov, 2015; Pantsyreva, 2024; Peretiatko & Rudik, 2021; Petrychenko et al., 2024). These soils have a natural potential to produce high yields, often exceeding the economic efficiency threshold of 2.5 t/ha (CP). Combined with its vast arable land resources, the favorable climatic and soil conditions provide an excellent environment for the profitable and sustainable production of soybeans — especially in the aforementioned central, north-western regions of the country (see Figure 9).

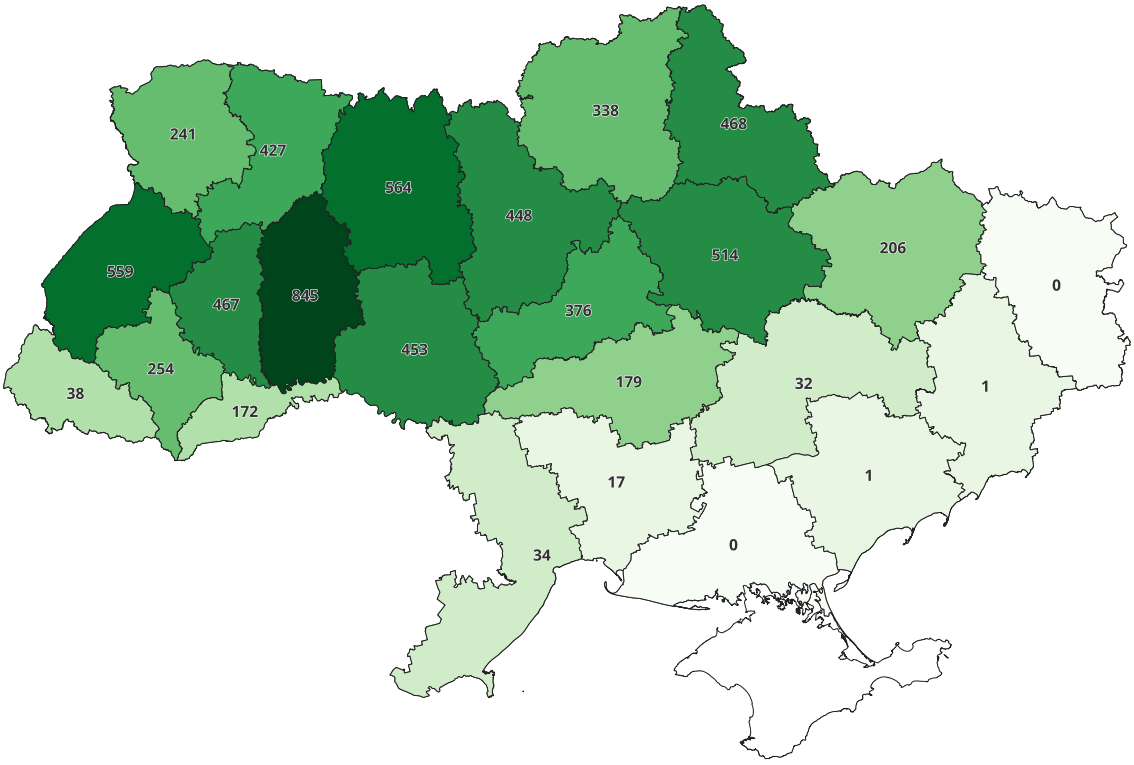


Figure 9: Soybean production in the different Oblasts of Ukraine in 2024 (in thsd t). The most soybeans were produced in the Khmelnytska Oblast (situated in the clearly recognizable 'soya belt'), whereas the lowest quantities were produced in the south-eastern regions, which not only provide the least favorable climatic conditions for soybean production, but were also most severely affected by the war. Source: own representation with data from Ukrstat (2025).

While the natural conditions in central, north-western Ukraine are very favorable for growing soybeans, especially sustainable soybeans, the regions of eastern and southern Ukraine are described as less suitable for soybean production, mainly for climatic reasons. In some interviews these regions are described as being too warm and dry, receiving comparatively little precipitation, meaning that soybean production in these regions is heavily dependent on irrigation systems (R2; P1; P2). However, it is still possible to cultivate soy in these regions. Actually,

> *"before the war, Ukraine has produced a lot of soybeans in the South in the partly occupied Kherson region, especially using the irrigation facilities, which even allowed for two crops of soybeans a year. Currently, there are discussions both in Ukraine and also in EU, among the donors that support the reconstruction of Ukraine, on how to restore and modernize the irrigation infrastructure in Ukraine to have the possibility of two crops of soybeans per year again"* (R4, Pos. 22).

In addition to the favorable natural conditions, there are also other reasons responsible for the drastic increase in soy production in Ukraine. These include factors such as cheap labor force, a lot of know-how, a fairly developed infrastructure, and finally the Soviet legacy (see Section 6.2), which has strongly shaped the agricultural sector and made it a highly industrial one, characterized by scale, efficiency, and managerial practices (R2; R3), primarily oriented

towards the export of the most profitable and globally demanded agricultural crops, including soybeans (CP). In general, Ukraine appears to possess considerable expertise in the agricultural sector, which is also reflected in the large number of specialized agricultural universities across the country (R3). This strong educational foundation will probably also have contributed to the development of a skilled and specialized workforce capable of managing the complexities of modern agricultural production. Moreover, as mentioned in some interviews, people working in the agricultural sector are highly committed to innovation and continuous improvement. Thereby, they are actively trying to adopt new technologies such as the use of digital tools (e.g. AI, GPS navigation and precision farming systems), testing new varieties, or learn to operate under continuously changing conditions to further optimize their production (OS; CP; R3; R4; P2).[42] This commitment to innovation and continuous improvement according to R3, P2, and CP, is mainly driven by a highly competitive environment and the absence of significant state support (e.g. in the form of subsidies, as is common within the EU or Switzerland).

The aspect of export orientation also highlights another factor that makes Ukraine a suitable location for soybean production. Owing to its geographical position, Ukraine enjoys advantageous proximity and connectivity (R1; CP) to its principal markets Europe, Asia, and Middle Eastern and North African (MENA) countries (Van Trump, 2025; Wetzels, 2020). And even though, Ukraine faces strong competition from South American producers when it comes to soybeans, especially regarding price dumping (CP), it also possesses certain advantages in this regard as — owing to its distinct seasonality — Ukraine is able to fill the temporary supply gaps of South American soybeans on the European market during specific periods of the year (R1). Additionally, compared to South America, Ukraine is able to produce more sustainable soybean, which *"meets the requirements of the anti-deforestation regulation that the EU is introducing"* (R4, Pos. 22). This, of course, represents a serious competitive advantage going forward, since soy can be cultivated on Ukraine's abundant agricultural land without requiring deforestation respectively conversion (P2). Furthermore, alongside its advantage of a deforestation respectively conversion-free production, Ukraine also benefits from a more sustainable and certified non-GM soybean production, strongly promoted by the Donau Soja organization (Ritter & Pugachov, 2023). This provides promising prospects, especially for the European Union — as the most important soybean market for Ukraine (Chekhov, 2015; Korobko, 2021) — to source soybeans from Ukraine for their livestock, industry or other purposes (IT6; De Visser et al., 2014), as only 8% of soybean meal consumption in the EU is covered by domestic production (Ritter & Pugachov, 2023).[43]

[42] As mentioned by P2, technology has developed significantly over the last few years. Nowadays tractors, harvesters, etc. often cost over 300'000 US-Dollars. However, these machines are also much more efficient, as they operate almost automatically using GPS navigation and thus are considerably less labor-intensive. During wartime though, these developments can also sometimes cause issues. For example, if there are air attacks, air defence disables GPS navigation because drones etc. are guided by GPS, which as a consequence also disables these automated machines (P2).

[43] Including non-EU countries, 22% of soybean meal consumption is covered by domestic production. Thus, non-EU countries play a substantial role in the European soy supply (Ritter & Pugachov, 2023).

7.3 Main Actors in the Soy Production of Ukraine

> *"Regarding the current development, soybean as a classic technical, industrial crop, is majorly cultivated by medium- and large-scale producers. Because the farms with more than 500 hectare collectively produce around 60% of the total production and farms with more than 2000 hectare produce around 30% of the total production. So it's a classical industrial crop" (R2, Pos. 47).*

This estimate is very similar to my own calculations based on data from Ukrstat (2025). According to my calculations, households in Ukraine are responsible for only 4.9% of soybean production, while the remaining 95.1% is produced by private farms (21.6%) and enterprises (73.5%).[44] If we look only at the combined share of enterprises and private farms (95.1%) and analyze the production volume according to the size of the agricultural entity, the statements made by R2 can also be substantiated by data. Together, enterprises larger than 500 ha are responsible for 58.2% of total soy production, while 28.8% is produced by farms larger than 2000 ha (see Figure 10).

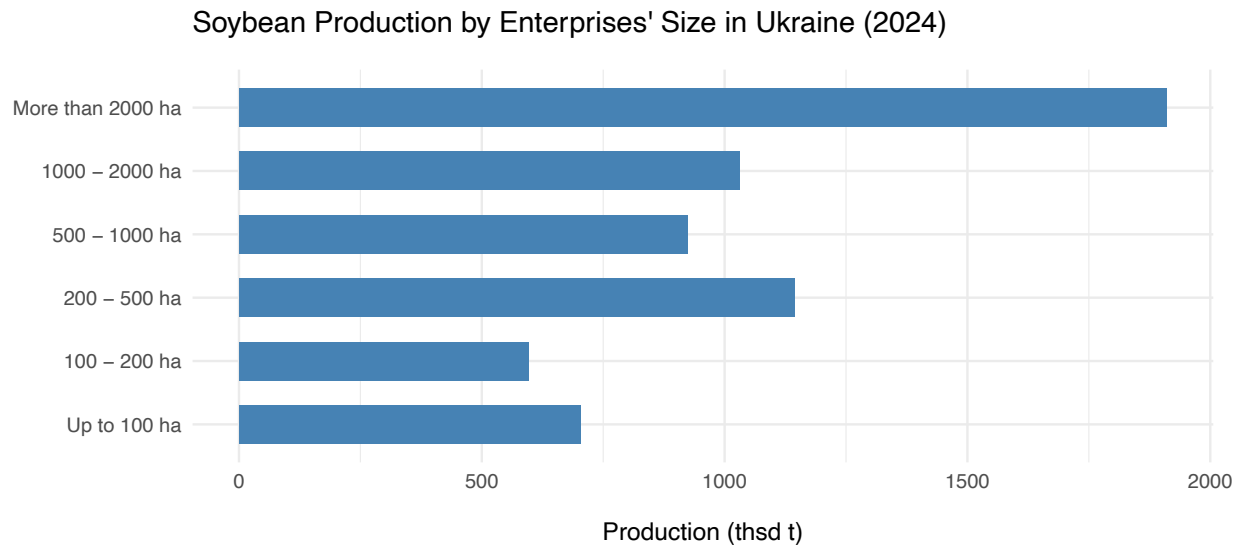


Figure 10: Soybean production per enterprise according to farmsize (2024). Large agricultural enterprises and agro-holdings covering more than 2'000 ha constitute the largest producers of soy in Ukraine. Source: own representation with data from Ukrstat (2025).

The reasons for this are manifold. Beyond the already mentioned great global demand of soy, which is more appealing to large export-oriented agricultural companies than more domestic-focused small-scale farms, R1 argues that it is primarily scale effects that enable these businesses to produce grains and especially oilseeds more efficiently (in an industrial sense) and accordingly in larger quantities. In spite of that, it is not only the scale of the enterprise that is relevant in this context. Other aspects are also relevant, such as the recent and ongoing development of agricultural holdings, particularly with regard to vertical integration (R4). Thereby, there is a continuous focus on investing in infrastructure, including harvesters, storage facili-

[44] Private farms in this sense, mainly regard small farms, whereas enterprises contain larger agricultural enterprises and agro-holdings (cf. Section 6.2).

ties, dryers, and processing plants, which improves efficiency and allows much of the production process to be executed internally respectively in-house. Additionally, these larger agro-holdings benefit from well-established networks that facilitate access to various high-quality inputs and technologies. Furthermore, they possess greater experience in exporting commodities and, over time, have developed optimized export channels and logistics. These factors enable larger enterprises (particularly agro-holdings) to gain easier access to markets and to establish an integrated soybean supply chain — from farms to processing facilities and ultimately to export ports (R1; R4).[45] Taken together, these circumstances also explain how larger enterprises, despite their comparatively small number of actors involved in soybean cultivation (see Table 5), account for a disproportionately large share of Ukraine's total soybean production (cf. Figure 10).

Table 5: Number of Enterprises engaged in soybean production. Source: own table with data from Ukrstat (2025).

Farmsize	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Up to 100 ha	7144	6464	6291	6310	7092	9037
100 - 200 ha	1169	1079	1049	1093	1293	1830
200 - 500 ha	928	804	770	797	985	1552
500 - 1000 ha	327	249	229	238	316	543
1000 - 2000 ha	166	136	145	139	159	282
More than 2000 ha	91	63	54	100	127	185
Total	9825	8795	8538	8677	9972	13429

Note: The table includes only enterprises, which in this case comprise both commercial enterprises and private farms. Households are not represented in the table.

As seen in Table 5, 13'429 agricultural entities (excl. households) were engaged in soybean production in Ukraine in the year 2024. There are certain differences between the years though. Whereas in 2019, the number of entities engaging in soy production was quite high (9'825), it dropped considerably by 2021 (8'538). This could be explained by declining yields in 2019 and due to the poor season of 2020 (cf. Section 7.2 and Figure 7). According to P2, the choice of crops depends heavily on previous experiences: *"In agriculture farmers memory is 12 months. Whatever was good price last time, I'll try to do the same"* (P2, Pos. 353). After 2021 and with the onset of the full-scale war in 24 February 2022, the number has risen significantly. Compared to 2021 (8,538), the figure for 2024 represents an increase of 57.3%. While significant increases can be seen across all farm sizes, the largest increase in agricultural entities involved in soybean production, totaling 242.6%, can be recorded in the 'More than 2000 ha' group. As will be discussed in later Chapters, this dynamic is closely linked to the war and its impact on the agricultural sector.

[45]This development is also evident in another interview: *"We used to trade soy when organic export in Ukraine started, it was 2016/2017. Then everything stopped, because farmers or organic companies started to trade themselves"* (P1, Pos. 8).

7.4 Advantages of Soy Production in Ukraine

Figure 11: Advantages of soybean production according to the conducted interviews. Source: own representation elaborated with MAXQDA based on conducted interviews.

Constant Demand and Good Prices: Looking at Figure 11 a little more closely, the term 'demand' was referenced in most interviews. According to various interview partners, the advantage of soy lies primarily in the fact that it is constantly in high demand, even increasing over time (OS; CP; PS; R3; P1; P4). Thereby, the main focus from a Ukrainian perspective is on external demand (R1), with Europe respectively the EU being mentioned in particular (CP; PS). The rising demand is mainly propelled by the consumers' interest in animal — and in the meantime also rising plant-based — protein options (R3; Voora et al., 2024). In addition to high and constant demand, there is also the price — *"Yeah, price, price and price"* (P3, Pos. 33). According to R1, P2 and CP, the agricultural corporations and farmers in Ukraine are strongly profit-oriented, and thus are mainly focusing on crops that are more profitable, and soybean is among these crops. As P2 noted, the price of soybeans in Ukraine has risen significantly, mainly due to the EU's commitment to the implementation of the EUDR announced in 2021 (see Section 4.3). Since then, the price has remained high, reflecting anticipation of the regulation's implementation.

> *"This is price, this is the only price. For example, we have a contract this year … almost 900 Euro per ton [soybean]. And I think our price, without logistics, without our costs, is about 500 to 550 [Euro]. And for productivity of 2 tons per hectare, I think it's not bad money. Because for example barley or oats with productivity, of 5 tons [per ha], our price is 200 [Euro] I think" (P3, Pos. 33.).*[46]

[46]Please note that the price quoted may differ from other prices. This is an export contract price for organic, Donau-Soja certified soy to Germany, which (normally) means a premium price.

However, there is an important thing to note. According to R2, there are almost no farms that are just oriented towards one crop. The majority of farms are multi-crop oriented and thus try to balance and diversify their crop 'portfolio' (R2; R3). The diversification of cultivated crops is partially also considered a reason why soybean production in Ukraine has increased over the past 20 years (R1). Thereby, according to P2, the decision as to which crops farmers choose is highly individual and depends mainly on climatical factors such as weather, precipitation, temperatures during the summer, moisture during the winter, etc. as well as the crops' 'agro-economical' suitability. *"When I speak about about suitability, then it's about the economic situation. Not all farmers will have soy in their crop rotation because they believe more in sunflower, in local demand or they [do not have] enough agronomical knowledge [to cultivate soy]"* (P2, Pos. 28) which could lead to higher production costs. Hence, when considering profitability, it is not only about the selling price but also about the costs associated with production. The 'geo-determined' conditions in which each farm operates thus plays a crucial role in this decision (cf. Section 7.2). As a result, even though soybean cultivation may be technically feasible, some farms might find it more profitable to grow other crops instead. Thus, *"it's up to farmers to decide whether it makes sense economically to seed and grow or [soy] not"* (P2, Pos. 28).

Soil Management and Crop Rotation: Besides the aforementioned economic incentives for producers to grow soybeans, soy is also very good for the soil, as mentioned several times in the interviews (see R1; R3; R4; OS; CP; PS; P1; P2; P4). There are different reasons for this. Firstly, soybeans are quite unique in that they are able to fix atmospheric nitrogen through a symbiosis with rhizobia bacteria in the soil and convert it into ammonium, which can be used by plants (Korobko, 2021; Peretiatko & Rudik, 2021). As a result, soy on the one hand promotes soil fertility and on the other hand requires less fertilizer, especially nitrogen fertilizers (R1; R3; CP; P1), which in turn reduces its production costs. At the same time, part of the enriched nitrogen remains in the soil after harvesting, which can also benefit subsequent crops. For this reason, soybeans are often used in crop rotations (V. Mazur et al., 2023; Peretiatko & Rudik, 2021; Petrychenko et al., 2024; Tsekhmeistruk et al., 2021). Thereby, *"it can be combined with everything with wheat, with corn, sunflower" (R4, Pos. 26).*

Next to its improvement of soil fertility, which naturally also benefits other crops (R1; R4; OS; PS; P1; P4), soybeans are also used in crop rotation to recover the soil after the intensive and exhaustive production of other crops (R1; R4; P2). *"For example, sunflower or rape seed are very exhaustive for the soil. Therefore, farmers need some legumes to introduce into crop rotation system to increase the nitrogen supply in the soil and soybean fits very well" (R1, Pos. 12).* Additionally, as a result of being less demanding on the soil, soybeans can be grown for two consecutive years, while sunflower and rapeseed require longer crop rotations (P2), which — particularly considering the favorable economic circumstances — represents a further motivation for soy production. Hence, according to OS, its emerging as a an important part of crop rotation for steadily more Ukrainian agricultural entities (cf. also Figure 5).

Technology and Infrastructure: For many farms, especially larger ones already involved in grain production, the shift to soybean cultivation is relatively straightforward. This is because soybean production relies on much of the same technology and machinery, including tractors, seeders, fertilizer spreaders, sprayers, and combine harvesters, which producers are already familiar with. Only minor adaptations are needed, such as adjustments to planting density, harvesting height, and post-harvest processing (P1; P3).

> *"When we started with organic production, we started to grow different grains and oil crops because we can do it with good quality [and it's a stable, workable technology]. We also experimented with lentils, with mustard... but you know, if you grow such crops, you must have special equipment and so problems with technologies are growing. That's why we stopped experimenting" (P1, Pos. 30-36).*

Another important factor in Ukraine is its infrastructure, on the one hand, in terms of logistics (e.g. many geographically well-located ports) as well as its proximity to the EU (P1) and, on the other hand, witg regard to Ukraine's surplus of crushing capacities (R1). Ukraine is a quite successful example regarding the production of added value commodities, especially sunflower oil (R4), where Ukraine ranks 2nd, just after Russia for the year 2025 (USDA, 2025). Numerous processing facilities have been built over the the last 20 years for the processing of sunflower seeds (R4). According to R2, this represents a direct result of increasing export tariffs on sunflower seeds during this time, which also seems to have influenced the producers' decision to switch to soybean production to some extent:

> *"Soybean is especially prominent also because of the... spillover effect from the [sunflower seed] market. Because in 2004 or 2005, the government of Ukraine came up with idea to impose export tariffs on sunflower seeds from Ukraine, because they were about to grow the processing [industry] in the country and this forced Ukraine to process and export the [processed] commodities" (R2, Pos. 10).*

Some of these plants are even multifunctional, according to R1. Thus, when there is a lack of sunflower seeds, these plants try to switch to soybean, which also represents a good strategy to hedge some risks on the sunflower market (R1). In total, according to R1, Ukraine is able crush around 20 million tons of oilseeds, while its production of oilseeds sometimes falls short of this actual figure, leading to under-loaded capacities. However, many processing plants are not multifunctional, and even if they are, this does not necessarily mean that all process steps can be carried out under optimal conditions for different raw materials. According to Demarco and Gibon (2020), soybeans, sunflower seeds and also rape seeds differ significantly in their chemical composition. Sunflower and rape seeds contain a much higher proportion of oil, while soybeans have a considerably higher protein content. As a result, they are usually processed by different methods. In sunflower and rape processing, mechanical pressing is typically used to extract the oil, whereas soybean processing requires a chemical–extractive method, often involving solvents such as hexane, in order to achieve efficient oil recovery. These differences in composition and extraction techniques necessitate specialized equipment and process parameters — for example, variations in temperature, pressure, and solvent handling. Conse-

quently, processing of both crops within the same production line is generally not economically viable or technically optimal, as each crop demands specific processing conditions to ensure maximum yield and product quality (Demarco & Gibon, 2020). Therefore, recently Ukraine has also increased its number of processing facilities for soybeans (Chekhov, 2015). Companies such as Astarta or MHP (cf. Section 6.3.2) are continuing to expand their vertical integration and as part of this built huge facilities for the processing of soybeans, which makes it also more attractive for other farmers and agro-holdings to produce it (R4).

7.5 Modes of Production

After the question of reasons producers grow soybeans, the next question concerns the cultivation method producers utilize in order to produce soybeans. Speaking about the main cultivation methods to produce soybeans in Ukraine, there are basically two main options. The first option represents the conventional soy production which, incidentally, involves the use of synthetic fertilizers, pesticides and modern technologies to maximize yields. The second option is cultivation according to organic standard, thus avoiding the application of synthetic chemicals and relying on the use of natural cycles, regulated crop rotation and biological fertilizers and pest control (P1; P3; R6; cf. Grabovskyi et al., 2023; Petrychenko et al., 2024).

7.5.1 Organic vs. Conventional Production

According to Cavigelli et al. (2008), the soybean yield in organic systems is on average 19% lower compared to conventional systems. Dozet et al. (2014), even report that the average yield of conventional production exceeded the one of organic soybean production by around 24%. This is mainly caused by increased weed competition, which is experienced in organic cultivation (Cavigelli et al., 2008). "Weed control is often a challenge in organic cultivation since producers are limited to mechanical and biological weed control, while conventional agriculture applies mechanical, biological and chemical weed control practices" (Grabovskyi et al., 2023, p. 106). The average price of organic soybeans though, was approximately 30-38% higher than that of conventionally produced soybean (Grabovskyi et al., 2023). Currently, soybeans produced in compliance with organic standards account for less than 0.1% of global soybean production. Nevertheless, global output of organic soybeans has been showing a gradual upward trend. Considering climate change, it would be particularly important to adapt cultivation methods, since it is projected that organic crop production consumes 39% less energy and results in 77% lower greenhouse gas emissions on average compared to conventional crop production (Grabovskyi et al., 2023).

In the Ukraine, too, a certain proportion of soybeans are grown organically.[47] However, the organic sector in Ukraine is estimated to be very small (R6; P2). CP, for instances,

[47] For example, three of the farms interviewed produce organic soybeans according to various standards, depending on the export destination:
P1: EU Organic Production and Processing Standard; German Standard Naturland; Canadian Organic Standards.
P3: EU Organic Production and Processing Standard.
P4: EU Organic Production and Processing Standard; Bio Suisse Organic.

mentions that only 1% of the entire arable land is used for organic production. This is despite the high potential emphasized by Pantsyreva (2024) for Ukraine to develop further in this sector thanks to its favorable natural conditions, especially in the 'soya belt'.[48] Thereby, the reasons for explaining the small proportion are manifold. Firstly, according to R5, certain standards or requirements (e.g. EU Organic Standard) proved to be difficult to comply with for many Ukrainian producers. Secondly, conversion to organic production takes 2-3 years and is associated with considerable costs (OS; P1). This is due to the fact that, more employees are required and, in most cases, new own machinery and equipment must be purchased (P1; P3). The reason being will be further explained in Section 7.6. *"So it's really expensive to start with the organic production, also because credits in Ukraine have a very high rate. If you take a credit to buy machinery or something else, you have to pay approximately 20% annually"* (P1, Pos. 72), which is why many farmers, particularly small-scale farmers, are not able to afford certification (R6; P2). However, according to P1, once you have established yourself as an organic producer, the costs per ton soybean based on average yields are comparable to those of conventional soy producers. But the expanses are different. As mentioned earlier, in organic production more employees, equipment and machinery is engaged, resulting into higher salary expanses and costs for fuel and spare parts, for instance. Whereas in conventional production, main expenses contain inputs such as agrochemicals (pesticides, mainly herbicides, and synthetic fertilizers). Thus, *"different kind of work with the same cost-price ratio"* (P1, Pos. 64).

According to R5 and R6, a certain distinction must also be made here between the various producers. Smaller producers are often perceived as less harmful to the environment. Although they also use certain chemical inputs, very small, non-certified organic farms in particular use them much less frequently overall. Most of these farms only use one chemical product to control the Colorado potato beetle (R6). Beyond that, they mainly rely on natural or traditional methods and inputs, often also because they lack access to chemical products or because these are too expensive or difficult to obtain (R6). The aforementioned costs of certification are also an obstacle that smaller businesses are more likely to encounter (R5).

With regard to the war, it is certainly the case that the war did not favour conversion to organic production, even though organic producers are less dependent on inputs such as agrochemicals, which were significantly more expensive and difficult to obtain during the war (see Chapters 8 and 9). This is mainly associated with the fact that conversion requires high investments, which were either not available during the war or were better invested elsewhere in order to survive. P3 also reports that after having certified around 1'200 ha (of totally 2'500 ha) before the war, the company had to stop the process during the war. R6 further questions the impact that soil contamination in occupied, attacked and mined regions will have on the future production and marketing of Ukrainian organic products.

[48] As OS noted though, there are observable improvements towards more organic production happening every year.

7.5.2 GM-Soy Production in Ukraine

Either way, to return to the various cultivation methods presented earlier, with the conventional method, a distinction must also be made between GM soy and non-GM soy. Indeed, even though growing the GM crops is illegal in Ukraine — unless for experimental reasons (R6) — and no GM varieties are registered for cultivation, GM seeds and GM cultivation of soybeans are widely spread across Ukraine (R1; R4; R5; R6; OS; CP; P1; P2; P3; P4; Ritter & Pugachov, 2023; Wetzels, 2020).[49] *"Officially, nobody grows GMO but ... [I know that farmers grow it]"* (P1, Pos. 54). Thereby, it is not totally clear how large the proportion of GM soy is, as there is no official data on the production of GM or non-GMO soybeans in Ukraine. However, according to some conducted interviews, it is assumed that a large share, even the majority, is GM soy. According to R4, 10 years ago, 80% of soybean production was genetically modified. But currently, given that the EU is the main market — connected with Donau Soja's efforts to expand non-GM soy production in Ukraine (R4; P3) — this percentage has probably decreased (R4). In the interviews, estimates of GM soy production range from 50-70% (R4; R5; P2; P3; CP). This is also consistent with information from Wetzels (2020) and Ritter and Pugachov (2023), where, according to market rumors, almost 50-65% of soybeans, 10-12% of rapeseed and almost 1% of maize grown in Ukraine are genetically modified. Furthermore, results of a field investigation conducted in 2018 by Agent Green (Romania) with the support of the Donau Soja Organization, in which 60 large soybean fields were investigated in six major soybean-producing regions of Ukraine, revealed that 48% of soybeans are genetically modified (Ritter & Pugachov, 2023; Wetzels, 2020).

The main reason for the frequent occurrence of GMOs in Ukraine is considered to be a lack of control on the part of the government. This situation, on the one hand, occurs due to the fact that companies are developing more rapidly than the state's regulatory capacity. And on the other hand, the government lacks the necessary instruments and financial resources to effectively regulate or monitor these developments (CP; P1; P2; Wetzels, 2020), as is also shown in the following quote:

> *"From what I see, during the 90s and 2000s, Ukraine made a lot of efforts to decentralize and decrease bureaucracy and make everything possible for farmers. But as a side-effect, it means there is almost no structure that can control whether it is GM or non-GM" (P2, Pos. 44).*

Thereby, as seen in Subsection 7.5.1, and in connection with the narratives surrounding large-scale industrial production in the 3rd Food System discussed in Chapter 3, one would assume that primarily larger agricultural enterprises are engaged in the cultivation of GM soy. As this quote from a Ukrainian seed merchant shows: "Small farmers selling their produce on local markets are now surrounded by plantations growing GM soya, run by conglomerates. Farmers are starting to ask themselves how they will ever be able to pass on fertile soils to their children" (Wetzels, 2021). This, however, should not exclude the involvement of small-

[49] Presently, no genetically modified organisms (GMOs) are officially authorized for agriculture and food production (Sobolev, 2023).

scale farms. While it is certainly the case that large-scale producers are responsible for a large amount of the cultivation of GM soy, small-scale farmers are also involved in its production (R4; R5; P1).

> *"I think most of them [small-scale farmers] produce produce GMO. They are less responsible in that sense and especially during the war, they face huge financial constraints. They have to aim for higher profitability and therefore they choose GM soy, which is more resistant to extreme weather conditions or pests" (R4, Pos. 42).*

P1 and R5 argue similarly, saying that smaller farmers, who do not practice subsistence farming and also produce a certain amount for the market, plant GM soy in order to be able to compete with larger agricultural companies because they need to have the same yields as them. In this context, it is also interesting to see how the situation changed during the war. As can be seen in the aforementioned quote, R4 believes that GM soy was used more during the war. This question was also explored in R6. According to R6, there were certain requirements that were mandatory in relation to GMOs. In the past, companies were obligated to test their seeds to prove that they were not genetically modified. Now, due to martial law, this is voluntary. Consequently, producers cannot be subjected to excessive pressure, since ensuring food production remains essential under the current circumstances (cf. discussions on 'food security'). R6 therefore estimates that even more farmers are using genetically modified seeds during the war, as these have been proven to be more resistant, easier to grow and yield higher returns (OS; R4; R5; P2; PS).[50]

A fundamental question in the discussion regarding GM soy concerns the origin of its seeds. This is not a simple matter, and could not be answered conclusively by the conducted interviews. CP, for example, believes that the seeds are mainly imported (e.g. from countries such as Canada or the US). A Ukrainian seed merchant interviewed by Wetzels (2021) shares a similar view: "GM seeds must have been smuggled into the country, because it is not permitted to grow genetically modified soya in Ukraine". He goes on to claim: "We suspect that the first genetically modified soya was smuggled into Ukraine by a big poultry producer to grow cheaper fodder" (Wetzels, 2021). P2 and Sobolev (2023) share a similar view. According to them, GM seeds were likely imported, probably labeled as regular soybean seeds, and not fully controlled, as comprehensive inspection is difficult and resource-intensive. Once such seeds are present in the country, they are reproduced and spread over time. Subsequently, according to P1 and R6, the product will likely be marketed remotely. R6 even suggested that this could occur through so-called gray markets, while it is also possible that these are traded as regular seeds. It cannot be denied that there still a certain level of informal economy existing in Ukraine and other post-Soviet countries. In fact, such informal economic structures can also enhance producers' resilience, according to R6, as they provide networks to obtain necessary inputs while bypassing certain regulations and formal requirements.

[50] However, it must be clarified that, as already mentioned, there is no available data on this, meaning it is pure speculation.

7.6 Challenges with Soy Production in Ukraine

Even though, as just seen in the last Section, the use of GMO can produce more resistant crops that are generally easier to cultivate and at the same time yield higher harvests, it still poses a challenge for certain producers, especially those who do not practice GM cultivation such as organic producers (e.g. P1, P3 and P4) or generally non-GM certified producers (e.g. P2). Firstly, many organic and non-GM producers struggle with the problem of GM cross-contamination of their seeds and crops (OS; P3), as the following quote shows:

> *"Of course we control our production and seeds for GMO, we pay money for our certification body. And last year we found GMO in our seeds. Theses were seeds from a famous producer and we found GMO. This is a big problem" (P3, Pos. 45).*

According to P3, this is not just an isolated case, but occurs frequently. Incidentally, this applies not only to GMOs, but also to pesticides (see also Section 8.1.3). Thereby, the exact source of the contamination remains unclear. It could already be present in the soil, result from cross-contamination with neighboring GM soybean fields, or stem from other stages of production (e.g. seed production). However, P3 is fairly certain that their own seed suppliers are not responsible. Thus believes that contamination is more likely to occur at a later stage of the commodity chain (during storage of seeds, for instance) where seeds from different producers are mixed. According to Sobolev (2023), the contamination during transport, due to insufficient cleaning of containers, is also conceivable. In this context, P1 emphasizes that it is particularly important for organic and non-GM certified producers to use their own machinery and equipment to minimize such risks. *"You must purchase your own machinery, because when you use rented machines, you don't know if it is clean or not. There might be contamination"* (P1, Pos. 68). The problem of the cross-contamination naturally also affects the producers' reputation, which according to P2 is considered very important and should be maintained as much as possible. Because if customers and partners notice quality issues or have certain concerns about the soybean production in Ukraine, markets can change quickly and rebuilding that reputation can take a long time. In this context, P3 mentioned something similar from own experiences: *"When I spoke with potential clients at BIOFACH, the first question always was: 'Are you from Ukraine? Bad quality, GMO, pesticides...' Every second client told me about this problem, with soybean first of all"* (P3, Pos. 63).

Other risks and challenges faced by Ukrainian producers are very similar to issues other countries are experiencing. From an economic perspective, competition with other producers poses a significant risk for countries that are heavily export-oriented. For example, with Russia, where it often remains unclear how large actual crop stocks are, or through cases of price dumping, whether through Russia or through other major exporting countries within South America (R1; R4; CP). Furthermore, as already described in Sections 7.2 and 7.4, soybean production is heavily dependent on climatic conditions, especially sufficient temperatures, but above all sufficient rainfall, substantially more than for sunflowers or rapeseed, for example. This is mainly because soybeans have relatively short roots compared to these crops and are therefore less efficient at extracting moisture from the soil (R1; P2; CP). *"If we didn't have*

any rainfalls during July and August, our yields can drop to 1.5 t/ha, despite the fact that we had perfect seeding, perfect machinery, perfect [timing]" (P2, Pos. 68).[51] For this reason, soybean cultivation in dry regions (i.e. in the southern parts of Ukraine) is difficult and heavily dependent on irrigation systems (R1; P2; CP). According to R1, this is why, for example, the destruction of the Kakhovka Dam (see more in Section 9.1) in the Kherson region and the resulting disruption of irrigation systems in southern Ukraine led to a notable decrease in soybean production in these areas (cf. Figure 18). As a response, farmers often adopt no-tillage systems or minimal-tillage systems, which are more effective in terms of conserving moisture and enhancing organic matter in the soil. However, these systems also come with some drawbacks, including a higher risk of pest and disease pressure, which in turn is resulting into an increased need for weed control (R1; R4).

Closely linked to this is the problem of climate change, which Ukrainian producers are also increasingly having to deal with — and will probably have to deal with even more frequently in the future. Because as seen in Section 4.3, Lesk et al. (2021) have also predicted that climate change is expected to negatively impact soy production in Eastern Europe, including Ukraine. Farmers are already facing its effects today, particularly increasing drought, as was repeatedly emphasized in the interviews (R1; R2; R3; CP; P2; P3; P4; PS). Good examples of this are the years 2020 and 2021, which were especially atypical. The dry season in 2020, with a scarcity of precipitation, led to a harvest loss of around 14% (cf. Figure 7). In 2021, the opposite occurred with an extra-rainy season, which was less detrimental to yields but still caused certain losses for some farmers (Ritter & Pugachov, 2023). The high variability and difficulty in forecasting make it increasingly difficult for producers to decide on a specific crops to cultivate.

[51] According to Grabovskyi et al. (2023), in 2000, the conditions were so dramatically poor that it led to a loss of 50% of the total yield.

8 Commodity Chain of Soy in Ukraine

After addressing the questions of where, why and how soybean is produced in Ukraine, the following Chapter takes a closer look on Ukraine's soybean commodity chain (cf. Figure 12).

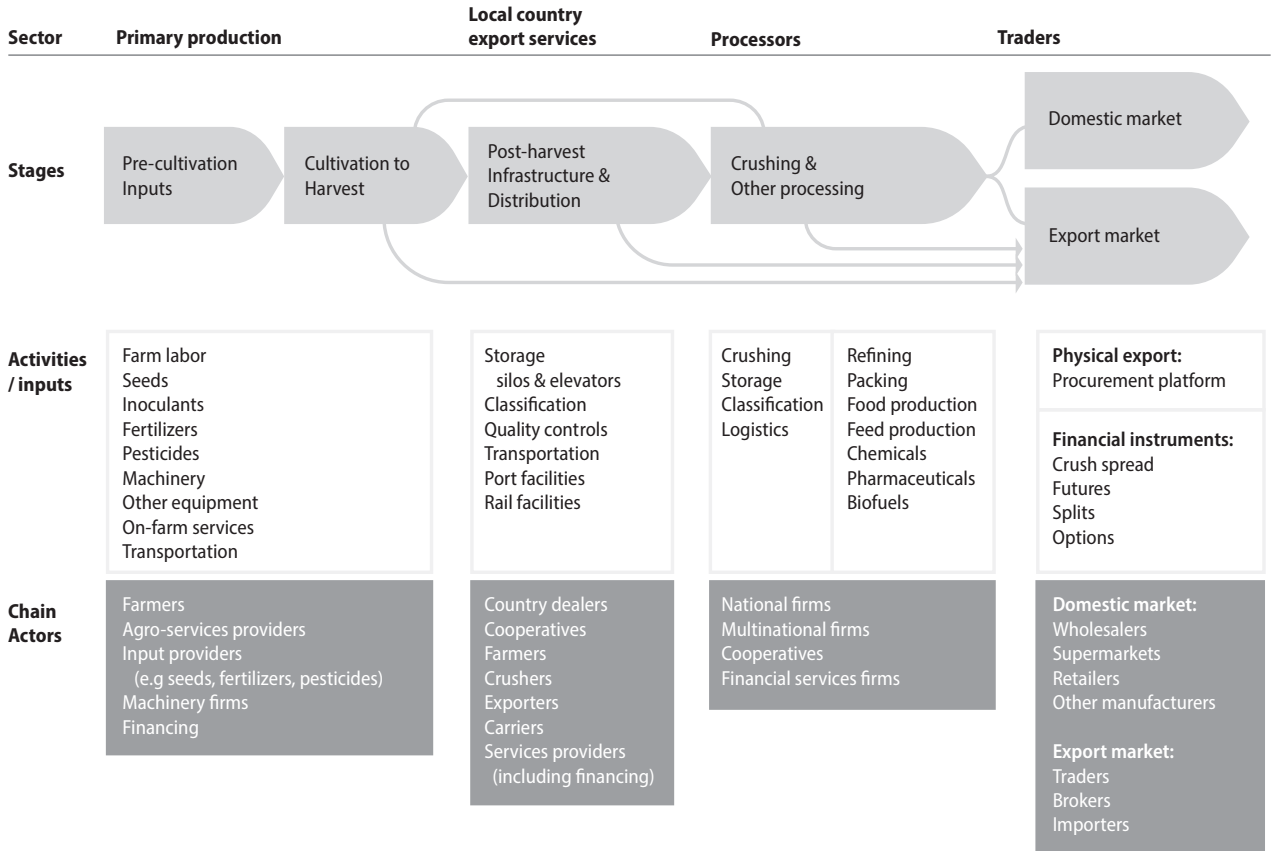


Figure 12: The actors and activities in the soybean commodity chain today. Source: Norberg and Deutsch (2023, p. 157).

8.1 Pre-Cultivation Inputs

8.1.1 Seeds

With regard to soybean seeds, according to R1 and CP, these are predominantly imported from abroad.[52] This statement is essentially correct, but could nevertheless be elaborated in a more comprehensive manner. According to Zakharchuk et al. (2022a), in 2020, Ukraine imported a total of 566 t of soybean seeds. 381 t (67%) from Canada, 96 t (17.0%) from France, 54 t (9.5%) from Austria, and 25 t (4.4%) from the Czech Republic, for a total value of 1.0 million USD.[53] Regardless, according to Zakharchuk et al. (2022a), in 2020, a total of 21.4 thsd t of 'certified' soybean seeds were produced in Ukraine. Which in turn would mean that

[52] *"Ukraine has own seed materials for wheat, and if I'm not mistaken sugar beets. The rest of seeds are mostly imported"* (R1, Pos. 48).

[53] For the year 2024, imports increased slightly to a total of 716 t, while the associated costs almost tripled, reaching 2.9 million USD. Canada remained the leading supplier with 270 t, followed by Austria with 185 t, Romania with 119 t, and France with 86 t (UN Comtrade, 2025b).

Ukraine is not dependent on imports of seed material. However, even though Ukraine produces a relatively large amount of certified soybean seeds, the country still remains dependent on foreign 'breeding material'. This is because most of these certified seeds produced domestically are based on foreign seed selection rather than Ukrainian varieties. In 2020, for instance, out of 21.4 thsd t certified soybean seeds, only about 2.3 thsd t originated from domestic breeding programs, while nearly 18.7 thsd t were produced in Ukraine using foreign seed selection, and an additional 393 tons were directly imported. Over the past decade, the share of certified seeds from domestic breeding has declined significantly from 50% to 10.8% (Zakharchuk et al., 2022a). Thus, to return to the initial statement posed by R1 and CP, Ukraine's dependence on seed imports is not primarily due to quantity, but is rather structural in nature and based on genetic and technological dependence on foreign seed companies and breeding programs.

In 2020, a total of 66 domestic and foreign companies were active in the Ukrainian market selling soybean seeds. Altogether, they registered 86 foreign and 35 domestic soybean varieties on the market (Zakharchuk et al., 2022a). The best-selling varieties for soybean in 2020 were predominantly those of foreign producers, including seed varieties from Euralis Semans (France), Huron Commodities Inc. and Semences Prograin Inc. (Canada), as well as Saatbau Linz eGen (Austria). However, there were also Ukrainian Varieties in 2020 that were sold in good amounts. For example the (1) Almaz variety, manufactured by a Poltava-based breeder and scientist called Lyudmila Bilyavska, the (2) Musa and (3) Siverka varieties, produced by the 'Institute of Agriculture of the National Academy of Agrarian Sciences of Ukraine' and the (4) Oriana variety, from the 'Institute of Feed and Agriculture of Podillya' of the 'National Academy of Agrarian Sciences of Ukraine' (ibid.).[54] In their article, Zakharchuk et al. (2022a) also mention Bayer-Monsanto and Syngenta, which were already discussed in Section 4.2. These companies are all also involved in the seed market in Ukraine, but primarily for maize and sunflowers.

According to R1 and Halytsia (2024), the seed sector represents a very prospective segment within the Ukrainian agricultural sector, especially because of the presence of big actors such as Corteva, Bayer-Monsato, Euralis or Syngenta. In this context, R6 also mentioned some very interesting insights into how some of these large corporations adapted and operated during the war:

> *"During the war, Monsanto has been distributing seeds for free. They labeled it as a 'charity campaign'. Of course we can see it as such, there's nothing in return. But it's also a way for the company to expand its market. And these seeds... you can't reproduce them. Thus, farmers have to buy them every year [anew], so it's making the farmers more dependent on the Monsanto seeds"* (R6, Pos. 28).[55]

[54] There are differences among the producers interviewed, some rely on foreign producers: *"If we speak about soy, mostly it's Saatbau. They have a good quality of seeds and they aren't treated"* (P2, Pos. 92), while others tend to buy their seeds from domestic producers: *"we often buy the seeds from a Ukrainian company"* (P3, Pos. 53).

[55] However, R6 also notes that Monsanto generally has a very good reputation in Ukraine, which is partly due to its diverse responsibility programs (cf. agro-holdings Subsection 6.3.1). However, R6 also believes that it is important to be careful not to become completely dependent on these transnational corporations.

8.1.2 Fertilizers

In addition to seeds, fertilizers are also important at the pre-cultivation input level. According to R2, on average Ukrainian producers consume half the amount of fertilizers per hectare as European producers. This is due, on the one hand, to the modern technologies used in highly industrialized farms and, on the other hand, to the fertile soils and generally good natural conditions (cf. Sections 7.2 and 7.4), enabling to obtain a competitive yield despite smaller applications of fertilizers. However, this does not mean that no fertilizers are used. Particularly, the production of wheat and corn requires a considerable amount of fertilizers, according to CP. Since, in contrast to soybeans, they are not able to fix atmospheric nitrogen through symbiotic bacteria, as described in more detail in Section 7.4. Nevertheless, although soy requires less nitrogen, it still requires a certain amount, especially phosphorus and potassium fertilizers (R4, P2).

> *"The problem? Russia [along with Belarus] are the main suppliers of potassium fertilizers. Thus, Ukraine fell a shortage of potassium fertilizers. Not so much of the nitrogen ones because Ukraine produces some nitrogen fertilizers [themselves]. But again, these nitrogen fertilizers require a lot of gas, which was also supplied from Russia" (R4, Pos. 58).*

As several interview partners confirmed, Ukraine has traditionally been well-positioned in the production of nitrogen fertilizers and is largely able to produce these domestically (R1; R2; R3; P2). However, as seen in the quote from R4, the production of nitrogen fertilizers is also highly gas-intensive, and since much of the gas supply previously came from Russia, domestic production has become increasingly challenging. This problem is further exacerbated by the fact that, many of the country's chemical industry facilities are located in south-eastern areas of the country that are now part of the active war zone and have also become direct targets of Russian attacks (R3; R5; P2). This ultimately resulted therein that *"Ukraine has reoriented itself towards natural gas supplies from EU, which is more expensive than the Russian natural gas, causing a shortage of production of nitrogen fertilizers"* (R4, Pos. 62).[56] In contrast, fertilizers based on potassium were predominantly imported from Russia and Belarus prior to the full-scale invasion (R4), which for obvious reasons is no longer possible. Domestically, it is hardly produced, meaning there is a considerable shortage and soils are gradually losing vital crop nutrients. Over a prolonged period of time, this can lead to significant reductions of both the quality and quantity of the harvest, potentially causing big issues regarding food security and Ukraine's role as the 'Breadbasket of Europe' (UKCEH, 2025). R6 and P3 therefore recommend switching to more sustainable organic fertilizers such as manure, which are available domestically and help to prevent soil depletion. Thereby, according to UKCEH (2025), a possible suggested measure could include the implementation of local systems collecting surplus manure and redistribute it to further farms, along with the sharing of knowledge and experience from Ukrainian producers already performing more sustainable practices.

[56] According to (KSE, 2023, p. 30), the "average expenditures of agricultural producers on the purchase of fertilizers increased 2.4 times."

8.1.3 Pesticides

The high level of development of agriculture in Ukraine not only requires fertilizers but also considerable quantities of plant protection products respectively pesticides. According to Simiachko and Mykhailova (2025), without their use, harvests would probably suffer losses of 33–48% across the entire agricultural sector. In their article, the authors also note that 'technical crops' in Ukraine require the largest amount of pesticides, with a total of 11'766.8 t, whereby the area of technical crops treated with pesticides reached 93.6% of the total cultivated area of these crops in 2024, totaling 1,820 kg/ha.[57]

As Simiachko and Mykhailova (2025) indicate, there consist some domestic producers in this sector (see below). But similar to the example of fertilizers, Ukraine is also dependent on pesticide imports. Therefore, during the war, pesticides suffered a fate similar to that of fertilizers. The loss of agricultural land, the destruction of industrial capacity, the disruption of logistic chains and labor shortages led to a reduction in the use and supply of plant protection products in 2022. The total volume of used pesticides fell by 27.3% to 28.2% in 2022 and 2023 compared to 2021. In 2024, however, the market for plant protection products stabilized again, with volumes of production, exports and imports of pesticides (including insecticides, fungicides, herbicides) increasing, while the average cost for the inputs decreased (Simiachko & Mykhailova, 2025). Thereby, in the period from 2020 to 2024, Ukraine's import markets consisted primarily of three countries: China, France and Germany. China has been the undisputed market leader among these countries in recent years. For example, China's share in 2024 amounted to 58.4% of Ukraine's total import volume (but only 32.8% of import value) in this commodity category (UN Comtrade, 2025b). This partly also explains why the average costs of these imports have decreased, as products from China in this regard — especially herbicides — tend to be cheaper compared to products from Europe or the US (R1; cf. Shattuck, 2021). In terms of specific producers, the market is mainly dominated by transnational corporations, which have already been mentioned several times in this thesis. In terms of sale value for the 2022/2023 season the following companies represent the market leaders: Bayer, BASF, Syngenta, ALFA Smart Agro, DEFENDA, Corteva, ADAMA, Ukravit, and Sumi Agro, followed by many other Chinese companies.[58] The largest component of imported agrochemicals are herbicides and plant growth regulators. They accounted for around 53% of total imports. They are followed by fungicides with 30% and insecticides with 12% (Simiachko & Mykhailova, 2025).[59]

As noted at the beginning of this Section, Simiachko and Mykhailova (2025) argue that, in the absence of pesticide use, crop yields across the agricultural sector would likely

[57] The article does not further specify which crops are defined as 'technical crops'. Therefore, it is quite difficult to assess if soy was classified as a 'technical crop' or as 'cereal and legume crops (excluding maize)'. The amount for the latter classification would be considerably lower with a total of 3'128,4 t and 0,873 kg/ha, whereby 93% of the total area are pesticide-treated.

[58] ALFA Smart Agro, DEFENDA and Ukravit are Ukrainian companies. Products from these domestic companies, like those from Chinese manufacturers, are generally in the cheaper price segment (Simiachko & Mykhailova, 2025).

[59] This would also be suitable regarding soy, because, as we have seen in Subsection 7.5.1, the main problem with organic soy production is weed control, for which herbicides would naturally be an efficient solution, especially in combination with GM soy (cf. Section 4.3).

decline by 33–48%. During the war years 2022 and 2023, pesticide use declined by 27.3% and 28.2%, respectively. However, according to research conducted by R6, based on interviews with different companies and private farmers, this did not inherently lead to smaller productions:

> *"In the first year of the war, there were shortages of many farm inputs, including the chemical inputs. What happened was that Ukrainian farmers used maybe one third less, maybe even half less chemical inputs during the growing period. And the yields were nearly the same as in peace time when they used chemicals according to the recommendations of chemical companies. [...] So overall, industrial agriculture is using more chemicals than it actually needs. The first year of the war in Ukraine demonstrates that" (R6, Pos. 18).*[60]

In addition to the discussion that the use of agrochemicals in Ukraine is generally considered to be rather excessive, a view also shared by P3, there is another issue concerning the use of pesticides in Ukraine. According to R1 and Ritter and Pugachov (2023), the Ukraine also faces widespread use of hazardous pesticides for its soy production. In fact, after the association agreement between the Ukraine and the EU in 2014, by the year 2018 the Ukraine has emerged as the third-largest importer of pesticides banned in Europe, receiving a total of 5'000 t of different agrochemicals. The majority of this was Acetochlor, a herbicide mainly produced by Corteva and Bayer, suspected of causing cancer and adversely affecting fertility. Acetochlor was banned in th EU more than 10 years ago due to its "high risk of groundwater contamination" (Gaberell & Viret, 2020). Besides Acetochlor, there are 35 other pesticides actively used in soy production in Ukraine, that are not approved in the EU and in addition to that, even two pesticides listed as highly hazardous by the WHO — Abamectin, Tefluthrin (Ritter & Pugachov, 2023). *"Every big enterprise, small enterprise, conventional enterprise, are using these cheaper pesticides [mainly from China.], 70% of these are [prohibited] in the EU"* (P3, Pos. 59).

According to R6, there was also an incident were certain EU-banned pesticides were found in grains in Slovakia exported from Ukraine through the established EU-Ukraine solidarity lanes (see Section 9.1) during the war. This is also implicated by P3, who also notes that similar to GM contamination, as seen in Subsection 7.5.2, there is also a contamination with pesticides. Specifically for organic producers, this poses severe challenges, again potentially damaging the producers reputation (cf. Section 7.6 and the Quote therein by P3). But more importantly, this also presents serious challenges for rural populations and ecosystems. According to Gaberell and Viret (2020), in addition to the contamination of soil, water and air, these hazardous pesticides have already led to acute poisoning among agricultural workers and are also held responsible for the decline of bee populations in certain areas.[61] According to P4, there is therefore an urgent need for greater awareness and control in this area.

[60] The term 'chemicals' here refers primarily to pesticides.
[61] The problem with bee poisoning through the use of pesticides was also addressed by R1.

8.2 Post-Harvest Infrastructure

8.2.1 Storage and Logistics

As mentioned in Chapter 6, the Ukraine represents the world's leading exporter of sunflower oil, while also cultivating and exporting a substantial share of corn, wheat, rapeseed, barley, as well as soybeans, of course (see Table 3). In 2021, wheat alone was responsible for an export volume of 50.8 mln t (Zakharchuk et al., 2022b). The export of such enormous amounts naturally also necessitates a lot of storage space. The biggest elevator capacities in Ukraine are located near the Black Sea coast in Odesa, Chornomorsk and Mykolaiv, from where they can quickly be transferred to ships for export (ibid.). For instance, the State Food Grain Corporation (SFGCU) — a state-owned vertically integrated corporation, primarily focused on storage, processing and export — has the largest elevator capacity with 3.5 mln t (ibid.). Besides the SFGCU, most of the storage capacities are owned and thus controlled by large-scale agro-holdings (R6; Suárez & Dreger, 2022), who regard this part of the soy commodity chain as a central component of their approach to vertical integration (cf. R4). For instance, agro-holdings such as Kernel, UkrLandFarming, Nibulon all own elevators with capacities over 2 mln t (Zakharchuk et al., 2022b). Among the producers interviewed, there were also those with a stronger focus on internal verticalization, in terms of storage and logistics:

> *"Talking about verticalization... We have roughly 320'000 tons of storage and 240 rail wagons in our assets. The storages are all equipped with lab equipment as well as drying and cleaning capacities, basically enabling all incoming grains and oilseeds to be in best condition in accordance with all certifications" (P2, Pos. 22).*

However, while incorporating storage into the post-harvest infrastructure of an agricultural enterprise offers significant advantages such as more efficient logistics, the possibility of cost savings and higher margins (cf. R4) as well as improved quality control (cf. Section 7.6), it can also pose issues for those without access to such facilities. Because as Suárez and Dreger (2022) claim, small-scale farmers often depend on agro-holdings, as they are the ones owning and controlling the agricultural commodity chains, including storage (cf. 'control grabbing' in Section 6.3.1). Thus, as small-scale farmers usually lack the capacity to store their crops, they are forced to sell their harvests to agricultural companies with elevators (P2) — sometimes at very low prices (Suárez & Dreger, 2022). Another issue with the storage, which in this case does not primarily affect small-scale farmers, but had an impact across the entire agricultural sector, was the war. "Before the war, new crops moved in and out of grain elevators — from harvest to export — like clockwork. But Russia's Black Sea blockage created a massive pileup" (Alderman, 2022). Enhanced by targeted Russian destruction of storage facilities (see Section 9.1), "room is growing scarce for the freshly reaped crops" (Alderman, 2022).

8.2.2 Crushing and Processing

As mentioned by CP, when private agricultural business started to develop and orient themselves more towards the global market in the early 2000s (cf. Section 7.1), they sought to integrate new crops, establish new agricultural technologies and to develop the post-harvest processing sector in Ukraine. The main idea behind this development was to increase profits, as processed products are more profitable than the raw commodities (Owoeye, 2025), and also to diversify their production portfolios, which helps hedge against market price fluctuations (R3; CP). As demonstrated in the Introduction, the usage of soybeans is highly versatile. They can be processed to soybean meal or oil. While soybean meal is primarily further used for feed purposes, soybean oil is mainly used for the food and feed industry with a small fraction also used for the production of biofuel (CP; P2; P4). An overview of Ukraine's exact processing numbers can be seen in Table 6.[62] While the Ukraine is actively involved in the processing of its soybeans, the domestic processing sector is rather small. Therefore, the Ukraine is still primarily focused on the export of the raw commodity, which is later on processed in EU countries (R3; R4; R5; OS).

> *"Well, we sell it as a raw material. So, we harvest it, dry it and clean it, pack it [into big bags of one ton each] as a raw material. Send it to Europe [mainly Germany]" (P1, Pos. 84-88).*

Table 6: Overview of soybean, soybean meal and soybean oil in Ukraine for 2025 (in thsd t). Source: own table with data from USDA (2025).

	Soybean	**Soybean Meal**	**Soybean Oil**
Beginning Stocks	213	514	7
Production	7600	2291	534
Import	2	2	0
Total Supply	7815	2807	541
Food Use Dom. Cons.	0	0	1
Feed Use Dom. Cons.	275	840	0
Export	4100	1400	530
Ending Stocks	540	567	10

Note: The 2'900 thsd t missing from soybeans is the amount that is crushed into soybean meal or oil.

[62] In 2025, a total of 7.6 mln t of soybean has been produced in Ukraine. Thereof, 4.1 mln t (52%) is exported directly as a raw commodity. 2.9 mln t have been crushed and further processed to either soybean meal or soybean oil, resulting in the production of 2'291 thsd t of soybean meal and 534 thsd t of soybean oil, whereby 50% of the soybean meal — mainly exported to Europe for feed purpose, according to R2 and Owoeye (2025) — and as much as 98% of the soybean oil is also exported. Besides a very small fraction of soybean oil that is used for the domestic food use, most of the soy that is consumed domestically is used as feed. Based on the available data, there is currently no evidence of domestic production of biofuel (USDA, 2025).

However, according to R4 and OS, the processing sector has significantly increased over the last few years (see also Figure 13) and is still in progress, as additional processing facilities are being constructed and further developed (cf. Section 7.4). The sector though, still lacks sufficient capacity, and thus should be expanded even further in the future — possibly with the involvement of major foreign investors — as the potential is definitely there (R1, R4; OS). For the moment though, this means that large quantities of soybeans meant for the EU market, will continue to be transported to Europe as the raw commodity, where they will then be further processed (cf. R3; R5). According to P2, though, this is not entirely unproblematic and represents some issues, especially for non-GM soy producers focused on the EU market. Because, since futures exchanges such as the Chicago Board of Trade (CBOT) are mainly based on GM soy, non-GM soybeans cannot be hedged on standard markets. Therefore, transactions take place directly between buyer and seller — through so-called over-the-counter contracts (forward contracts) — where aspects such as price, volume and delivery terms are agreed individually (P2). However, as P2 further explains, there are only few non-GM crushers, which has led to a certain oligopoly, with a small number of crushers (a.o. ADM) controlling prices. In doing so, these large crushers generate relatively high profit margins, while farmers tend to receive rather modest prices. Since they have few alternatives where to sell their products, as there is no demand for non-GM soy at a price premium outside the EU, farmers are still dependent on these few EU buyers though (P2).[63]

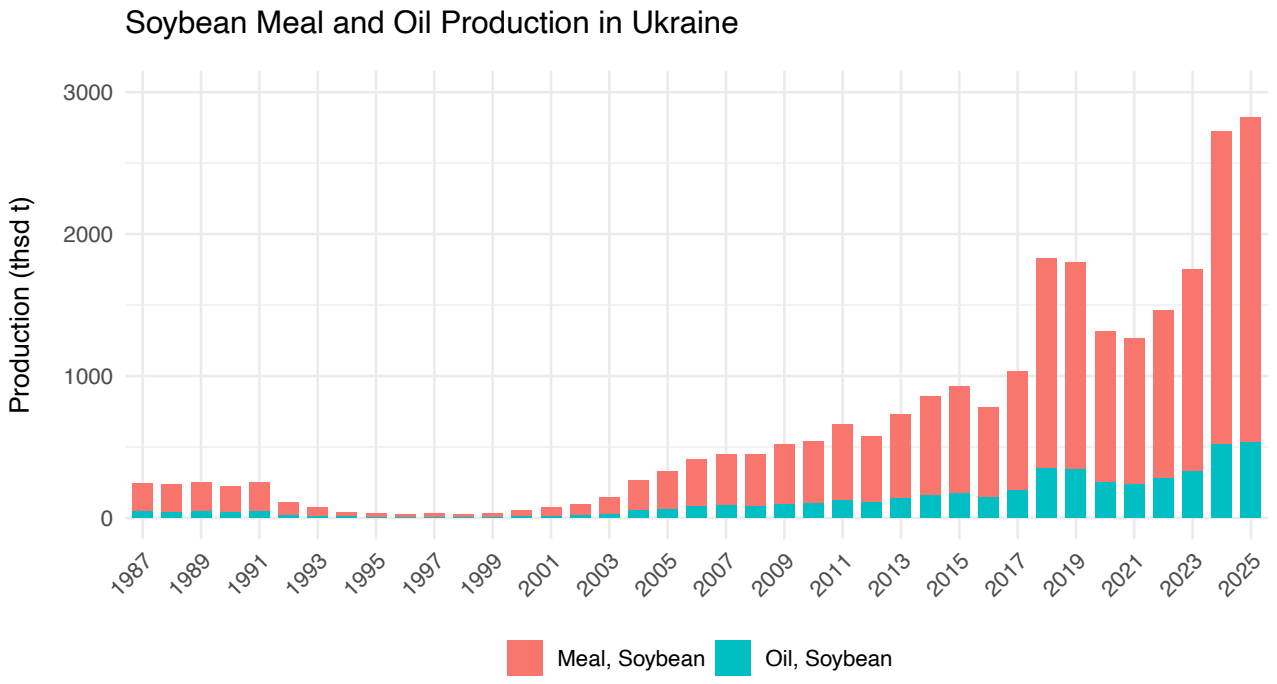


Figure 13: Soybean meal and oil production in Ukraine 1987-2025. Source: own representation with data from USDA (2025).

[63] As also mentioned by P2, this can also influence the producers' decision to grow non-GM soy in the first place.

8.3 Ukraine's Role and Main Markets

> *"Ukraine I would say, has no leading position in soybean production, because the gap in production volumes between Ukraine and Brazil, the US or [Argentina] is quite huge. But nevertheless, we are a regional player for the EU and MENA markets" (R1, Pos. 12).*

Indeed, Ukraine's role in a global perspective is rather small. Even though Ukraine, with a new production record of 7.6 mln t, currently ranks eighth in soybean production for the year 2025, it only accounts for 1.78% of total soybean production. However, Ukraine plays a somewhat greater role when it comes to exports. It ranks sixth in terms of total soybean exports (4.1 mln t in 2025, see Table 6) and is responsible for 2.18% (USDA, 2025). While these figures do not (yet) make Ukraine a global player, the country still plays a significant regional role as it represents the largest soybean producer in Europe (Wetzels, 2020). Thus, not surprisingly, and as already mentioned in several Sections before, *"soybeans are majorly exported to the European Union"* (R2, Pos. 14). This is mainly fostered by factors such as proximity (R1; CP) as well as policy decisions on part of the EU, such as its commitment to deforestation- and conversion-free soy (e.g. EUDR) or regarding the import of non-GM soy (R4; P2). However, although the EU represents the largest market, Ukraine is also an important exporter of soybeans to the MENA region, including Turkey (MENAT). Together, as of 2023, Turkey and Egypt alone, account for almost 50% of the total $1.39 billion soybean exports (see figure 14).[64] Due to the aforementioned EU policies, it can therefore also be assumed that the majority of GM soy is exported to MENAT, where, on the one hand, regulations, restrictions and controls as well as, on the other hand, the actual demand for non-GM soy are not as pronounced as in the EU (R2; R3; R4; P2; P3).

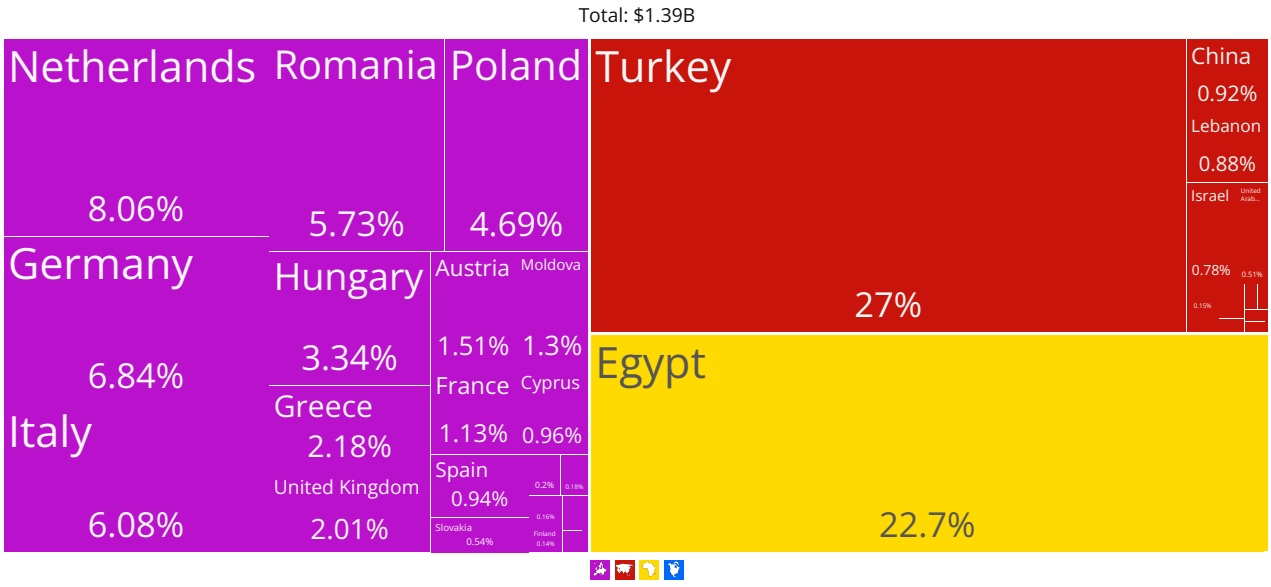


Figure 14: Ukraine soybean exports 2023. Source: (OEC, 2025).

[64] However, as noted by R2, the large numbers for Turkey are not attributable to a large domestic consumption. Turkey acts more as a processing hub, processing Ukraine's raw soybeans and then marketing them further, primarily in the Black Sea and MENA region. *"We call it the Turkey Game"* (R2, Pos. 95).

However, the main markets for soybeans from Ukraine have changed repeatedly over recent years and have also been significantly affected by Russia's military aggression against Ukraine in 2022. Ukrainian soybean markets in 2021 for instance were looking slightly different. Although Turkey was already the largest importer of soy from Ukraine at that time, accounting for 25.5% of imports, Egypt's share was significantly smaller at only 4.1%. Since 2004, Turkey has always been a strong importer of Ukrainian soy, while Egypt has always experienced fluctuations, but they have never imported as much soy from Ukraine as they have in 2023 (OEC, 2025). The total share of soy imports from Europe actually decreased slightly compared to 2021. This is partly due to Belarus, which in 2021 was the second largest importer of soybeans after Turkey, accounting for 18% of imports. With the war though, this situation obviously changed (OEC, 2025; UN Comtrade, 2025a).[65] China's share, as the biggest importer of soy (see Section 4.1.3), was also larger before the war, although still only about 3.4% for 2021. However, as Ukraine's total agricultural exports to China have declined, so too have soybean exports. While in 2021 China was still responsible for around 15% of total agricultural exports, the figure has now dropped to just below 10% (OEC, 2025). According to R2, this is mainly attributable to the Black Sea blockade, which made exporting to distant markets difficult (see more in Section 9.1), and also the fact that Russian companies are offering huge discounts respectively dumping prices for several commodities (up to 30%) for their Chinese buyers.

Besides the war, farmers are also facing various other obstacles influencing soybean production and its markets. Among them are export taxes for instance. According to Van Trump (2025), a new export tax introduced on July 16 in 2025, could reduce overall oilseed production, including soybeans. Ukraine's parliament passed a legislation imposing a 10% export duty on soybeans, rapeseed, and canola. The tax is set to be reduced by one percentage point each year until 2030 and then stabilize at 5% (Reuters, 2025). A similar situation was also experienced between 2017 and 2020, when changes to the Value Added Tax (VAT) on crop exports caused a sharp decline in the cultivated area (Van Trump, 2025). As can be seen in Figure 7, there is in fact a decrease in area under soybeans — from 2.02 mln ha in 2017 to 1.46 in 2020 resp. 1.44 mln ha in 2021. Production during this time also decreased from 4.83 mln t in 2018 to 3.00 mln t in 2020 (USDA, 2025). However, as should also be noted, this tax on soybeans as a raw commodity could, similar to the example regarding sunflowers in 2004/2005, mentioned by R2 in Section 7.4, also be linked to the incentive of expanding the domestic processing sector (cf. Section 8.2.2).

[65] In 2022, imports by European countries increased slightly, which could mainly be attributable to the EU-Ukraine solidarity lanes (see Chapter 9).

9 War Impact on Soy Production in Ukraine

In the previous Chapters, certain challenges relating to soybean production in Ukraine were discussed in more detail (see Section 7.6). However, challenges related to the war were only briefly touched upon and not explored thoroughly. Therefore, this Chapter examines the issues specifically linked to the war more closely. In a further step, the Chapter seeks to understand how agricultural producers adapt and remain resilient under these challenging conditions, with a specific focus on the role of soy.

Even though armed conflicts between the Russian Federation (RF) and Ukraine have been ongoing since at least 2014, following RF's annexation of Crimea, a full-scale war only began on 24 February 2022, when Ukraine was subjected to missile attacks from the RF and Belarus. Since then, numerous Ukrainian cities, towns and villages as well as hundreds of cultural heritages and infrastructure objects have been destroyed (KSE, 2023). Not to mention that RF soldiers have looted homes, shops, and offices, and above all have terrorized the civilian population through acts of violence, including killings and sexual assaults perpetrated against women, teenagers, and children (KSE, 2023). As a result, more than 14 million Ukrainians have left their homes, with 7.9 million of them registered as refugees across Europe. The impact of RF's invasion is immense and has caused enormous losses to Ukraine and its agricultural sector, interrupting the positive development dynamics of the last 20 years. According to Nivievskyi and Neyter (2024), Ukraine's GDP fell by 30% in 2022, whereby the total war damage for Ukraine amounts to 151 billion US-Dollars — almost equaling Ukraine's entire GDP in 2022. The damage to the agricultural sector is also considerable. As of 31 December 2023 the agricultural sector, according to Neyter et al. (2024), suffered a total of 80 billion USD in damages and losses. The damage is estimated at 10.3 billion USD, while total losses amount to 69.8 billion USD. While the value of war-related damages is defined by the amount of physical assets destroyed, stolen, or partially damaged due to military actions and occupations, the losses include challenges such as reduced crop and livestock output, lower domestic prices for key agricultural commodities, increased production expenses and the costs associated with land recultivation (see Figure 15).

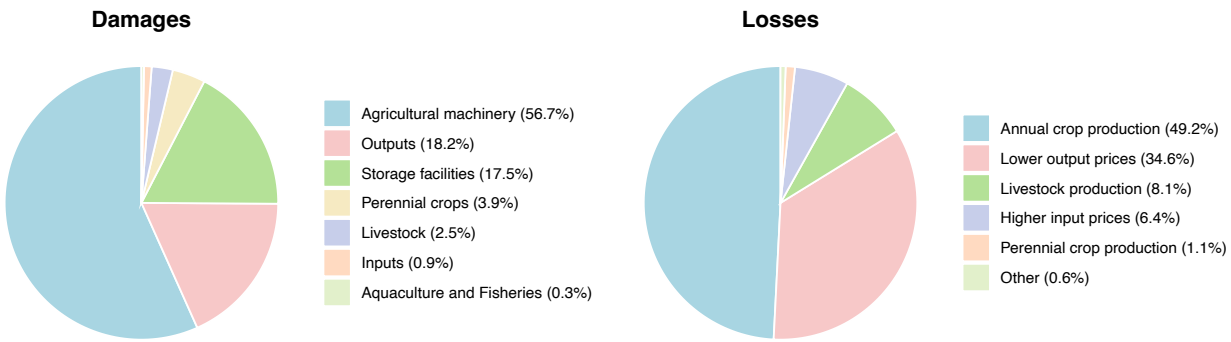


Figure 15: Agricultural damages and losses caused by the war, as per 31 December 2023. Source: own representation based on information from Neyter et al. (2024).

9.1 Main Changes and Challenges in Agriculture caused by the War

"We lose people, we lose workers. Losing workers is not a problem, losing people is a problem" (P1, Pos. 94).

The challenges faced by producers in the agricultural sector during the war were also discussed in the conducted interviews (see Figure 16). Thereby producers during the war faced (and still do so) several related issues that can be summarized into five main problems emphasized in this Section: (1) Occupation and Attacks, (2) Deliberate Targeting of Agricultural Infrastructure, (3) Blocked Logistical Export Routes, (4) Access to Inputs, and lastly (5) Shortage of Laborforce.

Figure 16: Main challenges in the agricultural sector during the war according to the conducted interviews. Source: own representation elaborated with MAXQDA based on conducted interviews.

Occupation and Attacks: The most obvious problem is the still ongoing war and Russia's occupation, leading to a loss of a considerable area of farmland that can no longer be cultivated (R3; R5; P2; P4; OS; CP). According to estimates, at the worst times, this affected around one third of the agricultural lands (R6; Suárez & Dreger, 2022). Added to this is the ongoing danger in the occupied regions, where attacks can be expected at any time. Suárez and Dreger (2022) even report, that Russian troops purposefully bombed tractors in occupied areas. Producers and businesses in particularly affected regions in most cases lost their farms and fields as a result and have had to cease operations (P1; OS; PS). In some instances it is also reported, that the Russian troops 'granted' certain farmers permission to cultivate their fields, under the condition that they signed mandatory contracts, obligating them surrender their yields to Russia (Suárez & Dreger, 2022). Even in areas that are not directly under attack or where the situation has temporarily settled down, farming is often impossible as many fields

are mined and contaminated (R3; R4; R5; R6; CP). Thus, even if the land was theoretically available, this could not be used. Numerous incidents have occurred in which mines have killed people and destroyed machinery. While the latter can be replaced, there is no replacing the people who died while clearing mines or working in the fields (R5). In addition to being mined, the fields are of course also heavily contaminated from an ecological perspective (R3; R4; R6; P2; P3). According to Skydan et al. (2023), Russia's war in Ukraine represents one of the most significant conflicts in terms irreparable damage to the environment in the last 20 years, whether this is through direct combat actions, or also through detonations of fuel and lubricant warehouses, or oil product storages. So far, already more than 250 cases of 'ecocide' have been reported (Skydan et al., 2023).

Additionally, another serious problem is that harvests and inputs stored in the affected regions as well as agricultural equipment such as combine harvesters, cultivators or tractors were systematically destroyed or stolen by Russian troops (CP; PS), resulting in the damages (e.g. 'Outputs', 'Inputs' and 'Agricultural machinery') seen in Figure 15. According to Neyter et al. (2024), an estimated 181 thsd units of agricultural machinery and equipment were either partially or completely damaged, resulting in a total of 5.8 billion USD of damage. Furthermore, the estimated 2.8 mln t of grains and 1.2 mln t of oilseeds located in the occupied territories and considered damaged or stolen, are estimated to cause damages amounting to 1.87 billion USD (Neyter et al., 2024).

Deliberate Targeting of Agricultural Infrastructure: However, even businesses located further away from the immediate front line are by no means safe (R3, PS). Actually, Russia's purposeful targeting of agricultural infrastructure and the blocking of logistical routes for exports has become a prominent trend of the war (Skydan et al., 2023). This affects, for instance, production facilities, parts of the road infrastructure, and targeted attacks on ports and their technical facilities, including processing plants or silos and elevators (R5). Thereby, the regions with the most substantial damages are Zaporizka, Khersonska, and Luhanska, which collectively represent 65% of the total damages (Neyter et al., 2024). However, what was mentioned most frequently in the interviews concerning agricultural infrastructure was the destruction of storage facilities (R4; R6; P2; P3; CP), also prominent in Figure 15. P2 even reports on own experiences in this regard: *"One of our elevators in March 2022 was targeted"* (P2, Pos. 201). According to Albaladejo (2024) and Neyter et al. (2024) an estimated 11.3 mln t of storage capacity is completely destroyed, whereas a further 3.3 mln t storage capacity is partially damaged, equaling around 20% of Ukraine's total storage capacity, not including facilities in occupied area. Thereby, the destruction of storage infrastructure poses a significant problem, as there is no longer sufficient capacity to store harvested products. As a consequence, producers were forced to sell their harvests sooner, which in some cases meant selling at lower prices as there was no opportunity to store their products in order to await and operate in more favorable market conditions (R3).

In addition, although less related to agricultural infrastructure but still impacting it significantly, the destruction of the Kakhovka Dam on 6 June 2023 resulted in catastrophic

flooding of 620 km^2 of land, causing considerable humanitarian, environmental and economic losses (R3; R6; Albaladejo, 2024; Nivievskyi & Neyter, 2024). Nivievskyi and Neyter (2024) further state, that the overall damages and losses to agriculture caused by the destruction of the Kakhovka Dam are estimated at 1.18 bln USD (with losses accounting for 1.15 bln USD and direct damages accounting for 25.7 mln USD). The damages mainly affect the fishing industry (cf. 'Aquaculture and Fisheries' in Figure 15) while the majority of the losses are attributable to the interruption of irrigation of highly drought-prone agricultural land in southern Ukraine (approx 262'000 ha). According to Albaladejo (2024), these areas — belonging to the most fertile and sunniest regions of Ukraine — now depend on uncertain rain-fed irrigation, resulting in significant productivity losses up to 70%. Thus, strongly contributing to the losses in the 'Annual crop production' in Figure 15, and also affecting soybean production in the region according to R1 (cf. Section 7.6).

Blocked Logistical Export Routes: As already briefly mentioned, besides agricultural infrastructure, Russia is also purposefully targeting and blocking logistical routes for export (R3; R4; R5; Skydan et al., 2023), which consequently meant that exporting became much more complicated and expensive (R2; R3; R4; R5; R6; P1; P2; P3; P4; CP; OS; PS; Broyaka, 2025; Murray, 2025), as the following quote illustrates: *"We had remains of products in our storages, but there was a great problem with transportation. It was very expensive and it was very problematic to pass the border"* (P1, Pos. 92). In the conducted interviews, export and logistics related issues represented the most frequently mentioned challenges faced by producers during wartime. Thereby, the most significant impact represent the Black Sea blockade, which impeded to export through maritime ports (R2; R3; R5; P1; P2; P3; P4; CP; PS). As can be seen in Figure 17, this is a very significant event, as in 2021 around 98% of total exports were exported by sea (Top Lead & Latifundist, 2024). Thereby, Russia's blockade of Ukrainian Black Sea ports did not only impact Ukraine itself, but also led to a sharp rise in international food prices and sparked fears of a global food security crisis (Albaladejo, 2024). For instance, according to Glauber and Laborde (2023), Russia and Ukraine account for about 12% of the total calories traded globally. Many countries, especially countries from the MENA region, rely heavily on imports from Ukraine and Russia, as over 50% of their cereal needs and a large proportion of wheat and barley are imported from Ukraine and Russia. However, due to the sea blockade, this supply was no longer possible (Ben Hassen & El Bilali, 2022; Glauber & Laborde, 2023; Leal Filho et al., 2023; Suárez & Dreger, 2022).

In response to the Black Sea blockade, on 12 May 2022, the European Commission and EU Member States bordering Ukraine introduced the so-called EU-Ukraine Solidarity Lanes, enabling the export of blocked Ukrainian commodities through EU road, rail, and river networks. Besides, the EU also agreed on temporary trade liberalization to facilitate trade within the EU and support Ukraine (R2; R3; P2; Albaladejo, 2024). While the Solidarity Lanes enabled exports to be upheld, there were also certain difficulties. Firstly, the neighboring EU-Member States *"were not ready to transport such huge amounts of agricultural commodities"* (R4, Pos. 56). Secondly, according to R5 and Alderman (2022), there were some issues with the railway tracks, as the tracks in Ukraine (Soviet-era tracks) are wider than in EU countries,

meaning it was very time-consuming and expensive to transfer the export commodities from one railway line to another once they reached the border. Hence, overall, transport margins have increased — not only due to the issues described above, but also because transportation itself has become highly risky, as a result of ongoing attacks and related security threats, which naturally drives up costs (R2). *"Vessels that would deliver something — now it's for $15 — they were costing $80.00 [per ton] due to the war, risks etc."* (P2, Pos. 249). Thus, all the price premiums that would have been received had to be invested in logistics (P2; P3), leading to much 'Lower output prices' (cf. Figure 15). And lastly, with the increase in EU imports of Ukrainian agricultural products, there has been growing pressure on prices in neighboring EU Member States, leading to protests among farmers, which ultimately led to export blockages or even import bans (R2; R3; P1; P3; Albaladejo, 2024). *"Polish and Hungarian farmers blocked our trucks at the border for 3-4 days and this was a problem for our clients of course"* (P3, Pos. 9).

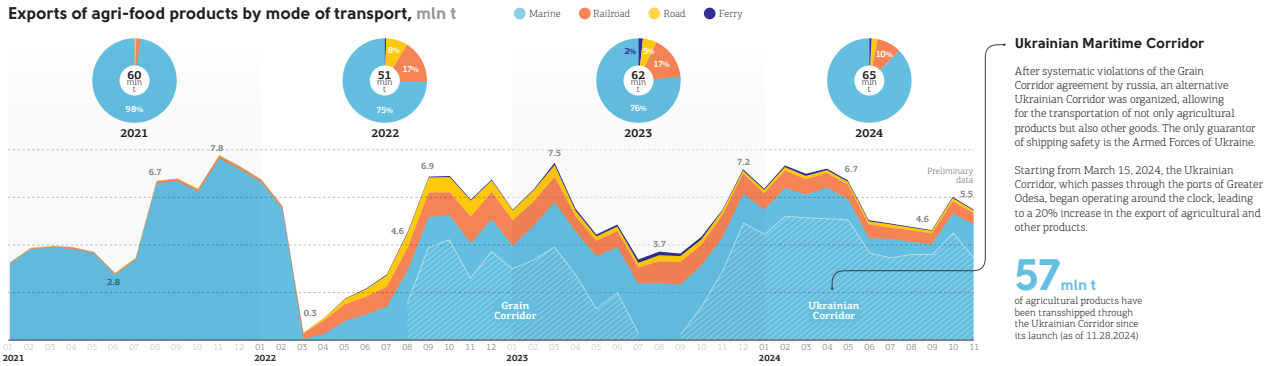


Figure 17: Exports of agri-food products by mode of transport. Source: Top Lead and Latifundist (2024, p. 12).

Parallel to the EU's efforts to establish Solidarity Lanes, the Black Sea Grain Initiative (BSG), supported by the United Nations and Turkey, was signed in Istanbul on 22 July 2022 to guarantee a maritime corridor through which authorized ships could safely navigate through the Black Sea to Istanbul. However, Russia terminated the initiative on 17 July 2023. As an alternative, the 'Ukrainian Corridor' was established (see Figure 17). Through missile and drone attacks, Ukraine has succeeded in driving the Russian fleet out of the western Black Sea, making transport across the Black Sea possible again (Albaladejo, 2024).

Access to Inputs: Closely related to the logistical challenges described above are the problems with access to operating resources, which were also highlighted repeatedly in the interviews. Thereby, this mainly concerns inputs such as fuel, seeds, fertilizers, and spare parts for machinery (R2; R3; R4; R5; P1; P2; P4). According to P1, *"some farms even did not pass the [2022] campaign, because of problems with diesel and spare parts"*, and adds *"...we are situated nearby the border, maybe that's why we passed. We had good partners, our suppliers, they helped us a lot"* (P1, Pos. 92). Indeed, in terms of fuel and fertilizer inputs, the invasion initially led to significant inflation and rising prices worldwide (KSE, 2023; Skydan et al., 2023). At the same time gas production sites and refineries in Ukraine were deliberately targeted. Although

Ukraine is not a major producer, this resulted in the loss of some of the quantities available for domestic use (R3; P1). In addition, imports from Russia and Belarus, which together account for a significant share of global fertilizer production, were cut off (Skydan et al., 2023). The aforementioned Grain Corridor also never allowed chemicals to be transported. *"It was only grains coming in and going out, mostly coming in empty"* (P2, Pos. 187). As a result, Ukraine had to turn increasingly to Europe, as already mentioned, which led to significantly higher import costs respectively 'Higher input prices' (see also Section 8.1.2 and Figure 15). Currency in this situation played another crucial role according to P1. While the Ukrainian Hryvnia has been less stable since the start of the war, the Euro has proven to be much more reliable. Since spare parts and fuel are mostly imported from Europe and their prices therefore depend on the exchange rate, this provides companies that work with the Euro with considerable advantages (P1).

Shortage of Laborforce: One topic that is rarely discussed in the context of damages and losses in the agricultural sector is people, yet they have naturally contributed greatly to this prosperous development of the sector. It is therefore not surprising that people, or rather the lack of them, were described as a huge challenge in the interviews (see Figure 16). The problems described, mainly relate to displacement, migration (internally and externally) and mobilization of people, leading to a significant shortage of laborforce (R2; R3; R4; R5; P1; P2; P3; OS; CP; PS). In particular, mobilization is having a major impact on the agricultural sector, as *"any man from 25 to 60 can be drafted to the army"* (P2, Pos. 207). The producers are thus losing numerous workers to the war zone, either through voluntary enlistment or through compulsory drafts (P1; P2). Unfortunately, *"we understand that some of them they will not come back"* (P2, Pos. 203).

Even though, according to P2, there is criteria in place allowing agricultural enterprises to block certain drafts, there is still a massive shortage, especially regarding male workers employed as harvest and tractor drivers, technicians, etc., whose skill-sets are highly sought after in the army (R2; P1; PS).[66] This has had a significant impact on the sector, as confirmed by the producers interviewed. On the one hand, according to P2, the average know-how in the sector decreases, as new people are less experienced and in some cases less qualified. Since, there is a lack of time and financial resources to 'qualify' new employees to perform more specialized jobs, such as the above mentioned operating of tractors or harvesters, according to R4, this goes hand in hand with higher mechanization, automation and digitalization of processes in agriculture. However, the *"decrease in labor doesn't mean an immediate substitution by technology. People are still needed, and especially educated people are needed. This is a big problem"* (R4, Pos. 56). Thus, according to R6 and P2, male workers that are not obliged to serve in the military are highly demanded, and cause strong competition between producers

[66] In the hope of increasing Ukraine's harvest, a law was introduced that allows certain agricultural businesses to be classified as 'critically important' (economically and with regard to food security), granting them certain exemptions from the call-up. From April 2023, this applies to agricultural enterprises with an area of more than 500 ha and an average of 20 insured employees (Piper & Polityuk, 2023). Additionally, people with more than 3 children under the age of 18 or people required and proven to remain at home to care for sick family members are also not obliged to serve in the military (P2).

(e.g. benefits such as higher salaries, special insurances, etc.). On the other hand, it also led to a significant increase of women working in the agricultural sector, as reported by P1: *"The main effect was that we have more women in our company. They they work in storages, fill big bags, etc. But drivers are still man mostly. We try not to involve women in very hard work, but sometimes we have to"* (P1, Pos. 96-102).

In addition to mobilization, also displacement and migration represent major problems. As already mentioned in Chapter 9, more than 14 million Ukrainians have left their homes, with 7.9 million of them registered as refugees across Europe (Nivievskyi & Neyter, 2024), and others who have found refuge within Ukraine, in central or western regions, for instance (R4; R5; R6). Needless to say, this also has a severe effect on the agricultural sector, as 20% of displaced people were involved in the agricultural sector before the war, according to R4. A special phenomenon is the fact that displaced people have not inherently migrated to the cities, but have also moved to rural areas in central and north-western parts of the country. There, many abandoned houses have been renovated to accommodate the internal refugees, which has led to a kind of 'renaissance' in many places (R6, Pos. 42). The agricultural sector in these regions also seems to benefit, as many (young) people are arriving and engaging in various agricultural activities (R4; R5; R6). However, *"the substitute compared to the labor reduction due to migration and mobilization is not enough... I mean it is not comparable"* (R4, Pos. 90).

9.2 Producers' Adaptations and the Role of Soy

Soybean production during the war has increased drastically. As mentioned in the Introduction, the 2025 harvest even reached 7.6 mln t, thus doubling the pre-war yield of 3.8 mln t in 2021 and representing an all-time record for soybean sown areas and production, according to data from USDA (2025). Even though there was a noticeable increase in 2022 compared to 2021, soybean production started to increase significantly from the 2023 sowing campaign onward (see Table 7). Thereby, this increase can be ascribed strongly to the challenges described before and the producers' subsequent adaptations.

Table 7: Soybean production and cultivation area during the war (in mln t resp. mln ha). Source: own table with data from USDA (2025).

Year	Production	Area	Increase P	Increase A
2019-2021 (mean)	3.8	1.61		
2022	4.1	1.82	7.9%	13%
2023	5.2	2.00	36.8%	24.2%
2024	7.2	3.00	89.5%	86%
2025	7.6	3.00	100%	86%

Note: The increase is based on the mean values from 2019-2021.

The primary reason for the increase of soybean production is not so much due to operational adaptation strategies from producers, but rather to the natural growing conditions and distribution of soybean cultivation, as described in Section 7.2. As can be seen in Figure 9, the most important soybean production regions are located in central, north-western Ukraine and are therefore far less affected by the ongoing war, especially in terms of occupation, direct attacks, or mined fields. In contrast, wheat and sunflower production, for instance, was primarily concentrated in the south-eastern regions (e.g. Luhanska, Donetska, Zaporizka, Khersonska) which were (and still are) highly affected by the war and thus their productions quantities were far more affected compared to soybean (R1).

In contrast to this first reason, the following reasons explaining Ukraine's increased soybean production during wartime can clearly be perceived as an adaptation on part of the producers. According to R5 and UCAB (2025), the rapid growth can mainly be explained by the fact that in the market years during the war, soybeans represented almost the only profitable crop due to favorable market conditions, which is why producers increased its sown areas. Central to this are particularly aspects such as the demand and the price (P1; P3; P4; OS), as seen in Section 7.4. And the price dynamics for oilseeds, especially for soybeans and also rapeseed, were quite supportive during this specific time period, compared to the price dynamics for grains (R2) — a.o. owing to the EU's commitment to the implementation of the EUDR announced in 2021 (see Section 7.4). While favorable market conditions contribute significantly to the increase in production, they only explain a superordinate part and disregard minor aspects encouraging producers to expand soybean production, which is why in the following, a more thorough examination of adaptations to the war-related challenges described previously will be provided.

"The average yield of oilseeds is two times lower compared to grains, but the price of oilseeds, on average, is two times higher" (R1, Pos. 12). Indeed, higher prices of certain crops mean that farmers can plant less hectares, while still obtain the same or even higher revenues (R1).[67] Hence, producers started switching from crops such as wheat or corn to soybean, as long as their given natural conditions (cf. Section 7.2) allowed for it (R2). The fact that the price per ton of soy is considerably higher than that of wheat or corn does not only mean that, theoretically, less land would be needed to generate the same revenues, but also that significantly less storage space is required (R4; P2). As mentioned in Section 9.1, in 2022, when export routes were blocked, harvests piled up in the storage facilities, resulting into an immense shortage in storage capacities. *"Therefore you seeded as much soy as possible. [...] It will give you 3 tons per hectare. So you have to store only 3 tons, instead of 10 tons of corn. [But it still gives you the same revenue]"* (P2, Pos. 363). Additionally, according to R4, soybeans may rather be stored without sophisticated storage infrastructure, which makes the storage of soybeans simpler and less cost-intensive compared to other crops (R4).

[67] This may also possibly prove interesting for producers who lost certain parts of their lands due to the occupation or mining. This could also explain the enormous increases of over 350% in Kharkivska (see Figure 18) Oblast, or the noticeable increases in the Chernihivska and Sumska Oblasts, which were occupied and attacked by Russia in the early stages of the full-scale war and may still be suffering from its consequences.

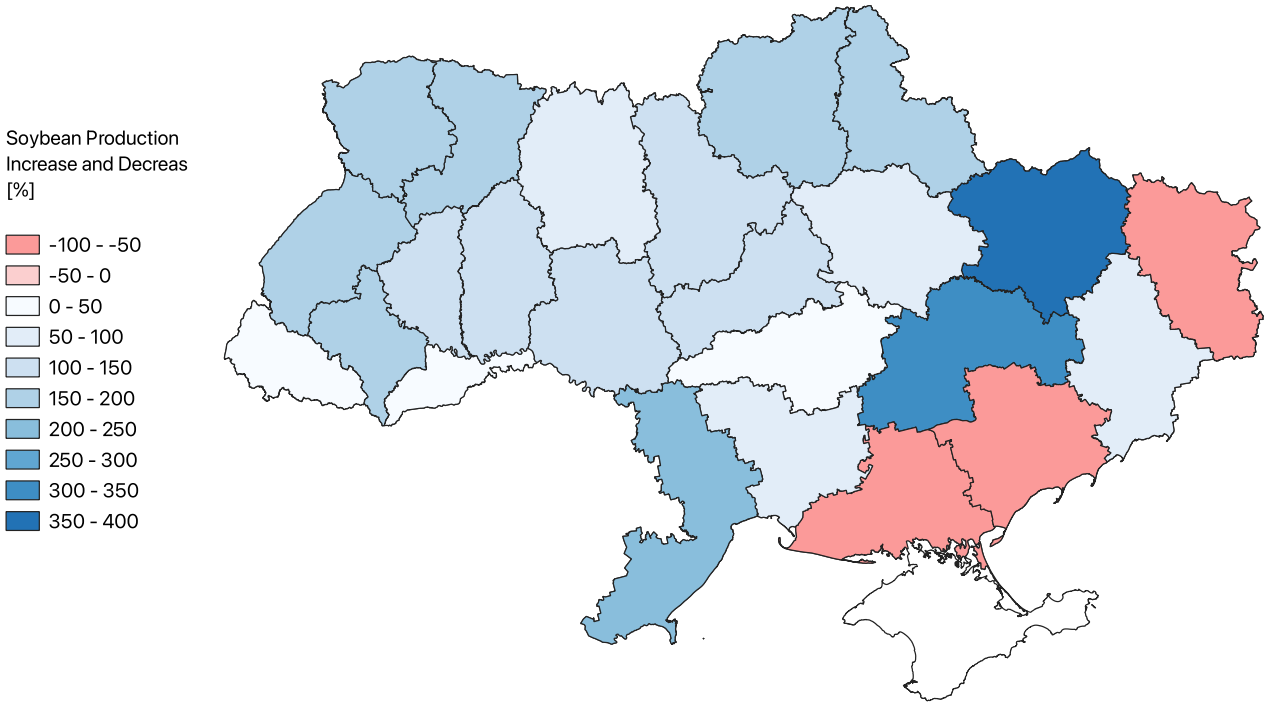


Figure 18: Soybean production increase respectively decrease in the different Oblasts during the war (2024 compared to mean value of 2019-2021). The most significant increases were registered in Kharkivska (350.3%) and Dnipropetrovska (332.7%). Source: own representation with data from Ukrstat (2025).

Besides storage, this also represents an advantage in terms of transportation, as soybeans are way less 'bulky' compared to corn or wheat, for instance, which amidst the logistic issues (cf. Section 9.1) represents a big advantage (R1). As mentioned, transportation — where the price is based on weight — got more and more expensive, which is why producers needed commodities which are not as bulky, in order to safe costs (R1; R4; P2). The fact that soy is relatively insensitive to storage conditions also additionally helps to facilitate transport. This proves particularly advantageous in the context of the switch to rail and road transport and the use of establishing river networks as part of the EU-Ukraine Solidarity Lanes (R4).[68] This leads directly to the next point. As mentioned several times, even before the war, the EU was the primary market for soy, especially non-GM soy from Ukraine, meaning there was less pressure to find new markets and buyers, enabling (deeply needed) fast returns (CP; PS). However, as was mentioned in Section 9.1, there were certain difficulties with exports trough the EU-Ukraine Solidarity Lanes, triggered by protests of farmers from the respective EU Member States (mainly Poland, Hungary and Slovakia), aimed at protecting their domestic production and prices. This consequently led to some exports being blocked at the border, or in some cases even lead to the introduction of export quotas and bans (R3; P1; PS). However, according to P1, this mainly concerned 'sensitive' crops such as wheat and corn. Soy, in contrast, was not regarded a sensitive crop for the respective countries, as its domestic production is relatively small and therefore does not affect domestic prices and production (P1; cf. Lalita AVD, 2025).

[68] This could also explain why particularly regions bordering the EU have increased their soy production (see Figure 18), as it can be exported quicker and more efficiently from these regions.

In general, in order to bypass the various problems associated with the exporting of products, according to Skydan et al. (2023) as well as Suárez and Dreger (2022), different farmers noted that the composition of agricultural crops underwent a slight shift during war, away from export crops to crops with a greater emphasis on the domestic consumption (e.g. more buckwheat, oats, peas), respectively towards industrial crops (including soybean), which can be processed within domestic markets and therefore are not as susceptible to potential export complications. Again, this speaks in favor of soy and the noticeable increases in its — in spite still being rather small — domestic processing sector (cf. Figure 13) during the war (R4; R6; UCAB, 2025). In this context, diversification of production portfolios was frequently mentioned in the interviews as an important adaptation strategy. Producers are expanding their crop portfolios in order to spread and hedge risks (R4; R6). Soy as a 'multifunctional crop' can obviously be very useful in this regard, as it can either be sold on domestic markets for further processing (i.e. for feed, food or industrial purposes), or exported in its unprocessed form (R6, Pos. 86). As further mentioned by R6, soy in this sense could soon be significantly more important for Ukraine, as there are several ongoing initiatives to promote the production of biofuel in order to be more independent in terms of energy.

Another big challenge discussed in the previous Section is the producer's access to inputs, which of course can be explained by the export and import problems described and, at the same time, the massive inflation of input prices caused by the war itself, especially affecting fuel and fertilizers (KSE, 2023; Skydan et al., 2023).[69] As a response, especially in the beginning of the war, producers did not inherently try to maximize their yields, but primarily minimize their input cost and thus perform a more extensive production (R1; R2; R4; R6), by significantly decreasing the usage of agrochemicals such as synthetic fertilizers or pesticides, as well as costs for fuel, machinery and repairs (R1; R2; R6; P3; CP; PS).[70] Subsequently, while small-scale farms still mainly focused on cutting their input costs by reducing fertilizer application, for instance, or switching to the usage of organic fertilizers, such as manure (CP; CP; R1; R6), large-scale producers — also related to the shortage of laborforce — adapted by investing in more modern digital technologies, allowing for more automatization and precision application of fertilizers and crop protection products (R2; R4; R6; PS), which allows for a more efficient use of the agrochemicals and thus also reduces their costs. However, as P2 notes, *"at the end of the day, [producers] always make decisions considering their own budget"* (P2, Pos. 369), which of course also means that not all large-scale producers inherently had sufficient capital to invest in new technology as an adaptation strategy. Nevertheless, to come back to the reason this is relevant regarding soybean production: As input costs are rising and import gets more and more complicated, many Ukrainian producers are switching to soybeans (Broyaka, 2025; Murray, 2025), as they require much less fertilizers compared to other crops (see Section 7.4), and can be grown quite effectively with limited resources, making them more profitable compared to other crops (R2; P4; Ritter & Pugachov, 2023). In this context, as seen in Section

[69] With diesel, not only was it difficult to import, but the available quantities were also needed for the war especially (e.g. for tanks or deliveries of all kinds), which made it even more difficult to use it for agriculture.

[70] R6 even mentioned, that in some cases, although very exceptional, people started plugging their lands with horses and thus had to perform much more manual labor, as there was no more fuel.

7.5.2, there is also a discussion to be held about the role role GM soy is playing in soy's increase during the war, because as several interview partners reported, there was a growing preference among producers, especially in small-scale farming, for cultivating GM soy varieties, as these have been proven to be more resistant, easier to grow and yield higher returns (cf. Section 7.5.2). However, as already mentioned, the data available on this issue is not particularly comprehensive, meaning it is difficult to interpret the impact GM soy had on the increase in soybean production during the war.

9.2.1 Resilience of Agricultural Actors

As briefly mentioned in the last Section, producers' adaptations are also slightly dependent on their scale and investment possibilities. When asked which actors were the most resilient during the war, the answers varied greatly. While some interview partners suggested that small-scale farmers are better positioned to withstand external shocks (R5; R6; PS), the majority of interview partners claimed that large-scale producers were significantly more resilient during the war (R1; R2; R4; P1; P2; CP): *"The larger the farm, the more resilient it is"* (R2, Pos. 111).

Interview partners who deemed small-scale farms to be more resilient primarily justified this with their ability to adapt quickly to changing circumstances. Due to their more manageable scale, decisions can be made faster and cultivation strategies can be adjusted more flexibly (R5). In addition, many of these businesses rely heavily on family labor and are closely embedded in local community structures. This social integration not only facilitates internal organization, but also enables local communities to support each other, further increasing their resilience (R6). At the same time, they were less likely to be targeted by military attacks, as they do not operate any strategically relevant agricultural infrastructure, such as elevators and silos, or storage facilities (R5). A further raised aspect relates to their ability to remain self-sufficient over extended periods, while still contributing significantly to domestic food security, particularly during periods of supply chain disruption (R5; R6). According to PS, this aspect also shifted their perception within society, increasing the priority and commitment given to small-scale farms and local food markets.

> *"The smallholders, they continued their activities and despite all the odds, they are the ones who fed Ukraine, their families and communities. They sent their food to the front, to soldiers fighting in the front line. They are the actual breadwinners of Ukraine in peacetime and also now in wartime"* (R6, Pos. 48).

Nevertheless, not all small farms produce goods for domestic consumption, those that mainly grow grains for export and thus try to compete with larger agricultural companies were significantly more affected by the war, because *"they don't have that control over their whole supply chain, so they're in a less favorable position than big transnational businesses"* (R6, Pos. 46). Hence, they suffered severely from increasing logistic costs (R4) and thus *"had hard times competing with big business"* (R6, Pos. 46).

In addition, it is naturally much more difficult for smaller businesses to obtain loans from banks (R4). However, during the war, measures were specifically taken to support these businesses, as they were considered particularly important due to their role in ensuring local food security. Against this backdrop, the 'Affordable Loans 5-7-9' program was introduced by the Ukrainian government in order to facilitate lending to small farms. Subsidized interest rates give them access to urgently needed financial resources that would be unavailable to them under normal circumstances (R2; R4). Another problem that naturally affects smaller businesses more severely is mobilization. Small businesses not considered 'critically important' naturally have no chance of canceling drafts, meaning that mobilization significantly impacts them (R5).

In contrast, although large-scale producers also face this problem with mobilization, as seen in the interviews conducted, they tend to suffer less than smaller producers, as they have significantly more staff available and are able — as long as considered 'critically important' — to stop certain drafts (R5; P3). In addition, larger companies benefit from more efficient technological equipment. The use of precision farming technologies enables them to use inputs more efficiently on the one hand and makes production less labor-intensive on the other through greater automation, which also provides certain advantages in relation to the mobilization problem. Moreover, many of these farms — provided they are vertically integrated — have their own infrastructure, including storage facilities and logistical assets such as railway wagons or their own transport trucks (see Section 8.2.1 and quote of P2 therein). Besides being less dependent on external service providers, this also allows them to operate more independently and with greater flexibility (R1; R5; R4). Furthermore, as R4 and R6 mentioned, they are significantly better connected to the market in terms of suppliers, among other factors, which also facilitates the import of essential inputs in bulk (cf. quote from P2 in Section 9.1). In addition, as seen in Section 6.3.2, many of the larger companies are foreign-owned, thus allowing them to rely more on foreign investments, which is particularly valuable in the event of a weak currency in Ukraine and reliance on imports of essential inputs, such as gas, fertilizers, pesticides, etc. (P1; P2).

However, there are also certain differences to consider here. Vertically integrated companies were presumably less severely affected, as they have various business areas and can partially offset revenue losses in one area with other operations. Agro-holdings, on the other hand, which specialize exclusively in crop production and often farm very large areas, were severely affected. This was also mainly due to the already mentioned (cf. Section 9.1) low prices, significant logistical difficulties, destroyed storage capacities and interrupted supply chains for important operating resources (R4). Therefore, a certain development is also observable, as agro-holdings are *"trying to secure their export routes and trying to have their own wagons, trains, and channels. They are trying to gain more control on the whole chain and not to use the intermediaries that much"* (R6, Pos. 46).

10 Discussion

The empirical part of this master's thesis has demonstrated that soybean production in Ukraine is determined by various factors such as favorable natural conditions, the existing agricultural structure, economic incentives of producers, as well as an adaptation to challenges regarding the war. This Chapter pursues to contextualize these processes by discussing the findings in regard to the research question(s) and embed them within the theoretical framework.

The main aim of this thesis was to determine **key factors driving the increase in soybean production in Ukraine, particularly in the context of recent geopolitical challenges**. As illustrated in Chapter 7, soybean production in Ukraine has increased significantly since the early 2000s. Besides, the favorable natural and climatic conditions, mainly concentrated in the 'soya belt' and soy's advantages regarding soil fertility and crop rotation, there are also more structural reasons responsible for this drastic increase in soy production in Ukraine. These include, for instance, factors such as cheap labor force and expertise, as well as a fairly developed agricultural sector, which in Ukraine's case is highly shaped by the Soviet legacy. As seen in Chapter 6, in the course of Ukrainian independence and the associated agriculture and land reforms, the so-called *kolkhozes* and *sovkhozes* in a first step were transformed into collective agricultural enterprises (CAE), which, in the wake of subsequent Decrees, have been distributed among the rural population in order to promote private farming. But for various reasons (e.g. the populations' lack of access to financial resources or markets) this largely failed. This led to the fact that the land mainly remained in these CAEs, which later metamorphosed into modern agricultural enterprises and agro-holdings. However, the subsequently imposed moratorium on land sales ensured that Ukrainian rural population retained their land rights, which they leased to agribusiness, while continuing to cultivate their household plots, creating a so-called 'bimodal agricultural structure'. This development has greatly contributed to create a highly industrial agricultural sector, characterized by scale, efficiency, and managerial practices, primarily oriented towards the export of the most profitable and globally demanded agricultural crops, including soybeans. The described development thus laid the foundation for the large-scale production and export of soy as a raw commodity.

Thereby, Ukraine's geographical location and connection to the Black Sea also provides great access to its main soy export markets the EU and the MENAT region, specifically Turkey and Egypt (cf. Chapter 8). The demand from the affected regions is very high. In the EU, for instance, only 8% of the soybean meal consumption, mainly used as feed, is covered by domestic production, leading to a high import dependency on soybeans, which, in addition to large imports from South America, is primarily to be expanded through imports from European non-EU countries, including Ukraine. In addition to the fact that Ukraine can supply non-GM soy, which is more widely accepted by society, soy from Ukraine, in comparison to soy from South America, is also deforestation- and conversion-free, thus compatible with the EUDR, to be incorporated on 30 December 2025 (only for large-scale companies). The anticipation in regard to the EUDR has also had an impact on the price of Ukrainian soybeans, which has remained quite high since its announcement in 2021 (cf. Chapter 7).

As seen in Chapter 9, the high demand and price of soybeans are also a decisive factor, explaining why soybean production has increased that significantly during and despite the full-scale war between Russia and Ukraine, in which Russia not only occupied large areas of agriculturally important land, but also deliberately targeted agricultural infrastructure, and blocked logistical export routes, which further was also limiting Ukrainian producers' access to inputs. Not to mention, the shortage of laborforce, resulting from displacement, migration and mobilization. The war caused considerable damages an losses for the agricultural sector. In the first year following Russia's invasion, Ukraine experienced a 30% reduction in grain and oilseed production. Not the soybean, however, which with a harvest of 7.6 mln t in 2025, doubled its pre-war yield of 3.8 mln t. Due to its higher prices compared to other crops, farmers could not only plant less hectares, while still obtain the same or even higher revenues, they could also reduce required storage space significantly, and even save costs for means of transportation, as soy is way less 'bulky' in comparison to other crops. Furthermore, as soybean production requires significantly less fertilizer application, it also proves to be particularly effective in regard to the difficult access to inputs, endured by the producers. In addition, soy also benefited from its expanding processing sector, which enabled farmers to produce more for the domestic market, which was not as susceptible to potential export complications. The mentioned reasons have led to soybeans representing the most profitable crop during the war. In addition to its profitability during wartime, also the aforementioned markets played an important role. Since a large proportion of the soybeans were exported to the EU anyway, the Black Sea blockade did not have the same impact on soy as it had on other crops, as it was 'easier' to switch to rail, road or river transports through the established EU-Ukraine Solidarity Lanes. Even though there were some challenges with the export through the Solidarity Lanes, triggered by protests of farmers from the respective EU Member States, leading to the introduction of quotas or even import bans, this mainly concerned 'sensitive' crops such as wheat and corn, whereas soy was less effected.

The example of Ukraine's agricultural sector with its emphasize on the large-scale production of globally demanded products indicates clear consistencies with what McMichael (2009b, 2013a), describes as the 'corporate food regime', characterized by its strong embedding in the general dynamics of the neoliberal globalization. This is evident in the market liberalization and also land privatization following the collapse of the Soviet Union, for instance. Thereby, mainly noticeable in the rise of large agricultural enterprises as well as agro-holdings and their strikingly industrial practices, involving high levels of mechanization and chemicalization, as remainders of the Green Revolution of the second food regime (cf. Friedmann & McMichael, 1989), but also the usage of genetically modified organisms, particularly prevalent in Ukrainian soybean production, as a new frontier in the third food regime (Bernstein, 2016; McMichael, 2009b).[71] Furthermore, it is also evident in the presence of the transnational corporations, described in more detail in Chapter 4, controlling the majority of the global soybean value chain both upstream and downstream of production (cf. Gereffi & Fernandez-Stark, 2011), whether in

[71] Although these large-scale enterprises and agro-holdings in the way they operate are very similar to the Argentinean *'pools de siembra'*, described in Chapter 4, they are fundamentally different in terms of their formation.

regard to breeding material, agrochemicals, logistics, or even in the processing of non-GM soy in Europe, as seen in Chapter 8. Hence, also in Ukraine and its soy commodity chain, dynamics are emerging in which the state is subordinate to global capital and thus follows the rules of institutionalizing "corporate power in the world food system" (McMichael, 2009b, p. 153).

As stated by McMichael (2013b), the dynamics of the third 'corporate' food system, also include the so-called 'land grab express'. As shown in Chapter 6, this was also the case in Ukraine, where, according to Cochet and Merlet (2011) and Visser and Spoor (2011), the post-Soviet Eurasian region has become an attractive destination for foreign agricultural investment, through low cost leasing agreements. Thereby, foreign investments in the region began in the early 2000s and mainly contained Western investors, viewing agriculture as a form of portfolio diversification. During the financial crisis of 2008, however, this trend was reinforced, along with new investors from the Middle East, increasing their engagement in order to secure food supplies through outsourced agricultural production, resembling to what McMichael (2013b) described as the 'agro-security mercantilism'. These agreements, however, were not only concluded by foreign parties, but mainly by large Ukrainian agricultural enterprises and agro-holdings, as successors of the aforementioned CAEs. As mentioned by Zoomers (2010), these deals are often associated with a lack of transparency, limited consultation, and insufficient respect for the rights of local communities, which often leads to strong resistance and protests by local communities. In Ukraine, however, this 'expulsion–resistance scenario' (Borras & Franco, 2013) ultimately was not the case, as was discussed in Chapter 6. This is mainly attributable to the way in which the dispossessed groups are integrated in the land deals (Mamonova, 2012, 2017). On the one hand, this is achieved trough the mentioned 'illusive inclusion', resulting in lease payments for the landholders. On the other hand, 'subordinate inclusion', offers the rural residents the possibility to engage in wage work in the large agricultural enterprises, which firstly is mostly accompanied by higher wages compared to independently operating farmers and secondly — owing to 70 years of Soviet legacy — is viewed as a desirable occupation. However, there are also certain cases of 'competitive exclusion' associated to a negative attitude among private family farmers towards large-scale land acquisitions, as those farmers, on the on hand, have to compete against large-scale agricultural enterprises for leased land, and on the other hand, are dependent on different services among the soybean commodity chain, as theses are mostly controlled by large-scale agricultural enterprises and agro-holdings. The given cases also exemplify, why it is rather difficult to speak of a legitimate 'land grab', as there is no real dispossession and displacement of rural communities, but could rather be perceived as a 'control grabbing' (cf. Mamonova, 2017; Plank, 2013), which in light of the dynamics outlined above, hinders the development of small-scale farmers.

In Chapter 3, the resilience of the current food regime was questioned. Thereby, many scholars seem to argue that after inadequate political responses to the food crisis in 2007-2008, further exacerbated by the COVID-19 pandemic, the war between Russia and Ukraine clearly demonstrated the fragility of the current food system (Clapp, 2023; Mamonova et al., 2023; Stephens & Hinton, 2025). Indeed, as discussed in Chapter 9, the deliberate destruction of agricultural infrastructure combined with the blocking of logistic routes (e.g. Black Sea

blockade), sparked severe fears of global food security, as many countries, especially countries from the MENA region, heavily rely on food imports (mainly grains) from Ukraine and Russia (see Ben Hassen & El Bilali, 2022; Glauben et al., 2022; Leal Filho et al., 2023; Suárez & Dreger, 2022), which could no longer be exported due to the blockade. Thus, confirming that the third food system, as suggested by Clapp (2023), with a strong 'concentration' on a limited selection of staple crops on field level, is highly susceptible for external shocks. This mainly concerned crops, such as wheat or maize, meant for more distant markets, which was prevented for a considerable time in the year 2022, following the blockage of the Black Sea (cf. Chapter 9). However, even though this caused significant losses, the agricultural sector managed to adapt to the situation, through the establishment of new logistic routes such as the EU-Ukraine Solidarity Lanes and also by switching their production focus to more favorable and profitable commodities, such as soy (see Chapter 9). Thereby, soy's favorable position is also highly influenced by its 'multipleness' and 'flexibility' making it a so-called 'flex crop' (Borras et al., 2016). Particularly soy's flexibility, enabling the possibility to switch between the different uses ('multipleness') depending on market conditions, has provided soybeans with an advantage over other crops. In contrast to corn — also considered a flex crop — soy's possibilities, in a Ukrainian scope, prove to be significantly more flexible. On the on hand, this is explainable through Ukraine's higher processing capacities for soy compared to corn and on the other hand, through the facilitated access to different markets, such as the EU. Thus, even though Ukraine's case shows the strengths of flex crops in their ability to reduce risks in volatile markets and to exploit changing opportunities (Borras et al., 2016), this does not affect all flex crops in the same matter, but is highly dependent on a countries flexibility and own means to enable 'multipleness'.

The war in Ukraine has also demonstrated the necessity to be more independent (cf. Clapp, 2023). Besides different inputs, such as seed material, various agrochemicals and fuels, this also concerns domestically produced food for the domestic markets. As seen in Chapter 6, this role is mainly associated with small-scale farmers, which primarily focus on niche cereals and account for the vast majority of production for products such as vegetables, fruits, milk and meat, thus representing an important pillar for domestic food security. In times of war, this got even more important, as seen in Chapter 9, as small-scale farmers were the ones feeding Ukraine, their families and communities, and even sent food to the soldiers fighting at the frontline. This aspect, among other things, also led to a certain shift in the perception of their importance, entirely in the spirit of the discussion surrounding 'food sovereignty' (McMichael, 2013a; Pimbert, 2009) and its symbology of 'food from somewhere' vs. 'food from nowhere' (McMichael, 2009b). However, the war has not only shown how fragile the Ukrainian agricultural structure is in the face of external shocks — in this case a military aggression initiated by Russia — but also demonstrated how quickly it is able to adapt despite these very adverse circumstances. As described in Chapter 6, the agricultural export sector in particular has proven to be of enormous importance to the Ukrainian economy, which also means that the revenue generated from this sector will play an important role in the country's reconstruction. Hence, one must be careful not to get trapped in a strict binary representation of corporations versus

small-scale farmers (Bernstein, 2016), because in Ukraine's case, both play a crucial role in the present and in the countries' future.

Ultimately, certain limitations of this thesis need to be addressed. As described in Chapter 5, this thesis is primarily based on semi-structured expert interviews. Consequently, the selection of interview partners is naturally crucial, as they form the basis for the coding process performed with MAXQDA (Kuckartz & Rädiker, 2019). However, this also means that if different interview partners were selected, the outcome and findings of this thesis might be slightly different. Of course, this was also the case with the interviews conducted, as not all the participants always shared the same opinion. For example, this is apparent in Chapter 9, in the Section following the question regarding the resilience of the various agricultural producers in relation to the war-related challenges. In this context, the choice of interview partners, in particular the group of producers, obviously plays a major role. As presented in Table 2, all interviewed producers operate more than 2000 hectares and thus, according to Stolnikovych (2024), can clearly be classified as large agricultural enterprises or in one case even as an agro-holding, which also means that the discussion surrounding the Ukrainian agricultural sector is mainly based on highly industrialized paradigms and parameters. By contrast, the perspective of small-scale farmers remains relatively limited. Despite the fact that, as seen in Chapter 7, the group involving 'More than 2000 ha' is most heavily involved in soybean production, the perspective of smaller farms would also have been very interesting, as there might be further niche reasons, not covered in this thesis, explaining the increase in soybean production during the war.

Further research regarding Ukraine's soybean production could be more focused on alternative agricultural systems (cf. Chapter 3) and thus also include the role of small-scale farmers and their perspectives on soy production, which, as just mentioned, has been slightly neglected in this thesis. Furthermore, Ukraine's soybean production could be reanalyzed with a view to a possible and desired EU-accession in order to determine what changes would be necessary in production (e.g. regulations regarding the use of GMOs and hazardous pesticides) and what impact the accession would have on the country's agricultural structure. Would the fundamentally different agricultural structures of the EU and Ukraine be compatible? What challenges could arise as a result and how would they impact Ukraine's soy sector?

11 Conclusion

As this thesis has demonstrated, several factors have been responsible for the considerable development in soybean production in Ukraine over the last 20 years. Whether these comprise the favorable natural and climatic conditions, particularly prevalent in the central and north-western parts of the country, as well as soy's advantages regarding soil fertility and its role in crop rotation or more structural aspects such as cheap labor, a high level of know-how, and an agricultural structure strongly influenced by the Soviet legacy, mainly based on large agricultural enterprises and agro-holdings, focused on exporting the most profitable and globally demanded crops, including soybeans. The full-scale war, following Russia's act of aggression, has further reinforced this significant increase, leading to a yield of 7.6 million tons for the year 2025, doubling the pre-war output of around 3.8 million tons in 2021. This can be explained, on the one hand, by favorable market conditions, making soy the most profitable crop during this time, but on the other hand, also by the fact that producers with soy — owing to its high prices in comparison to other crops — could not only plant fewer hectares while still obtain the same or even higher revenues, but at the same time were able to reduce the heavily required storage space and even save transportation-related costs. Moreover, in regard to the limited access to inputs, soy proves to be particularly effective as it requires significantly less fertilizers than other crops.

In addition, this thesis also illustrated, that soybean production in Ukraine is majorly based on large-scale agricultural producers, as enterprises are responsible for 73.5% of the entire soybean production in Ukraine, while small farms (21.6%) and particularly households (5.1%) represent rather marginal contributors. This is mainly attributable to the fact, that soy is mainly produced for the export market. However, as was also demonstrated in this thesis, the processing sector in Ukraine has severely expanded, over the last few years, which also means that more soy will be produced for the domestic market, which in turn could also prove more interesting for smaller producers which, as seen, primarily produce goods for the local and domestic markets. Furthermore, also soy's commodity chain was elaborated on more closely. As has been shown, Ukraine possesses a variety of facilities in the pre-cultivation phase, both in the seed and agrochemical sectors. Nevertheless, the country remains heavily dependent on other states and also transnational corporations. For instance, merely 10.8% of the certified breeding material for soybeans is domestically produced, leaving Ukraine strongly dependent on genetic and technological breeding programs of transnational corporations (Zakharchuk et al., 2022a). A similar dependence is also prevalent in the agrochemical sector (Simiachko & Mykhailova, 2025), particularly with regard to gas, which is essential for producing various inputs, such as nitrogen, for instance. Thus, clearly demonstrating the frailties and criticisms surrounding the third 'corporate' food regime (cf. Clapp, 2023).

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A Appendix

A.1 Reference Map Ukrainian Oblasts

Figure 19: Reference Map Ukrainian Oblasts. Source: Own representation.

A.2 The Versatile Uses of Soy

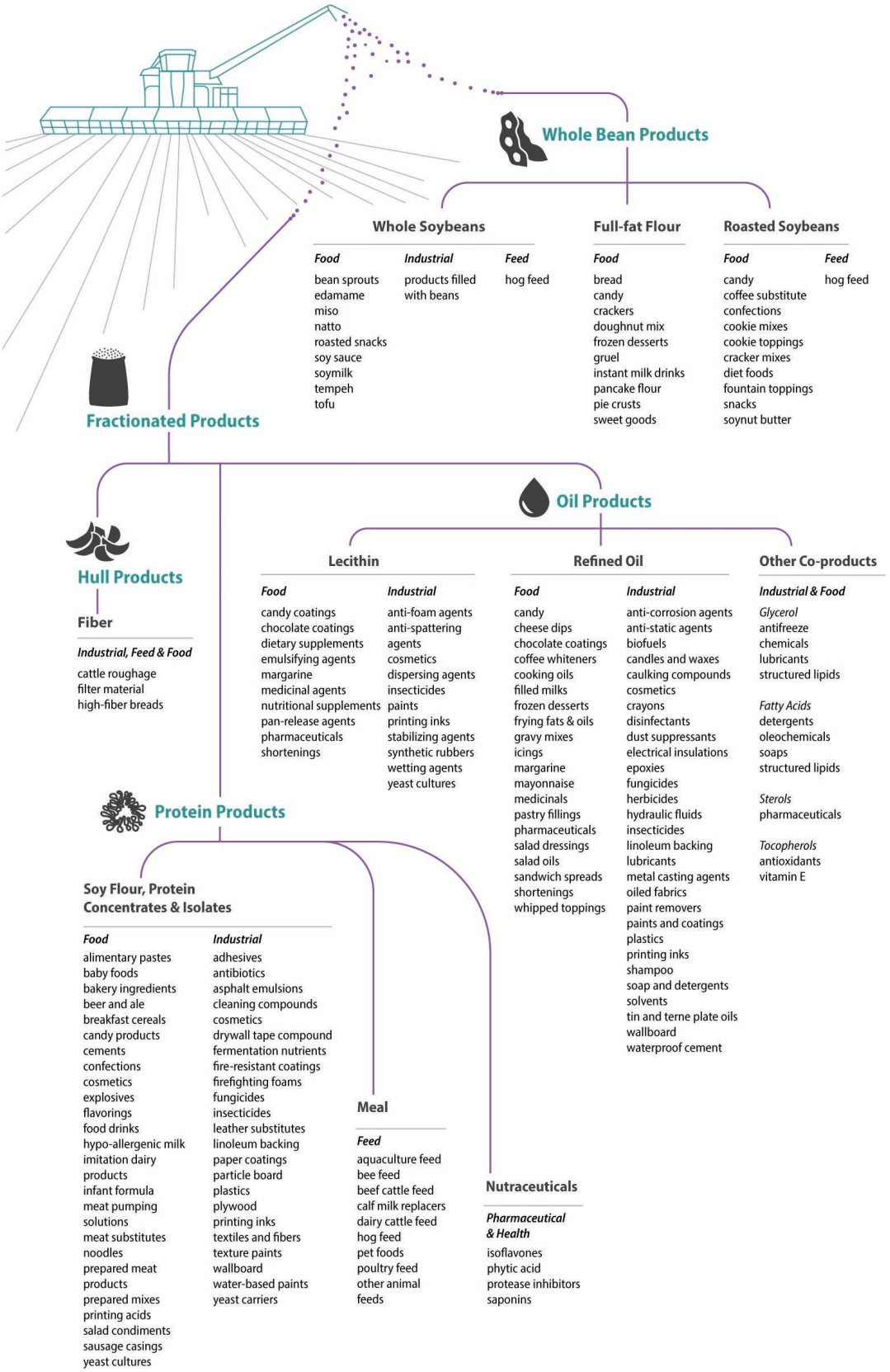

Figure 20: The versatile uses of soy. Source: Norberg and Deutsch (2023, p. 3)

A.3 Textcorpus

Table 8: Textcorpus Part I

Author	**Source**	**Title**
Alderman, L.	News Article	Crops 'Stored Everywhere': Ukraine's Harvest Piles Up
Broyaka, A.	Presentation	Ukrainian Grain and Oilseed Markets after Three Years of Resilience
Gaberell, L. and Viret, G.	Website Article	Brazil, South Africa, Ukraine: high-risk destinations
Hetman, O.	News Article	Shadow Land Lease: Finding a compromise between de-shadowing the sector and pressure on business.
IAMO	Website	Top 10 Ukrainian agricultural land users 2021
Kvartiuk, V. et al.	Agro Policy Report	Rental Price Dynamics of State-Owned Agricultural Land in Ukraine
Korchahina, I.	Presentation	Donau Soja: Insights from the Regions — Ukraine
Lalita AVD	News Article	Price pressure risk persists for border farmers despite EU-Ukraine trade deal changes
Matuszak, S.	News Article	The moratorium on the sale of agricultural land is lifted in Ukraine
Murray, D.	News Article	Ukrainian ag exports diversifying, holding after three years of war
Owoeye, F.	News Article	Ukraine soybean meal targets the European market amid intense competition from South America
Parusinski, K.	News Article	Experts: New Ukraine- Cyprus deal still leaves lots of loopholes for tax evasion
Piper, E. and Polityuk, P.	News Article	Insight: Ukraine farms lose workers to war, complicating a tough harvest
Reuters	News article	Confusion over documents halts Ukrainian rapeseed, soybeans exports, union says
Ritter, L. and Pugachov, V.	Presentation	Soy production in Europe. Developments in 2023

Table 9: Textcorpus Part II

Author	**Source**	**Title**
Shurtleff, W. and Aoyagi, A.	Bibliography and Sourcebook	History of Soybeans and Soyfoods in Eastern Europe (Including All of Russia) (1783-2020)
Sobolev, D.	Report	Biotechnology and Other New Production Technologies Annual
Top Lead and Latifundist	Infographic report	Agribusiness Ukraine 2023/24
UCAB	Agricultural Market Report	Outlook for Ukrainian agricultural market 2025
UKCEH	Analysis	Depletion of Ukraine's soils threatens long-term global food security
Van Trump, K.	News Article	Ukraine Emerging as a New Global Soybean Exporter
Wetzels, H.	News Article	Where Soya has Scale – Ukraine, Big Ag and Land Concentration
Wetzels, H.	Analysis	The soya curse: Is Ukraine facing the same fate as the Amazon?
Zamuruieva, I.	Interview	Land Reform and Agriculture in Ukraine During Wartime — Interview with Dr. Natalia Mamonova

A.4 Interview Guidelines

Preperation

- Greeting / Thanking for the willingness to conduct the interview
- Introduction of the interviewer (myself)
- Instructions on the interview process and description of the work
- Answering any possible questions
- Asking for permission to record

Guiding Question	Check – Follow-up Questions	Specific Inquiries
Introduction		
You are responsible for X at X. Could you describe your specific role and key responsibilities within X?	Milestones? Goals (short/long-term)?	
Part I: Ukraine Soy		
Ukraine is one of the largest soy producers after Brazil, Argentina and the USA. Can you explain what makes the country particularly well-suited for soybean cultivation?	Advantages, opportunities? Risks, challenges?	How does soybean compare to other agricultural crops in terms of advantages and disadvantages?
In your opinion, what role does Ukraine play in the European and global soy market?		
Can you outline, how soy production in Ukraine has evolved over time?	Beginning of soy production? Development? Underlying factors? Demand? Processing?	What are the main soy cultivation methods used in Ukraine – conventional, organic, or GMO? What trends can be observed? Where does Ukrainian soy go after production, and what is it mainly used for?
What major challenges have impacted soy production in Ukraine in recent years?	Impact on industry?	How have these challenges been addressed and managed?
Part II: Resilience		
Since February 24 in 2022, following the large-scale Russian attack by the Russian army, Ukraine and Russia have been at war. Could you explain how Ukrainian agriculture has changed since the start of the war?	Impact on personal work? (direct/indirect)	What does the war mean for soy production and the European/global soy market?
Despite the war, soybean production in Ukraine has still increased. How do you explain this development?	Insights? Key factors for choice of crops? Personal increase (production/area)?	Compared to other crops, what are the biggest advantages and disadvantages of soybeans during the war?
What strategies are producers using to continue producing soy and generating yields despite the challenging circumstances?	Role of farm size?	Which actors are more resilient resp. better in coping with external shocks (small family farms or large industrial operations)? Why?
Part III: Inputs		
Large-scale soy production often requires heavy usage of pesticides to achieve high yields. How do you assess soy production in Ukraine in this context?	Amount of pesticide? What types? How do producers acquire pesticides? Main markets? Actors?	Are there noticeable differences in pesticide use between EU member states and non-member states (e.g., Ukraine)?
What other inputs play an important role in soy production, in your opinion?	Most important Inputs? Why? GM-Soy in Ukraine?	How do these inputs influence the decision to grow certain crops or not?
Since the outbreak of the war, agricultural operations have had to continuously adapt to new situations. Could you elaborate on how different inputs have played a role during the war?	Challenges regarding inputs? Noticeable changes in usage? Main actors involved? Activities war? Seed market?	How do pesticide-free or pesticide-reduced farming methods compare to conventional methods (during the war)?
Part IIII: Land		
Could you explain how land ownership and access to agricultural land are regulated in Ukraine?	Challenges? Impact on soy production? Labour?	How large are the typical farms on which soy is produced?
How would you describe the situation regarding land concentration in Ukraine, especially in relation to soy production?	Underlying reasons/factors? Main actors? Conflicts (small vs. large-scale)?	What role does the Soviet Union play in this? Were there any structural developments concerning land respectively land ownership relations because of the war?
In my research, I came across several reports about foreign investments in Ukrainian agriculture. Could you explain the role that foreign investors play in Ukrainian agriculture, specifically in soy cultivation?	Influence on land use/ownership?	How have foreign investments been affected by the war?
To what extent does the lifting of the moratorium on the sale of agricultural land in Ukraine in 2021 impact the future of agriculture in Ukraine?	Impact on soy production (other commodities)? Impact on land ownership/access? Foreign investments?	
Outlook and Perspective		
In your opinion, what is the strategic approach regarding the future development of soy production in Ukraine?		
What role will soy play in the future of Ukrainian agriculture?		Which political measures (such as subsidies, trade policies, or EU integration) could have an impact on the future of Ukrainian soy production?
Are there also improvements or lessons that Ukraine and its producers can learn from the war in terms of agriculture?	Current strategy sustainable? 3rd Food-System? Processing?	
Do you have any additional input you'd like to share, or is there a topic that hasn't been covered in this interview that you believe is important?		

Outro:

- Thank you very much for your time and insights.
- May I ask if you could recommend any potential IT partners for further collaboration?

Figure 21: Interview Guideline General

Preperation

- Greeting / Thanking for the willingness to conduct the interview
- Introduction of the interviewer (myself)
- Instructions on the interview process and description of the work
- Answering any possible questions
- Asking for permission to record

Guiding Question	Check – Follow-up Questions	Specific Inquiries
Introduction		
You are responsible for X at X. Could you briefly introduce X as well as your specific role and key responsibilities within X?	Structure? Size? Products?	
Part I: Ukraine Soy		
Ukraine is one of the largest soy producers after Brazil, Argentina and the USA. Can you explain what makes the country particularly well-suited for soybean cultivation?	Advantages, opportunities? Risks, challenges?	How does soybean compare to other agricultural crops in terms of advantages and disadvantages?
In your opinion, what role does Ukraine play in the European / global soy market?		
Can you outline, how soy production in Ukraine has evolved over time?	Beginning of soy production? Development? Underlying factors? Demand? Major actors?	What are the main soy cultivation methods used in Ukraine – conventional, organic, or GMO? What trends can be observed?
How and when did you/your company start producing soy?	Why? Benefits? Product(s) before soy? Dis-/Advantages of soy?	How important is the production of soy for your company? How much of your land is used for the cultivation of soy?
Can you briefly describe the value chain of soy in Ukraine?	Usage? Export? Processing?	Where does Ukrainian resp. your soy go after production, and what is it mainly used for?
What major challenges have impacted soy production in Ukraine in recent years?	Impact on industry?	How have these challenges affected your company and how have you adapted to them?
Part II: Resilience		
Since February 24 in 2022, following the large-scale Russian attack by the Russian army, Ukraine and Russia have been at war. Could you explain how Ukrainian agriculture has changed since the start of the war?	Impact on personal work? Export? Value Chain?	What does the war mean for soy production and the European/global soy market?
Despite the war, soybean production in Ukraine has still increased. How do you explain this development?	Insights? Key factors for choice of crops? Pers. increase of production? Why?	Compared to other crops, what are the biggest advantages and of soybeans during the war? Are there also disadvantages?
What strategies are you using to continue and generating yields despite the challenging circumstances?	Role of soy? Role of farm size?	Which actors are more resilient resp. better in coping with external shocks (small family farms or large industrial operations)? Why?
Part III: Inputs		
Large-scale soy production often requires heavy usage of pesticides to achieve high yields. How do you assess soy production in Ukraine in this context?	Amount of pesticide? What types? How do producers acquire pesticides? Main markets? Actors?	What role do pesticides play in the production of soy in your company?
What other inputs play an important role in soy production, in your opinion?	Most important Inputs? Why? Employees? Machines? Seed Market? GM-Soy in Ukraine?	How do these inputs influence the decision to grow certain crops or not (considering the war)?
Since the outbreak of the war, agricultural actors have had to continuously adapt to new situations. Could you elaborate on how different inputs have played a role during the war?	Challenges regarding inputs? Noticeable changes in usage?	How do pesticide-free or pesticide-reduced farming methods compare to conventional methods (during the war)? Who are the main actors regarding inputs? Are they still active during the war? How?
Part IIII: Land		
Could you explain how land ownership and access to agricultural land are regulated in Ukraine?	Challenges? Conflicts? Impact on soil and soy production?	How large are the typical farms on which soy is produced? How did you personally get your land and what does it require to get this? Were there any structural developments concerning land respectively land ownership relations because of the war?
In my research, I came across several reports about foreign investments in Ukrainian agriculture. Could you explain the role that foreign investors play in Ukrainian agriculture, specifically in soy cultivation?	Influence on corporation and land use/ownership?	Is your company also supported by foreign investments? How have foreign investments been affected by the war?
To what extent does the lifting of the moratorium on the sale of agricultural land in Ukraine in 2021 impact the future of agriculture in Ukraine?	Impact on soy production (other commodities)? Impact on land ownership/access? Foreign investments?	To what extent does it affect your company? Do you intend to take up the opportunity of the new land markets?
Outlook and Perspective		
In your opinion, what role will soy play in the future of Ukrainian agriculture?	Strategic approach? Personal goals?	Which political measures could have an impact on the future of Ukrainian soy production?
Are there also improvements or lessons that you as producers can learn from the war in terms of agriculture?	Current strategy sustainable? Diversification? Processing?	
Do you have any additional input you'd like to share, or is there a topic that hasn't been covered in this interview that you believe is important?		

Outro:

- Thank you very much for your time and insights.
- May I ask if you could recommend any potential IT partners for further collaboration?

Figure 22: Interview Guideline Producer

Introduction

1. Can you briefly introduce the Ukrainian Pulse and Soybean Association and its activities?

Part I – Soy in Ukraine

2. Ukraine is one of the largest soy producers in a European context. Can you explain the reasons making Ukraine particularly well-suited for soybean cultivation?
3. In your opinion, what role does Ukraine play in the European and global soy market?
4. Can you outline, how soy production in Ukraine has evolved over time?
    a. When and why did farmers start producing soy in Ukraine?
    b. What are the main cultivation methods used in Ukraine regarding soy – conventional, organic, or GMO? What trends can be observed?
5. Can you explain the Value Chain of Ukrainian soy?
6. What are the main advantages and disadvantages of soybeans compared to other crops and oilseeds?
    a. Where do you see the main challenges of producing soy in Ukraine?

Part II – Resillience

7. Could you explain how Ukrainian agriculture has changed since the start of the war?
8. Despite the war, soybean production in Ukraine has still increased. How do you explain this development?
    a. What are the main factors, driving this increase of soy production?
9. What strategies are producers using to continue producing soy and generating yields despite the challenging circumstances?

Part III – Inputs

10. Large-scale soy production often requires heavy usage of pesticides to achieve high yields. How do you assess soy production in Ukraine in this context?
    a. What types of pesticides are used for the soy production in Ukraine? What are the main pesticide markets for Ukraine? Where does Ukraine have its GMO seeds from?
11. What other inputs play an important role in soy production (e.g. labor, land and capital) and how have they been influenced by the ongoing war?

Part IV– Land

12. How would you describe the situation regarding land concentration in Ukraine, especially in relation to soy production?
13. Could you explain the role foreign investors resp. investments play in Ukrainian agriculture, specifically in soy cultivation?
14. To what extent does the lifting of the moratorium on the sale of agricultural land in Ukraine in 2021 impact the future of agriculture respectively soy production in Ukraine?

Outlook / Perspective

15. What role will soy play in the future of Ukrainian agriculture?
16. Are there also improvements or lessons that Ukraine and its producers can learn from the war in terms of agriculture?
17. Do you have any additional input you'd like to share, or is there a topic that hasn't been covered in this guideline that you believe is important?

Figure 23: Interview Guideline UPSA — Written Response

Introduction

1. Could you briefly present an overview of your company and its main areas of operation?

Part I – Soy in Ukraine

2. Ukraine is one of the largest soy producers in a European context. Can you explain the reasons making Ukraine particularly well-suited for soybean cultivation?
3. What are the main advantages of soybeans compared to other crops and oilseeds?
    a. Where do you see the main challenges respectively disadvantages of producing soy in Ukraine?
4. Can you outline, how soy production in Ukraine has evolved over time?
    a. How and when did you/your company start producing soy? Why?
    b. What trends can be observed in Ukraine's soy production (e.g. organic, vs. conventional or GMO)?
5. Can you briefly describe the value chain of the soy your company produces? Where does your soy go after production, and what is it mainly used for?

Part II – Resillience

6. Could you explain how Ukrainian agriculture has changed since the start of the war?
    a. How has the war impacted your company and personal work?
7. Despite the war, soybean production in Ukraine has still increased. How do you explain this development?
    a. Has your company itself experienced an increase in soybean production respectively the area cultivated with soy during the war? If so – why?
8. What are the key factors enabling a company to remain resilient and continue producing despite the challenging circumstances?

Part III – Inputs

9. What inputs play an important role in soy production in Ukraine (e.g. labor, land and capital) and how have they been influenced by the ongoing war?
    a. In this context, how do you evaluate the situation regarding pesticide use in Ukrainian soy production?
    b. What role does genetically modified (GMO) soy play in Ukraine?

Part IV– Land

10. Could you explain how land ownership and access to agricultural land is regulated in Ukraine?
    a. How does it impact the operations of your company? Are there any challenges?
11. In your opinion, how will Ukraine's 2021 lifting of the agricultural land sale moratorium influence the future of agriculture – particularly soybean production – in the country?
12. In my research, I came across several reports about foreign investments in Ukrainian agriculture. Could you explain the role that foreign investors play in Ukrainian agriculture, specifically in soy cultivation?

Outlook / Perspective

13. What role will soy play in the future of Ukrainian agriculture?

Figure 24: Interview Guideline Producer — Written Response

A.5 Coding System MAXQDA

List of Codes	Frequency
Total Codes	1519
Soy Production Ukraine	0
Suitability	24
Development	31
UdSSR	10
Trends	15
Production	29
Certification	6
Policies	20
Organic	31
Conventional (non-GM)	23
GM-Soy	50
Advantages of Soy	33
Disadvantages of Soy	7
Challenges of Soy	58
Value Chain	19
Processing	20
Market	19
Export	32
UA role in soy market	8
Inputs	38
Know-How	2
Actors	3
Pesticides	23
Fertilizers	19
GMO	1
Seeds	12
Technology/Machinery	30
Fuel	4
Labor	38
Capital	22
Land	3
Structure Agriculure UA	70
Ownership / Access to Land	33
Challenges Land	25
Landgrabbing	17
Land Sale Moratorium	22
Foreign Investment	27
War	4
Changes & Challenges in Agriculture	118
Occupation of Land	11
Dangerous Attacks	4
Mines	4
Ecological Contamination	5
Lost Infrastructure	17
Kachkovska Dam	2
Machinery GPS	1
Transport/Export/Logistics	25
Countermovements EU Countries	5

Figure 25: Conducted Codes MAXQDA. Part I

Access Inputs	23
Losses and Damages	5
Market Power	1
Credits	3
Low Prices	1
Hedging Prices	1
Uncertainty	1
Limited Investments	3
Laborforce	24
Stress	1
Payment of rented lands	1
Clients	3
Crimea	1
Organic Conversion War	1
Adaptation Producers	56
Soy during War	45
Adaptation and Role of Soy	69
Adapt_Location	2
Adapt_Price	14
Adapt_Storage	3
Adapt_Logistics	16
Adapt_Markets	1
Adapt_Tariff	2
Adapt_Processing	4
Adapt_Diversification	7
Adapt_Inputs	26
Adapt_GMO	3
Adapt_Strategy	2
Adapt_Farmsize	4
Adapt_Laborforce	1
Resilience	52
Resilience_farmsize	23
Recovery	2
Outlook / Perspective	1
EU Integration	23
Future of Soy	23
Learnings Agriculture Future	22
Further Interesting Information	0
Statements	9
Producer Information	4
Producers decision for Crops	3
Foodsystem	5
Deglobalization Foodsystem	1
Socio-cultural	1
Market Power Soy	2
General Information	4

Figure 26: Conducted Codes MAXQDA. Part II

Personal declaration: I hereby declare that the submitted thesis is the result of my own, independent work. All external sources are explicitly acknowledged in the thesis.

DeepL and ChatGPT were used for translation and reformulation in order to improve language and style in some circumstances. ChatGPT was also used in certain instances for coding problems in LaTeX and R. Additionally, NotebookLM was used to analyze information from Ukrainian sources.

Zurich, November 30, 2025

Nino Farrér