TEACHAVC

**Innovative Pedagogical Approach for Agricultural Value Chain Research**

# Value chain analysis of malting barley in Poland


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The report has been published in open access for professional users, in particular stakeholders in the malting barley value chain in Poland, as well as a teaching material for academic use in courses related to agri-food value chain analysis.

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## Introduction

Poland is a country in Central and Eastern Europe. With an area of 312,000 km² and a population exceeding 36 million in 2024, it is the sixth-largest country in the European Union by territory and the fifth by population (Eurostat, 2025a). The population density in Poland is 120 people per km²; however, it is gradually decreasing as the country's population declines.

The Gross Domestic Product (GDP) of Poland in 2024 amounted to €848 billion, with a GDP per capita of €16,470. Despite the challenging period of the COVID-19 pandemic, which significantly affected the economies of many EU countries, Poland maintained stable GDP growth during 2020–2024. One of the significant challenges in recent years has been the relatively high inflation rate, especially in 2022–2023. In 2022, inflation reached 13.2%, and in 2023 it stood at 10.9%, resulting in substantial increases in the prices of goods and services. In 2024, inflation began to decline and is currently at 3.7%, which, combined with sustained GDP growth, provides optimistic forecasts for the country's continued economic development.

Poland borders the Baltic Sea to the north, as well as the Sudetes and Carpathian mountain ranges to the south. The country shares borders with Germany, the Czech Republic, Slovakia, Ukraine, Belarus, Lithuania, and Russia. Poland has a three-tier administrative division comprising 16 voivodeships (Figure 1), 314 counties (including cities with county rights), and 2,477 municipalities (GUS, 2025).


**Figure 1.** Map of Poland with administrative divisions
Source: nationsonline.org/oneworld/map/poland-administrative-map.htm, October 29, 2025.

This administrative system has been in place since the 1999 reform and aims to improve the efficiency of state governance. Each level has its own self-government bodies responsible for local matters such as education, infrastructure, and transportation. The capital of the country is Warsaw.

Poland is located in a temperate transitional climate zone, with an average annual temperature of 8-11 degrees Celsius. The country is characterized by geographical diversity — from lowland areas in the north and central regions to uplands and mountainous areas in the south. In terms of soil quality, Poland is predominantly covered by medium to low-quality soils, which is reflected in the structure of agricultural production. Among Polish soils, approximately 60% are well-suited for agricultural use, including chernozems, brown and podzolic soils, alluvial soils, black earths, and rendzinas. An additional 26% are suitable only for very undemanding crops (e.g., podzol soils), while 14% of Polish soils are unsuitable for any agricultural use. Based on agrarian suitability, soils in Poland are divided into classes, with class I representing the most fertile soils, and subsequent classes indicating decreasing quality. The most prevalent soil classes in Poland are Class IV and Class V. The growing season in Poland generally lasts 180 to 230 days, though its length depends on location. This period is shorter in the northeastern part of the country and longest in the southwestern regions.

Agriculture plays a significant role in the Polish economy, particularly as a foundation of food security and an essential component of exports. Although its share in GDP creation amounts to approximately 2–3%, the sector holds considerable social importance, employing over 1 million people. Thanks to its well-developed agricultural production, Poland is among the leading food exporters in the European Union. Polish agriculture is characterized by substantial structural diversity, stemming from historical conditions, agrarian reforms, and the political and economic transformation of the 1990s. Today, the agricultural system is based mainly on family farms, with small-scale, extensive farms coexisting alongside modern, large-scale commercial enterprises specialized in market-oriented production. According to data from the Central Statistical Office (GUS), there are approximately 1.2 million agricultural holdings in Poland, covering a total area of nearly 15 million hectares. The majority of these holdings are smaller than 10 hectares (873,000 farms). However, in terms of land use structure, medium-sized farms (10–50 ha) dominate, utilizing around 40% of agricultural land. Analyzing the overall agricultural output in 2023, plant production accounted for 49%, while animal production made up 51%. Among plant products, cereal crops are dominant (16.8% of total agricultural output), including wheat, rye, and barley. As for animal production, slaughter livestock accounted for the most, representing 27.4% of total output.

# 1. Functional analysis of the malting barley value chain

## 1.1 Overview of the global barley market

### 1.1.1 Production

Barley has accompanied human activity for thousands of years, serving as a source of food for both humans and animals, as well as playing a key role in the production of beer and other alcoholic beverages, such as whisky. It is considered to be the most widely cultivated plant in the world (McFarland, 2014). Barley ranks fourth among the most commonly grown cereal crops, with an annual production of approximately 150 million metric tons. Barley comes in many different types: winter, spring, and facultative growth habits, two- and six-row spike types, covered and naked, colored and noncolored, waxy and nonwaxy starch, and high or low beta-glucan (BG) (Shewry et al., 2023).

Global barley production has fluctuated in recent years, reflecting not only weather conditions but also geopolitical disruptions and structural changes in agriculture. It is important to note that, compared to other cereals, barley holds slightly less economic significance than wheat or maize; however, it plays a crucial role in the feed and brewing industries. In 2020, global production reached 161.2 million tons, but already in the following year, it dropped to 145 million tons, and in subsequent years, it remained at a lower level (Table 1). According to USDA projections for 2025, global barley harvests are expected to reach 147.3 million tons, a slight recovery but still below levels observed at the beginning of the decade.

The European Union remains the largest producer of barley, despite a temporary decline in production between 2021 and 2023. A rebound is projected, with output expected to reach 53.2 million tons by 2025. Notably, Ukraine has experienced a significant decline in production since 2022; in 2021, it was still among the global leaders with 9.9 million tons. As a result of the ongoing war and infrastructure damage, production is forecast to fall to 5.7 million tons in 2025. This conflict has had a substantial impact on the entire grain market, disrupting supply chains and destabilizing exports from the Black Sea region. Canada, the United Kingdom, and the United States have also experienced production volatility, primarily due to droughts and unpredictable weather conditions.

**Table 1.** Barley production in leading producing countries, 2020-2025 (million tons)

| Country | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 *(forecast)* |
|---|---|---|---|---|---|---|
| European Union | 54.2 | 52.1 | 51.8 | 47.9 | 50.3 | 53.2 |
| Russia | 20.6 | 17.5 | 21.5 | 20.5 | 16.3 | 17.5 |
| Australia | 14.6 | 14.3 | 14.1 | 10.8 | 13.3 | 15.0 |
| Canada | 10.7 | 7.0 | 10.0 | 8.9 | 8.1 | 8.2 |
| United Kingdom | 8.1 | 7.0 | 7.4 | 7.0 | 7.1 | 7.1 |
| Turkey | 8.1 | 4.5 | 7.4 | 8.0 | 7.0 | 6.1 |
| Ukraine | 7.9 | 9.9 | 6.1 | 6.3 | 5.8 | 5.7 |
| Argentina | 4.0 | 5.3 | 4.7 | 5.1 | 4.9 | 4.9 |
| Kazahstan | 3.7 | 2.4 | 3.3 | 2.6 | 3.8 | 3.7 |
| United States | 3.7 | 2.6 | 3.8 | 4.1 | 3.1 | 3.1 |
| Rest of the World | 25.6 | 22.4 | 21.3 | 22.3 | 23.6 | 22.8 |
| **World Total** | **161.2** | **145.0** | **151.4** | **143.5** | **143.3** | **147.3** |

Source: USDA FoodData Central, https://apps.fas.usda.gov/psdonline/app/index.html#/app/downloads, November 3, 2025.

The factors behind fluctuations in barley production—such as droughts, armed conflicts, and structural changes in agriculture—are also reflected in data on yield performance and planned cultivation area (Table 2). This enables analysis of the extent to which changes in production result from declining yields rather than from decisions about the scale of cultivation in individual countries. One of the most distinctive patterns observed during the analyzed period is the high yield variability in countries exposed to adverse climatic conditions. In Canada and Turkey, barley yields have shown significant year-to-year fluctuations, primarily due to droughts and irregular rainfall. For example, Canada, which achieved yields of nearly 4.0 t/ha in 2020, experienced a sharp decline to 2.3 t/ha in 2021. A similar trend was observed in Turkey, where climatic variability—particularly rainfall cyclicality—resulted in substantial fluctuations throughout the entire period under review. Australia, despite its generally high production potential, has also been vulnerable to climatic shocks, which became particularly evident in 2023.

In contrast to the above examples, in countries with high levels of mechanization and technological advancement in agriculture, such as the European Union and the United Kingdom, barley yields remain relatively stable. The European Union, the world's largest producer of barley, maintains yields in the range of 4.6–5.1 tons per hectare, which—combined with a large sown area—ensures its dominant position on the global market. Similarly, stable

yields are recorded in the United Kingdom, where the average yield approaches 6.1 t/ha, enabling strong production despite a relatively modest cultivation area.

**Table 2.** Estimated barley yield and area in selected countries, 2020-2025 (yield in tons per hectare, area in million hectares)

| **Country** | **2020** | **2021** | **2022** | **2023** | **2024** | **2025** *(forecast)* | **Area (2025)** *(forecast)* |
|---|---|---|---|---|---|---|---|
| European Union | 4.91 | 5.07 | 5.02 | 4.63 | 4.88 | 5.13 | 10.4 |
| Russia | 2.53 | 2.28 | 2.77 | 2.68 | 2.46 | 2.73 | 6.4 |
| Australia | 2.67 | 2.81 | 3.43 | 2.57 | 2.87 | 3.13 | 4.8 |
| Canada | 3.82 | 2.32 | 3.79 | 3.29 | 3.4 | 3.61 | 2.3 |
| Ukraine | 3.08 | 3.7 | 3.13 | 3.78 | 3.63 | 3.56 | 1.6 |
| Turkey | 2.13 | 1.22 | 1.95 | 2.16 | 1.87 | 1.74 | 3.5 |
| United Kingdom | 5.85 | 6.05 | 6.62 | 6.12 | 5.91 | 5.94 | 1.2 |
| United States | 4.15 | 3.25 | 3.86 | 3.89 | 4.13 | 4.19 | 0.7 |

Source: USDA FoodData Central, https://apps.fas.usda.gov/psdonline/app/index.html#/app/downloads, November 3, 2025.

An analysis of the projected sown areas for 2025 reveals that most countries do not plan a significant expansion of barley cultivation. This suggests a prevailing strategy focused on intensification—i.e., improving productivity—rather than increasing the cultivation area. In this context, the European Union maintains a unique position, combining one of the highest yield levels with a substantial sown area, projected at over 10 million hectares in 2025.

Although specific data on malting barley production are limited, it is estimated that approximately 25% of barley produced in the United States is used for malting. Of this amount, around 80% is used for beer production, 14% for distilled spirits, and 6% for malt syrup production (Zhou, 2009). These figures are consistent with global estimates, which suggest that approximately 19% of total barley production is used for industrial purposes, including brewing (Table 3). In the European Union, a similar share—around 20–22% of total barley production—is expected to be allocated to brewing purposes. This is based on an estimated EU malting capacity of approximately 10 million tons per year (Euromalt, 2022), relative to total barley production of around 50 million tons. This is further confirmed by Shewry et al. (2023), who point out that the majority of the global barley harvest is used as animal feed, followed by malting for brewing and distilling, with human food consumption representing the smallest share.

**Table 3.** Global barley utilization by category 2025/26 (forecast)

| Use Category | Volume (Mt) | Share (%) |
|---|---|---|
| Food | 7.1 | 4.8 |
| Feed | 101.0 | 68.9 |
| Industrial | 27.3 | 18.6 |
| Other | 11.2 | 7.6 |

Source: International Grains Council https://www.igc.int/en/markets/marketinfo-sd.aspx, November 3, 2025.

### 1.1.2 Trade

In recent years, global barley trade has shown significant volatility, reflecting broader changes in the grain market. After reaching a notable export volume in the 2020/21 season, trade volumes gradually declined, hitting their lowest point in the 2022/23 season (Figure 2). This decline was the result of a combination of factors, including disrupted export flows from the Black Sea region, particularly from Ukraine, and shifting demand among major importers. In the 2023/24 season, a moderate recovery occurred, partly due to eased logistical challenges and adjustments in export destinations. Nevertheless, trade volumes did not return to previous levels, and forecasts for the 2024/25 season suggest another downturn. This indicates that the rebound was temporary and that supply and demand pressures remain persistent.

When considering the largest barley importers, China's demand has a significant impact on the global market. Despite fluctuations linked to trade policies, China remains one of the world's leading barley importers. Other significant importing countries include Saudi Arabia, Spain, and the Netherlands, all of which are key destinations for barley, using it for both feed and industrial purposes. Although barley feed usage in importing regions has remained relatively stable, global demand has become increasingly unpredictable. This is primarily due to changes in animal feeding practices, yield variability in importing countries, and economic pressures that affect global trade dynamics.

On the supply side, global barley production has been relatively stable or slightly declining in recent years, limiting the potential for export growth. Of particular importance are the export constraints from Ukraine, resulting from the ongoing conflict and infrastructure-related challenges. Australia, the world's largest barley exporter, has brought some stability to the market by resuming shipments to China following the lifting of trade barriers. However, competition from other feed grains, such as maize and wheat, continues to limit barley's share in global markets. In addition, barley exports are dominated by the world's largest producers, namely the European Union and Russia.

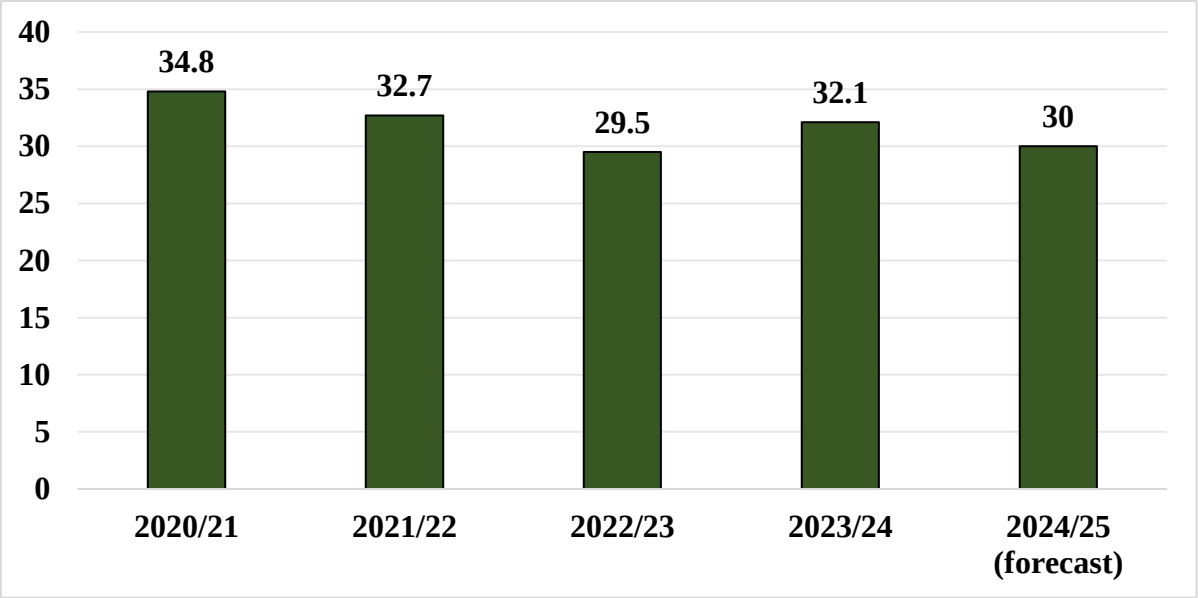


**Figure 2.** Global barley trade overview 2020/21–2025/26, in million tons
Source: International Grains Council https://www.igc.int/en/markets/marketinfo-sd.aspx, November 3, 2025.

### 1.1.3 Prices

Fluctuations in the barley market in recent years have been directly reflected in global prices, which have undergone significant changes in response to macroeconomic, geopolitical, and structural factors. Data from 2020–2025 indicate that the market experienced sharp price increases, followed by a downward trend that became evident in 2023 (Table 4).

The initial price surge began in 2021, when the average barley price rose by over 70% from the previous year. This was the market's response to a series of crises—including global logistics disruptions, the effects of the COVID-19 pandemic, and weather- and geopolitical-related uncertainty in key production regions. In 2022, prices continued to rise, although at a more moderate pace. The peak in barley prices occurred during this period, as tensions in the Black Sea region and concerns over grain availability, including barley, led to heightened purchasing activity from importers and speculative price spikes.

**Table 4.** Global barley prices, 2020-2025 (USD/tonne)

| Year | Average price (USD/t) | YoY Change (%) |
|---|---|---|
| 2020 | 104.6 | -5.3 |
| 2021 | 178.1 | 70.2 |
| 2022 | 225.2 | 26.5 |
| 2023 | 166.9 | -25.9 |
| 2024 | 136.1 | -18.4 |
| 2025 (two-quarter average) | 114.3 | -16.0 |

Source: International Monetary Fund, Global price of Barley [PBARLUSDQ], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/PBARLUSDQ, November 3, 2025.

Since 2023, the situation has begun to reverse: barley prices dropped by nearly 26%, driven by a gradual normalization of international trade, increased competition from other feed grains (mainly maize), and a slightly weaker demand from major importers such as China and Saudi Arabia. The downward trend continued in 2024, and available data for the first two quarters indicate it is persisting into 2025.

As of early 2025, the barley price stands at USD 114.3 per ton, marking the lowest level in several years. For producers, this signals a decline in profitability, especially in countries where production costs remain relatively high. At the same time, lower prices may stimulate import demand, particularly in regions with high feed requirements, such as Africa and the Middle East. It is expected that changing price conditions will influence domestic supply-demand balances, sowing decisions, and trade policy in the upcoming seasons. In a context of rising climate and geopolitical volatility, the barley market remains highly sensitive to disruptions, and future price developments will largely depend on supply and demand dynamics in the world's most strategic regions.

### 1.1.4 Position of Poland

Barley prefers a stable, moderately dry climate and performs poorly in very hot, humid conditions. As for soil, fertile soils are ideal, though clay soils are also suitable for barley cultivation (McFarland et al., 2014). Within the temperate transitional climate zone, Poland offers favorable agroecological conditions for malting barley cultivation. This is particularly true in northern and western voivodeships, where optimal rainfall distribution, soil richness, and moderate temperatures create an ideal environment for growth.

Poland plays a moderate role in the European barley market. In terms of production, the country ranks among the top 20 global producers and fourth in the EU, after France, Germany, and Spain. In 2023, barley production amounted to 2.9 million tons, accounting for 6% of EU production. Although the area under barley cultivation in Poland is declining, production is intensifying (FAOSTAT, 2025). In Poland, barley is mainly grown for feed, and according to the Polish Association for Sustainable Agriculture and Food (2025), malting barley accounts for about 8-10% of production.

In the context of foreign trade, Poland is not among the leading global players — its share in global barley trade remains low, at approximately 1.2%. Barley exports play a supplementary role in Poland's grain sector. When considering barley's share in Poland's total grain exports, it is marginal, amounting to 3.5% (FAOSTAT, 2025). Polish barley exports are primarily concentrated in the EU market, with Germany as the main recipient.

Both domestic harvest conditions and international trends shape pricing in the Polish barley market. Feed barley prices in Poland are comparable to EU averages and are primarily influenced by developments in the broader feed grain sector. As of the first quarters of 2025, the price of barley in Poland was approximately PLN 720 per ton (around USD 197/ton), while the EU average is approximately USD 206/ton (KOWR, 2025). Prices for malting barley are typically higher, although the availability of raw material with suitable quality parameters is becoming increasingly challenging. Overall, the domestic barley market in Poland is characterized by high seasonal volatility and growing sensitivity to external factors — such as currency exchange rates, transportation costs, and competition from other grains.

### 1.2 Recent history of barley production in Poland

Barley production in Poland has undergone significant structural and technological transformation over the last few decades. Historically, the cultivation of this cereal was much more dispersed; in 1980, the area under barley cultivation was approximately 1.3 million hectares, and at the turn of the 1980s and 1990s, the harvest reached 4.2 million tons (UOKiK, 2025). Since then, there has been a clear downward trend in the number of producers. In recent years, the number of farms growing barley has decreased from 492,000 in 2005 to less than 190,000 in 2020. At the same time, between 2000 and 2024, the total area under barley cultivation decreased by 37% (agropolska.pl, 2025). Despite the decline in the number of farms, they are consolidating and becoming more professional. In 2024, the average farm had less than 8 ha of cereals, which represents an increase of 59% compared to 2000 (UOKiK, 2025). In terms of barley production, the average area per farm was approximately 2.6 ha in 2010 for both types of barley (winter and spring), while in 2020 it was 4.7 ha for winter barley and 3.1 ha for spring barley.

The current production situation, based on 2024 data, indicates stable harvests with a smaller area under cultivation than in the previous decade. Barley currently occupies 695,000 ha. Despite a smaller area than a decade ago, agrotechnical progress has enabled relatively high yields, allowing harvests to be maintained. The average barley yield in 2024 was 4.3 t/ha, which is significantly higher than in 2010 (3.5 t/ha) (Figure 3). Total production in 2024 was therefore 3,016,000 tons, compared to approximately 3,400,000 tons in 2010. In terms of production value, however, barley shows a downward trend compared to other crops, reaching a 2.44% share in the total value of plant production in Poland in 2024, compared to 4.00% in 2010 (Figure 4) (GUS Statistical Yearbook of Agriculture, 2024, 2025).

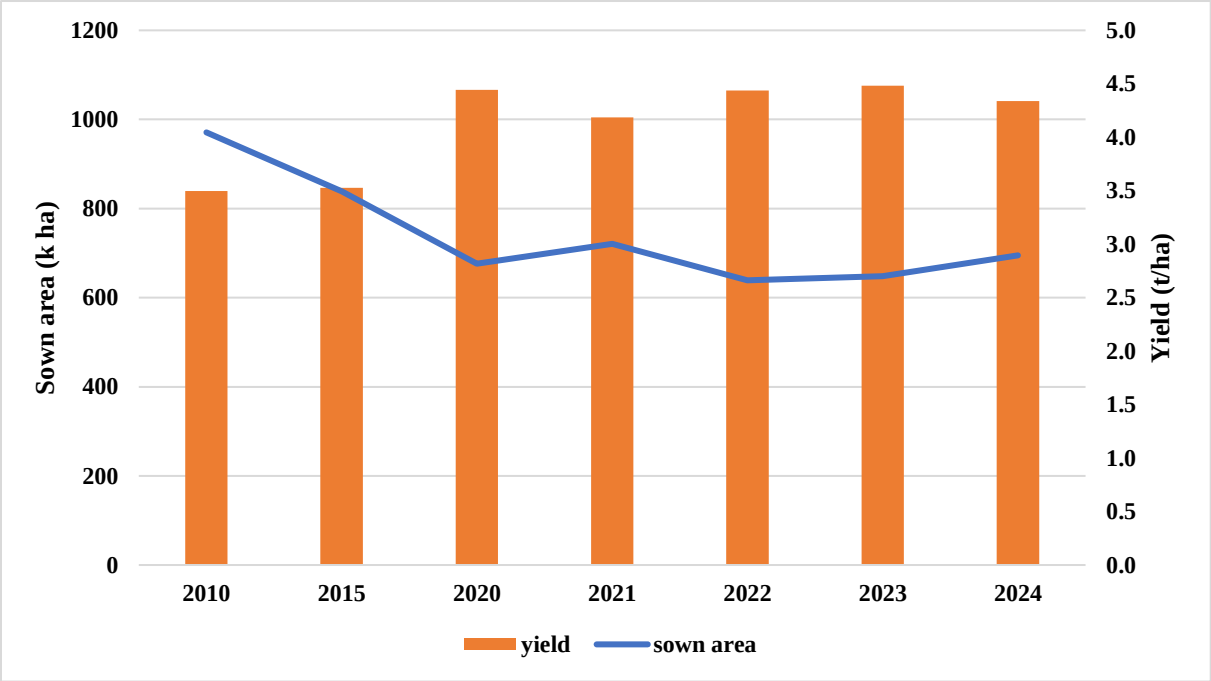


**Figure 3.** Sown area (thousand ha) and yields (t/ha) of barley in Poland in 2010-2024
source: Statistical Yearbooks of Agriculture, GUS.

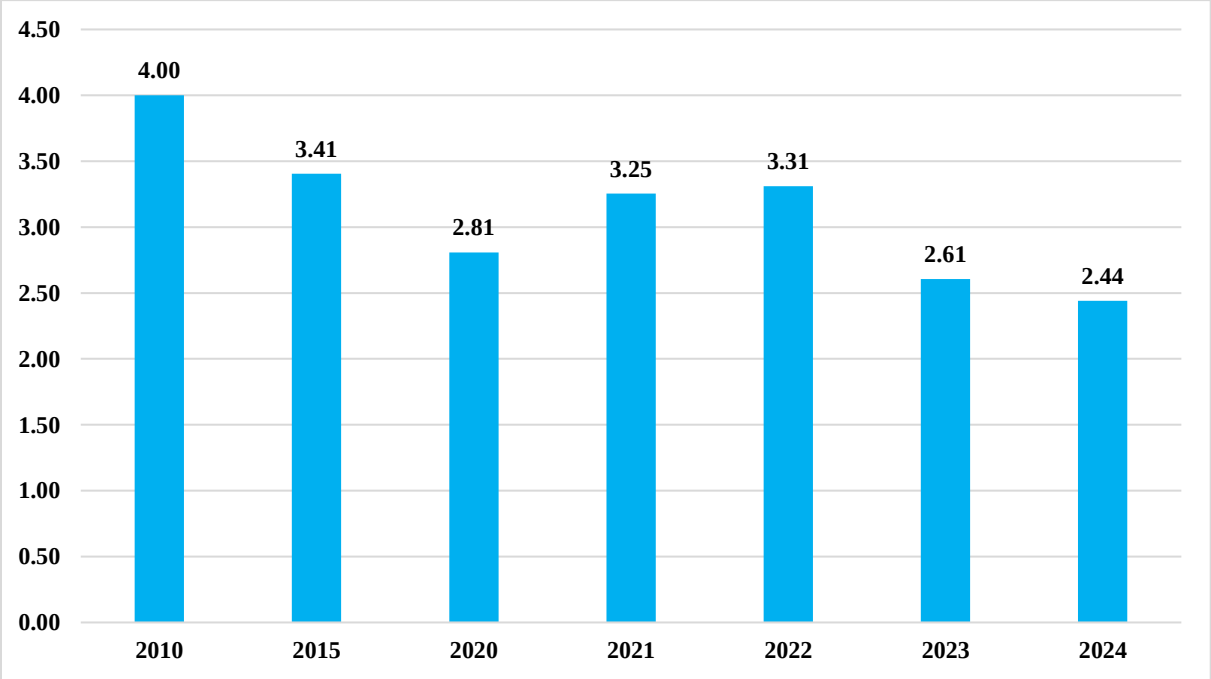


**Figure 4.** Barley's share in the value of crop production in Poland in 2010-2024 (%)
source: Statistical Yearbooks of Agriculture, GUS.

A key trend over the last 15 years has been a radical change in the structure of barley cultivation. In 2010, spring barley (722,000 ha) dominated Polish agriculture over winter barley (249,000 ha). Currently, the situation has reversed – in 2024, winter barley covered 420,000 ha, while spring varieties covered only 275,000 ha (Figure 5). This is significant for the production potential of malting barley, as it is mainly spring varieties that are used for malting. This change is due, among other things, to the higher productivity of winter varieties, whose yield in 2024

averaged 4.68 t/ha, compared to 3.83 t/ha for spring barley (IERiGŻ-PiB, 2024). Spring barley is also more sensitive to adverse weather conditions, including water shortages during key growth stages.

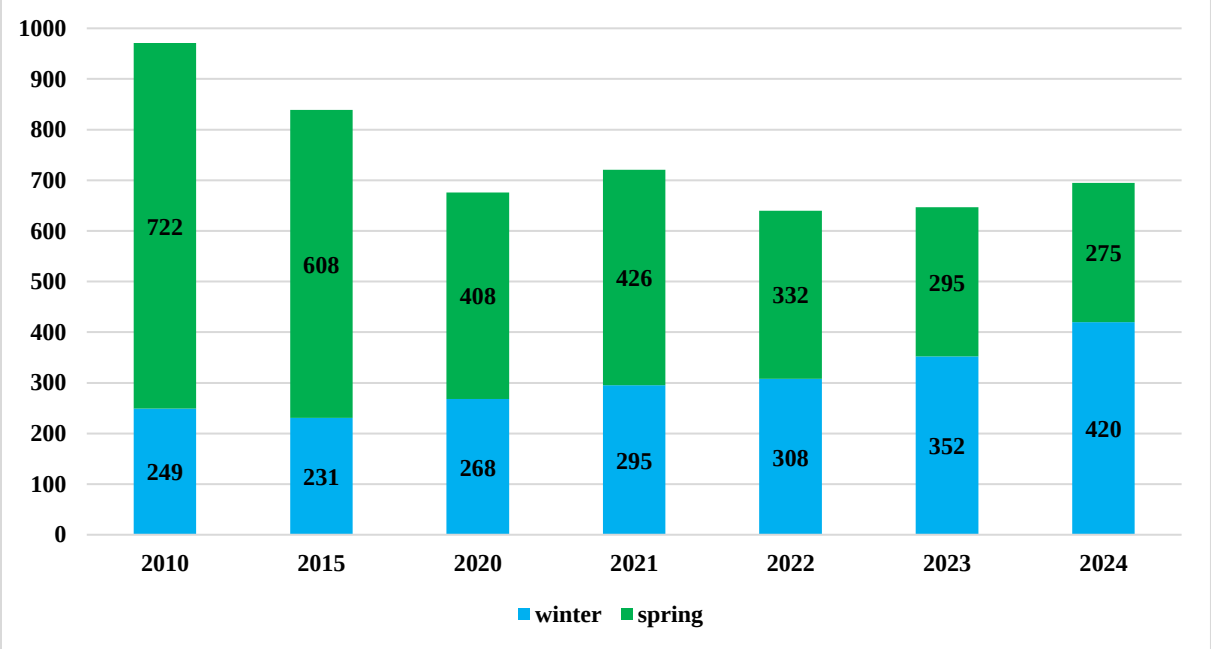


**Figure 5.** Sown area of barley crops in Poland in 2010-2024 by type (thousand ha)
source: Statistical Yearbooks of Agriculture, GUS.

As mentioned earlier, the primary use of barley in Poland is for feed production (grazing). Barley is considered an excellent nutritional component for pigs, poultry, cattle, sheep, and horses, mainly because it has a lower content of anti-nutritional substances that reduce production efficiency compared to other cereals (UOKiK, 2025). This use takes two forms (IERiGŻ-PiB, 2024):

- Grazing in unprocessed (farm) form: this mainly applies to oats, mixtures, and triticale, but also to a significant proportion of barley that does not reach the market.
- Industrial feed production: this sector is showing systematic growth, which is related to the concentration of livestock farming and the pursuit of improved feeding efficiency.

Malting barley accounts for approximately 8–10% of the total amount of barley grown in Poland. However, this segment requires the highest level of agricultural expertise. Malting varieties are bred for specific quality characteristics: low protein content, high purity (appropriate thickness), and grain uniformity (homogeneity). The cultivation of barley for malt differs from feed production primarily in its rigorous approach to nitrogen fertilization, which must be limited to avoid excessive protein levels in the grain (Polish Association for Sustainable Agriculture and Food, 2025). Despite large overall barley harvests, agricultural producers often struggle to meet brewing parameters, resulting in the grain ultimately being sent to the feed

sector as a lower-quality raw material. The Polish market regularly experiences a shortage of barley with the required brewing parameters, forcing processors to supplement their supplies with imported raw materials (UOKiK, 2025). According to estimates by the Polish Association for Sustainable Agriculture and Food, domestic malting barley production in recent years has ranged from 240,000 to 300,000 tons.

Barley production in Poland is heavily dependent on price fluctuations and production costs. Average barley purchase prices have fluctuated wildly over the last 15 years: from PLN 48.98/dt in 2010, through a record high of PLN 129.96/dt in 2022 (resulting from destabilization following Russia's aggression against Ukraine), to PLN 74.44/dt in 2024 (Figure 6).

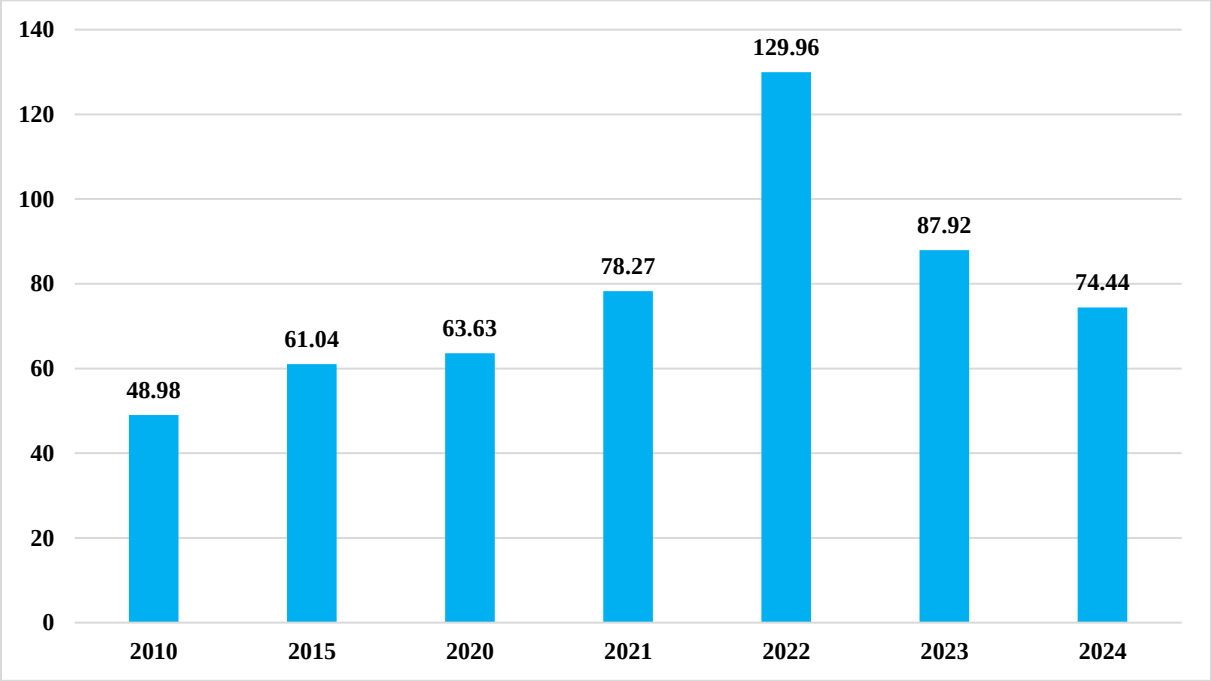


**Figure 6.** Average purchase prices of barley in Poland in 2010-2024 (PLN/dt)
source: Statistical Yearbooks of Agriculture, GUS.

Malting barley, as a higher quality product, but also one that incurs higher costs and production risks, should receive a certain premium for this reason. Comparing the prices of food, feed, and malting barley over recent years (Figure 7), it can be seen that this premium has not always been significant or has been absent altogether at times. Looking at the average purchase prices for the year, the lowest premium for malting barley compared to feed barley was in 2021 (6%). The situation began to change in 2022, when malting barley was on average about 13% more expensive than feed barley. In 2023 and 2024, however, the premium for malting barley was 39% and 44%, respectively.

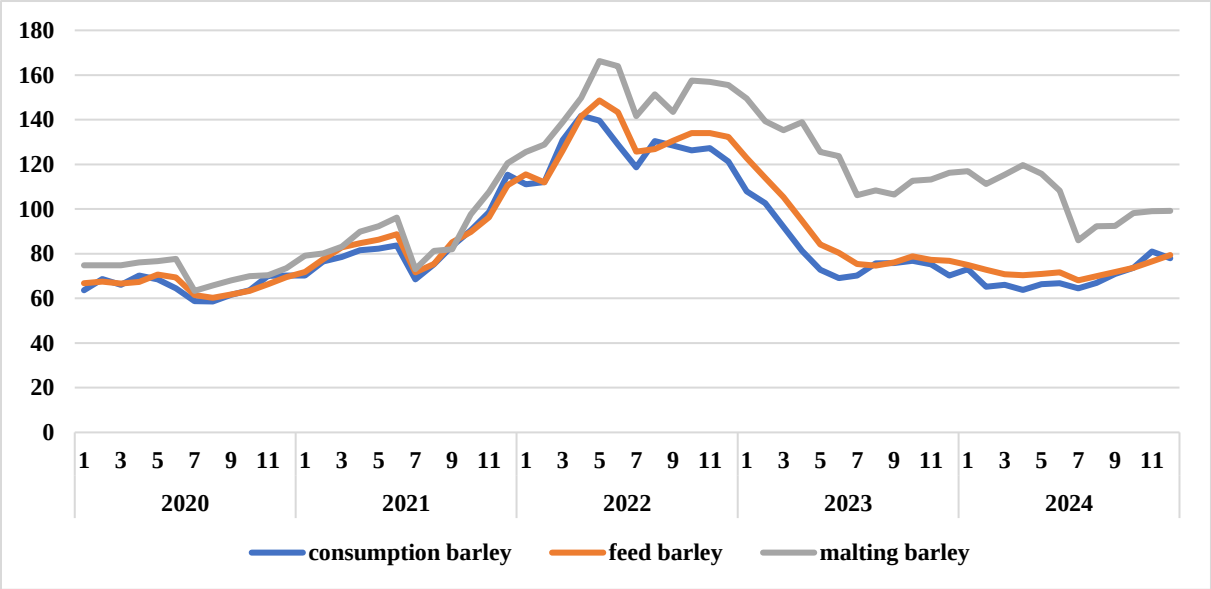


**Figure 7.** Average monthly purchase prices for various types of barley in Poland in 2020-2024 (PLN/dt)
source: Integrated Agricultural Market Information System, Ministry of Agriculture and Rural Development.

An analysis of the latest data from the Integrated Agricultural Market Information System indicates that in 2025, the price difference between malting barley and feed barley will decrease again, to around 15% (based on monthly data from January to November).

### 1.3 Barley balance

From a food balance perspective, Poland's barley self-sufficiency remains high, as exports exceed imports every year. In recent years, the domestic market has been able to absorb an average of 1.75 million tons of grain for feed, which is the dominant use of barley in the country. An average of 108,000 tons is used for food purposes, while around 100,000 tons is used for sowing (seed grain). Losses and shortages in the annual balance are estimated at 111,000 tons. Surplus production is directed to exports, which average 579,000 tons per year, while imports average 493,000 tons to supplement stocks (Figure 8).

Self-sufficiency at the general level does not mean self-sufficiency in every segment of barley production. As mentioned earlier, malting barley is produced in smaller quantities than are needed for processing, hence the need to supplement it through imports. As indicated by data on the value and volume of barley exports and imports over recent years, export prices were higher than import prices only in 2022, when market turmoil caused by the war in Ukraine was exceptional. This situation occurred for both seeds and grain. In 2023 and 2024, barley export prices accounted for 73% and 65% of import prices, respectively, indicating that imported material was of higher quality. One of the reasons for this is the import of malting

barley, which is of higher quality than, for example, feed barley, which is exported to a greater extent.

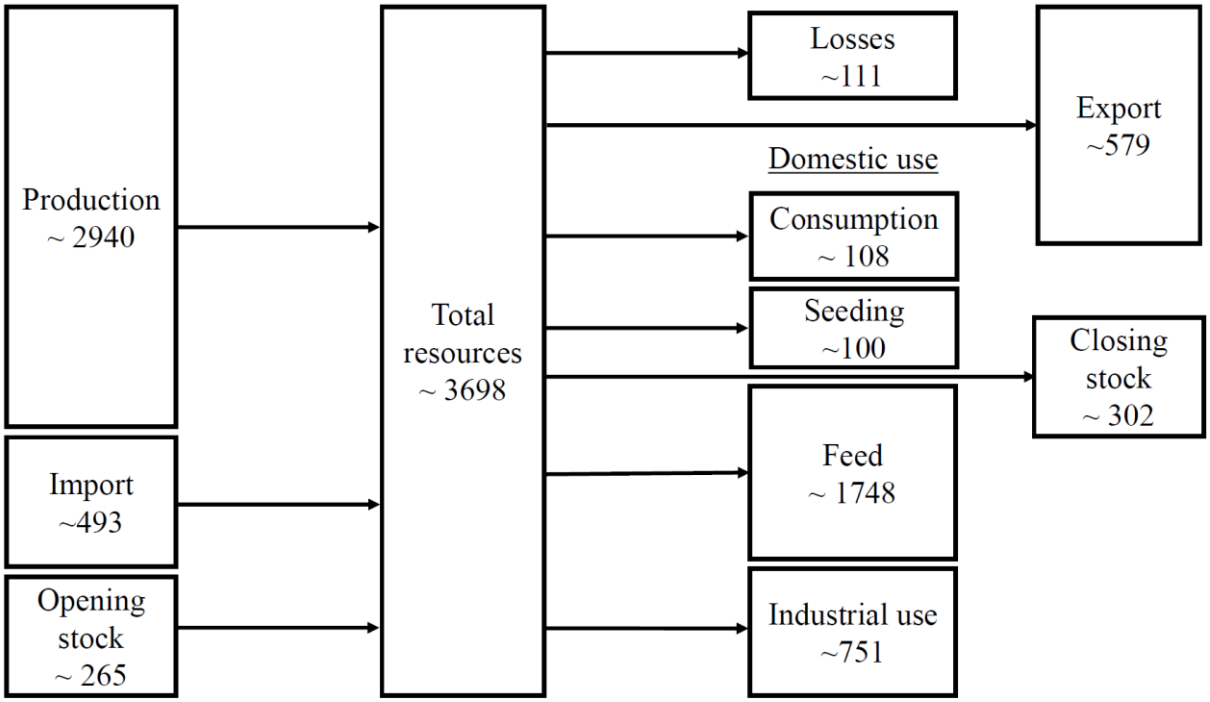


**Figure 8.** Average annual barley balance for 2021-2024 (thousand tons)
source: Own calculations based on IERiGŻ-PiB (2024).

For seeds, international trade data indicate a high level of domestic self-sufficiency. In 2023 and 2024, Poland exported more than four times as much barley seed as it imported. Furthermore, barley seed accounted for only 9.5% and 12% of total barley imports, respectively, while exports accounted for nearly 19% and 26% of total international trade volume.

### 1.4 Suppliers of inputs

The market for suppliers of production inputs for farms producing malting barley in Poland is part of the broader market for commercial agricultural supplies, dominated by large companies that produce fertilizers, plant protection products, and seeds, as well as an extensive network of distributors (agrodealers). In practice, it is the distributors who integrate sales with logistics, service, and, above all, ongoing technological advice. Under time pressure during the season and with the growing complexity of cultivation technology, suppliers' recommendations on variety selection, fertilization strategies, and plant protection programs are becoming a key source of operational knowledge for many producers. At the same time, it should be emphasized that this advice is linked to commercial interests, often based on the promotion of specific

brands, packages, and solutions, which means that farmers usually compare it with their own experience, public advisory recommendations, and, in larger farms, also with independent advisors.

The specificity of malting barley lies in the fact that suppliers of production resources operate in an environment that is more quality-oriented than in the case of feed grains. Grain sales in this segment are more often linked to malting technology requirements, i.e., parameters influenced not only by the variety but also by crop management, especially nitrogen management, fungicide protection, and lodging risk reduction. As a result, the market for malting barley inputs is characterized by "technology for parameters": suppliers offer farmers not only individual products but also entire cultivation programs designed to increase the likelihood of obtaining a homogeneous batch of grain with stable characteristics. In this context, certified and treated seed plays a strategic role, as the choice of variety is often determined by the customer market (list of preferred varieties, proven in malting, local availability) and by the assessment of variety suitability in regional conditions. Seed suppliers, together with the distribution network, therefore have a significant influence not only on the decision to sow, but also on the set of agrotechnical practices to be used to minimize the risk of failing to meet quality requirements.

In the fertilizer and plant protection products segment, Poland has a mature market where domestic production and imports coexist, along with extensive regional distribution. Typical fertilization strategies for malting barley are based on compound fertilizers (to supplement P and K), readily available nitrogen sources, and, increasingly, micronutrients or foliar mixtures to address the risk of deficiencies. It is nitrogen fertilization that is the most sensitive element from the perspective of malting barley quality, which is why suppliers' recommendations focus not only on the dose, but also on the timing and distribution of application, as well as the selection of fertilizer form appropriate to the moisture and growth conditions of the plants. In turn, a programmatic approach dominates in plant protection: herbicides targeting dicotyledonous weeds (and, if necessary, supplementary treatments against monocotyledonous (grassy) weeds, such as common windgrass), fungicides that reduce the pressure of leaf and ear diseases, and, depending on the season, insecticides against pests. Growth regulators also play an important role in malting barley, as reducing lodging promotes grain uniformity and health and facilitates timely harvesting. In practice, this means that suppliers of plant protection products compete not only on price, but also on the reliability of their program (selection of active substances, application window, compatibility of mixtures, safety for plants) and product availability during short periods of peak demand.

The price volatility of key means of production is one of the main cost risk factors at the production stage. In recent years, cost pressure in this segment has not been uniform: individual groups of inputs reacted at different times and with varying intensity, making it difficult for farms to plan cultivation technology and seasonal financing in a stable manner. The most predictable cost element in 2021-2024 remained seed. Its prices rose moderately and relatively steadily, without the sharp spikes characteristic of other inputs (Figure 9). Fertilizer price fluctuations introduce significantly greater instability. Their price indices indicate a strong shock in 2022, followed by a two-year downward correction in 2023–2024. This pattern of change means that fertilization costs rose sharply in a short period of time and then fell. However, from the perspective of farm decisions, this does not always translate into proportionally rapid adjustments in production. Fertilization plays a key role in malting barley, as it affects not only yield but also grain quality parameters. As a result, farmers have limited options. Cutting doses too much may increase the risk of yield decline or crop deterioration.

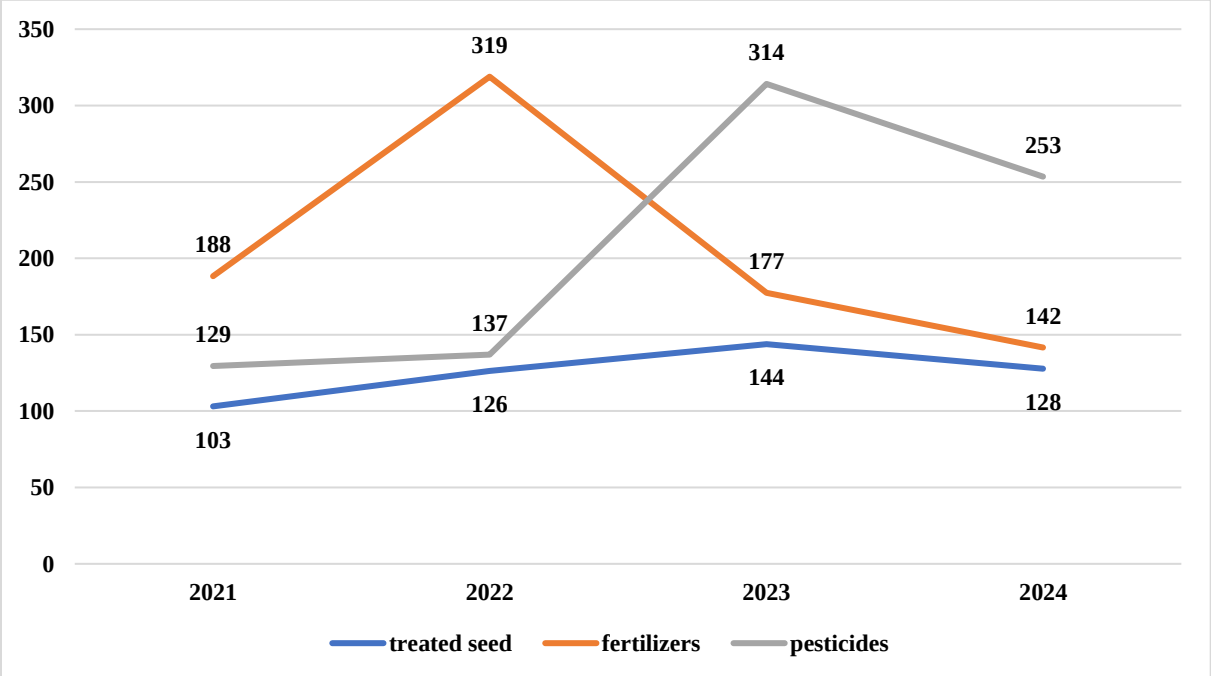


**Figure 9.** Price indices for means of production in spring barley cultivation (2020 = 100)
source: Own elaboration based on calculations for the cultivation of 1 ha of spring barley at a high level of productivity, Kujawsko-Pomorskie Agricultural Advisory Center in Minikowo.

Pesticides have also been a significant source of cost pressure in recent years. Their prices fluctuated moderately between 2021 and 2022, but jumped in 2023 and only partially corrected in 2024. This means that prices remain higher than in 2020. This is of direct importance to the malting barley chain, as the plant protection program and crop regulations are key to obtaining a uniform batch of grain that meets the parameters expected by malt houses. Reducing treatments in response to price increases may lead to risk of disease, lodging, or

deterioration in uniformity, which in turn increases the risk of batch rejection or price reductions in trade.

An important element of the supplier market in Poland is the linking of sales of means of production with financing and services. Various forms of trade credit and deferred payments (seasonal) are popular, as well as bundling (e.g., combining seeds with protection and fertilization) and discounts based on volume and purchasing loyalty. At the same time, the market for field and equipment services plays an important role: some farms, for example, use harvesting services, as well as cleaning, drying, and preparation services for grain batches for sale. In the malting barley chain, these services have not only a cost dimension but also a quality dimension – professional harvesting and post-harvest handling reduce grain damage and help maintain batch parameters, which, in quality systems, translate into risk management for acceptance or rejection of the raw material.

Compared to other cereals, relations between farmers, suppliers of production inputs, and grain buyers in the malting barley sector are usually more coordinated. Even if contracting formally goes through an intermediary or malting house, in practice the market functions as a system of interdependencies: the quality requirements of recipients reinforce the importance of variety and technology recommendations, and suppliers – through consulting, product availability, commercial terms, and financing – have a real impact on how crops are grown. From the perspective of farms, it is therefore crucial not only to find the cheapest source of supply but also to choose a partner who will ensure timely deliveries, consistent technology, and support during the season, thereby reducing the production and quality risks characteristic of malting barley.

### 1.5 Storage and logistics

The storage and logistics of malting barley play a crucial role in linking seasonal agricultural production with the continuous, year-round demand of malt houses. This stage is essential for ensuring the timely availability of raw material and for maintaining the technological parameters required for the malting process. This is particularly important because the quality of barley cannot be improved after harvest–it can only be preserved. Therefore, proper drying, batch purity, and appropriate storage conditions constitute the foundation for value creation in subsequent stages of the value chain (Kiaya, 2014).

It is essential to distinguish between malting barley and feed barley. Malting barley is considered a technological raw material and must retain its germination capacity, as the malting

process relies on controlled grain germination. In practice, this means meeting strict requirements for germination capacity (often ≥95%) and specific thresholds for protein and nitrogen content, moisture levels, and batch purity (e.g., limiting the proportion of small kernels, impurities, or damaged grains) (UK Malt, 2020).

The literature indicates that germination capacity is the primary quality criterion for malting barley, typically assessed using standardized tests such as “germination energy” (Frančáková et al., 2012). To meet these quality requirements, it is necessary to ensure appropriate storage conditions that minimize microbiological risks, including mold growth and mycotoxin production. Studies emphasize the importance of maintaining low grain moisture (generally not exceeding 14%) and controlled storage temperatures, both of which are critical for reducing unwanted microbial growth during storage (Galiwango et al., 2024).

As a consequence of these quality requirements, logistics practices differ significantly. Within the malting barley value chain, it is common to use segregated storage by variety, contract, and quality parameters to prevent batch mixing and compromise technological uniformity. A frequently used approach is "identity preserved", which involves variety-specific contracting and maintaining batch identity throughout the entire flow—from procurement to the malt house (UK Malt, 2020).

In commercial practice, this reinforces the development of extensive batch metadata (e.g., contract number, batch number, lot number, variety, grain storage location), in line with quality audit and risk management requirements in storage. For example, some maltsters’ purchasing specifications require all samples and deliveries to be clearly labeled with contract and batch-related data.

In contrast, feed barley is typically handled more as a commodity raw material, where basic safety (e.g., absence of contaminants) and parameters that enable secure storage are key. However, it does not require high germination capacity or strict varietal purity to the same extent as malting barley.

From a value chain analysis perspective, it is also important to note that storage and transport infrastructure determine both the cost structure and resilience of the entire system. In practice, it often becomes a bottleneck, particularly during the peak post-harvest supply period. The European Commission highlights that, for cereals in the EU, both storage capacity and the identification of problem areas in logistics are key factors (European Commission, 2017). The most frequently cited barriers include:

- Post-harvest drying: Insufficient number or capacity of dryers – resulting in queues and the risk of quality deterioration (e.g., increased moisture, mold development);

- Storage capacity and standards: Lack of silos with aeration or temperature monitoring – makes it difficult to maintain malting barley parameters, leading to greater quality losses;
- Batch uniformity: A large number of small deliveries with varying parameters – increases sorting and cleaning time and costs;
- Peak-season transport: Shortages of trucks, railcars, and drivers; infrastructure limitations – leading to higher freight rates and delivery delays;
- Throughput capacity of elevators/port terminals: Limited capacity for intake, cleaning, weighing, and loading – causing queues and costly idle times.

As a result, identifying logistical bottlenecks should be considered a key component of the malt value chain analysis, as they play a critical role in determining costs, the risk of quality loss, and the stability of supply throughout the year. The cereal storage infrastructure in the European Union is multi-level in nature and includes on-farm facilities, cooperative storage, and facilities located at transport hubs (e.g., ports).

In the EU context, Poland stands out for the relatively large role of on-farm storage. The share of storage capacity at the farm level is estimated at approximately 67%, with the total national storage capacity reaching around 24 million tons. This structure contributes to the fragmentation of supply (many small lots), which, in the case of malting barley, increases the importance of intermediary nodes (such as purchasing points and grain elevators) responsible for consolidation and segregation of batches according to malt house requirements. In Poland, agricultural cooperatives, due to their scale and service to external entities, are often classified not as “agricultural storage” but rather as part of wholesale trade or processing sectors. This has implications for the interpretation of statistics regarding storage capacity structure. Barley grain in Poland is stored primarily in flat warehouses and silos, with long-term storage typically carried out in silos (Instytut Ochrony Roślin, 2023).

Due to the seasonal nature of barley cultivation and harvesting, drying and post-harvest moisture reduction of the grain represent key challenges. Demand for drying services peaks immediately after harvest, and the availability of drying capacity determines the intake speed at storage facilities and the risk of quality deterioration. The cost of this stage is highly correlated with energy prices, as drying is one of the most energy-intensive operations in grain handling. Studies on cereal crops indicate that drying can account for a significant share of energy consumption throughout the entire production cycle (Chojnacka et al., 2021; Panigrahi et al., 2023).

In terms of grain storage (including barley), key challenges include controlling temperature and moisture increases within the grain mass. This requires aeration, cooling, temperature monitoring, and, if necessary, pest control measures. From the perspective of quality preservation, the most important factors are rapid reduction of grain moisture to safe levels and temperature control, as heat and humidity accelerate mold growth and insect activity (Casada et al., 2002; Jones & Hardin, 2010).

Irregularities during the transport and storage stages lead to both quantitative and qualitative losses, which–due to the nature of the product–most often occur within the first weeks after harvest. These losses are primarily caused by delayed drying, prolonged storage, mold contamination, pest infestations, and damage during loading, unloading, and transportation (e.g., mechanical damage, contamination, mixing of batches). In practice, losses are minimized by rapid moisture reduction, batch cleaning, maintaining storage hygiene, and monitoring temperature and humidity.

Thus, loss mitigation relies on effective control and organization of raw material flows. As a result, the movement of malting barley from farms to malt houses is generally more strictly managed compared to feed grain. In practice, this means a dominance of contract-based supply models and logistics systems focused on identity preservation–maintaining batch identity from the farm, through storage and collection points, all the way to delivery at the malt house, while minimizing the mixing of varieties or batches with different parameters (UK Malt, 2020; Viking Malt, 2020).

There are two main supply models operating within the malting barley value chain (UK Malt, 2020):

• Direct deliveries from farm to malt house, which support better traceability and minimize handling steps;

• Deliveries via intermediaries (collection centers, trading companies, cooperatives), where key functions include consolidation and segregation of raw material: cleaning, classification, assembling larger homogeneous batches, and managing seasonal supply peaks.

From a value chain risk perspective, it is important to note that failure to meet quality criteria results in batch downgrading to the feed market, leading to price and margin reductions. Therefore, quality control and batch information management are integral components of malting barley logistics (Bagger-Jörgensen, 2024).

### 1.6 Processing (malting)

Malting represents a crucial stage in the value chain, as malt is the most important ingredient in beer after water, based on its quantitative share (UOKiK, 2025). During the malting process, grain is transformed into a technological raw material that provides enzymes and sugars essential for the brewing process–factors that determine the flavor and color of beer.

Malt refers to germinated and dried cereal grains, primarily barley or wheat. From a product perspective, malt encompasses a wide range of varieties (e.g., barley malt, wheat malt, rye malt; pale and dark malts, Pilsner and Munich malts), reflecting differences in process parameters and the final product profiles. In Poland, barley malt dominates malting output, accounting for approximately 91–92% of total malt production between 2019 and 2022, highlighting the critical importance of malting barley availability for the operational stability of malt houses and the entire brewing sector (https://kompendiumpiwa.pl/slody/, accessed 8.12.2025; UOKiK, 2025).

In 2024, there were 14 malt houses operating in Poland, but the majority of malt production was concentrated in five domestic companies:

- Malteurop Polska Sp. z o.o. (Gdańsk),
- Optima Malt Sp. z o.o. (Poznań),
- Viking Malt Sp. z o.o. (Sierpc and Strzegom),
- Słodownia Soufflet Polska Sp. z o.o. (Poznań),
- Crisp Malt Sp. z o.o. (Bydgoszcz).

Polish entities accounted for 54% of the malt sold on the domestic market (UOKiK, 2025). Compared with previous years, malt production in Poland reached a record high in 2024, totaling approximately 370,000 tons (Table 5). Based on 2015 production benchmarks, the maximum domestic malt production capacity is estimated at around 400,000 tons, indicating that national producers are operating at nearly full capacity. Production constraints are mainly due to raw material shortages, specifically malting barley, and to infrastructure limitations. Producing 400,000 tons of malt requires approximately 500,000 tons of malting barley, with up to 50% of this demand met through imports (https://www.agropolska.pl/aktualnosci/polska/slodowni-coraz-mniej-a-jeczmienia-browarnego-i-tak-brakuje,3649.html, accessed 8.12.2025; survey estimates for UOKiK 2025).

Due to these raw material deficits, expanding malting infrastructure is not considered economically viable, as such investment would be capital-intensive. Despite the increase in

production volume, the value of sold malt in 2024 was approximately PLN 820,000, down from 2023 and 2022.

**Table 5**. Volume and value of malt production in Poland

| | 2022 | 2023 | 2024 |
|---|---|---|---|
| Value [thousand PLN] | 844 783 | 1 046 662 | 820 896 |
| Volume [t] | 359 658 | 346 027 | 368 317 |

Source: own study based on data from https://dbw.stat.gov.pl/baza-danych

According to UOKiK (2025), Poland's foreign trade balance for malt in 2023, as in previous years, was negative, amounting to -108 thousand tons (exports approx. 114 thousand tons, imports approx. 222 thousand tons).

Malting is a process consisting of many stages, which are time- and energy-consuming. In industrial practice, grain is first cleaned and sorted, and then undergoes three main phases: steeping, germination, and drying. The grains are irrigated, which causes them to grow and generates significant amounts of heat. Aeration and oxygenation for proper growth are also important during this time. After steeping, the grain moisture content should be around 45%. This prepared grain is then left to germinate, which usually takes 3-4 days. The germination process also requires ensuring the appropriate temperature and aeration. After obtaining "green malt" (germination), drying occurs, which stabilizes the product (slows biological processes) and shapes its color and aroma. Initial drying occurs first, reducing the malt's moisture content to approximately 10-12% at temperatures up to 50°C. At this stage, the temperature ranges from 30°C to 50°C and is selected to avoid deactivating the enzymes that have formed. After reducing the moisture content, higher temperatures of approximately 80-100°C are used in the subsequent drying process, allowing the malt's moisture content to be reduced to the desired level below 5% (Baca, 2004).

The technological processes in a malting plant make energy costs a key factor in malting, particularly in the drying process and ventilation systems. Typical energy consumption in malting plants is often cited as approximately 750 kWh of gas (heat) and 150 kWh of electricity per tonne of malt. A modern plant, on the other hand, indicates that consumption can be around 600–650 kWh/t of thermal energy and around 130 kWh/t of electricity, with water consumption of 3–4 $m^3/t$ (approximate values, depending on the technology and malt mix) (Moresi, Cimini, 2025; ukmalt.com, accessed December 31, 2025; Viking Malt Group, 2025). From the value chain perspective, it is worth emphasizing that malting is the stage where energy and water costs strongly influence the unit costs of malt and, consequently, the competitiveness of suppliers throughout the entire chain (from barley contracting to breweries).

## 1.7 Brewing

### 1.7.1 Production process

In Polish brewing, a voluntary definition of beer is commonly applied, based on the former standard PN-A-79098:1995. This definition was developed through cooperation between Poland's two largest beer industry organizations – ZPPP Browary Polskie and the Association of Regional Polish Breweries. It is estimated that over 90% of beer brewed in Poland complies with the criteria established by this definition. According to the definition, *Beer is a beverage obtained through the alcoholic fermentation of brewer's wort. The wort is produced from brewing malt and water, with the addition of hops or hop-derived products, without or with the addition of unmalted raw materials and permitted substances. The total amount of unmalted raw materials added may not substitute more than 45% of the malt in the grist. The beer may contain food ingredients, as well as approved additives and processing aids* (Browary Polskie, 2023).

The beer brewing process consists of several distinct stages (Figure 10). As described in detail by Anderson et al. (2000), the process begins with the milling of malt and other grains, which serve as the primary source of starch. Next, after adding warm water, the process enters the mashing stage, during which enzymes break down starch into fermentable sugars. Following this, the insoluble residues are separated (wort separation), and the clear wort proceeds to the boiling stage, where it is boiled with hops. This stage not only imparts bitterness and aroma but also denatures enzymes and removes undesirable volatile compounds.

After boiling, the wort is clarified and cooled, then undergoes fermentation, during which yeast converts the sugars into alcohol and carbon dioxide. This process lasts several days and results in the formation of beer, which is then conditioned under controlled conditions for several weeks or even months. Two main types of fermentation are distinguished: bottom fermentation and top fermentation. Bottom fermentation occurs when yeast ferments at low temperatures–typically 4–10°C, according to Stewart and Priest (2006), or 8–12°C, as noted by Anderson et al. (2000)–and settles at the bottom of the fermentation vessel (Stewart & Priest, 2006). This type of fermentation is slower, which promotes the development of a clean flavor profile, free from pronounced fruity or spicy notes. Among the most popular bottom-fermented beers are lagers, including pilsners and ležák-style beers–light, crisp, dry beers with a delicate hop aroma and an alcohol content typically ranging from 4% to 6%. Other notable styles include the Baltic Porter–a strong, dark beer (up to 10% ABV) with rich caramel, chocolate, and dried fruit flavors, considered a national brewing treasure of Poland–as well as Koźlak (bock), a

slightly lighter and maltier beer with distinct toasty, roasted notes. Examples of Polish bottom-fermented beers include Koźlak from Browar Amber and various Baltic Porter variants brewed by local craft breweries (WGBF, 2025).

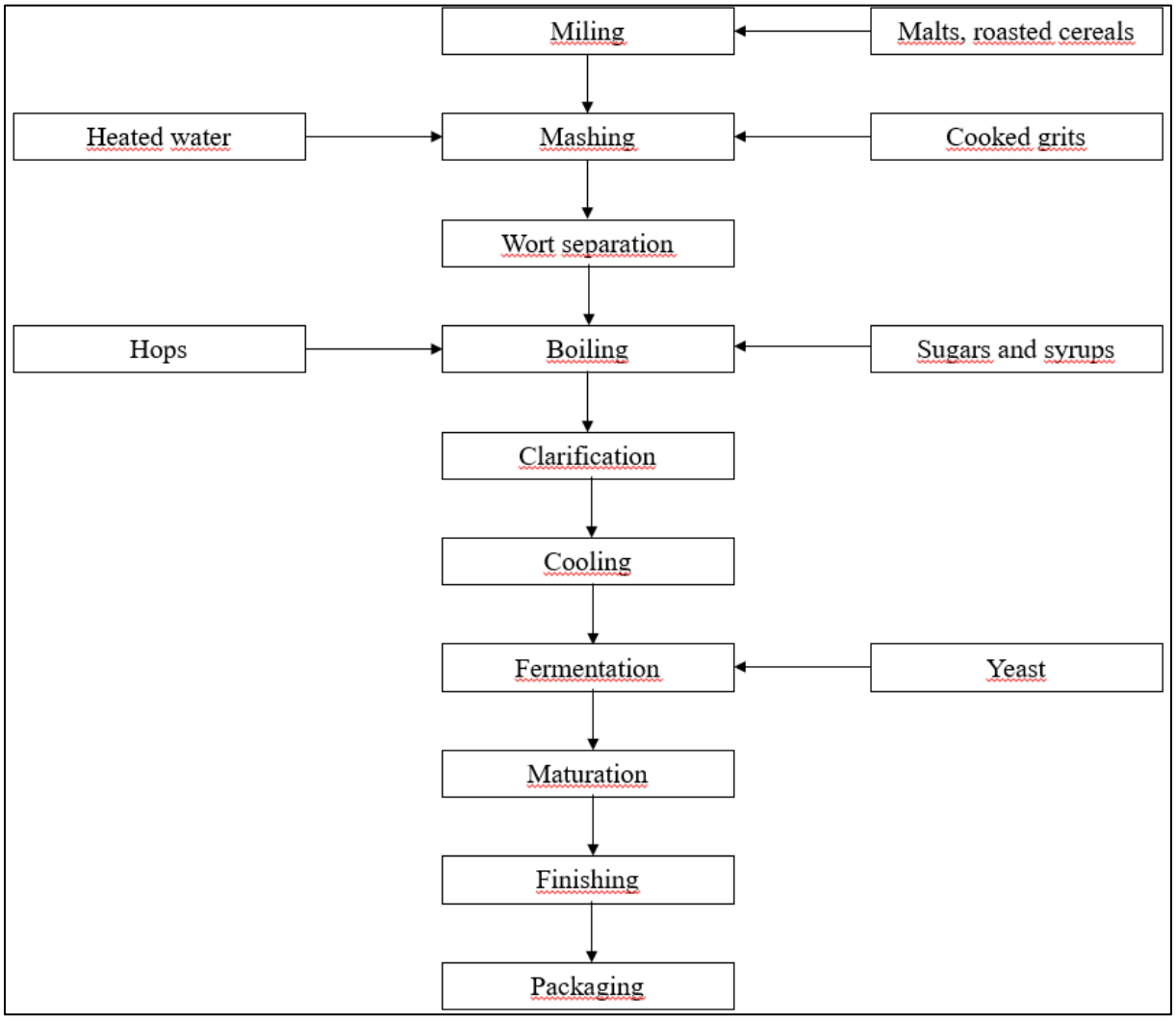


**Figure 10**. The beer production process
Source: Anderson et al. (2000).

Top-fermented beer, on the other hand, ferments at a higher temperature (15–25°C), with yeast working on the surface of the wort, resulting in a richer, more complex aromatic profile (Stewart and Priest, 2006). Most craft beers fall into this category, such as IPA (India Pale Ale), characterized by an intense hoppy aroma and pronounced bitterness (in Poland, for example, Atak Chmielu from Browar Pinta), as well as its variants, including Black IPA and APA, a milder version of IPA. Other notable top-fermentation styles include Weizen – a wheat beer with subtle banana and clove notes; Stout and its variations, ranging from classic to coffee or imperial versions; and Witbier, which is pale and spiced. A top-fermented beer style also includes the Polish Grodziskie, distinguished by its low alcohol content and light smoky aroma (WGBF, 2025).

The maturation stage plays a crucial role in reducing unwanted fermentation by-products and in developing the beer's flavor profile. The final finishing stage includes filtration, stabilization, and optional additions that influence the beer's clarity, foam, or shelf life (Anderson et al., 2000). The finished product then reaches the last stage: packaging – into bottles, cans, or kegs. Although technologically complex, this process is based on a tradition that relies on the natural abilities of enzymes and yeast to transform cereal raw materials into a beverage with consistent flavor, aroma, and alcohol content. Modern brewing, although operating in an industrial, highly automated environment, still relies heavily on this natural process.

### 1.7.2 Structure of the beer market in Poland

After 2000, the Polish economy gradually opened to international markets, encouraging the inflow of new investments. In the brewing industry, this process was associated with access to modern production technologies, automation, and financial resources that enabled infrastructure development. During this period, global brewing corporations also entered the Polish market. Heineken International became the main shareholder of Grupa Żywiec, while Carlsberg Breweries integrated the Okocim, Bosman, Kasztelan, and Piast breweries, forming Carlsberg Polska. Meanwhile, SABMiller acquired a majority stake in Kompania Piwowarska, and in 2009, after purchasing 28.1% of shares from Kulczyk Holding, became its sole owner. Smaller foreign groups also entered the Polish beer market, including Brau Union, Holsten-Brauerei, Royal Unibrew, and Binding-Brauerei (Deloitte, 2022).

Currently, in 2024, there were 337 breweries actively operating in the Polish market, employing approximately 8.7 thousand people, with the market value estimated at PLN 22.9 billion (CASE, 2025). Among the key players in the Polish market, Kompania Piwowarska has maintained its dominant position in recent years, holding over 30% market share (Figure 11). Following closely is Grupa Żywiec, which has been steadily increasing its share, and in third place is Carlsberg. Given that the three largest companies in the sector account for over 80% of the market, the Polish beer market is highly concentrated. According to Porter (2006), a competitive market is typically characterized by a concentration ratio of no more than 40%. Therefore, the Polish brewing industry can be classified as an oligopoly, a form of imperfect competition in which the main producers compete with one another (Klimek, 2014). Calculating the level of market concentration in Poland using the Herfindahl-Hirschman Index (HHI)–the sum of the squares of the market shares of the top three players–the index was 2,460 in 2021

and 2,350 in 2024, indicating a highly concentrated market, as values above 1,800 already denote strong concentration (Purczyński, 2012).

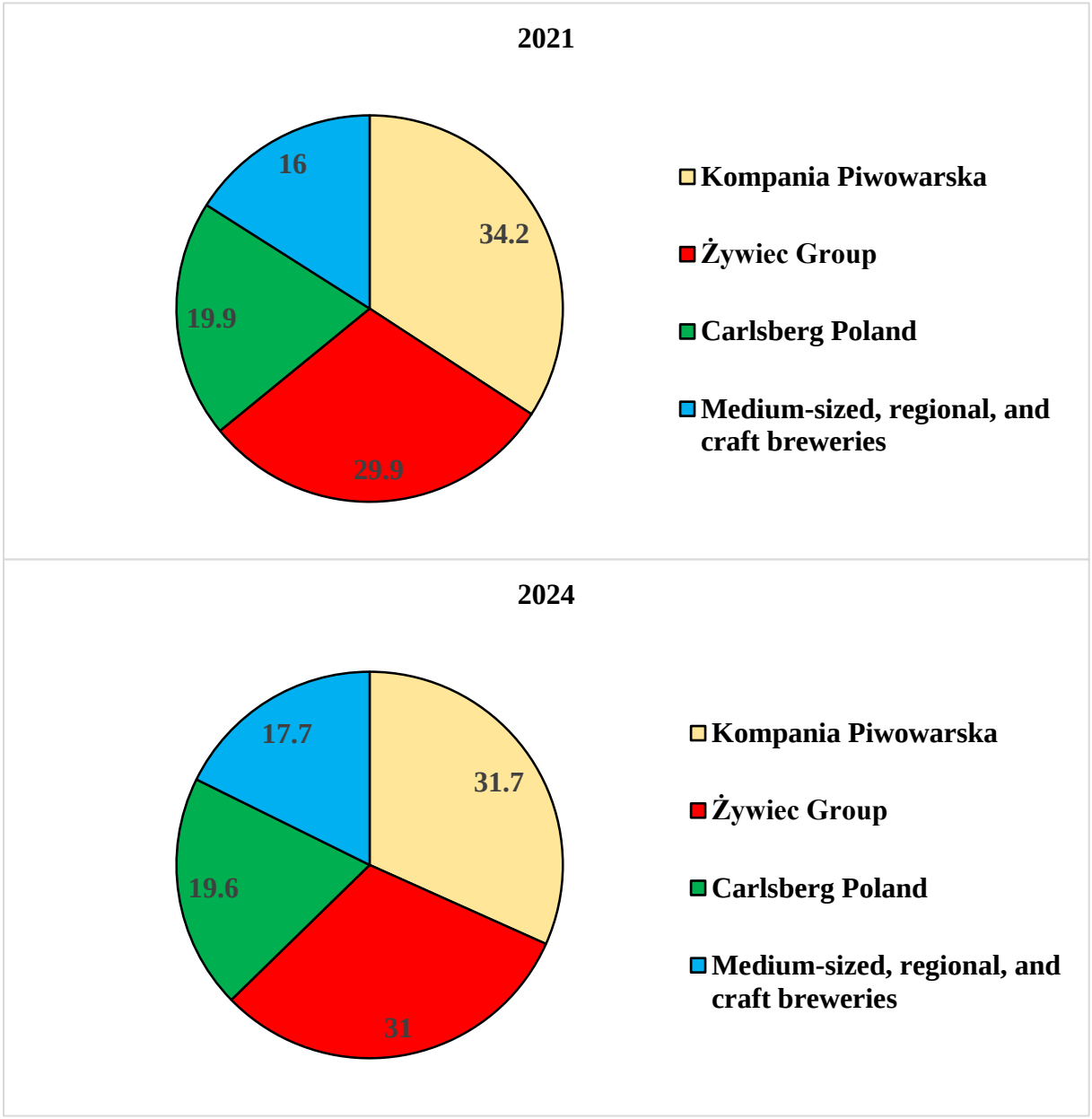


**Figure 11.** Structure of the beer market in Poland in 2021 and 2024
Source: Structure in 2021: Deloitte, 2022. Structure in 2024: CASE, 2025.

In recent years, craft breweries have been gaining importance in Poland, with their market share gradually increasing. Currently, the Polish Association of Craft Breweries (PSBR) includes 29 breweries, with annual production volumes ranging from 400 hectoliters to 30,000 hectoliters. Despite their relatively small output, these breweries are strengthening their market position (PSBR, 2025). Moreover, craft breweries proved to be more resilient to the initial effects of the COVID-19 pandemic in 2020. While large breweries experienced production declines, the average production growth of craft breweries in 2020 was 4.2% compared to the year before the pandemic (PSBR, 2021).

### 1.7.3 Production and prices

Poland is the third-largest beer producer in the European Union, following Germany and Spain (European Beer Trends, 2024). It is noted that the Polish beer market grew most rapidly between 2000 and 2008. Total domestic production increased from 25 million hectoliters to 37 million hectoliters, a 48% increase (Deloitte, 2022). In contrast, in recent years, the Polish brewing sector has experienced a noticeable shift away from previous trends. According to data presented in Figure 12, domestic production of beer made from malt (with alcohol content above 0.5%) reached its peak in 2018 at 41.5 million hectoliters, after which a downward trend began, leading to 35.0 million hectoliters in 2024. This decline represents a drop of over 15% within six years. This phenomenon may result from several overlapping economic, demographic, and cultural factors. Among the key reasons are changing consumer preferences, including increased interest in alternatives such as non-alcoholic beverages, as evidenced by the growth of the alcohol-free beer market (ZPPP, 2025), as well as rising awareness of healthy lifestyles and efforts to reduce alcohol consumption.

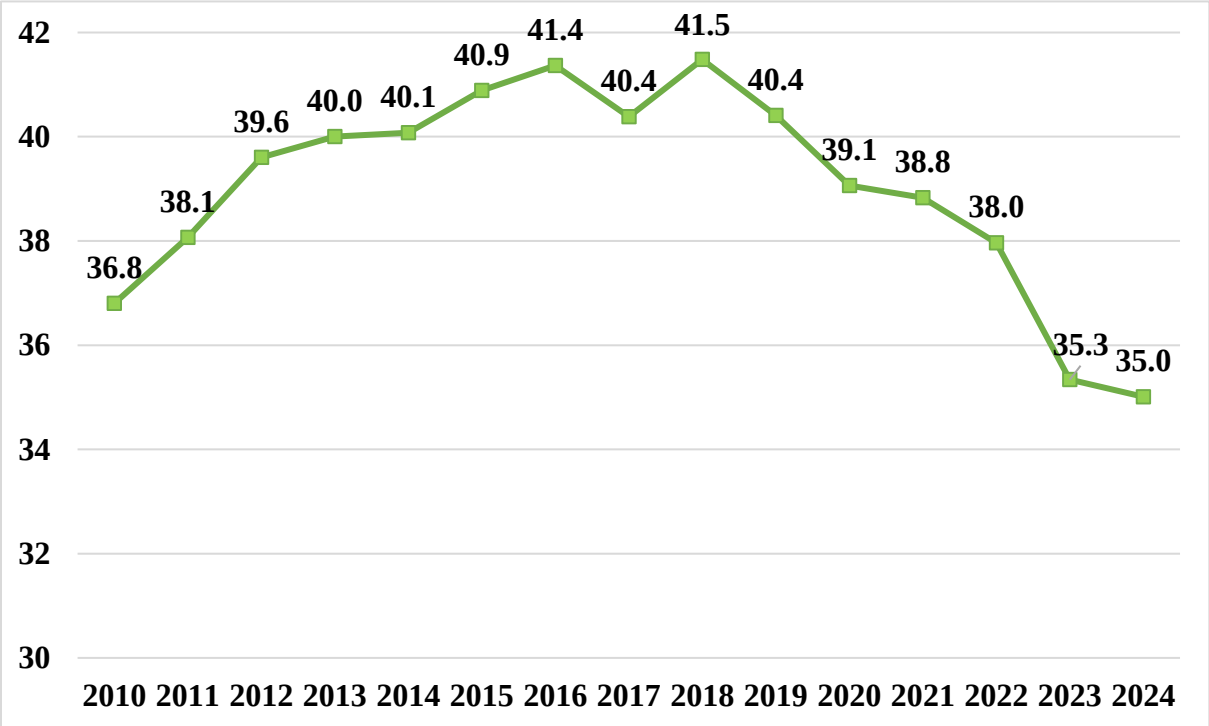


**Figure 12.** Production volume of beer produced from malt (with an alcohol content above 0.5%)
Source: GUS, 2025.

In addition to cultural changes, the decline in beer production in Poland may also have been influenced by macroeconomic and regulatory factors. Rising production costs–including the prices of raw materials, energy, and transportation–as well as inflation, have contributed to higher retail prices, which may have constrained consumer demand. At the same time, newly

introduced regulations, such as stricter alcohol advertising laws and changes in alcohol taxation (e.g., an increase in excise duty on beer), may have further discouraged consumers and influenced producers' strategic decisions (ZPPP, 2025). An additional factor was the COVID-19 pandemic, which significantly impacted the HoReCa sector (hotels, restaurants, catering)—a key distribution channel for beer. As a result, despite the growing number of craft breweries and product innovations, the Polish beer market began to contract.

The decline in beer production in Poland has affected the average retail price of beer (Figure 13), with a clear upward trend since 2018. Initially, between 2010 and 2018, the retail prices of standard pale lager in Poland remained relatively stable. Fluctuations between 2.8 and 2.9 PLN per 0.5-liter bottle meant that the cost of beer was virtually unchanged, or even slightly decreasing in real terms. This moderate price level reflected the general market environment—brewing raw material prices (such as malting barley and hops) were relatively stable, and competition among the major brewing groups likely kept price increases in check. Since 2018, however, a clear upward trend has emerged, visible both in unit prices and in the Harmonised Index of Consumer Prices (HICP) for beer (Figure 14), which includes not only the average retail price of bottled pale lager but also all beer types, such as ALE, lager, or porter (Eurostat, 2025b).

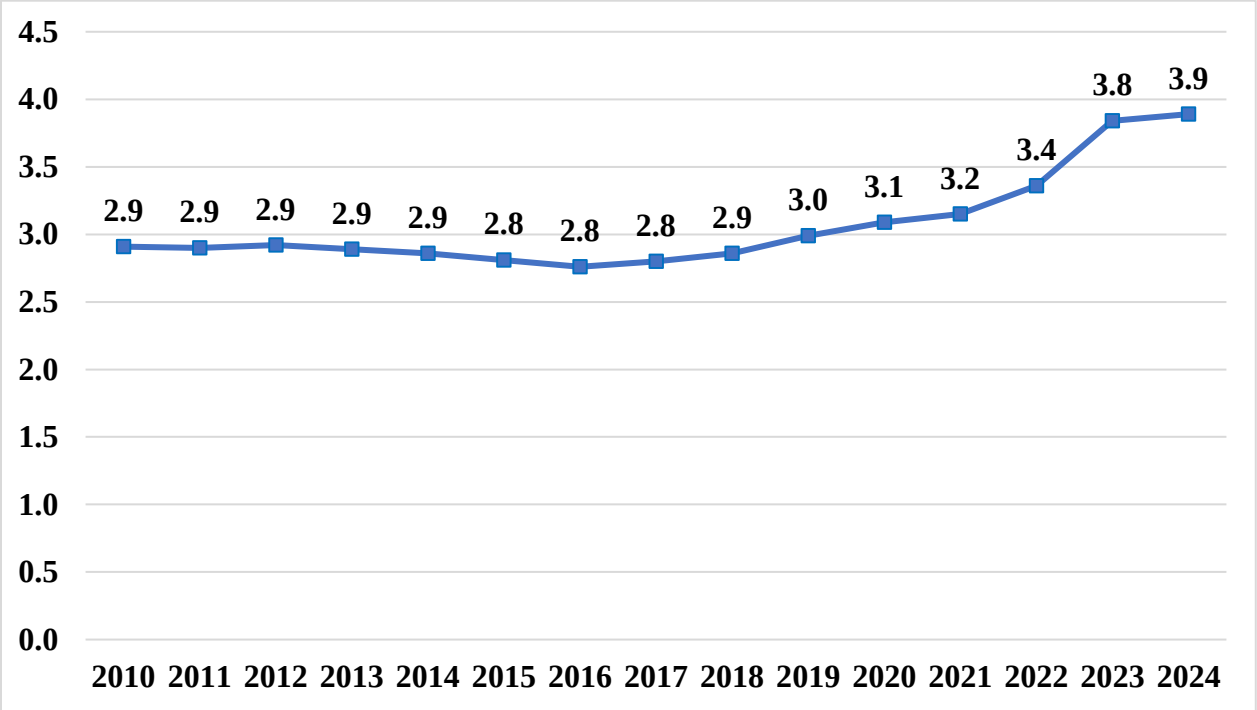


**Figure 13.** Average retail price of standard bottled pale lager (0.5 L) in Poland in the years 2010–2024
Source: GUS (2025).

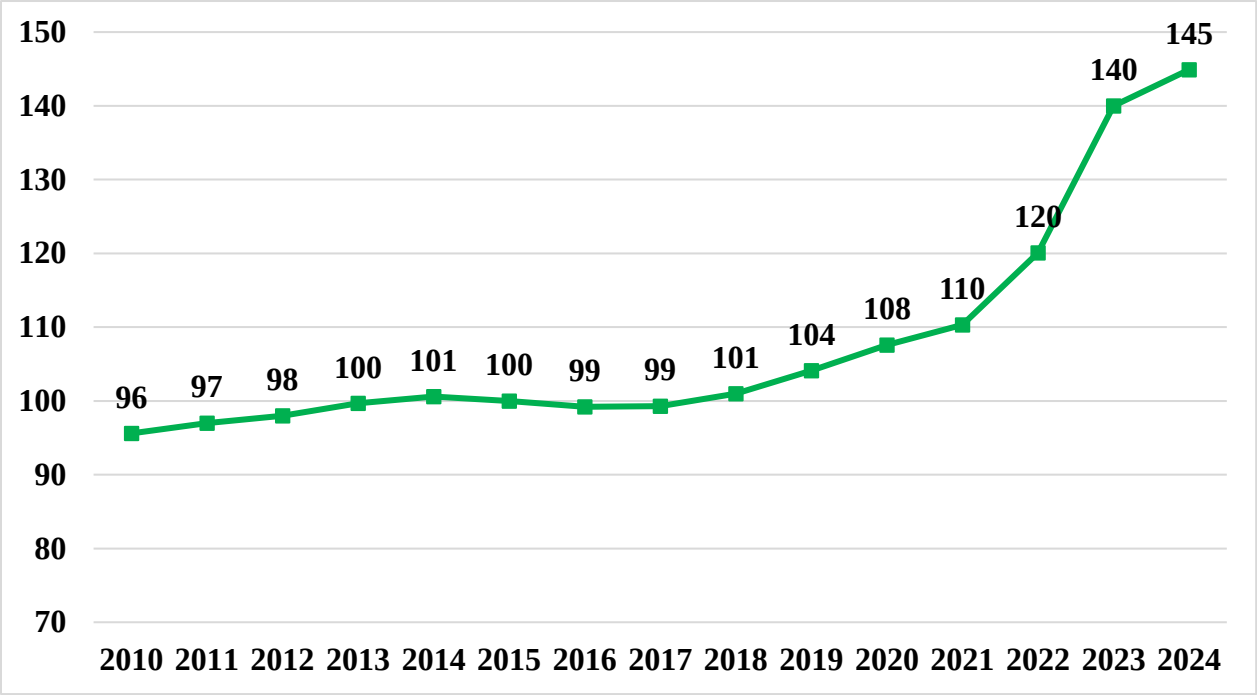


**Figure 14.** Harmonized Index of Consumer Prices: Beer for Poland (2015=100)
Source: Eurostat, Harmonized Index of Consumer Prices: Beer for Poland [CP0213PLM086NEST], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/CP0213PLM086NEST, November 13, 2025.

Until 2018, HICP values fluctuated around 96–101, indicating minimal real price changes, resulting from a balance between production costs and the competitive structure of the beer market. After 2019, a systematic increase began, intensifying significantly in 2021–2024, when the index rose from 108 to 145. This sharp rise reflects the convergence of several factors: the energy crisis, which increased production and packaging costs, the rise in agricultural raw material prices, and disruptions in supply chains during and after the COVID-19 pandemic. Additionally, the relatively high inflation and increases in alcohol excise taxes contributed to the upward price trend. The observed HICP growth for beer also aligns with broader shifts occurring in the European alcoholic beverage market, where rising costs of energy, packaging, and transport have placed particular strain on energy-intensive sectors with high packaging material usage, such as brewing (European Beer Trends, 2024).

Among the raw materials essential for beer production, water ranks first, as it makes up over 90% of beer's composition. According to Carlsberg's estimates (Carlsberg Polska ESG Report, 2023), producing 1 liter of beer requires 2.55 liters of water. An example of water resource management is Browar Żywiec, which sources surface water from the Leśnianka stream, delivered to the brewery by gravity, and also maintains an emergency intake from Lake Żywieckie, used when supply stabilization is needed (drugastronaz.pl/obieg-wody-w-browarze). Aside from water, the primary raw materials are malt, hops, and yeast. Malt,

primarily produced from malting barley, shows a clear dependence on developments in the beer market, which directly affect the agricultural sector and grain processing industry.

### 1.8 Whisky distillation

According to Euromonitor International data, in 2023, Poland accounted for nearly one-third of the value of luxury goods sales in Central and Eastern Europe. The fifth-largest segment by value, with sales of PLN 1.7 billion, was the luxury alcohol market, which grew by 20.5% compared to 2022. Whisky was the dominant player in the premium segment of the luxury alcohol category. The dynamic growth of the luxury goods market in Poland was due to several factors, primarily the growth of the Polish economy, the increasing number of high earners, and the development of retail trade, including new forms of sales such as pop-up stores and digital transactions using virtual reality and artificial intelligence (KPMG, 2024).

The spirits market in Poland is an essential segment of the domestic alcohol industry. Through its contribution to the national budget, it is strongly linked to the economy, domestic consumption, and exports. As the raw material base of the spirits industry primarily consists of products from domestic agriculture, its role in the agri-food chain is also important. Every year, the spirits industry requires 1.6 million tons of grain (Branża spirytusowa…., 2025). Furthermore, given the links between the spirits industry and other sectors of the economy, which lead to job creation and gross value added, it is vital to highlight the indirect impact of this industry on other sectors critical to economic growth (Szczepaniak et al., 2022).

According to data from a report by the Polish Spirits Industry Employers' Association (Związek Pracodawców Polski Przemysł Spirytusowy – ZPPPS), the value of the alcoholic beverages market in Poland in 2024 was approximately PLN 68.6 billion. Its largest segment was beer, accounting for PLN 31.2 billion in sales and nearly 55% of total sales volume. Spirits accounted for approximately 2/5 of the alcoholic beverages market in Poland, generating approximately 45% of the value and 39% of the sales volume (calculated as pure ethyl alcohol). The consumption of spirits accounted for almost 39% of total alcohol consumption in Poland and generated approximately 71% of alcohol excise duty revenue (PLN 10.3 billion in 2024), underscoring the strategic importance of this product group to the national budget. Taking into account tax and fee revenues (PLN 16.8 billion), contributions paid by employees and other levies, the Polish public finances are supplemented annually by the spirits industry with an amount exceeding PLN 18.6 billion (Branża spirytusowa…., 2025).

At the end of 2024, the spirits industry in Poland directly employed 4,500 people. The total direct (value of goods produced) and indirect (the sector generates demand for products and services from other industries, such as agriculture, packaging, transport and logistics, HoReCa, and marketing) impact of the spirits industry on GDP creation in the Polish economy in 2024 could be estimated at PLN 25.7 billion. This means that the Polish spirits industry accounted for approximately 0.71% of Polish GDP (Branża spirytusowa…., 2025).

After 2021, whisky became the fastest-growing segment of Polish alcohol exports. While its exports did not exceed PLN 40 million per year until 2021, in 2024 they reached PLN 197 million, i.e., more than five times that amount. In addition, domestic demand increased: in 2025, whisky sales in Poland were estimated at over PLN 2.5 billion, up from PLN 1.8 billion in 2012 (an increase of nearly 40%). The growing tendency of consumers to consume premium alcohols stimulated their import. Total imports of spirits in 2024 reached PLN 3.7 billion, of which over 43% (PLN 1.6 billion) was accounted for by whisky, which was the dominant product among imported goods (Branża spirytusowa…., 2025).

Between 2004 and 2024, whisky imports increased more than 38-fold in value and almost 20-fold in volume (Table 6). At the beginning of the period analysed, 1.2 million litres of whisky worth EUR 9.7 million were imported into Poland; in 2024, the volume of imports of this alcohol amounted to 22.8 million litres, and its value reached EUR 373.6 million. Over 70% of supplies came from two non-EU countries, namely the United Kingdom (€186.1 million in 2024) and the United States (€78.5 million). Including Ireland (€33.8 million in 2024), the three largest whisky suppliers accounted for 80% of Poland's total import value (Eurostat, 2025).

At the same time, whisky exports grew even more dynamically. A more than 31-fold increase in export volume, from less than 50,000 litres to 1.6 million litres, translated into an almost 40-fold increase in value (€46.2 million in 2024, Table 6). Robust export growth has been observed since 2020. In the period 2020-2024, whisky exports from Poland increased almost 7-fold in value and 8.5-fold in volume. In terms of both value and volume, 55% of whisky was exported from Poland to other EU countries. The largest quantities of whisky were exported to the Dutch market (€8.2 million), the Latvian market (€7.9 million), and the Estonian market (€6 million). The largest non-EU recipient of this alcohol was Ukraine (€4 million) (Eurostat, 2025). Throughout the entire period under review, Poland remained a net importer of whisky, and the deficit increased from €8.6 million in 2004 to €327.4 million in 2024. In terms of volume, from 2020 onwards, approximately 21,000 litres more whisky was imported into Poland than was exported.

**Table 6**. Foreign trade in whisky in Poland in 2004-2024 (million euros, thousand liters)

| Specification | | Imports | Exports | Balance | Imports | Exports | Balance |
|---|---|---|---|---|---|---|---|
| | | million euros | | | thousand litres | | |
| 2004 | value/volume | 9.7 | 1.2 | -8.6 | 1,163.8 | 49.8 | -1,114.1 |
| 2005 | | 15.0 | 1.9 | -13.2 | 1,828.1 | 107.8 | -1,720.4 |
| 2006 | | 19.8 | 2.0 | -17.8 | 2,873.5 | 74.3 | -2,799.2 |
| 2007 | | 33.9 | 2.0 | -31.9 | 2,870.5 | 60.8 | -2,809.6 |
| 2008 | | 43.6 | 2.0 | -41.6 | 4,130.9 | 48.1 | -4,082.8 |
| 2009 | | 38.4 | 1.9 | -36.6 | 3,805.4 | 51.0 | -3,754.4 |
| 2010 | | 49.7 | 2.3 | -47.4 | 4,680.7 | 55.8 | -4,624.9 |
| 2011 | | 62.3 | 2.5 | -59.7 | 6,366.4 | 62.7 | -6,303.7 |
| 2012 | | 71.8 | 3.4 | -68.5 | 7,539.1 | 78.6 | -7,460.5 |
| 2013 | | 93.6 | 3.9 | -89.7 | 9,971.4 | 72.6 | -9,898.9 |
| 2014 | | 84.1 | 3.8 | -80.2 | 7,380.2 | 74.9 | -7,305.2 |
| 2015 | | 107.4 | 4.6 | -102.8 | 10,122.2 | 112.4 | -10,009.8 |
| 2016 | | 126.7 | 5.2 | -121.5 | 12,214.7 | 135.9 | -12,078.8 |
| 2017 | | 147.3 | 5.8 | -141.6 | 13,213.9 | 109.4 | -13,104.4 |
| 2018 | | 170.9 | 5.8 | -165.1 | 15,246.9 | 113.3 | -15,133.6 |
| 2019 | | 189.8 | 7.9 | -181.9 | 17,077.9 | 174.4 | -16,903.5 |
| 2020 | | 213.5 | 6.7 | -206.8 | 21,099.2 | 184.7 | -20,914.5 |
| 2021 | | 238.0 | 8.4 | -229.6 | 21,124.4 | 214.9 | -20,909.5 |
| 2022 | | 284.7 | 18.8 | -265.9 | 22,291.7 | 580.3 | -21,711.4 |
| 2023 | | 324.3 | 24.1 | -300.2 | 21,969.6 | 942.9 | -21,026.6 |
| 2024 | | 373.6 | 46.2 | -327.4 | 22,782.8 | 1,557.6 | -21,225.2 |
| | 2004=100 | 3,836.0 | 3,981.1 | 3,816.3 | 1,957.5 | 3,130.5 | 1,905.2 |
| | 2020=100 | 175.0 | 688.9 | 158.3 | 108.0 | 843.4 | 101.5 |

Source: Eurostat (2025), own calculations.

Despite growing consumer interest, whisky production in Poland is low. In 2018-2022, production decreased from 877 hl 100% to 398 hl 100%. Considering the average alcohol content of whisky (40%), this yields around 100,000 liters of whisky. At the same time, whisky sales increased from 17.6 million liters in 2012 to 18.2 million liters in 2022 (Szczepaniak et al., 2022), and imported products mainly meet demand for this beverage. Interestingly, the growing popularity of whisky on the Polish market has not been halted by the Covid-19 pandemic. In 2020, compared to 2019, whisky sales volume increased by 15.3%, and Poles'

spending on this alcohol increased by 19.6% (to PLN 3.2 billion) (Mazurkiewicz, 2021). Unlike vodka or beer, for which small shops remained the most important sales channel, in the case of whisky, discount stores became more critical, accounting for around half of the volume. Sales growth in the premium segment was faster than in the entire category, indicating a continuing premiumisation (an increase in the popularity of more expensive spirits, considered higher-quality products). According to a Nielsen report (2018), in 2017, total whisky sales increased by 14.2% in value terms compared to 2016 (the largest increase in the spirits market), while the premium segment increased by 21.8%. Outside the premium segment, the source of growth in whisky sales was the introduction of flavoured variants, whose sales grew faster than those of pure whisky, by 20.5% and 14.2% respectively. The growth in sales of flavoured products was due to increased sales in hypermarkets and wine and confectionery shops, while discount stores focused on the classic whisky portfolio (Szczepaniak et al., 2022).

In addition to industrial whisky production, craft production is also developing in Poland. An example of a family-run craft whisky production project in Poland is Paprocky Whisky. The brand's products, such as Paprocky Single Malt and Single Barrel, are made from malted barley and aged in oak barrels, which impart the spirits' characteristic aromas and flavours. Paprocky is also gaining international recognition (including a silver medal in the whisky category at the International Spirits Challenge), which attests to the quality of its production and the export potential of Polish craft whisky (https://www.polishwhisky.com, 30 December 2025).

Another example of a Polish distillery is the Wolf & Oak Distillery, run by Michał Płucisz, who has been producing craft spirits since 2011, including vodka, gin, and whisky. The decision to build the distillery was made in 2016. In 2018, a 19th-century distillery in Stanica, Lower Silesia, was purchased, where not only the production of high-quality spirits is planned, but also the development of distillation tourism (hotel and restaurant facilities). The “Wolf & Oak Distillery” brand and trademark were established in 2018, and in October 2019, products bearing this brand name were distributed to 60 Auchan stores in Poland (https://wolfoak.pl/historia/, 30 December 2025).

Apart from Paprocky and Wolf & Oak, other distilleries and brands on the market are experimenting with whisky, most often using Scottish technology or barrels made from different types of wood, which enriches the products' flavour profiles. Chronologically, the most well-known ventures in this field include Mazurskie Miody “Piasecki Destylarnia” (Warminsko-mazurskie Province), which has been producing Polish single malt whisky since 2017, Legacy Distillery (Wielkopolskie Province), which has been producing whisky since

2023, and Millside Distillery (Pomorskie Province), which began producing whisky under its own brand in 2025. Craft distilleries illustrate the growing culture of whisky production in Poland, combining tradition with innovative and natural production methods. Their activities are a response to growing demand and global competition.

### 1.9 Flow chart

Figure 15 shows a flow chart of the malting barley value chain in Poland, including volumes and prices for specific commodities (barley, malt, and beer). The reference year is 2024. A flow chart is constructed using official state data sources, market reports, and financial statements. More details on the data sources and derivation of the numbers presented can be found in Section 2 – Contribution of the value chain and operating accounts of its actors.

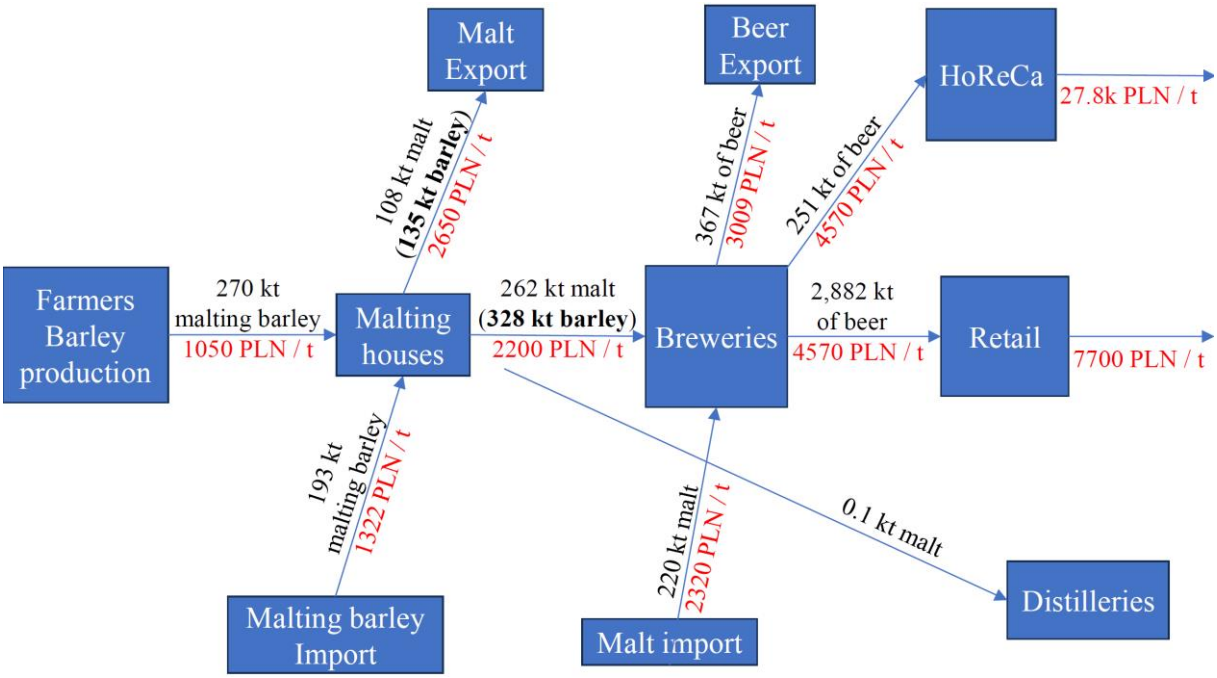


**Figure 15**. Flow chart of malting barley in Poland (2024)
Source: Own elaboration.

### 1.10 Governance

The grain market in Poland includes producers (farmers), buyers (trading companies, processors, elevators), processors (mills, bakeries, feed companies), exporters and importers, as well as government institutions, which include:

- Ministry of Agriculture and Rural Development (Ministerstwo Rolnictwa i Rozwoju Wsi – MRiRW), responsible for agricultural policy, market monitoring, and support for agriculture, including the grain sector;

- The Agency for Restructuring and Modernisation of Agriculture (Agencję Restrukturyzacji i Modernizacji Rolnictwa – ARiMR), which provides financial support to farmers and manages intervention stocks of cereals;
- The National Agricultural Support Centre (Krajowy Ośrodek Wsparcia Rolnictwa – KOWR), which intervenes in the market (purchasing and selling cereals to stabilise prices), analyses and monitors the market, and provides assistance, e.g., through the cereal subsidy programme;
- Agricultural chambers, which represent the interests of farmers, monitor prices and market conditions and take intervention measures within their competence.

Other vital players in the malting barley supply chain include seed companies offering certified barley seeds with the required brewing parameters, breeding companies developing new varieties with the desired characteristics, malt houses, breweries, and whisky distilleries.

Subsidies for farmers growing malting barley in Poland come mainly from direct payments, de minimis aid for seed and other support programmes under the Common Agricultural Policy, including the "Integrated Production (IP)" eco-scheme. In 2025, the call for applications for subsidies for elite or certified seed used for sowing lasted from 25 May to 10 July. For conventional seed, the subsidy was PLN 65/ha, and for organic seed, PLN 78/ha. Agricultural producers who own agricultural plots of land on which they grow crop species covered by subsidies, with a total area of not less than 1 ha, and who have used elite or certified seed for sowing, were eligible to apply for the subsidy (https://www.gov.pl/web/arimr/material-siewny-pomoc-de-minimis-kampania-2025, 05.01.2026). Under the IP eco-scheme, in 2025 it was possible to obtain support of approximately EUR 146.07/ha (PLN 600-700/ha, depending on the exchange rate), provided that the relevant training was completed and the crops grown in accordance with the approved IP methodology were reported to the certifying body at least 30 days before sowing (https://www.gov.pl/web/rolnictwo/integrowana-produkcja-roslin, 05.01.2026).

Additional forms of support may be launched periodically. For example, in 2024, there were subsidies for the sale of malting barley on specific dates (e.g., until March and May 2024) with different rates per hectare (e.g., PLN 740/ha or PLN 1,110/ha), but regardless of the purchase price. This aid was intended to compensate farmers for losses resulting from low market prices. It was available for up to 300 ha of crops (https://www.gov.pl/web/arimr/doplaty-do-zboz--rozpoczelo-sie-wydawanie-decyzji-pierwsze-platnosci-na-kontach-rolnikow, 05.01.2026).

The alcohol market, including the beer and spirits market in Poland, is regulated by the Act on Upbringing in Sobriety and Counteracting Alcoholism of 26 October 1982 (Journal of Laws 1982 No. 35, item 230). The Act introduces the requirement to obtain appropriate sales licences for a fee and restrictions on advertising (prohibition of advertising to minors, specific broadcasting hours, mandatory warnings). It also sets out rules for sales (e.g., rules on the location of points of sale and serving of alcoholic beverages, bans on night-time sales, restrictions on sales at mass events, types of establishments where spirits may be sold) and provides for penalties for illegal sales or advertising.

The spirits industry is subject to strict regulation throughout the entire supply chain, from the production of ethyl alcohol to the sale of spirits to consumers. The law imposes fiscal burdens (excise duty) and administrative obligations on businesses in this industry. Importantly, excise duty on alcoholic beverages is a harmonised tax under EU law. For this reason, the Polish legislator does not have complete freedom to determine the structure and rates of excise duty on alcoholic beverages. According to the regulations, the tax base for spirit products is one hectolitre of pure alcohol contained in the products. In contrast, for beer, EU Member States may determine the tax base as one hectolitre per 1% of pure alcohol or one hectolitre per 1 degree Plato. The second solution is currently used in Poland. Allowing the possibility of setting excise duty on beer based on the number of degrees Plato is a sanctioning of historical regulations in force in some EU countries (Branża spirytusowa..., 2025).

In connection with the obligation to pay excise duty, producers of spirit products are subject to numerous administrative responsibilities, including the obligation to obtain a licence to operate a tax warehouse, as well as to keep records of the warehouse, excise stamps, and control books. In addition, producers of spirit drinks are subject to constant control by the National Revenue Administration (Krajowa Administracja Skarbowa) in the area of production, purification, or denaturation of ethyl alcohol. They are also required to mark their products with excise stamps in the form of excise stamps (Branża spirytusowa…., 2025).

The trade in spirits with an alcohol content of over 18% is strictly regulated. Wholesale trade requires a permit from the minister responsible for the economy (currently the Minister of Development and Technology – Minister Rozwoju i Technologii). It can only be carried out on one's own behalf, and the permit, which specifies the trade limit, is issued for a maximum of one year. A separate licence is required to increase the limit. The licence is subject to a fee determined by the number of litres of alcoholic beverages specified in the application. Additional fees are charged for decisions introducing new places of business and the sale of alcohol to retailers in individual packages with a nominal quantity of alcohol not exceeding 300

ml. Entrepreneurs may only sell alcoholic beverages listed in the permit to entrepreneurs who have a license for the wholesale or retail sale of such drinks (Branża spirytusowa…., 2025).

A retail license is issued by the mayor (or city president) competent for the location of the point of sale. Retailers, like wholesalers, may not commission sales to another entity. Permits are issued for a period of not less than 4 years, and in the case of the sale of alcoholic beverages intended for consumption outside the place of purchase, not less than 2 years. The conditions for revoking a permit are also regulated. An entrepreneur may lose their licence, among other things, if they fail to notify the competent authorities (primarily the police) twice within 6 months of a disturbance of public order arising from the sale of alcoholic beverages at their point of purchase. After the licence is revoked, a new one may be applied for 3 years from the date of revocation. The Act of 1982 (Journal of Laws 1982 No. 35 item 230) also prohibits the sale of alcohol to persons under 18 years of age and grants sellers the right to request proof of the purchaser's age. However, it does not regulate electronic sales. It does not meet the needs of contemporary trade and consumer behaviour, especially that of niche and premium consumers. Poland, alongside Finland, remains the only EU country where the sale of alcohol online has not yet been regulated by law (Branża spirytusowa..., 2025).

Notably, a process of self-regulation can be observed in the spirits industry. In 2011, members of the Polish Spirits Industry Employers' Association developed a Code of Good Marketing Practices, according to which the promotion of spirits must be carried out in accordance with the law and good manners and must not in any way encourage irresponsible consumption or alcohol abuse. A year later, the "Procedure for the Code" was adopted, setting out the rules of conduct in the event of a breach of the code, including expulsion from the Association (https://zppps.pl/samoregulacje/, 10 January 2026).

Considering the importance of educational activities in the field of responsible alcohol consumption, the Polish Spirits Industry Employers' Association has been running educational campaigns for almost 20 years, such as "If you drink, don't drive", "Alcohol. Always responsibly", and "If you drink, do it with class". These educational activities reach approximately 3 million people annually. In addition, the Association organises training courses for sellers and servers of alcohol in HoReCa outlets on responsible alcohol sales (Branża spirytusowa..., 2025).

### 1.11 SWOT analysis

| Strengths | Weaknesses |
|---|---|
| • Poland is one of the most important beer producers in the EU (experience, know-how, high-quality standards, large, stable, recognizable enterprises).<br>• Relatively good access to domestic raw materials, such as grains and malts.<br>• Location in the EU and access to the common market.<br>• Developed and strong retail distribution network (good access to sales channels in the country).<br>• Competitive raw material production costs compared to the Western EU. | • Fragmented barley supply (farm-level storage, large number of small barley batches, which increases consolidation costs and increases the risk of quality deterioration)<br>• Short season – seasonal post-harvest accumulation – high storage and logistics pressure, which impacts costs and quality<br>• High drying costs, sensitivity to energy prices.<br>• High logistics and packaging costs (some returnable packaging)<br>• Infrastructure constraints, insufficient drying facilities, and warehouses |
| **Opportunities** | **Threats** |
| • Modernization of malting plants and warehouses – reducing energy losses/heat recovery, automation<br>• Expanding the product range, broad product diversification opportunities<br>• Development of new malting barley varieties and improved agronomic practices for enhanced stability and raw material quality<br>• Investments in new drying facilities and warehouses<br>• Malt exports | • Climate change and variability in barley yields and quality – risk of malt shortages/quality deterioration<br>• Fiscal burdens, e.g., excise taxes, environmental requirements related to waste<br>• Continuous increases in energy and transportation costs<br>• Changes in consumer preferences<br>• Biochemical threats, e.g., pesticide contamination, etc.<br>• Growing environmental and sanitary requirements<br>• Competitiveness of foreign entities – imports |

## 2. Contribution of the value chain and operating accounts of its actors

The analysis of the value chain starts with the field production. Therefore, the first step is to estimate an archetype (a representative unit for the entire population) of a farm producing malting barley in Poland. For obvious reasons, such an exercise is not straightforward and relies on various assumptions and simplifications. The entire procedure in the economic analysis depends on the VCA4D methodological brief; as such, it should be considered with an order-of-magnitude.

For this analysis, only one average farm archetype producing malting barley in Poland was established. According to official state data, Poland's barley production in 2024 was around 3 million tons. We assumed that 9% of this volume accounted for malting barley (the middle value from the 8-10% estimates by the Polish Association for Sustainable Agriculture and Food), yielding 270 kilotons (kt) of malting barley harvested in 2024. The previously mentioned sources indicate that the average yield of spring barley in 2024 was 3.83 t/ha. The average farm in 2020 had around 3.1 ha of spring barley. Assuming a constant growth rate, the farm's final size is estimated at 3.2 ha. Therefore, one farm produces 12.256 tons of malting barley. The average producer price of malting barley in 2024 was 1050 PLN/t. Considering the prevailing deficit of malting barley on the Polish market, combined with the low production capacity of farmers and lower prices of barley exports than imports, we assume that all malting barley produced in Poland is sold domestically.

The UOKiK report (2025) shows that in a normal year, approximately 70% of barley purchased by malt houses comes directly from farmers under contract, with the remaining 15-20% from other agreements with farmers (mostly ad hoc). Only about 10-15% of domestic production is sold to malt houses with intermediaries involved. In general, intermediaries play a minor role in the malting barley value chain in Poland. However, it is at the stage of selling grain to malt houses that their role is greatest. Despite this, a simplified assumption is made in this study that 100% of sales are made without intermediaries.

The average costs of farms presented in the operating account for 1 farm (Table 7) are derived from various calculations of spring and malting barley production prepared by agricultural advisory centers (which provide public extension services to Polish farmers). Average costs of consumables were estimated mainly based on the spring barley cultivation calculations of the Kuyavian-Pomeranian Agricultural Advisory Centre in Minikowo. The fertilizer and Pesticide prices in the table are recalculated averages based on applied doses and prices of different substances. Fertilizers are a combination of multi-component fertilizers

(NPK) and ammonium sulphate. Pesticides are a combination of fungicides, insecticides, and growth regulators. Only family work (not valued) is assumed, without hired work. Based on estimates from the Wielkopolska Chamber of Agriculture, depreciation is assumed to be 5% of total costs. Such a value is confirmed as realistic by an interview with a barley farmer.

**Table 7**. Operating account of 1 typical farm producing malting barley in Poland (2024)

| Calculations for the production of malting barley on 1 farm (3.2 ha of barley) | | Value (PLN / t of barley) | Final costs / revenues (PLN) |
|---|---|---|---|
| Production | Malting barley | 1 050 | 12 869 |
| | Subsidies | 319 | 3 907 |
| Total production + subsidies (PS) | | | **16 776** |
| Consumables (C) | Seeds | 104 | 1 270 |
| | Fertilizers | 349 | 4 279 |
| | Pesticides | 224 | 2 748 |
| | Fuel and machinery | 308 | 3 770 |
| | Maintenance and others | 296 | 3 629 |
| | | | **15 695** |
| Services (S) | Harvesting | 133 | 1 629 |
| | | | **1 629** |
| Wages | | 0 | **0** |
| | | | |
| Taxes | | 74 | **906** |
| | | | |
| Depreciation (D) | | 73 | **900** |
| Total Costs (TC) | | | **19 129** |
| Profitability Ratios | | | |
| Gross Operating Surplus (GOS) (PS – TC + D) | | | -1 453 |
| Net Operating Surplus (NOS) (PS - TC) | | | -2 353 |
| Gross Value Added (GVA) (PS - C - S) | | | -548 |
| Net Profit Margin (NOS / PS) | | | -14.0% |

Source: Own calculations based on various sources mentioned in the text.

Malting barley producers in Poland in 2024 operated at a loss, as shown by the negative values of the gross and net operating surpluses. However, even the value added is negative, specifically because of the decline in malting barley prices in 2024 (Figure 7), with costs still relatively high after the 2022 spikes. Such a situation resulted in a -14% net profit margin. It is worth noting that such a loss can be sustainable only because barley production is not the only

commodity produced on farms. In reality, farmers diversify crops for the technical requirements of the rotation and for diversification. Each year, some commodities are produced at a loss, but others can generate profit. Therefore, it is essential to remember that the calculations in this study represent only a portion of the farm's production focused on costs and revenues attributable to malting barley. Thus, it is not a comprehensive operating account for the entire farm.

In the case of malting houses, the decision was made to represent the five biggest producers in Poland, which together account for around 99% of malt production. The study assumes that these entities are similar in size, although in reality their production is subject to annual fluctuations. Therefore, the operating account relates to a single entity representing 20% of total barley malt production in Poland, amounting to 74 kt (Table 8). As previously mentioned, the production of barley malt in 2024 was 370 kt. Using a technical conversion rate (1.25) of barley needed to produce malt, it means that 462.5 kt of malting barley was used in the production process. Knowing that domestic producers provide 270 kt of barley, it can be concluded that the remaining part is imported by malt houses.

In official international trade statistics, there is no specific information on malting barley prices. There is only data on barley for seed and other barley (feed and others combined). Therefore, the cost of imported malting barley has to be estimated. To do so, we used information that one of the biggest producers of malting barley, which sells to Poland, is Denmark. Denmark, as a relatively small country, lacks the capacity to export barley for feed. Therefore, it is assumed that import prices from Denmark best reflect the general prices of malting barley imported into Poland.

The role of intermediaries in trading malt in Poland is marginal. Due to the high concentration of production at individual stages of the value chain (malt houses and breweries), trading mainly takes place directly. As far as the domestic market is concerned, intermediaries account for approximately 0.5% of trade in malt produced in domestic malt houses. Intermediaries play a slightly more significant role in malt imports. The percentage of malt imported directly by breweries reaches 98%. The remaining 2% of imports are handled by malt houses and intermediaries combined, with malt houses playing a dominant role (UOKiK, 2025). To complete the picture of the marginal role of intermediaries, it should also be mentioned that malt exports outside the country are carried out almost entirely directly by malt houses, i.e., without the involvement of intermediaries. Therefore, to simplify, intermediaries are entirely omitted in the framework of this study.

**Table 8**. Operating accounts of 1 typical malt house producing malt in Poland (2024)

| Calculations for malt production in 1 malting house (74 t of malt, 20% market share) | | Value (PLN / t of malt) | Final costs / revenues (thou. PLN) |
|---|---|---|---|
| Production | Malt sold domestically | 2 200 | 115 280 |
| | Malt exported | 2 650 | 57 240 |
| Total production + subsidies (PS) | | | **172 520** |
| Consumables (C) | Domestic barley | 765 | 56 595 |
| | Imported barley | 690 | 51 029 |
| | Energy and other materials | 301 | 22 301 |
| | Other consumables | 9 | 650 |
| | | | **130 574** |
| Services (S) | Insurence | 22 | 1 659 |
| | Other external services | 199 | 14 750 |
| | | | **16 409** |
| Wages | | 90 | **6 631** |
| | | | |
| Taxes | | 15 | **1 134** |
| | | | |
| Depreciation (D) | | 49 | **3 633** |
| Total Costs (TC) | | | **158 382** |
| Profitability Ratios | | | |
| Gross Operating Surplus (GOS) (PS – TC + D) | | 240 | 17 771 |
| Net Operating Surplus (NOS) (PS - TC) | | 191 | 14 138 |
| Gross Value Added (GVA) (PS - C - S) | | 345 | 25 537 |
| Income tax (IT) | | 36 | 2 686 |
| Net Profit Margin ((NOS - IT) / PS) | | | 6.6% |

Source: Own calculations based on various sources mentioned in the text.

According to the flow chart (Figure 15), around 66% of malt houses' revenue comes from the domestic market. Based on that, we determine what percentage of production is domestic for a single entity. The average selling prices of malt were determined based on Table 5, with the export price taken from the UN Comtrade database and converted at the average USD/PLN exchange rate in 2024.

To estimate the costs of malt production, the financial statements of one malt house were used. The cost structure has been adjusted based on production volume; i.e., total costs in the financial statements account for approximately 91% of sales revenue. We transfer this

percentage to the production volume resulting from the flowchart (74 kt of malt, of which 52.4 kt is sold domestically and 21.6 kt is exported). At the same time, each malt house uses proportional amounts of barley (according to the flowchart, 41.7% imported and 58.3% domestic). To produce 74 kt of malt, 92.5 kt of barley is needed (technical coefficient 1.25); hence, each malting house consumes approximately 38.6 kt of imported barley and 53.9 kt of domestic barley.

Based on the operating account, malt houses operated in 2024 at a 6.6% net profit margin, calculated as net operating surplus less income tax, divided by the sum of production value and subsidies. Although some subsidies for malt houses are possible, especially in the form of grants for R&D activities, for simplicity, we assumed them to be 0, as they are not permanent.

The last of the analyzed stages in the value chain are breweries. An analysis of breweries in Poland should begin with an explanation of their production structure. As shown in Figure 11, the three largest corporations account for approximately 82-84% of beer production. However, this production is carried out by 10 breweries, which are considered production units. In this study, the term “brewery” refers to the entire company. Thus, for example, the Żywiec Group, which has four production units, is considered a single brewery. The same applies to Kompania Piwowarska and Carlsberg Polska, which each have three production units.

For a brewery archetype, we assume a 33% market share (1,155 kt of beer) in the operating account (Table 9). This way, we account for the scale of market concentration in Poland. However, the presented accounts reflect the average situation in the three previously mentioned companies, without accounting for the specific nature of small entities on the market. Having the opportunity to conduct in-depth interviews with smaller producers, it would be ideal to separate the analysis into a segment for smaller breweries, for which separate accounts could be created.

Beer sales prices were calculated based on Żywiec LLC's financial statements. For this purpose, knowledge of the rules for calculating excise duty was used, which in Poland is calculated based on the Plato degree (a scale showing the extract content (mainly sugar) in the solution) of the finished product. The value of the due excise tax was divided by the quotient of the tax per hl (PLN 10.4/hl) and the average Plato degree of the finished product (12.2), determined on the Federacja Przedsiębiorców Polskich (2021). Then, the volume and value of foreign sales were deducted (using the average export price obtained from the UN Comtrade

database). On this basis, the remaining part of production (domestic sales) was estimated at PLN 4.57 per liter.

**Table 9**. Operating accounts of 1 typical brewery producing beer in Poland (2024)

| Calculations for beer production in 1 brewery (1 155 000 t of beer, 33% market share) | | Value (PLN / t of beer) | Final costs / revenues (thou. PLN) |
|---|---|---|---|
| Production | Beer sold domestically | 4 570 | 4 725 463 |
| | Beer exported | 3 010 | 364 210 |
| Total production + subsidies (PS) | | | **5 089 673** |
| Consumables (C) | Domestic malt | 165 | 190 212 |
| | Imported malt | 146 | 168 432 |
| | Energy and other materials | 109 | 126 227 |
| | Other consumables | 1 025 | 1 183 887 |
| | | | **1 668 758** |
| Services (S) | Transportation services | 192 | 221 633 |
| | Sales and marketing | 294 | 339 889 |
| | Repairs | 57 | 65 408 |
| | Other services | 250 | 288 384 |
| | | | **915 313** |
| Wages | | 364 | **420 787** |
| | | | |
| Taxes | Licences | 44 | 50 405 |
| | Other taxes and fees | 83 | 95 867 |
| | | | **146 272** |
| Depreciation (D) | | 199 | **230 055** |
| | | | |
| Excise Tax (ET) | | 1 234 | **1 425 431** |
| Total Costs (TC) | | | **4 806 617** |
| Profitability Ratios | | | |
| Gross Operating Surplus (GOS) (PS – TC + D) | | 444 | 513 111 |
| Net Operating Surplus (NOS) (PS - TC) | | 245 | 283 056 |
| Gross Value Added (GVA) (PS - C – S - ET) | | 935 | 1 080 171 |
| Income tax (IT) | | 47 | 53 781 |
| Net Profit Margin ((NOS - IT) / PS) | | | 4.5% |

Source: Own calculations based on various sources mentioned in the text.

The same sales price was assumed for both restaurants and stores, as price differentiation at this level goes beyond the scope of the analysis (it does not affect the brewery's

accounts). Similar to malt houses, the cost structure of breweries was derived from the financial statements. Based on the operating account, breweries operated in 2024 at a 4.5% net profit margin, calculated as net operating surplus less income tax, divided by the sum of production value and subsidies (assumed at 0). It is worth noting that the excise tax is treated as a normal cost, decreasing net operating surplus, but, like income tax, it is not part of value added.

In the final study, the operating account for whisky distilleries was not prepared, as whisky production remains a niche in Poland compared to consumption volumes. Furthermore, the analysis excludes accounts for the HoReCa industry and retail due to the lack of uniformity among these entities, which makes it impossible to accurately reflect the market situation in the construction of archetypes.

The analysis of the value chain is complemented by a calculation of its contribution to the economy. This calculation was performed using dedicated AgriFood Chain Analysis (AFA) software developed at the French Agricultural Research Centre for International Development (CIRAD). The software enables the calculation of the direct and indirect effects of the value chain, i.e., calculations of the value added generated directly in the value chain and indirectly through the use of inputs (taking into account multiplier effects) (Table 10).

**Table 10**. Contribution of the malting barley value chain to the Polish economy (2024)

| | **Direct effects** | **Indirect effects** | **Total effects** |
|---|---|---|---|
| **Imports** | 765 546 000 | 828 608 650 | 1 594 154 650 |
| **IC not disaggregated** | | 2 002 309 931 | 2 002 309 931 |
| **Value added** | | | |
| **Wages** | 1 482 302 274 | 864 486 672 | 2 346 788 946 |
| **Taxes** | 5 609 656 112 | | |
| **Subsidy** | 86 075 718 | | |
| **Tax (+) Sub (-)** | 5 523 580 394 | 4 004 678 | 5 527 585 072 |
| **Depreciation** | 830 286 407 | 228 867 108 | 1 059 153 515 |
| **Net Operating Profit** | 936 170 168 | 924 632 241 | 1 860 802 409 |
| **VA Total** | 8 772 339 244 | 2 021 990 698 | 10 794 329 942 |

Source: Own calculations with the AgriFood Chain Analysis software.

The values obtained as a result of calculations using AFA software may differ from the values presented in the operating accounts (Tables 7-9) due to rounding and the conventions

adopted. The calculations show that the total effect of the malting barley value chain in Poland was approximately PLN 10.8 billion, which represents about 0.3% of Poland's GDP in 2024. Moreover, the chain accounted for approximately 1% of total transfers to the state budget in the form of taxes and fees.

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