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Opportunities And Challenges In Developing The Leather Industry In Kazakhstan: A Review

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Abstract
Leather and leather products are economically important sectors of developing countries in the field of light industry, which includes a wide range of industrial destination products and consumer items. This review analyzed statistical data on the current state of leather production, such as the share of light industry products in the Republic of Kazakhstan, the domestic raw material base, cattle skins, exports of small cattle skins to foreign countries, the production of leather products, measures to support the leather industry by the state, and discussed the problems and indicators of the industry's development. The role of state support and the potential to increase the competitiveness of Kazakhstan's products, as well as the possibility of contributing to the sustainable growth of the leather industry in the future, were also considered. In the context of long-established traditions, a review of leather production was conducted, and attention was paid to the importance of the leather industry for Kazakhstan, taking into account the existing shortcomings. In conclusion, the necessity of a comprehensive approach to solving these problems is emphasized, including the implementation of environmentally friendly technologies, the improvement of specialist qualifications, and the development of both domestic and international markets for light industry products.

Keywords
Leather industry, animal husbandry, raw materials, competitiveness, Kazakhstan.

1. Introduction

The light industries are characterized by a high market capitalization, driven by essential consumer needs, and their demand remains largely inelastic. The development of the textile, leather, fur, and footwear industries has been a focal point in countries such as Turkey, Belarus, and Uzbekistan [1]. For example, in Poland and other European Union countries, light industries (textile and clothing in particular) are recognized as major contributors to the economy [2]. Textile products encompass a range of properties that meet specific requirements depending on their intended use, the characteristics of the fibers, their structure, and the manufacturing processes involved [3].

Among the most significant sectors of the light industry, the leather industry plays a crucial role in the social and economic development of countries worldwide. Leather, a durable and flexible material, is produced through the tanning of animal hides [4]. Since ancient times, humans have used animal skins for various purposes, including protection, comfort, and ornamentation. Leather goods such as clothing, footwear, and accessories are considered essential consumer items [5]. Over the years, leather processing has evolved into a science-based industry. The processing of soft leather involves complex technological procedures that impose stringent requirements on the properties of the leather [6]. As a byproduct of global meat, milk, and wool consumption, animal hides have become recognized as a renewable and accessible raw material, particularly from cattle and small livestock. Although materials such as fabrics, polymers, and rubbers have gradually replaced leather in some applications [7], research aimed at replicating leather's physiological properties in synthetic materials has largely failed. While several substitutes have been proposed, none have matched the functional characteristics of leather according to established reference standards [8–10]. Reproducing the bionic structure of leather through alternative biological methods remains a major research challenge and a long-term goal in the field [11].

Leather's collagen stability is achieved through its strong bonding with organic or inorganic tanning agents. Inorganic agents such as chromium salts form coordination complexes with collagen, thereby biochemically stabilizing the leather [12]. Other types of inorganic salts used in tanning include aluminum, zirconium, silicon, and iron [13]. Organic tanning agents, derived from plant sources such as mimosa, acacia, tara, and oak bark, are also widely used. For environmental reasons, many countries have imposed strict regulations on tanning processes, especially regarding chromium use and associated toxic residues [14,15]. This has driven the development of chrome-free tanning technologies. Recent innovations include synthetic organic tanning agents such as 1,3,5-triazine derivatives, which can covalently bond with collagen and achieve high thermal stability in leather without using chromium [14,15]. Adoption of such chrome-free wet-white tanning methods can significantly reduce hazardous waste while meeting stringent quality and environmental standards.

Due to the unique properties and widespread availability of leather, the global leather industry has evolved into a highly developed sector. This development has also facilitated the establishment of recycling capacities in developing countries, where local skin recycling processes are increasingly common [16]. High-quality leather processing ensures the preservation and enhancement of the material's characteristics. Kazakhstan can play a

leading role in the implementation of new trends and finishing works, using domestic skills in the leather industry [17].

Technological advances in leather processing have significantly impacted the German leather industry, contributing to the stabilization of production volumes, as shown in Figure 1 [18].

The stabilization of production, combined with the high quality of German leather and raw materials, and the strategic targeting of the growing automotive sector, helped maintain the industry's strength. Today, Germany ranks as the third-largest leather producer in the European Union, following Italy and Spain. Notable contributions to the field of leather science have been made by researchers such as Dr. Reed, Stanley Briggs, Stanley Wolstenholme, and Professor Ward. Additionally, Dr. Laight and Ibrahim studied the impact of technological factors on leather quality, leading to the development of direct methods for analyzing production processes in tanneries [19].

The development of leather production in Kazakhstan is strategically crucial for strengthening the national economy, enhancing its global competitiveness, and expanding its export capabilities. Therefore, it is relevant to study, develop and identify effective ways to integrate the leather industry into the global economy. The aim of this study was to investigate the current main problems and causes of domestic leather production, evaluate the main obstacles, development scenarios of developed countries, conduct a comparative analysis, and identify promising directions for the development of the Republic of Kazakhstan. Graphical and tabular methods were used to interpret and analyze information.

1.1 Problems and Difficulties in the Light Industry of Kazakhstan

Kazakhstan is endowed with abundant raw materials such as cotton, wool, and leather – resources that are highly sought after in the global market and essential for the advancement of the light industry. In addition to being successful and meeting the needs of consumers, leather production has serious challenges of sustainable development.

The leather industry has the potential to thrive in the rapidly developing global market, striving for Sustainable Development and Technological Innovation. To support the development of the leather processing industry, large developed countries pay the main attention to simplified taxation, attracting investment, and stimulating exports. The textile industry is the most important sector of the economy in industrialized countries in terms of domestic products, export turnover, employment of the population, Germany and the United States account for 7% of gross domestic product, Turkey and China 12%, India 16%, and Kazakhstan's share of less than 1% is explained in Figure 2 [20–22].

Animal husbandry in Kazakhstan represents a waste-free production system, supplying by-products such as horns, hooves, wool, and hides to the light industry. However, a major challenge lies in determining the most effective direction for diversifying export products derived from secondary animal-based raw materials. Animal hides are processed into semi-finished products such as laminated leather, varnish, composite and tanned leather, suede, and dry parchment. These products are used in the production of a variety of goods, including gloves, clothing, shoes, musical instruments, furniture bindings, car interiors, bags, wallets, and sports equipment.

Kazakhstan, known for its diverse climatic zones, flora, and fauna, attracts tourists and is often referred to as "the country after Sweden." Leather and wool products, with their unique and exclusive character, are produced by the local population and have become emblematic of Kazakhstan's brand in the developing tourist cluster of the East Kazakhstan region. To survive in the future, it is necessary to balance land resources with consumption and population growth. Given leather's status as a quality and association with it as a luxury item, consumers tend to maintain skin stability over alternatives such as plastic. Renewable sources of raw materials, leather recycling, and efficient use of leather waste lead to success. In addition, it is necessary not to limit oneself to the manufacture and sale of leather and leather goods [23,24]. Despite

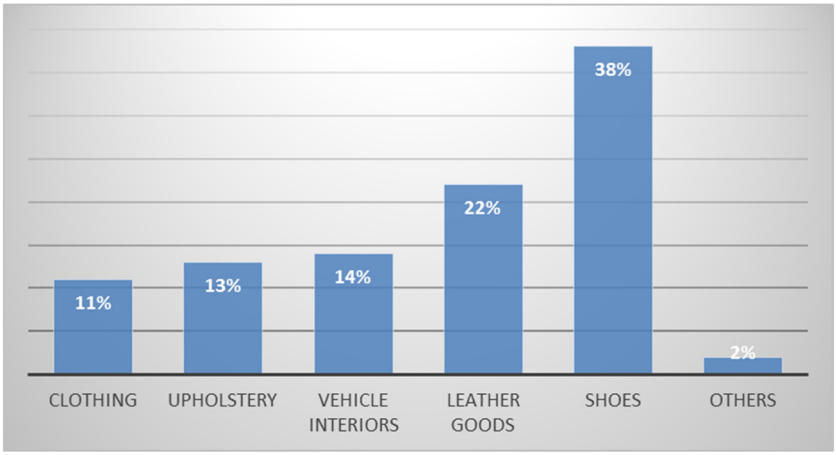

Figure 1. Use of leather in the EU by application (share of total leather output, 2018).

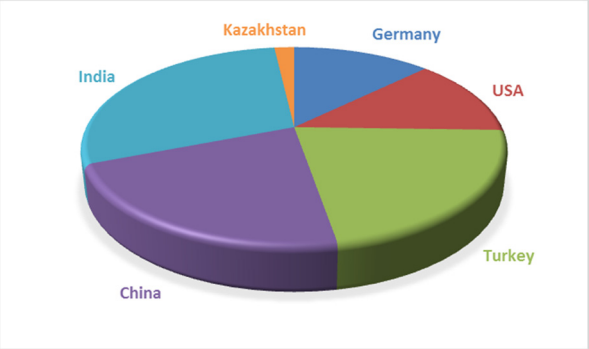

Figure 2. Share of light industry in gross domestic product (selected countries, circa *2018).*

Figure 3. The main share of light industry products in Kazakhstan (2022).

these strengths, the domestic leather industry faces several obstacles: insufficient processing capacity for raw materials, outdated production infrastructure, high costs associated with technological upgrades, and a limited number of qualified specialists. The integration of modern technology and scientific research is vital for the sustainable growth of the industry.

As illustrated in Figure 3, textile products account for the largest share (56.6%) of light industry output in Kazakhstan, followed by clothing (33.9%) and leather products (9.5%).

According to statistical data, the leather industry has experienced a decline in the production of light industry products. The state and development of animal husbandry significantly influence the quality and quantity of leather raw materials. Transitioning animal husbandry to an industrial model would enhance the raw material base for the leather industry and create conditions conducive to further growth and development. Kazakhstan can move forward by using all its strengths to address critical vulnerabilities and adopt innovative strategies that promote long-term growth and sustainability [25,26].

The structure of exports and imports (in million dollars), based on official statistics, is presented in Figure 4. In 2022, the export value of leather raw materials, fur, fur raw materials, and leather goods totaled $4.92 million, while imports amounted to $49.2 million. In 2023, both exports and imports showed an increase, reaching $6.5 million and $116.1 million, respectively. Notably, the export and import of textiles and light industry products saw a two-fold increase in the first half of 2023 compared to the same period in 2022.

The main indicators of animal husbandry development in the Republic of Kazakhstan are based on updated administrative data from farm reports. In accordance with subparagraph 2 of paragraph 10 of the rules for reviewing official statistical information, a special revision of specific livestock statistics for 2022 and 2023 was conducted. This revision focused on peasants and farms, as well as personal subsidiary farms. Figure 5 presents the headcount of cattle, horses, camels, sheep, and goats for these years [27].

According to the Bureau of National Statistics of Kazakhstan [27], the total number of cattle hides obtained in 2023 was 816,756 pieces, and in 2024, it increased to 928,949 pieces, representing a 113.7% increase compared to 2023 (Figure 6). Similarly, the number of sheep and goat skins in 2024 was 1,761,160 pieces, up from 1,730,837 pieces in 2023, reflecting a 101.8% increase (Figure 7).

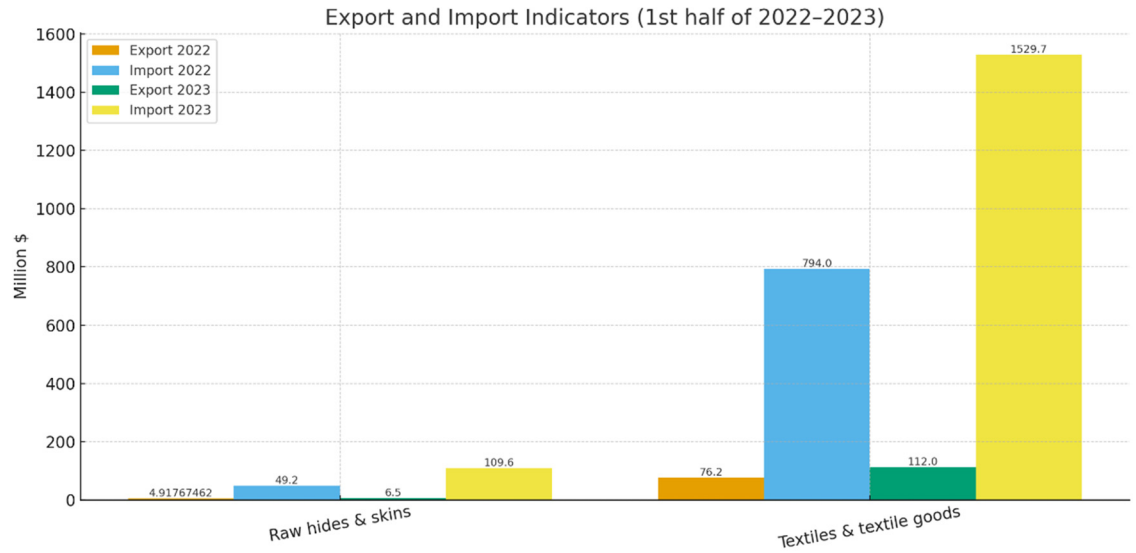

Figure 4. The structure of exports and imports according to official statistics in 2022 and 2023 million dollars.

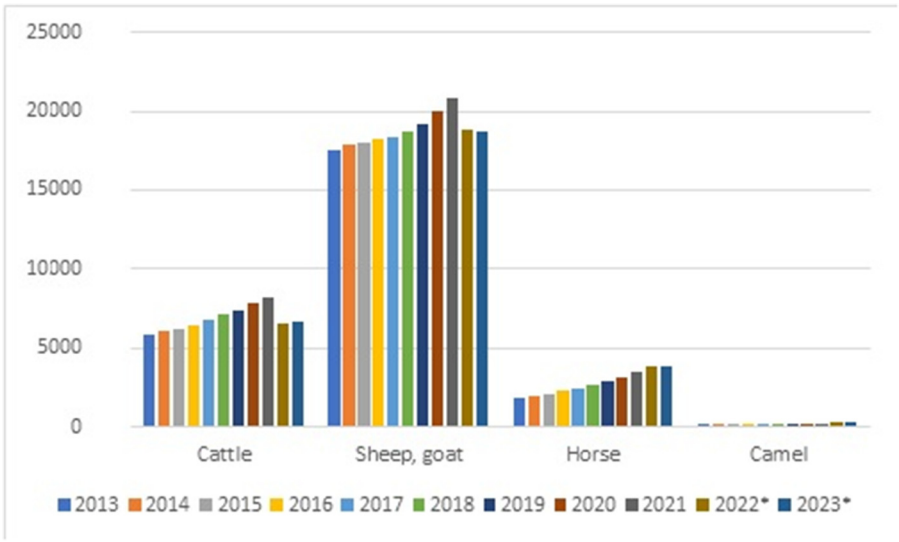

Figure 5. Number of livestock in Kazakhstan (2022–2023), thousands.

In Kazakhstan, several initiatives have been implemented to support leather production. In 2019, to address the shortage of domestic raw materials, the export of skins was banned. The "Birlik" program was launched to finance the development of domestic milk, fur, and wool collection points. Additionally, the approved roadmap for 2019–2021 focused on the development of the domestic light industry. This program aimed to provide leather processing enterprises with raw materials, eliminate illegal goods from circulation, and stimulate economic growth [28].

Currently, the domestic leather industry faces challenges such as inefficient use of natural resources, lack of environmental product certification, and low competitiveness in international markets. Given the increasing competition, it is crucial to modernize domestic leather processing industries, develop new technologies, and enhance export opportunities. Along with these issues, Kazakhstan has great opportunities for the development of leather production. The demand for environmentally friendly products, the introduction of modern processing technologies, and economic diversification are the main factors influencing the development of leather production.

The development of leather production in Kazakhstan is a strategically important step towards strengthening the country's economy, increasing its competitiveness in the global market, and expanding its export opportunities. Therefore, it is necessary to assess current challenges, examine successful international models, and identify promising directions for integrating Kazakhstan's leather industry into the global economy. This study aims to evaluate the current problems facing domestic

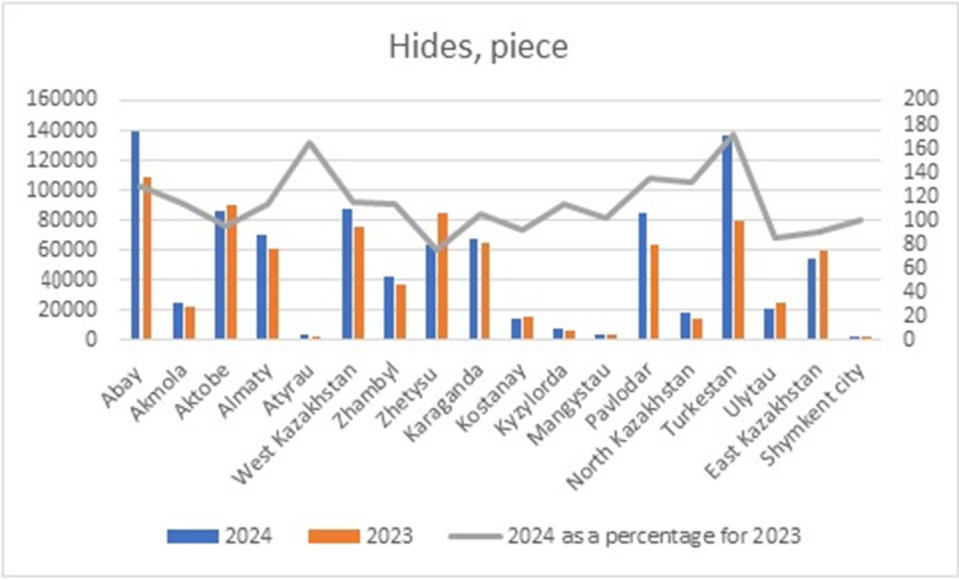

Figure 6. Hides in Kazakhstan for 2023–2024 (pieces).

leather production, compare development scenarios from leading countries, and propose practical recommendations for Kazakhstan's future in this sector.

2. The Current State of Leather and Light Industry Production in Kazakhstan

The leather and leather products sector accounts for 6% of the total light industry production in the Republic of Kazakhstan. Since leather production is continuously developing in many countries of the world and affects the country's economy, the Ministry of Industry and Infrastructure Development of the Republic of Kazakhstan set a target to create 10,000 jobs by 2025, giving priority to enterprises producing textiles and leather products in order to support the light industry. This goal was ambitious and thus far not been achieved; indeed, despite these plans, data from the National Bureau of Statistics reveal that the domestic leather processing industry has underperformed. Conversely, the export of unprocessed cattle hides to foreign countries such as the Russian Federation (RF) and China has increased significantly.

According to Customs Union statistics, the export of unprocessed cattle skins amounted to 3.4 tons, the annual indicator increased by 72.9%, and the export of small cattle skins to Uzbekistan amounted to 8 thousand pieces of unprocessed raw materials. In contrast, exports of processed leather have declined. For example, in 2023, exports of processed bovine leather to China, India, Turkey, and Italy totaled 4.3 thousand tons, but this volume dropped to 2.4 thousand tons in 2024 – a 43.7% decrease. Exports of processed small animal skins fell to 25% of previous levels [29].

Globally, raw material markets are heavily influenced by agencies such as Reuters. Currently, Kazakhstan has 1,534 enterprises in the light industry, including 20 large, 35 medium, and 1,479 small businesses. Most of these are involved in clothing production (874 enterprises), followed by 476 textile producers and 184 leather product manufacturers. Nine of the largest enterprises in the light industry are located in South Kazakhstan, producing a wide range of items including hats, bovine and equine hides, and finished textiles [30].

Kazakhstan's current strategy emphasizes both the processing of domestic raw materials and the expansion of foreign trade in light industry products. To promote the development of the light industry, attention is given to breeding livestock breeds that meet the raw material needs, providing state support to local factories, and shifting from raw material production to processed goods. In 2024, the light industry was included as a key investment sector under the 2023–2029 Manufacturing Industry Development Concept, which aims to stimulate growth and enhance the global competitiveness of domestic producers [31].

To accelerate development, Kazakhstan has begun collaborating with Turkish investors in leather processing. Presently, the majority of leather processed domestically only reaches the "wet blue" stage of tanning (chrome-tanned semi-finished leather). Extending the processing stages could enable the production of higher-value leather suitable for furniture, belts, bags, and footwear. At present, nearly all Kazakh tanneries rely on traditional chrome tanning processes, producing wet-blue leather as the intermediate product. There has been no significant adoption of chrome-free tanning techniques in the country so far. Furthermore, unlike in the European Union – where regulations strictly limit toxic residues such as chromium(VI) and formaldehyde in leather products – Kazakhstan's leather has no publicly reported monitoring of these hazardous substances [15]. Strengthening environmental compliance by introducing regular chemical safety testing and cleaner tanning methods remains an important unmet need for the industry.

Leather processing has been expanding in Kazakhstan, with plants in Arkalyk, Semey, Ekibastuz, and Shymkent contributing to the industry's growth. The tannery in Arkalyk supplies leather to shoe factories in countries such as Uzbekistan, Ukraine, and the RF, while five fur collection points have been established in the Kostanay region. Despite these developments, the sector still faces significant challenges: many plants operate with outdated equipment and lack the capital needed to modernize and reach full production capacity. Moreover, delays in securing state guarantees and difficulties in recovering budget funds further hinder growth.

The cost structure for producing a pair of shoes, including leather raw materials, is as follows: 30% for the wages of 12 workers in the workshop and store, 20% for raw materials, 8% for rent (store, warehouse, and workshop), and 3% for simplified taxes. As a result, the cost of domestically produced shoes is higher than that of some imported alternatives.

To support local manufacturers, shoe labeling has been introduced. According to the Department of Light Industry of the Ministry of Industry and Construction of the Republic of Kazakhstan, 20 million Kazakhstanis purchase 2–3 pairs of shoes each year, meaning the total consumption is approximately 70 million pairs. However, official import data suggests that imports account for only half of this number [32].

In 2023, the production of shoes in Kazakhstan increased by 38% compared to 2022; that is, 295.2 thousand pairs of shoes were produced. The fact that men's shoes made of leather increased by 24% (165 thousand pairs) and waterproof shoes made of rubber or polymeric materials tripled (53 thousand pairs) is shown in Figure 8 [33].

3. The Revival of the Leather Industry in Kazakhstan

One of the major challenges facing the leather industry in Kazakhstan is the

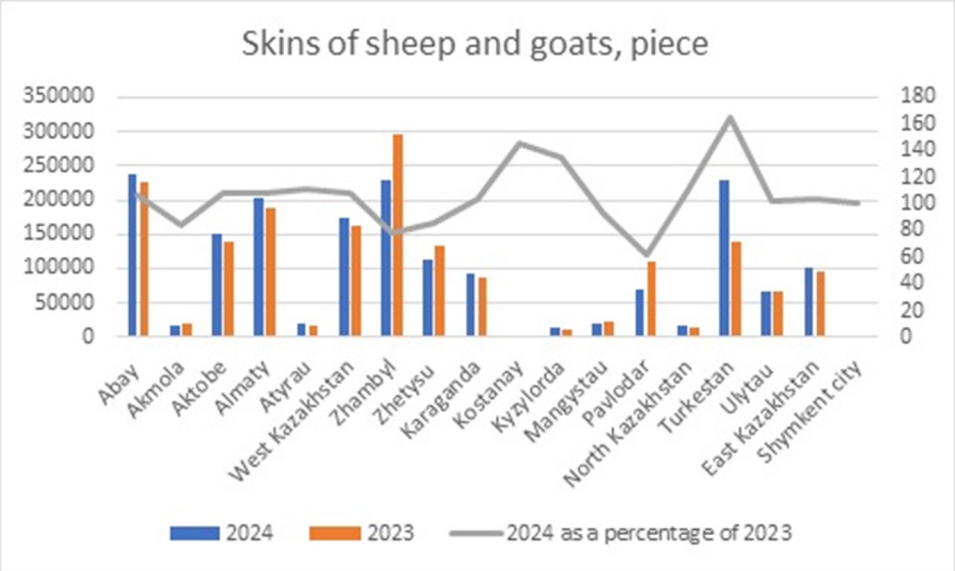

Figure 7. Skins of sheep and goat in Kazakhstan (pieces).

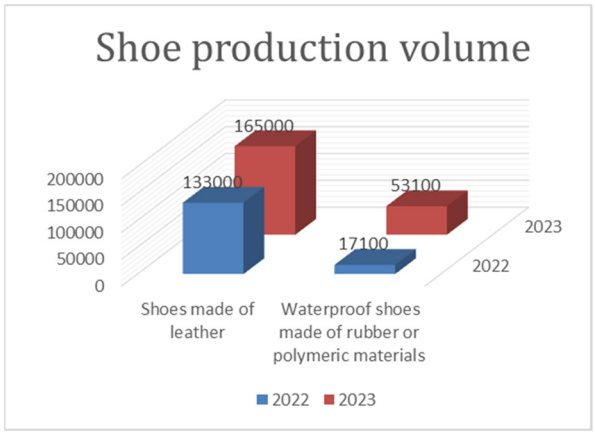

Figure 8. Volume of shoe production in the Republic of Kazakhstan.

export of unprocessed hides, particularly high-quality ones, to countries such as Turkey and Uzbekistan. Although an export duty of €200 per ton has been introduced, this measure has proven ineffective, as it remains unprofitable due to the high costs of imported goods. Currently, only 10–20% of the 2.5–3 million cattle slaughtered annually are utilized for leather production within the Republic; the remaining hides remain unprocessed. Although all leather processing plants operate at full design capacity (3 million hides per year), only approximately 1.75 million hides are currently being processed. A substantial portion of unprocessed hides is unsuitable for processing due to poor slaughtering techniques and inadequate animal care, both of which severely diminish the quality of raw hides. In fact, the most critical factor affecting hide quality is the improper handling of livestock during slaughter. In contrast, the RF ensures the quality of raw materials by restricting market access to hides lacking veterinary certification and vaccination records. There, meat processing plants directly supply unprocessed hides to tanneries, thereby ensuring traceability and quality control. In Kazakhstan, however, regulations set by the Ministry of Agriculture are often ignored, and hides are frequently smuggled into China via Kyrgyzstan. Notably, Kyrgyzstan – despite its small landmass – officially exports 3.4 million hides annually, a figure that surpasses Kazakhstan's exports, even though Kazakhstan's territory is significantly larger. Mongolia, a leading country in leather processing, has implemented a ban on the export of cattle skins, and as a result, all 34 of its leather processing plants now export only finished products. Similarly, the Republic of Uzbekistan has developed a comprehensive program to enhance its leather processing industry. This includes a ban on the export of raw leather, the introduction of a 10% customs duty on semi-finished leather exports, and various benefits for leather processing enterprises. These benefits include exemptions from land and property taxes for enterprises that export processed leather products, as well as a Value Added Tax (VAT) exemption on leather purchased from individuals. Consequently, leather processing has become a strategically important economic sector in Uzbekistan [34].

Today, the overall quality of raw hides in Kazakhstan is quite low. Approximately 80% of cattle hides fall into third or fourth-grade categories due to cuts and other defects from improper slaughtering practices. In Kazakhstan the highest quality skins are currently obtained in the Shymkent region. Small animal skins can be utilized for linings in winter footwear for the military, railway workers, and oil workers. The processing of leather within the country adds value to the product, which in turn boosts wages in the sector. Countries such as Turkey, Italy, Spain, France, China, and South Korea are leaders in the global leather and footwear industries. Among them, Italian leather is in the highest demand, and RF is the second-largest importer of Turkish leather goods. If the light industry is less competitive against the imports of industrialized countries, then this industry should be protected until it reaches the level of development [34–36].

According to the Statistics Committee, the export ban has not led to increased productivity within Kazakhstan's leather industry. Leather and leather product output declined from 155 m^2 meters in 2016 to 102 m^2 meters in 2019 – a 30% drop. In 2017, production stood at 88 m^2 meters (a 14.1% decrease from 2016), and in 2019, a further 8% decrease was recorded relative to 2018.

The development of the leather industry in Kazakhstan remains critical, especially as the country seeks to diversify its economy. The higher the efficiency and profitability of leather production, the greater the volume of both finished products and raw materials [37]. Figure 9 illustrates the export of unprocessed cattle skins from Kazakhstan to RF, China, and other countries [38].

The transformation of Kazakhstan into an open economic system and the efforts of domestic producers to secure a stable position in the global market represent key national priorities. The stability of the economic system and the well-being of the population are directly correlated with the volume of goods produced and sold. In the competitive struggle, enterprises that quickly adapt to any changes in the market situation win, that is, they become competitive [39]. Figure 10 presents the volume of unprocessed hides and skins exported from Kazakhstan to foreign markets over recent years.

In 2020, Kazakhstan exported 749 tons of cattle and horse hides, as well as 19.8 thousand tons of sheep and goat skins without processing. However, this represented a decline in rawhide exports compared to previous years. In 2019, the export of unprocessed sheep and goat, cattle, and horse hides exceeded 50 thousand tons, and in 2018, it was more than 100 thousand tons. According to the National Bureau of Statistics, in 2020, the number of cattle in the country was 7.8 million, the number of horses was 3.1 million, and sheep and goats totaled 20 million [40].

The primary reason for the current crisis in Kazakhstan's leather production is the poor quality of raw materials. During slaughter, the hides are often cut or pierced, leading to suboptimal skin quality. As noted above, about 80% of these hides often end up in the third or fourth grade categories, which do not have a viable market price. To address this issue, it is proposed that Kazakhstan establish an import-substituting complex. Despite the abundance of domestic raw materials, the cost of processing these hides in rural areas does not justify the sales price, leading to their non-processing. Given the high value of leather, these raw materials are exported to developed countries, where they are processed and imported back as finished products at significantly higher prices [41].

In countries such as Italy, the United States, France, and Germany, the production of garments and footwear accounts for up to 20% of state textile industry revenues, meeting 75–85% of domestic demand with locally manufactured goods [41]. In contrast, the textile and clothing industry in the Republic of Kazakhstan meets only 10% of domestic market demand. To strengthen the country's economic security, it is essential for domestic production to meet at least 30% of the country's demand [42].

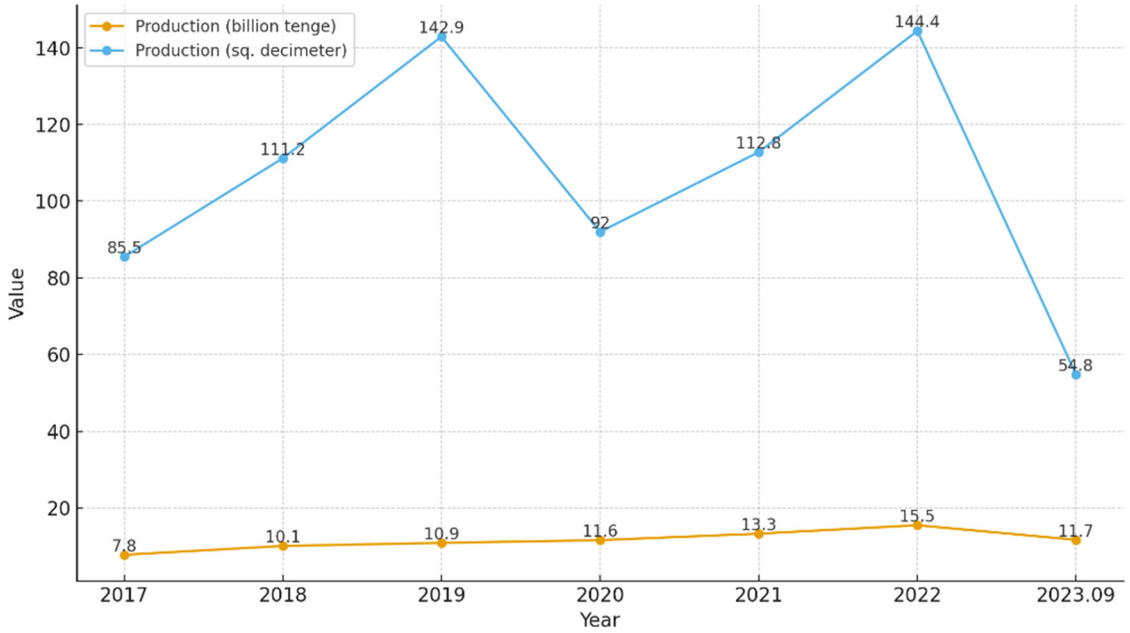

Figure 9. Export of leather and leather products production.

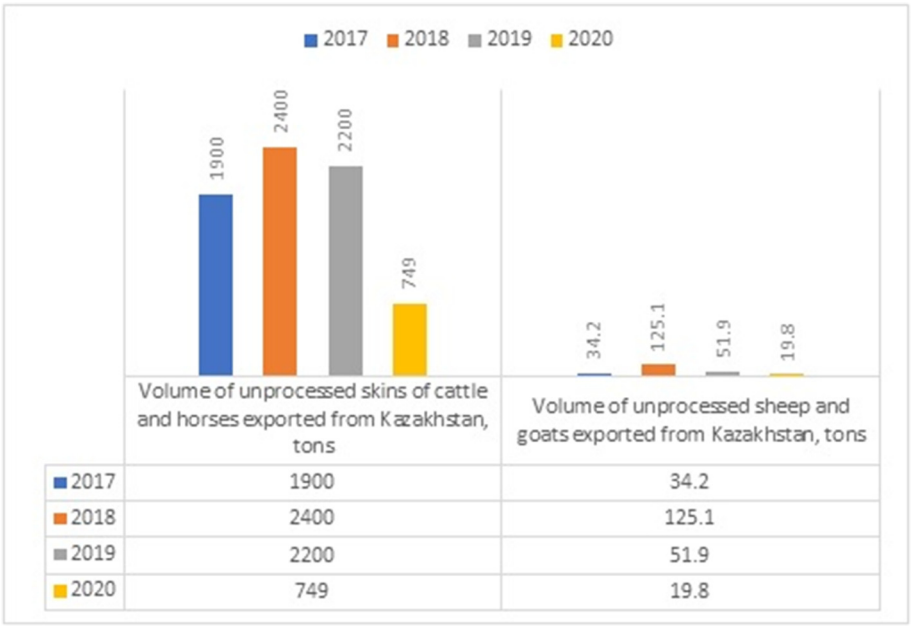

Figure 10. Volume of skins exported from Kazakhstan.

The globalization of trade has shifted the center of textile production from Europe to Asia, where a large potential market exists, and labor costs are relatively low. In this context, it is crucial for Kazakhstan to establish its own textile and light industry to produce competitive products [43]. The necessary conditions have been created for the creation of a resource base in Kazakhstan. However, domestic entrepreneurs have shown limited interest in textile-related activities – including cotton farming, leather and wool processing, and garment and footwear manufacturing – due to low profitability compared to other trade and service sectors [44].

According to the Bureau of National Statistics of the Republic of Kazakhstan, in 2022, light industry enterprises produced goods valued at 178 billion tenge, marking a 27.1% increase compared to the previous year. However, from January to September 2023, cattle leather production decreased by 55.8%, declining from 123.9 m^2 meters to 54.8 m^2 meters. Simultaneously, the export of unprocessed cattle and horse hides rose by 72.9%, reaching 3.4 thousand tons. RF remains the primary importer of these raw materials. In 2024, an additional

8 thousand units of unprocessed raw materials were exported, including sheep and goat skins to Uzbekistan. Conversely, the volume of processed leather exported by domestic enterprises has declined. Exports of tanned hides – natural leather without surface finishing – decreased by 43.7%. From January to August 2022, Kazakhstan exported 4.3 thousand tons of such semi-finished leather to countries including China, India, Turkey, and Italy. However, during the same period in 2023, only 2.4 thousand tons were exported. Similarly, the export of processed small ruminant skins declined by 25%, as shown in Figure 11. The imposition of an export customs duty (ECD) of 200 euros per ton negatively affected the export of unprocessed hides. According to experts from JSC "Kazakhstan Center for Industry and Export QazIndustry," the fur sector comprises 8.4% of the country's light industry [45].

Due to the limited capacity of processing enterprises in Kazakhstan, a significant portion of animal skins is being wasted. Additionally, the introduction of ECD caused the price of untreated skins to decrease, leading to a reduced demand. In 2023, the Interdepartmental Commission decided to reduce the ECD on cattle skins to 100 euros per ton and eliminate the duty entirely for sheep and goat skins [46].

Animal husbandry provides light industry with valuable wool and leather raw materials [47]. Currently, in Kazakhstan, one of the major issues is the salting and processing of animal skins from cattle, horses, sheep, and goats, as well as the sale of expensive skins and wool to specialized checkpoints. Many animal skins are discarded because demand has sharply decreased. The processing of fur and wool is becoming an increasingly critical concern in the agricultural sector. Farmers in the Akmola region, for instance, are disposing of thousands of tons of animal skins and furs. Due to the low purchasing price of these skins, the hides of millions of animals have essentially become waste.

Each year, Kazakhstan produces 3.4 million skins from slaughtered cattle and 7.9 million skins from slaughtered sheep and goats. These skins are in high demand worldwide, yet in Kazakhstan, only 15% of cattle skins are processed, and sheep and goats are largely ignored. Recently, the director of "MV4" LLP was able to send 8 tons of animal skins to the Taraz fur plant. However, the recommended price for raw cattle skins, salted and kneaded, remains very low. In winter, storerooms fill with these skins, but by summer, they spoil. This results in significant losses, as the skins are stacked in layers in the warehouse.

A new initiative led by Akan Zhunusov, a professor at North Kazakhstan State University, has sought to address this issue. Under his leadership, a small plant has been established to process animal skins into protein supplements for livestock. This plant has already tested its feed mixture on a local poultry farm, with promising results. The plant now receives skins from local villages at 50 tenge per kg, which translates to about 500–570 tenge for cattle skins. The plant processes up to 2,000 skins per day. From 10 kgs of animal skins, the plant can produce up to 1 kg of powder, with a daily output of up to 5 tons. Given the demand for the product, the plant is expected to generate substantial income [48].

4. Prospects for the Development of the Industrial Complex

The volume of domestic production is due to the fact that textiles and the light industry are one of the main sectors of the economy that make up the budget in many countries. It is necessary to meet 30% of domestic demand [49,50]. The Republic of Kazakhstan is rich in unique resources that offer significant potential for the development of its leather industry, that is, the availability of Natural Resources, great prospects for the development of Agriculture to increase the added value of local raw materials, and the production of high-quality products in the leather industry. Figure 12

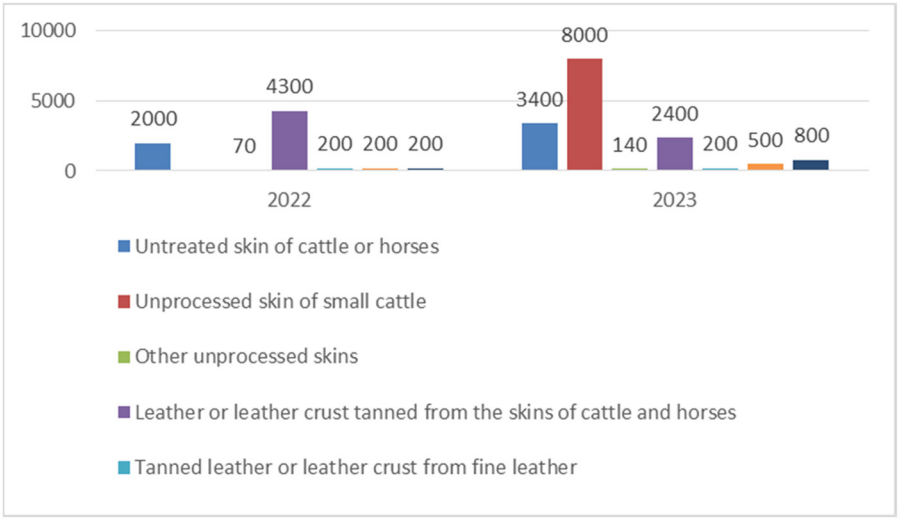

Figure 11. Export indicators of animal skins export from Kazakhstan, in tons.

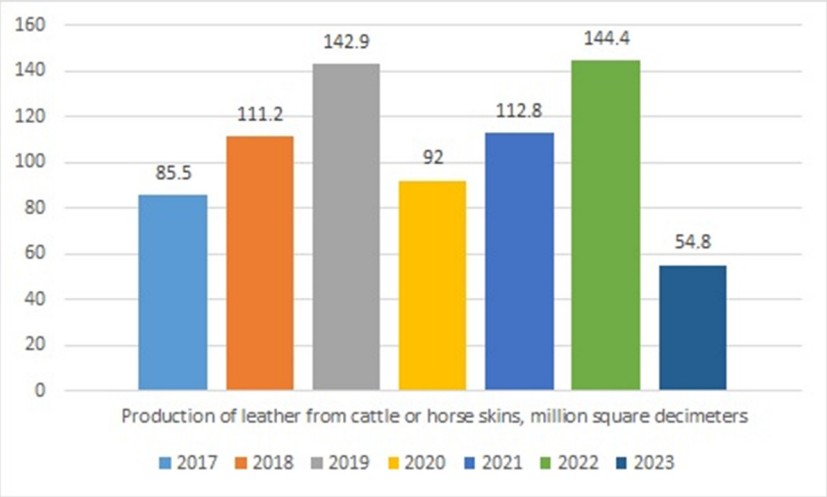

Figure 12. Production of leather from cattle or horse hides, m^2 decimeters.

illustrates the statistics for leather production from cattle and horse hides, which amounted to one m^2 decimeters in 2023 [51].

Several large enterprises are pivotal to the development of leather production in Kazakhstan. One of the most economically stable plants is the leather shoe factory of Tarazkozhobuv LLP. This plant stands out for its integrated production process, which spans from raw leather processing and tanning to the production of finished shoes. The factory has the capacity to produce various types of leather, allowing for waste-free processing of cattle raw materials into semi-finished leather products. Another key player is the Almaty Leather Plant LLP, which is one of the largest tanneries in Kazakhstan, processing up to 1.5 million tons of cattle leather annually. This plant contributes significantly to the country's leather production capacity. The Semey Tannery Leather Processing Plant LLP is another important enterprise, specializing in the production of semi-processed leather primarily for export. Additionally, Turan-Skin LLP stands as one of the largest leather processing enterprises in the country, offering a wide range of leather goods. These factories, including Tarazkozhobuv LLP, also produce leather shoes for various sectors, including every day, military, and household footwear. The products are certified, ensuring high standards of quality. Key consumers of Tarazkozhobuv LLP's products include national organizations such as the Ministry of Finance, the National Security Committee, and other major industrial entities in Kazakhstan [52,53]. In 2023, Tarazkozhobuv LLP, one of the largest fur processing and manufacturing companies, contributed 327.9 million tenge to the national budget – double the amount contributed by all other factories combined. Almaty Leather Factory, which has been in operation since 2020, ranks second in terms of tax contributions. Turan-Skin LLP in Shymkent takes the third position, having significantly increased its tax base [54]. The Semipalatinsk Tannery was inactive for 10 years, but after just 6 months of operation, it successfully restored production and resumed exports. The company now specializes in the production of chrome-tanned semi-finished leather, particularly wet blue, which is in high demand abroad. Wet blue is produced through a three-phase tanning process and is known for its durability, high quality, and affordability. This semi-finished leather is used in manufacturing light jackets, shoes, and accessories. Local suppliers provide the raw materials and chemicals for production, with some additional materials sourced from RF.

In 2021, the plant increased its production, and it aims to process up to 250 tons of raw materials monthly. With a maximum capacity of 1.7 m^2 meters of wet blue per year, the plant purchased 800 tons of cattle hides, but was unable to reach its maximum capacity due to pandemic-related disruptions. Closed borders hindered the export of finished products, the import of necessary chemicals, and the procurement of raw materials from other regions. Despite these challenges, the plant's output has steadily grown, and it currently operates at 30–40% of its capacity. The Semey Tannery has successfully established a network of leather suppliers across Kazakhstan and formed strong partnerships with domestic producers [55].

The Eurasian Economic Commission (EEC) has canceled import customs duties on a number of chemical industry goods used as finishing materials in leather production and for raw materials in the shoe industry. For the next 3 years, duties will be set at 0%, a move aimed at supporting the manufacturing of leather, leather goods, and shoes. However, it is important to note that these products are not produced within the Eurasian Economic Union (EAEU).

The decision is part of a broader strategy to develop cooperative efforts within the light industry sector. The effectiveness of this measure is expected to improve production conditions, foster growth in the leather shoe industry, increase finished product output, and enhance competitiveness. In September, the EEC board also reduced duties on paints, varnishes, water-based pigments for leather

processing, and surfactants for leather shoe production.

In Kazakhstan, light industry enterprises are predominantly located in the southern regions. In 2022, the combined share of production in the Almaty and Turkestan regions, as well as Shymkent and Almaty city, accounted for 53.6% of total production. This high concentration is largely due to the proximity to resource bases and the availability of affordable labor [56].

In Aktau, the Zhamal-Ai LTD shoe factory has been developing the production of high-quality footwear that is unique in the market, manufacturing 120,000 pairs of domestic shoes annually. These shoes are primarily designed for workers in the oil and gas fields, construction sites, and the military sector. The factory also produces modern-style shoes aimed at the younger generation. Since 2015, the factory has been producing leather moccasins under the "Sharkey" brand. Known for their comfort, style, and superior quality, these moccasins have gained great demand among consumers. In addition to moccasins, the plant also manufactures shoes, sneakers, and suede footwear, all made from genuine leather and featuring modern designs.

A key advantage of the factory's products is that only natural materials are used in production. Raw materials are sourced from suppliers in Kazakhstan, RF, Turkey, and Italy. The quality of the factory's products is consistently higher than that of neighboring countries.

The company operates successfully and steadily, supplying high-quality shoes to many regions of Kazakhstan. Its products are delivered to transport companies, security agencies, law enforcement, and other state organizations. The factory's production capacity grows each year, thanks to its powerful base of technical equipment and highly skilled workforce. Currently, 160 specialists work at the plant, producing top-notch shoes and clothing. With an excellent reputation in the domestic market and extensive experience, Zhamal-Ai LTD is continuously working to enhance production, improve product quality, and foster competition in the industry [57].

According to the Bureau of National Statistics of the Ministry of Internal Affairs of the Republic of Kazakhstan, there are currently six shoe companies operating in the country. The largest of these enterprises, "Tarazkozhobuvy," has the capacity to produce 500,000 pairs of boots, shoes, sports footwear, and boots annually. Similarly, KAZLEGPROM-Almaty LLP, a clothing and footwear factory, also boasts the same annual production capacity. Among the oldest manufacturers is the Almaty plant of JSC "Zhetysu." In 2022, all enterprises in the leather industry (including shoe production and leather processing) generated products worth 15.5 billion tenge, reflecting a 16.6% increase in value compared to the previous year. From January to April 2023, the cost of leather processing products exceeded 5.8 billion tenge, marking a 26.8% increase compared to the same period in 2022 (Figure 13).

Currently, Kazakhstan's leather shoe industry is developing rapidly. However, the insufficient processing of skins restricts the full potential of domestic leather. In 2023, the number of cattle in animal husbandry amounted to 8.76 million heads, which highlights the country's potential for producing high-quality leather. Nevertheless, the advanced processing of leather raw materials remains underdeveloped, particularly as the export of unprocessed hides continues to increase. Rather than supplying domestic tanneries, Kazakh farmers often choose to export raw hides abroad.

The leather industry is also experiencing new production and consumption trends, influenced by societal challenges. The circular economy model encourages a shift from the current linear economic model toward a more sustainable one, in which waste is minimized, and resources are reused or recycled whenever possible. For this transition, Life Cycle Assessment (LCA) plays a crucial role in guiding decision-making [58]. Over time, the

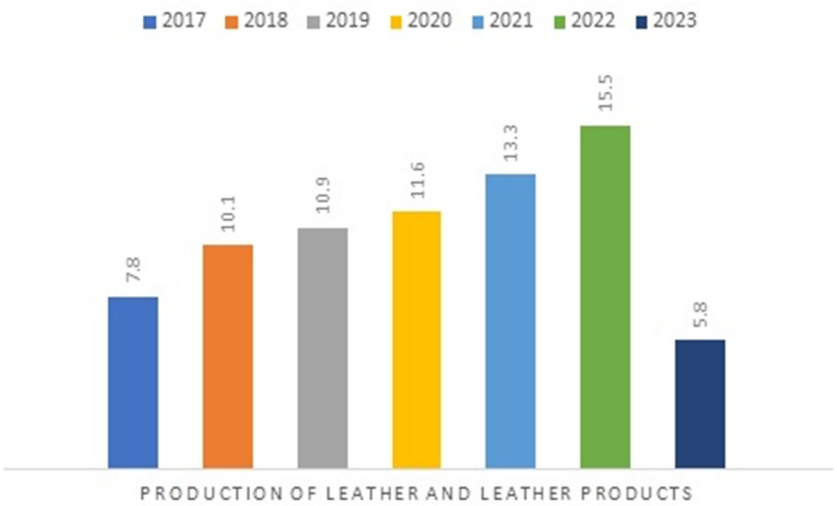

Figure 13. Production of leather and leather products, billion tenge.

leather industry has evolved, moving from traditional plant-tanned leather to modern chrome-tanned leather, which is now the standard for producing shoes, clothing, and furniture upholstery. This progression has been accompanied by innovations in the development of chemicals, new processing methods, and enhanced properties of finished leather [59,60].

Historically, Kazakhstan possessed significant production and scientific potential in the light industry sector. However, this potential declined considerably during the years of reconstruction, resulting in a loss of industrial capacity and international competitiveness. In contrast, the light industry continues to play a key role in the economy of neighboring Uzbekistan, where it contributes 16.7% to the national GDP. The EU leather industry produces some of the most valuable calfskin, largely dependent on access to raw materials and export markets. Regional concentration is strong; it often plays a key role in the local economy, being the dominant creator of wealth and employment [61]. This comparison highlights the importance of revitalizing Kazakhstan's light industry to regain its former position and foster sustainable economic growth.

In recent years, Kazakhstan has made notable progress in modernizing its production facilities, particularly in the textile industry. These efforts have enabled the production of high-quality textile goods that comply with safety requirements, technical regulations, and both national and international standards. As a result, Kazakhstan's textile products have become increasingly suitable for foreign markets. Considering the historical and current dynamics of the sector – along with ongoing and planned government support, enhanced industry integration, and growing innovation among enterprises – the competitiveness and development prospects of the textile and light industries are expected to strengthen significantly in the coming years.

Moreover, Kazakhstan's vast natural pastures, totaling 187.55 million hectares, provide substantial opportunities for producing competitive and environmentally sustainable animal-based products [62]. As of August 2024, the cattle population reached 8.7 million heads, with the largest concentration found in the Turkestan region (1.1 million heads) and the smallest in the Mangistau region (19.4 thousand heads) [24,63,64].

5. Conclusions

The sustainable development of the leather and light industries in Kazakhstan necessitates a comprehensive approach to addressing several critical challenges. To enhance international competitiveness and support the emergence of domestic brands, it is essential to increase the depth of leather raw material processing, modernize production infrastructure, and adopt innovative and environmentally sustainable technologies. Specifically, this study identified that only a fraction of available hides is processed domestically (around 10–20%), with the majority exported in raw form, and that up to 80% of collected hides are of low grade due to quality issues. Addressing these issues will require stricter enforcement of raw hide export restrictions and improvements in slaughtering practices to increase both the quantity and quality of local raw materials. A key factor in advancing the sector will be the creation of favorable investment conditions, alongside initiatives to stimulate demand by supporting local manufacturers. The development of a skilled workforce, improvements in labor productivity, and the production of competitive, high-quality goods will constitute the foundation for long-term industrial growth and strengthen Kazakhstan's position in the global market.

Active support for domestic producers, continuous improvement in product quality, and the integration of advanced technologies (such as modern tanning methods and waste treatment systems) will enable Kazakhstan not only to meet a greater share of its domestic demand but also to establish a stronger presence in international markets with high-quality leather products. Achieving the government's job creation and output targets by 2025 and beyond depends on successfully implementing these strategies. In summary, a multifaceted effort – improving raw material utilization, upgrading technology, ensuring environmental compliance, and bolstering human capital – is required to revive Kazakhstan's leather industry and realize its full potential for contributing to economic diversification and sustainable growth.

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Conflict of interests

The author(s) declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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