



Review article

Corn Production and Corn Seed Market in Kazakhstan

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Abstract

Agriculture is the strategic economic sector in Kazakhstan that requires further modernization and introduction of innovative practices to boost the agricultural production in the country. Though wheat and barley are main crops among Kazakhstani farmers, alternative crops like oilseeds, corn, vegetables, fruits, etc. contribute to the country's gross agricultural product and food security. The corn production in Kazakhstan was rarely elucidated or discussed in the academic community. Though, this crop is an essential income source for many farmers in the southern Kazakhstan. The objective of this paper, therefore, is to shed light on the status, development, and perspectives of corn production in Kazakhstan with a focus on its seed market. The corn production area in Kazakhstan was around 301 thousand hectares in 2021, from which grain corn production comprised 63% and silage corn was 37%. The leading area of corn production in Kazakhstan was Almaty region. The region alone contributed 50% of grain corn in the country. Corn seeds of more than 25 originators were sold to Kazakhstani farmers in 2021. The latter planted more than 150 various corn hybrid varieties. 60% of all corn seeds were imported. The slow modernization of available equipment and agricultural practices were essential handicaps in quick and successful development of Kazakhstani farmers. The research about corn, corn production, corn market, and corn seed market in Kazakhstan is very limited. Therefore, further detailed studies in this field are necessary to illuminate various aspects of corn growing in Kazakhstan for international academic community.

Keywords: Kazakhstani Corn, Corn Market Development, Corn Cultivation, Seed Sales.

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INTRODUCTION

Agriculture is an important economic sector in Kazakhstan that provides an employment for almost a fifth of the country's population (FAO, 2022). During the first decade of the independence (1991-2000) Kazakhstan experienced significant decline of agricultural production due to drastic changes of political, economic, and social characters (Aimurzina et al., 2019; Baer-Nawrocka & Sadowski, 2019; Petrick et al., 2016). The breakdown of economical networks existed among former Soviet countries, the decline of public support, unstable financial development, imperfect land reforms, the massive migration of non-Kazakhs from the country and other factors aggravated the situation (Espolov et al., 2020; Oralbayeva, 2020). As a result, the country commenced the new millennium with a severely destroyed and ineffective system that had little share in the country's total GDP (World Bank, 2022).

The economic boom of 2000s that was triggered by the increasing prices for oil and other natural resources the Kazakhstani government could start re-structuring agriculture. With increasing state supports the government tried to re-build outdated or disrupted agricultural system and stimulate growth in agricultural production (Ismailova et al., 2016; Temyrbekova et al., 2015). These supports were crucial for the course of the agricultural development in the country. However, they became a subject of the intensive discussion in the recent years. The modern Kazakhstan targets the development backed by strong agricultural producers that are market- and profit-oriented and, consequently, will try to reduce subsidizing the sector directly (OECD, 2022).

Kazakhstan has almost 30 million ha of cropland appropriate for plant production (FAO, 2022). From this area, about 22 million ha are covered by different predominantly annual crops. The remaining part is left either as fallow land or unseeded. The biggest part of plant production in Kazakhstan is rainfed. Traditionally farmers prefer spring wheat and spring barley for their yield stability and market demand. However, the recent trends of the country's agricultural development towards crop diversification stimulate farmers' interest in growing alternative cultivars like corn, oil crops, vegetables, etc.

Overview of corn production in Kazakhstan

The share of corn production is relatively low in Kazakhstan due to various reasons. The major cause is climate constraints for effective corn growing. Kazakhstan is a country with harsh weather conditions represented with very cold winters and unstable temperatures in summers (hot on some days and cold on others). Although the modern corn varieties' portfolio is very extensive and can be grown in different climatic zones in the world, the southern parts of Kazakhstan contribute the biggest production volume and the highest yield of this crop.

In 1990 one year before the breakdown of the USSR Kazakhstan planted 35 million ha, from which ca. 24 million ha were under cereals and pulses (Table 1). Corn acreages reached almost 2,5 million ha and were primarily comprised of silage corn because Kazakhstan had large animal husbandry facilities consuming feedstuff. The big pressure from Moscow forced agricultural enterprises in the country to plant crops in areas that were inappropriate or economically ineffective for corn production. In the first years of transition from planned to the liberal economy (1991-1999) the national agricultural system experienced severe destruction which can be seen as a drastic decrease of cropland in Table 1. After 2000, the situation was stabilizing and in the recent decade, the sown areas have stayed on a constant level (21-22 million ha). The similar development shows corn, the planting area of which drastically decreased in 1990s, stabilized in the first decade of 2000s, and finally started to increase after 2010. However, corn production areas are not significantly large and was around 1.3% of total sowing area in 2021 (Bureau of National statistics, 2022). The statistical data divide corn into two different categories - grain corn and silage corn, although both types are used mainly in animal and poultry feeding.

In the Soviet era, Kazakhstan was an agrarian country with enormous animal production facilities. Therefore, many agricultural enterprises grew various feed crops including silage corn. However, from 1991 to 2000, during the transition period, the animal head number drastically fallen as well as silage corn areas (Table 1). In recent years the corn area (both for grain and silage type) exhibited an increasing trend and reached ca. 303 thousand hectares in 2021, from which only 189.3 thousand ha was grain corn. According to USDA data Kazakhstan was the 60th nation among 115 countries that produced grain corn in 2021 (Index Mundi, 2022). The total world planting area for grain corn was something about 199 million ha (USDA, 2022).

Table 6. Total, cereals, and corn sown areas in Kazakhstan (*Thousand ha*)

	All sown areas	All cereals and pulses	Corn for grain	Corn for silage	All corn	Share of total corn area in all sown area
1990	35182.1	23355.9	128.6	2281.7	2410.3	6.85%
1995	28679.6	18877.7	85.8	814.3	900.1	3.14%
1996	25644.1	17187.7	85.8	811.1	896.9	3.50%
1997	21843.7	15651.4	69	273.8	342.8	1.57%
1998	18610.4	13526.7	65.8	138.7	204.5	1.10%
1999	15285.3	11392.5	66.5	101.5	168	1.10%
2000	16195.3	12438.2	79.4	75.5	154.9	0.96%
2001	16785.2	13208.7	88.3	71.7	160	0.95%
2002	17756.3	14022.7	106	71.9	177.9	1.00%
2003	17454.2	13872.6	102.1	63.1	165.2	0.95%
2004	18036.4	14278	103.4	67.6	171	0.95%
2005	18445.2	14841.9	104.4	67.3	171.7	0.93%
2006	18369.1	14839.8	90.9	56	146.9	0.80%
2007	18954.5	15427.9	93.2	60.7	153.9	0.81%
2008	20119.2	16190.1	97.8	62	159.8	0.79%
2009	21424.9	17206.9	100.7	71.3	172	0.80%
2010	21438.7	16619.1	97.6	72.2	169.8	0.79%
2011	21083	16219.4	98.6	80.2	178.8	0.85%
2012	21190.7	16256.7	101.5	75.3	176.8	0.83%
2013	21271	15877.6	108.5	82.1	190.6	0.90%
2014	21244.6	15291.5	126.3	76.9	203.2	0.96%
2015	21022.9	14982.2	139	73.9	212.9	1.01%
2016	21473.6	15403.5	135.3	78.6	213.9	1.00%
2017	21839.9	15405.4	138.7	85.1	223.8	1.02%
2018	21899.4	15150	153.3	98.9	252.2	1.15%
2019	22135.8	15396.6	156.5	97	253.5	1.15%
2020	22582.3	15878.4	164.7	110.4	275.1	1.22%
2021	22925.7	16108	189.3	113.4	302.7	1.32%

Source: Bureau of National Statistics, 2022

According to the latest general program Agriculture Development Concept 2021-2030 corn is a strategic crop for Kazakhstan's agriculture (Ministry of Justice, 2022). Consequently, the corn-growing areas will increase in the future. Though, this increase will not be drastic due to existing limitations in corn production which will be discussed later in this article.

Three legal structures are involved in agricultural production in Kazakhstan: agricultural enterprises, individual entrepreneurs and peasant farmers, and households (Bureau of National statistics, 2022). All three groups grow corn for grain and silage (Figures 1 & 2). However, grain corn production

is largely organized by small farmers and individual entrepreneurs, whereas legal entities focus on silage growing.

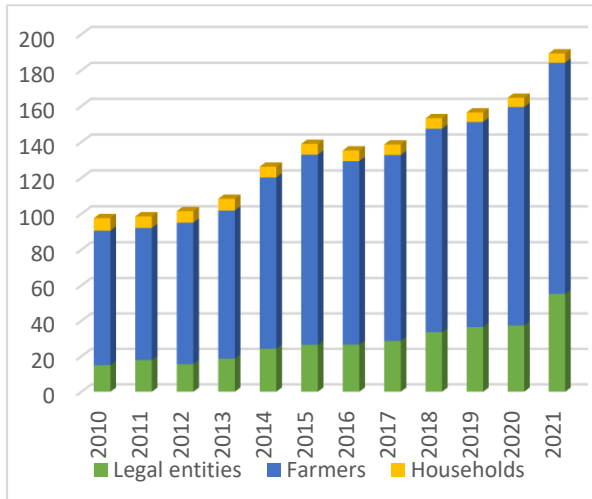


Figure 1. Grain corn areas by legal status

Source: Bureau of National Statistics, 2022

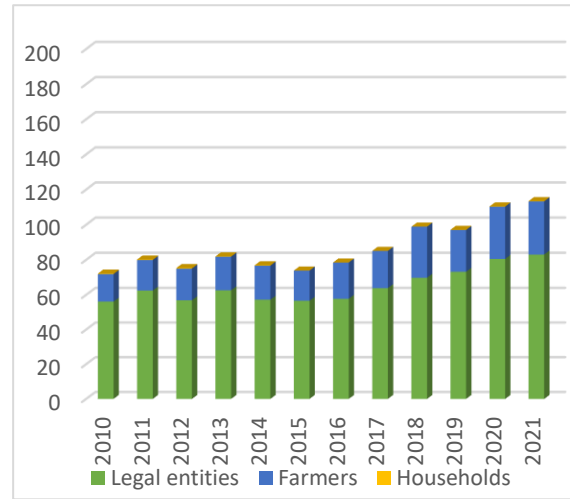


Figure 7. Silage corn areas by legal status

Source: Bureau of National Statistics, 2022

The dominant position of legal entities in silage corn growing is explained by their involvement in livestock production (milk or meat). To provide animals with better feed composition, agricultural companies cultivate various feed crops, including silage corn.

The main target for corn growers is high yield because it directly influences their incomes. The average grain corn yield of Kazakhstani growers was about 6 tons per hectare in 2021 but it was not always on that level. In 1990s its value was the minimal since the independence and began increasing steadily in the new millennium reaching its maximum in the recent years. The overall improvement of growing technologies resulted in increasing land productivity of grain corn. Though its value was close to the world's average 5.8 tons/ha in 2020 (FAO, 2022), Kazakhstan has a strong potential to boost grain corn yield.

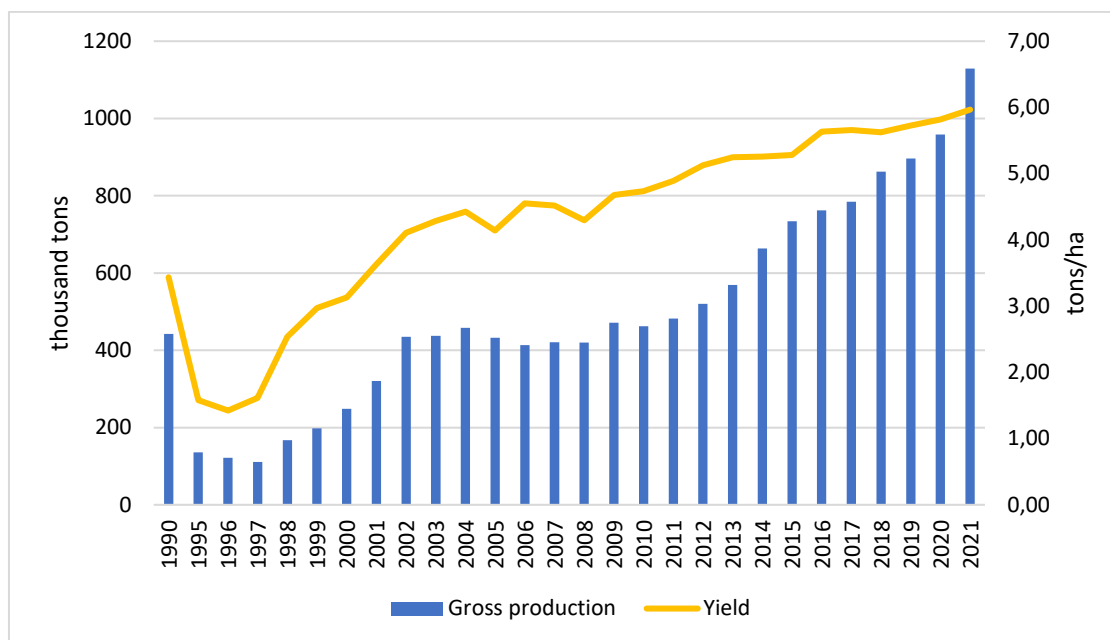


Figure 3. Gross production and yield of grain corn in Kazakhstan

Source: Bureau of National Statistics, 2022

The most grain corn growing region in Kazakhstan Almaty, followed by Turkestan and Zhambyl regions. Almaty region alone cultivated more than 50% of all grain corn in the country, whereas three main regions of grain corn growing covered 85% of total crop area (Table 2). Due to grain corn biology (this crop likes warmth, sun, and water), the most beneficial areas of its cultivation are situated in the southern regions of Kazakhstan. Consequently, southern corn growers get the highest production volume and yield comparing to other regions. However, grain corn areas grew in other regions of Kazakhstan too which is a sign of continuous diversification of crop production in the country.

Table 2. Regional distribution of grain corn areas in Kazakhstan

	Almaty region	Zhambyl region	Turkestan region	Other regions	Share of three regions in total area	Share of Almaty region in total area
2010	60.2	9.8	25.6	2	98%	62%
2011	62.7	10.2	24.9	0.8	99%	64%
2012	66	10.3	24.4	0.8	99%	65%
2013	67.8	13.7	25.1	1.9	98%	62%
2014	69.5	15.7	38	3.1	98%	55%
2015	72	13.8	50.2	3	98%	52%
2016	76.1	14.5	40.8	3.9	97%	56%
2017	78.7	15.7	37.6	6.7	95%	57%
2018	80.1	18.1	44	11.1	93%	52%
2019	81.7	18	46.1	10.7	93%	52%
2020	86.6	19	45.5	13.6	92%	53%
2021	96.4	18.7	46.2	27.9	85%	51%

Source: Bureau of National Statistics, 2022

Almaty region¹

The leading position of Almaty region in corn-growing is connected to its history, geography, climate, and infrastructure. During the Soviet era Almaty region was the centre of corn breeding and seed production activities for the whole country. It was the leading region for grain corn cultivation too. After collapse of the Soviet Union, Almaty region continued to be the dominant area of grain corn growing in Kazakhstan.

The grain corn area increased from 60.2 thousand ha in 2010 to 96.4 thousand ha in 2021 (almost for 60%, Table 2). It is expected that corn areas will be growing further due to favorable climate conditions in Almaty region as well as increasing demand for crop on the domestic and world market.

Not every district of the region is focused on corn production. In those areas where poultry and livestock facilities are available corn cultivation is more intense. Moreover, favorable climate conditions enable to harvest stable yields with high-quality grain which makes Almaty corn attractive for importers, especially from Central Asia. Moreover, China as a neighbor country of Almaty region has a big potential to become the main export destination for corn producers.

All corn area comprised more than 11 % of the total cropland in Almaty region in 2021. The grain corn was the dominant type. Among 20 administrative districts of the region, corn cultivation was concentrated in five of them (Table 3). They were Panfilov, Enbekshiqazaq, Uigur, Ile, and Talgar districts. These five districts contributed 77% of corn growing in Almaty region (Figure 4). In Panfilov and Uigyr districts, more than half of the total sowing areas were occupied by corn becoming the most important cash crop for growers in these zones.

Table 3. Corn growing in Almaty region (2021), in ha

Administrative district	Total cropland	Grain corn area	Yield, tons/ha	Silage corn area	Total corn area	Corn share in total cropland	District share in total corn area
TOTAL AREAS	972789.58	96363.9	68.60	14118.50	110482.40	11.36%	100.0%
Panfilov	44529.00	26586.00	65.00		26586.00	59.71%	24.06%
Enbekshiqazaq	85616.91	25051.60	67.20	3828.60	28880.20	33.73%	26.14%
Uigyr	22414.60	12145.30	68.30	50.00	12195.30	54.41%	11.04%
Ile	71371.99	7165.00	84.80	2630.00	9795.00	13.72%	8.87%
Talgar	32701.14	5798.00	80.50	2128.00	7926.00	24.24%	7.17%
Other 12 districts and 3 towns	716155.94	19618.00	40.10 - 83.40	5481.90	25099.90	3.50%	22.72%

Source: Bureau of National Statistics, 2022

¹ In June 2022 Almaty region was separated in two regions: Almaty and Zhetyysu, but in the study old administrative area was considered

In Almaty region there were ca. 48000 active enterprises involved in agricultural production (January 2022). More than half of the regional gross agricultural production was created by these enterprises. About 500000 households contributed to its remaining part. Among enterprises, peasant farms were the most widespread form of business organization in 2021 (more than 90 % of all enterprises in Almaty region). Therefore, corn was cultivated mainly by peasant farms in 2021 (Bureau of National statistics, 2022).

According to the Bureau of National statistics (2022) grain corn was one of the most profitable crops within all cultivated plants in Almaty region. Its gross profitability was approximately 63.6% in 2021 which was higher than the aggregative effectiveness of the regional plant production (49.1%).



Figure 8. Corn belt of Almaty region (inside the red line area)

Source: adapted from Wikimedia Commons, 2021 https://commons.wikimedia.org/wiki/File:Almaty_administrative_divisions_-_colored.svg

Corn trade (commodity)

Kazakhstan was by large a corn exporting country, where Uzbekistan bought more 90% of the total commodity export volume in 2020 (Figure 5). The rest of corn was mostly delivered to other Central Asian countries. 99.8% of the corn import volumes came from Russia and covered the demand in northern parts of Kazakhstan.

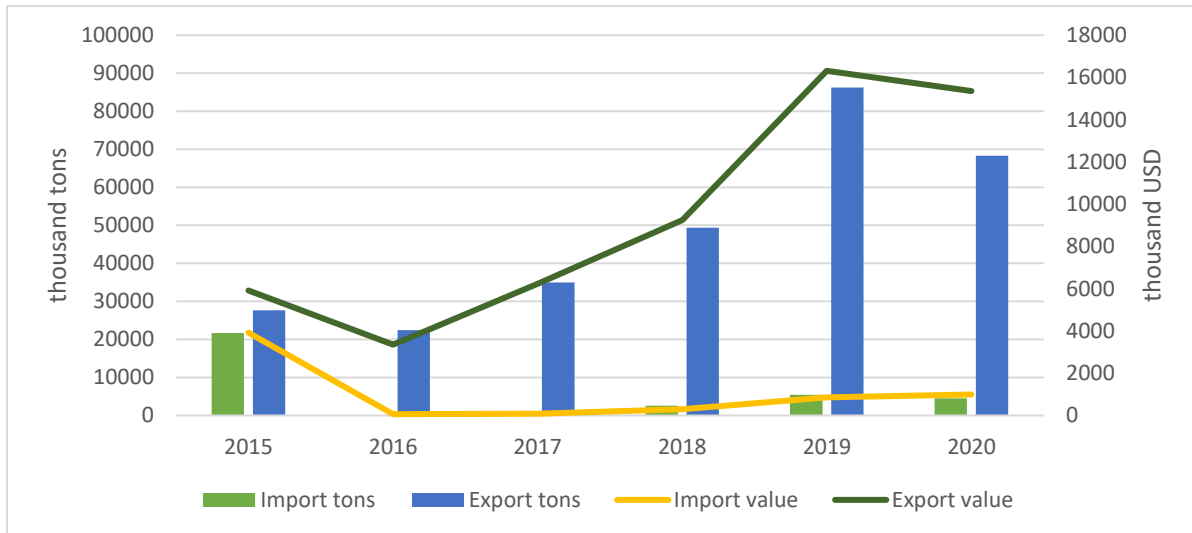


Figure 9. Corn trade balance in Kazakhstan

Source: United Nations, 2022

The technology of corn growing

The corn production technology varies between crop types (grain or silage), regions, varieties, and farmer's common practices. The central differences are the vegetation period and irrigation (Table 4). In Kazakhstan almost 100 % of used corn varieties are certified non-GMO hybrids and bought annually from seed sellers. Some farmers save seeds for planting in the next season but their number is very small.

Status and governmental support

Kazakhstan is predominantly a soft spring wheat producer, famous for its high protein wheat on the international commodity market (Madiyev et al., 2018). Spring wheat is the main or usually monocrop cultivated by many farmers in the country. In the years when wheat prices go very low, Kazakh farmers suffer from financial loss and need additional resources to continue their activities. To somehow minimize the dependence on wheat as well as price risks, some farmers have started diversification of their crop production by including other profitable cultivars in rotation. Though, this shift in many cases needs expensive investment into machinery and technology in general. Therefore, the government has taken an active role on the way to new agricultural development in Kazakhstan. It has become the most important operator of the country's diversification and modernization policies through direct support (seed, CPP, fertilizer subsidies) as well as providing low-interest rate credits for equipment and machinery. Several major Programs were introduced in recent decades which aimed to increase the overall effectiveness of the country's agriculture (Table 4).

Table 4. Corn growing technology in Kazakhstan

Areas	South	North	East	West
Vegetation period in days	From 120 days	80 days	90 days	100 days
Irrigation	Yes	No, rainfed	Mainly rainfed	No, rainfed
Planting	From February to May	Mid May	Mid May	End April
Harvesting	From September to November	August-September	September	August-September
Corn type	Mainly grain	Mainly silage	Mainly silage	Silage+grain
Share of western hybrids	High	Middle	Low	Low to middle
Share of modern equipment	Low	Middle	Low to middle	Low to middle
Average ha per enterprise	Up to 50	At least 200 ha	200 ha	2000 ha
Main operations	Soil preparation, fertilizing, seeding, cultivation, pesticide spraying + fertilizing, irrigation up to 3 times, harvesting	Water-saving operations, soil preparation, fertilizing, seeding, cultivation, pesticide spraying + fertilizing, harvesting	Water-saving operations, soil preparation, fertilizing, seeding, cultivation, pesticide spraying + fertilizing, harvesting	Water-saving operations, soil preparation, fertilizing, seeding, cultivation, pesticide spraying + fertilizing, harvesting

Source: own interpretation

Following this policy, each region has selected a list of crops suitable for their climate conditions and economically reasonable for farmers.

Table 5. Major state programs on agricultural development in Kazakhstan until 2021

Program	Years	Aim	Planned Budget	Results / Status
Agro-Industrial Development 2017-2021	2017-2021	ensuring the production of competitive products, food stability, a saturation of the domestic market, and development of exports potential	7.4 billion USD	Finished
Agribusiness 2020	2013-2020	Improving the competitiveness of domestic agribusiness	20 billion USD	Not finished, changed for AID 2017-2021
Development of Agro-Industrial complex 2010-2014	2010-2014	Food security, increase in gross product, export, productivity, and quality of agricultural products,	8.7 billion USD	Not finished, changed for Agribusiness 2020
Concept of Sustainable development	2006-2010		3 billion USD	
Development of rural areas	2004-2010	Optimization of rural settlement and increase of live standards in rural areas	1,3 billion USD	Finished
State Agri-Food Program	2003-2005	Food security, production increase, the establishment of the effective agricultural system, rationalization of state support		Finished
Development of Agricultural Production	2000-2002	Production stabilization and economic growth of competitive agricultural commodities		Finished
Conceptual program on development of agriculture	1991-1995 and up to 2000			Finished
On Socio-economic development of rural areas (AUYL)	1991-1995 and up to 2000			Finished

Source: adapted from Ministry of Justice (2021)

Oil crops, feed cultivars, fruits, and vegetables are among the priority crops for diversification in Kazakhstan. Corn as one of the most important feed crops is of particular interest to farmers. Corn areas have been steadily increasing since 2012, but with a low growth rate comparing to other crops, for example oil plants. If in the northern part of Kazakhstan corn areas are primarily limited by climate conditions (late summer, early frost, low productivity), the deficit of appropriate machinery, irrigation issues, the lack of technology knowledge, and financial resources to invest into corn restrict the southern farmers of the country.

The government supports farmers including corn growers through input (fuel, seed, fertilizers, CPP) subsidies and credits for machinery modernization. However, small farmers which represent the major group in the southern regions of Kazakhstan are still very passive to radically change their

production methods. Thus, the slow technological advance in agricultural practices and low equipment modernization rate hinder the constructive change in agricultural production as well as a sufficient increase of corn areas.

Problems of corn production

Despite the relatively large areas under crop production, productivity per 1 ha remains lower compared to many corn growing countries in the world (Figure 6). The primary reason for low productivity is the weak adoption of modern innovative technologies. The majority of corn producers in Almaty region are characterized as small-size (less than 50 ha) using old machinery. They are not able to provide their crops with sufficient irrigation, to nourish with fertilizers, and protect plants from weeds, pests, and diseases. Furthermore, the seed quality of currently planted corn varieties is not always the best. The low income of many farmers forces them to seek the cheapest seeds available on the market, even if their yield potential is limited. The penetration of improved genetics developed by the multinational seed breeding and production companies is slow, whereas the domestic breeding activities are not adequate to meet the specific requirements of local growers.

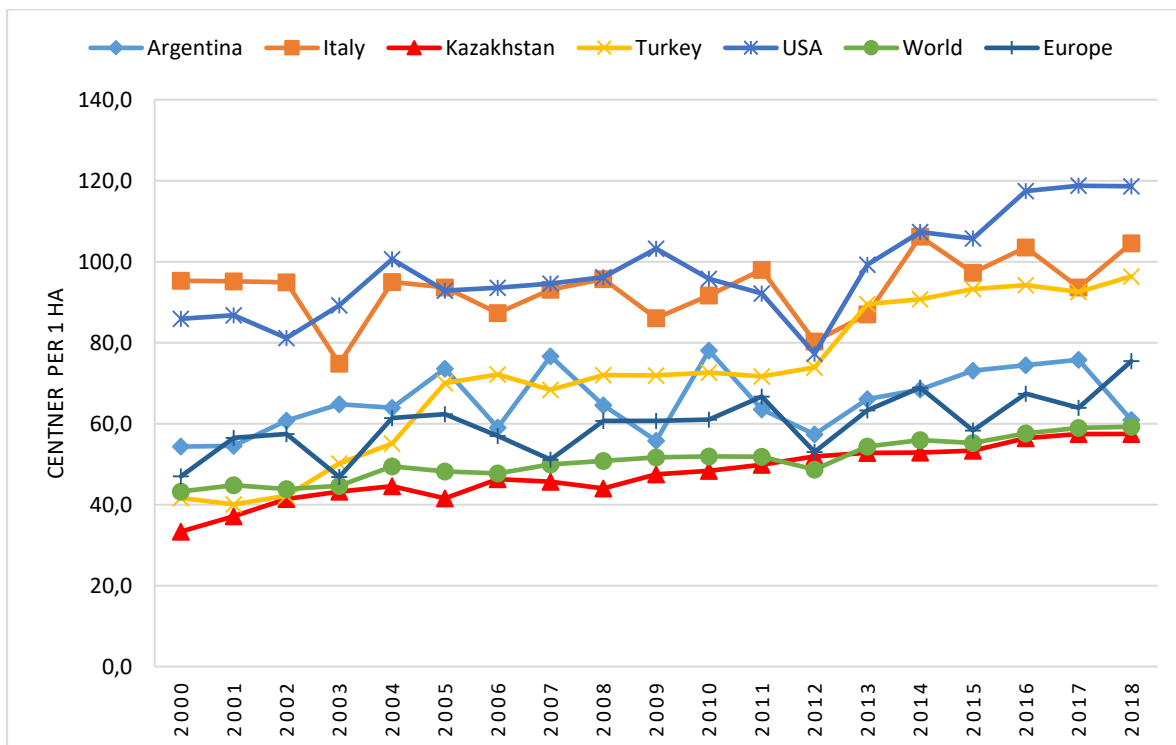


Figure 10. Grain corn yield

Source: FAO, 2022

Low yields are associated with insufficient irrigation, fertilizers, and CPP application which significantly hinders plant potential. Water and macro fertilizers are the next important factors to maximize yields after the soil, temperature, and variety's genetics. The deficit of any of these inputs can

dramatically impact plant productivity. Moreover, proper pesticide use alone can contribute to increased crop yield (Zhang et al., 2020). Thus, to surge the effectiveness of corn production farmers should take into account all elements of best agricultural practices. Unfortunately, the severe degradation of agricultural enterprises in the 1990s has had its lasting consequences up until nowadays. The economic instability in the country, price fluctuations of agricultural inputs as well as commodities, and the deficit of professional labor resources hampered fast agricultural growth in Kazakhstan. Therefore, corn productivity is still below the level of many developed countries.

Natural	<ul style="list-style-type: none"> •Severe weather conditions in some years (cold rainy springs, summers or autumns) •Unexpected pest or disease infestation
Production	<ul style="list-style-type: none"> •Old machinery, inadequate use of fertilizers, pesticides, and seed hybrids •Outdated irrigation methods, inappropriate water supply in irrigated areas •Corn quality issues
Economic	<ul style="list-style-type: none"> •Cash deficiency to invest in operational costs •Currency devaluation causes price increase of inputs (fertilizers, CPP, seed) •High bank interest rate causes difficulties in machinery renovation
Social	<ul style="list-style-type: none"> •Rural migration especially of young generation leads to decrease in labor availability •Low education level and social life possibilities in rural areas
Market	<ul style="list-style-type: none"> •Low corn prices in some years •Export bans •quality restrictions in imported countries
Infrastructure	<ul style="list-style-type: none"> •Lack of after-harvest processing (drying, cleaning) and storage facilities •Lack of railway wagons to transport corn grains
Labor	<ul style="list-style-type: none"> •Severe lack of professional staff and experts in agriculture from agronomists to top managers • Insufficient agricultural education

Figure 11. Main issues of corn production in Kazakhstan

Source: own interpretation

The future of corn production

The Kazakhstani agrarians are on their way to increase the productivity and effectiveness of agricultural production. They see their strengths in the development of plant production as well as animal husbandry. Corn as one of the most important feed resources is also considered for further area increase, quality, and quantity development as well as investment into its growing technology improvement.

It is expected that both grain and silage corn production areas will annually increase by ca.4-5 %. The prognosis is based on domestic as well as main import markets' demand for Kazakh corn as well as production limitations.

Further active international collaboration as well as governmental support is necessary to improve the current production level of corn cultivation.

Corn seed market of Kazakhstan

The collapse of the Soviet Union in 1991 led to the shift from a centrally commanded planned economy to a capitalistic liberal market for all sectors of independent Kazakhstan, including agriculture. In the Soviet era, the seed system was controlled by the central governmental organizations. Breeding institutes developed new varieties, whereas seed production entities multiplied breeder seeds to lower grades and distributed them to sovkhozes and kolkhozes that grew crops. Usually breeding institutes situated in different republics of the Soviet Union, which became independent units after 1991. Consequently, the relationship between them was disrupted. Moreover, the building of its independent budget, economy, financial, social, and political systems was extremely tough for new Kazakhstan. The cash deficit, migration from rural areas, land reforms, lack of modern machinery and technology, and many other issues should be solved to make agriculture effectively working. As a result, the old seed system which previously provided the huge country with necessary planting material was not functioning. Although state seed institutes work until today, their impact on the seed market, especially on the corn seed market, is minimal. The lack of appropriate investment into corn seed development as well as of scientists and experienced staff led to the dominance of imported genetics in corn production.

Main features of today's seed sector and corn seed market

The state regulates the seed market by defining the rules (certification, organization, functioning, etc.) for the players. In Kazakhstan, two organizations are accredited as corn seed breeders: the Kazakh Research Institute of Agriculture and Plant Growing and Budan. They are both located in Almaty region. Eleven organizations in Almaty region are allowed to multiply corn seed or produce corn hybrids (Ministry of Agriculture, 2021). As discussed above, Almaty region was and still is the preferable place for corn seed production.

The corn seed marketing was carried out by 38 companies involved in corn seed sales in Kazakhstan according to the official information for 2021 (Information and Accounting Center, 2021). The business is not limited by one region and corn seeds are distributed almost in every region of the country. However, the nationwide distributors had their head offices mainly in Almaty city, the financial and business capital of Kazakhstan. Thus, the Kazakh corn seed market was quite competitive with several big players like Budan, A.S.K. Kazakhstan, Alem Agro, Ukaz Group, and others.

Based on the current growing areas the estimated value of the corn seed market is about 11 million USD. Kazakhstan was a net importer of corn seed and its exports were very limited (Figure 8). In 2019 Kazakh farmers imported 2143 MT of corn seed for a total value of 5.1 million USD which is 40 %

more in quantity and 7 % more in value comparing to 2018. The faster growth rate in quantity than in value showed that the average corn seed price per kg was lower in 2019 than in 2018.

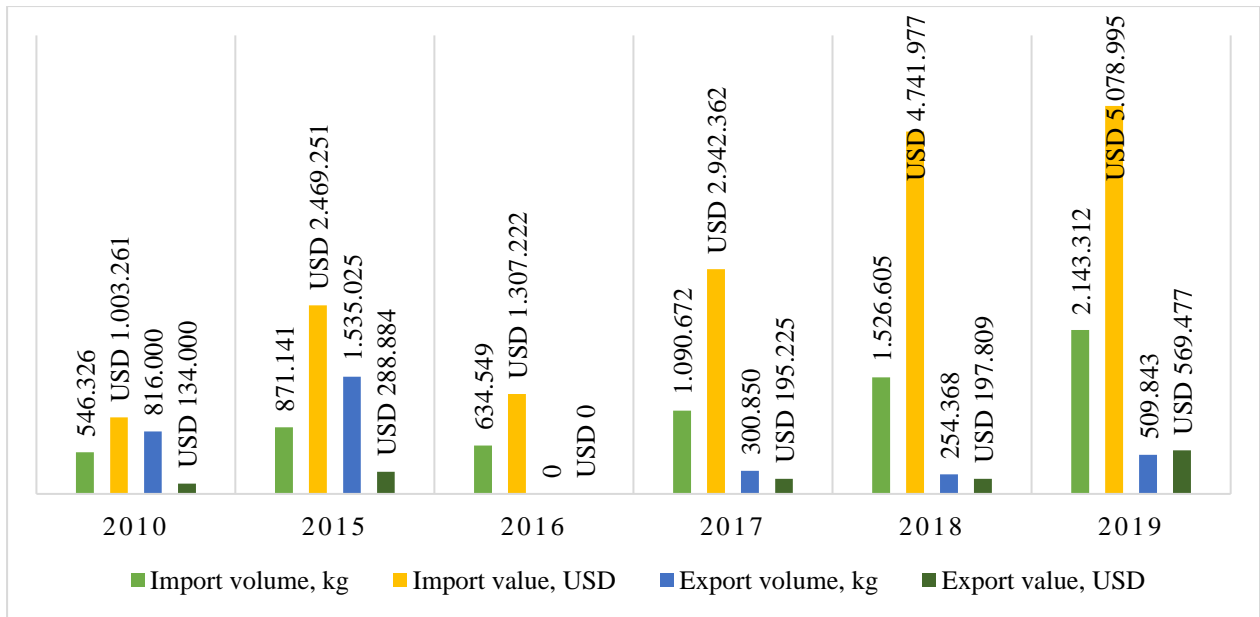


Figure 12. Corn seed trade in Kazakhstan

Source: United Nations, 2022

The corn seeds arrive at large from Russia, Ukraine, and EU countries (Figure 9). However, in terms of value, Kazakhstan paid for corn seeds originated in the USA and Turkey the most because the planting material of developed states has usually higher prices comparing to seeds produced by breeders in developing countries.

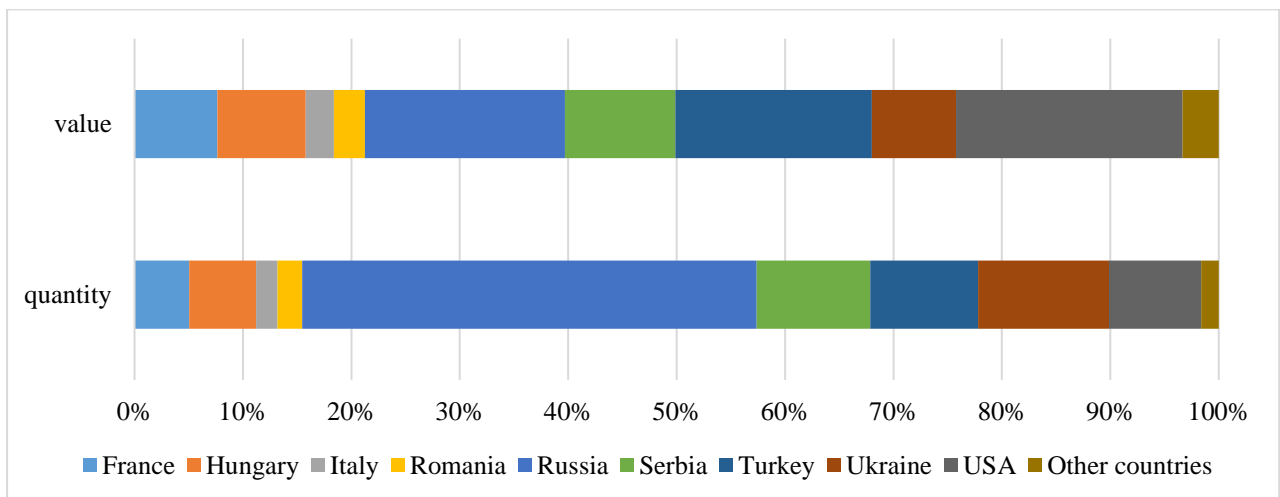


Figure 13. Main corn seed supplying countries in 2019

Source: United Nations, 2022

The highest price was by the US corn seed and the lowest was by Russian companies (Figure 10). Russian corn seed price was 5.6 times lower than this of the US. Corn seed from Turkey had the second-largest price in 2019.

It is important to notice that any actual seed originator (e.g., Pioneer, Syngenta, etc.) can export their products from different countries depending on production areas and facilities location. For instance, Pioneer seeds are mainly exported from Austria, Romania, Hungary, and Turkey.

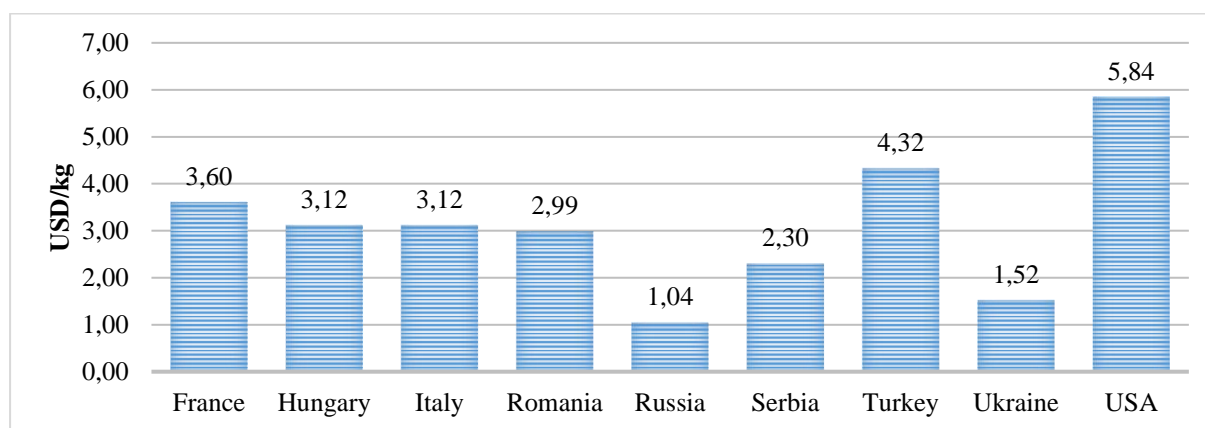


Figure 14. Corn seed import prices by country of origin in 2019

Source: Adapted from United Nations, 2022

Regulations concerning seed market in Kazakhstan

The state regulation of seed breeding, production, and sales is carried out through various legislative documents. The most comprehensive document is the Law on Seed Production of 2003 which covers all legal, organizational, and economic aspects in the plant seed industry, the regulation of seed system functioning as well as the state control of seed production, procurement, processing, logistics, marketing, and general use in plant growing. Such important topics as seed certification, quality, quality control, testing and registration of appropriate varieties in the country, support of local seed producers, seed subsidies, financing of seed producers, international regulation of seed business, etc. are highlighted in this law.

The Law on Legal Protection of Selective Breeding Achievements of 1999 illuminates the aspects of international regulations in breeder's right protection and important to bring foreign know-how in the country.

The middle- and short-term targets of agricultural development are defined in periodical programs the last of which is the State Programme of Agro-Industrial Complex Development for 2017-2020. This Programme declares the agricultural strategy in Kazakhstan. It has some points concerning seed subsidies, local seed production aims, and support measures too.

The Government of the Republic of Kazakhstan is the main state executive body that develops the major direction of the national policy in seed production. The implementation of the policy and overall seed regulation is carried out by the Ministry of Agriculture and its regional representative institutions.

Corn varieties used for planting

The corn seed market of Kazakhstan is quite rich despite relatively few growing acreages. If in the 90s seeds were mainly farm-saved uncertified varieties, in the new millennium Kazakh farmers had been gradually switching from them to certified hybrid seeds. According to experts, the hybrid rate within all seeds used for corn planting in recent years is almost 100 %. Nevertheless, largely farmers prefer cheap local corn hybrids to expensive western hybrids, even if the quality of the latter is higher.

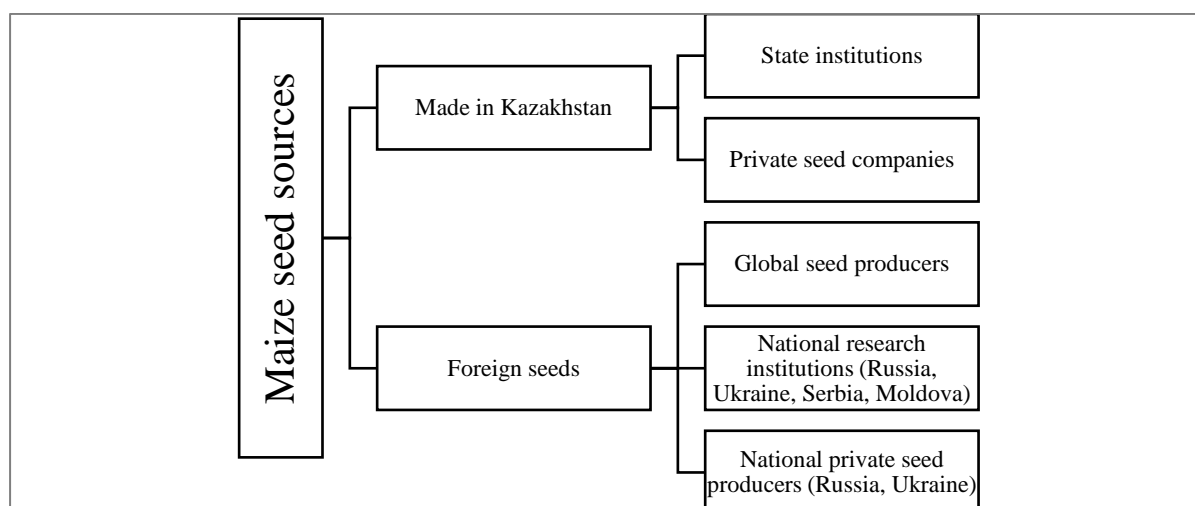


Figure 15. Sources of corn seeds in Kazakhstan

Source: own interpretation

The List of approved varieties or hybrids in Kazakhstan prepared and annually updated by the Seed testing authority contains more than 130 unique corn races as of 2020 (Ministry of Agriculture, 2021). Some of them were registered in 1974, but with a small chance, they are used in commercial fields. It is difficult to know the exact number of actually planted corn seed materials, but according to the Ministry of Agriculture (2021) more than 30 hybrid brands were planted in 2020.

More than 40% of used varieties in Kazakhstan are produced domestically. Though, it does not mean that these hybrids were developed by Kazakh breeding institutions. The major producer of corn seeds in Kazakhstan, Budan, has a long-term collaboration with the breeding organization in Serbia (Zemun Pole). The Kazakh Research Institute of Agriculture and Plant Growing which was established in 1934 is the dominant breeding facility for corn and other crops in the country but rarely do they register any new competitive corn hybrids.

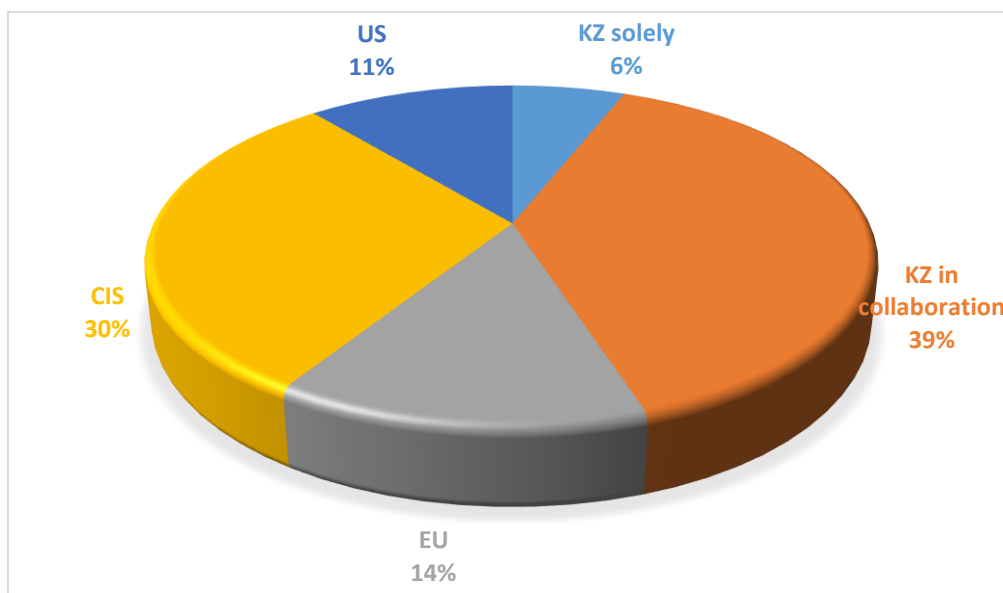


Figure 16. Breeders' origin countries of corn hybrids grown in Kazakhstan in 2020

Source: adapted from Information and Accounting Center, 2022

As seen in Figure 12 about 25% of corn seed has its origin in the developed countries, whereas its lion part comes from the former Soviet (Russia, Ukraine, Moldova) or communistic states (e.g. Serbia).

Main brands and players of the corn seed market

Figures 12&13 show that domestic and foreign suppliers are the main contributors of corn seed in Kazakhstan. The share of domestic corn seeds offered by KAZNIIR and Budan is close to 45 %. The remaining 55 % of the seed corn market is distributed between different brands like Pioneer, DeKalb (Monsanto), Syngenta, Limagrain, etc. (Figure 13).

Among the main corn seed suppliers, the domestic company Budan takes the major share (almost 40 %). Budan was established in 1999 and is located in Almaty region. Through cooperation with the Serbian Institute Zemun Pole, the company provides Kazakh corn growers with seeds of various vegetation periods. Zemun Pole carries out the main breeding operations, whereas Budan manages the ecological testing, first-screen tests, production of parental lines, and finally seed hybridization in Kazakhstan. Budan's product portfolio is wide and covers seed demand in all regions of Kazakhstan where corn is cultivated. Some volumes may be exported to the neighboring countries – Kyrgyzstan and Uzbekistan. The company sells its seeds directly to farmers or small seed sellers but does not have any large distributorship network.

KAZNIIR is a state research institute and involves in breeding activities of various field crops. It provides different farmers in Almaty region with parental lines to produce its corn hybrids. Usually, the

same producers sell seed to corn growers and pay royalties to KAZNIIR. Therefore, no comprehensive sales department or marketing operations exist.

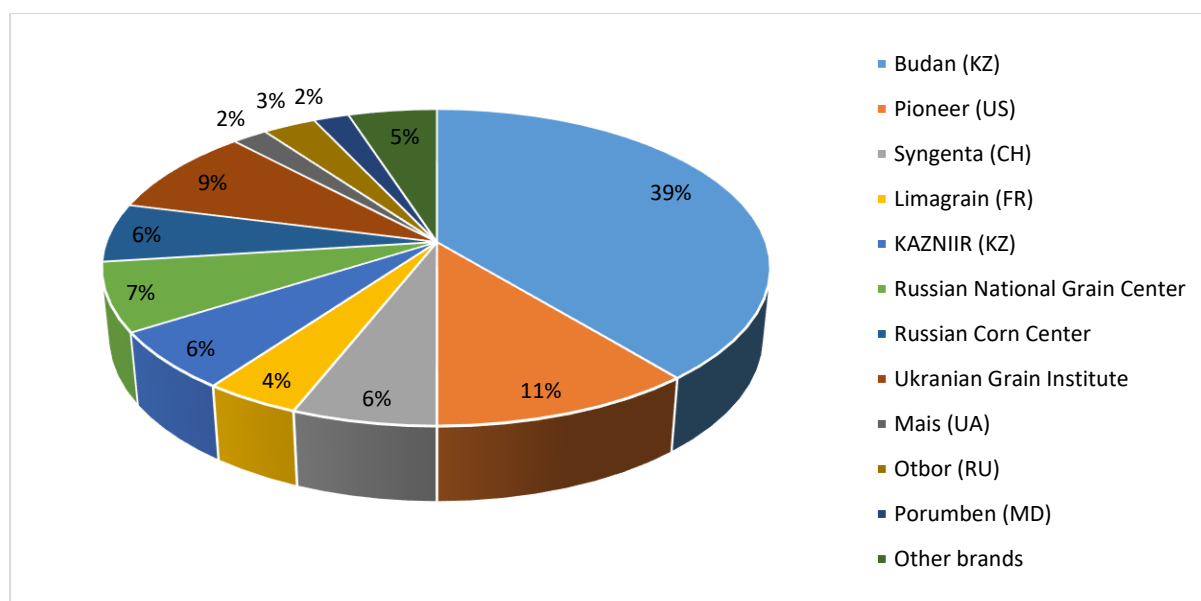


Figure 17. Different brands and their estimated share in Kazakhstan in 2020

Source: adapted from Information and Accounting Center, 2022

The main competitive advantage of locally produced corn hybrids is their low price comparing to all other offers on the market. Those growers who are largely focused on cost minimization rather than on productivity increase prefer domestic producers to other companies selling imported corn seed.

The most popular imported corn seed brands are Pioneer, Syngenta, and Limagrain. Moreover, Russian, Moldavian, and Ukrainian state research institutes, as well as commercial companies, deliver various corn hybrids which are primarily demanded by silage corn growers in northern and eastern parts of Kazakhstan.

One of the oldest international brand cultivated by Kazakh corn growers is Pioneer, which has been a Corteva seed division since 2019. In Kazakhstan Pioneer corn seeds appeared at the beginning of the 2000s. Despite their high prices (Figure 14) Pioneer corn seed could enter the Kazakh market and take a position within other suppliers.

Top corn seed brands like Pioneer, Dekalb, Syngenta, and Limagrain are present in Kazakhstan with a share of approximately 21 % (2020). Other breeding companies mainly from EU countries (Spanish Semillas Fito, French Euralis Semences, Maissadour Semences, Ragt Semences, German KWS, Seed Alliance, etc.) are trying to expand their sales activities in Kazakhstan. However, their share is still low (3-4 % in 2020).

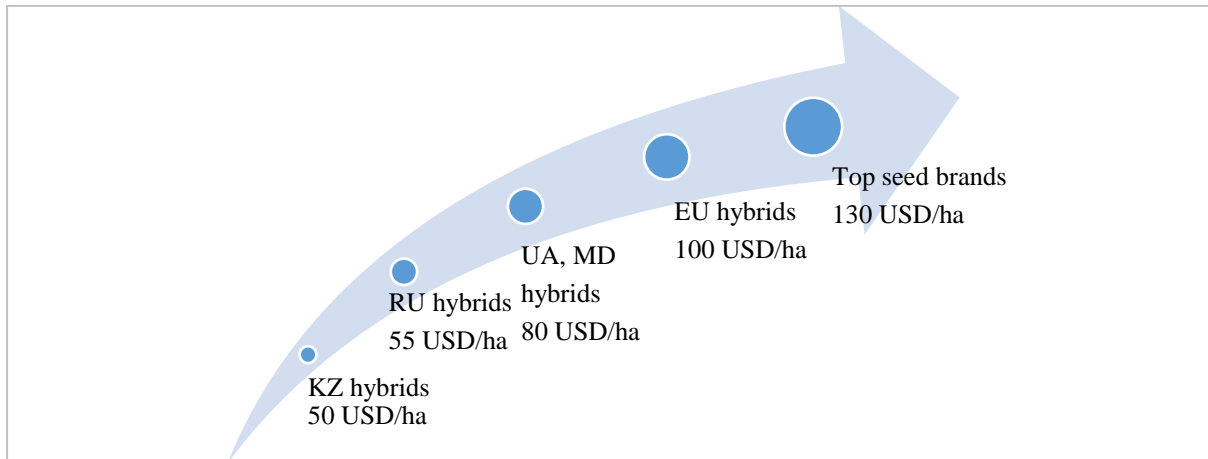


Figure 18. Average on-farm corn seed prices in Kazakhstan in 2020

Source: adapted from Information and Accounting Center, 2022

About 40 commercial companies are involved in corn seed sales and marketing activities in Kazakhstan. Some firms offer products of only one brand exclusively, while others distribute different corn seed hybrids. Overall, seven companies deliver 70 % of all planted corn seeds in Kazakhstan (2020). The remaining 30 % is distributed to growers by 31 organizations (Figure 15).

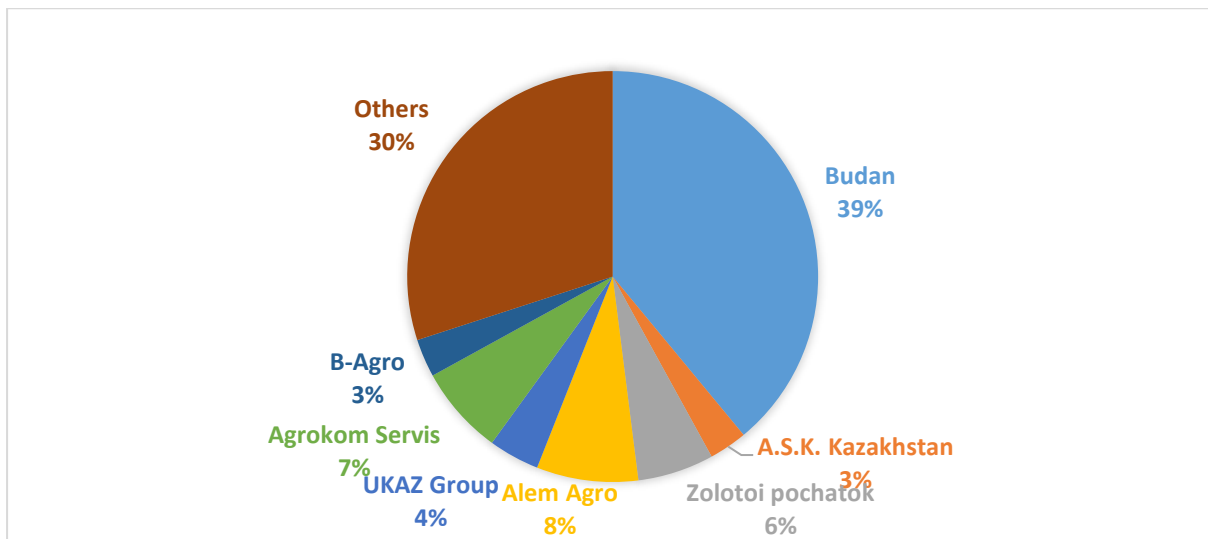


Figure 19. Main corn seed sellers in Kazakhstan in 2020

Source: adapted from Information and Accounting Center, 2022

Constrains for further development of corn seed market

The problems of the corn seed market are rooted in the poor status of a general seed system in the country. They exist along the whole cycle starting from science or breeding and ending at a farm (Figure 16).

The breakdown of the Soviet Union led to the disintegration of the country's seed system. The inadequate investment into agriculture hindered the progress in seed development and production too. The current local plant breeding facilities are out-dated and primitive comparing to work done in the developed countries and transnational corporations. New corn varieties require updated production methods (technology + machinery) which are not available and affordable for Kazakh seed producers. The processing of corn seed should be organized by using modern equipment providing the best seed quality. Unfortunately, advanced seed processing facilities are not widespread in the country. Thus, local farmers are dependent on seed imports to reach modern high-yielding varieties.

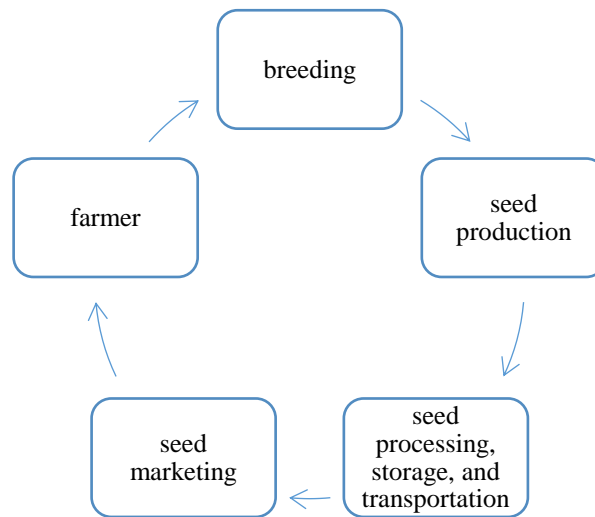


Figure 20. Seed cycle

Source: own interpretation

On the international level, it is getting more expensive to develop new varieties that will show the best adaptability to changing climate conditions as well as bring farmers the maximum dollar per ha. Therefore, seed prices especially of modern genetics are high and these hybrids are not affordable to a broader community of corn growers in Kazakhstan.

Because productivity and quality of local corn seed are lower comparing to western varieties, an end-user of this seed or a farmer obtains relatively low yields (as for example shown in Figure 13) and, therefore, is restricted in profit accumulation. Additionally, the overall farming in Kazakhstan needs modernization to increase its productivity and profitability.

Seed marketing is mainly focused on price privilege and less on the consultation ability of sales companies. The company offering the smallest price accumulates more sales in the short-run. However, this strategy is not positive for technology advances, because sales companies cannot afford the important function of their business which is participation in knowledge exchange concerning better agricultural practices and corn growing. Relatively high expenditures for sales staff and general

activities result in low profitability of corn seed sales. Additionally, very often corn growers fail to fulfill their payment obligations towards input suppliers which strongly influence the activities of the latter.

Unfortunately, a lot of negative factors limit the effective development of the corn seed market in Kazakhstan. The improvement steps done in the last decades are not enough to cardinaly change the situation, but important for the market, in general. Hopefully, the joint efforts of governmental support, seed producers, subsidiary sectors, and farmers' activity, as well as seed sellers will help to advance corn or, in general, the agricultural crop seed market in Kazakhstan.

Support of corn seed market

On the whole, the support of the corn seed market can be divided into direct and indirect measures. The direct aid comes in the form of demand support or seed subsidies. The subsidy rate is regulated by the Ministry of Agriculture and depends on the crop, production area, priority status in a particular region, land ownership, and regional budget. Seeds produced in Kazakhstan receive the highest rate when up to 50 % of the seed price is covered by the state subsidy. All other imported seeds are subsidized at a maximum 30 % rate. The subsidies are essential for the development and increase of seed demand among corn growers because help to accumulate additional resources to invest in technology.

The indirect measures refer to the development of state breeding activities, support of local seed breeders and producers, improving seed industry infrastructure as well as seed market regulations and legislative environment.

CONCLUSION

Kazakhstan is on the way to build a modern agricultural sector. After years of severe destruction, the country still tries to stabilize, strengthen, and increase effectiveness of agricultural production. Diversification is one of the main pillars in the modernization of Kazakhstani agriculture. In this study the current status of corn production and corn seed market were discussed.

Corn does not comprise the big area in Kazakhstan but it is an essential crop in agricultural production of farmers in the southern parts of the country. Comparing to large cereal and oil crop producers in the remaining areas of the country, southern farmers are small and, in most cases, lack strong on-farm infrastructure.

The corn seeds market offers various conventional hybrids from improved lines of well-known brands to local seeds. Local production is definitely more affordable for Kazakhstani farmers, but does not always meet their expectations (protein content, stay green, dry speed. etc.). Therefore, Kazakhstan annually imports up to 60% of corn seed. The seed system in Kazakhstan requires improvements on every level of its corn production chain and innovative solutions are core stones of effective modernization. The growing area of corn in Kazakhstan has a potential to grow due to increasing

domestic and regional (Central Asia) demand for corn products. Therefore, Kazakhstan should develop its own corn breeding and seed production sector by creating appropriate conditions either for own research entities or for collaborations with foreign companies interested in expansion of their R&D activities.

The comprehensive research on corn production in Kazakhstan should be stimulated and critical points within the chain should be identified. The stakeholders should look for improvements and solutions to increase current productivity and profitability of the corn sector in Kazakhstan.

REFERENCES

- Aimurzina, B., Kamnova, M., Omarova, A., Ainakanova, Bahytgul, Kazkenova, A., & Shaikenova, N. (2019). Methods of Sustainable Regulation of Agricultural Enterprises at the Present Stage. *Journal of Environmental Management and Tourism*, 9(5). [https://doi.org/10.14505/jemt.v9.5\(29\).22](https://doi.org/10.14505/jemt.v9.5(29).22)
- Baer-Nawrocka, A., & Sadowski, A. (2019). Food security and food self-sufficiency around the world: A typology of countries. *PLoS ONE*, 14(3). <https://doi.org/10.1371/journal.pone.0213448>
- Bureau of National Statistics (2022). *Statistics of Agriculture, Forestry, Hunting and Fisheries*. Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan. Available at <https://stat.gov.kz/official/industry/14/statistic/5> (accessed Nov. 30, 2022).
- FAO (2022a): *Statistics for Land Use*. [Dataset]. Food and Agriculture Organization of the United Nations (FAO). Available at <https://www.fao.org/faostat/en/#data/RL> (accessed Nov. 15, 2022).
- FAO (2022b): *Statistics for Crop and Livestock Production*. [Dataset]. Food and Agriculture Organization of the United Nations (FAO). Available at <https://www.fao.org/faostat/en/#data/QCL> (accessed Nov. 15, 2022).
- Espolov, T., Espolov, A., Tireuov, K., Zharylkassyn, Z., Keneyev, M., & Suleimenov, Z. (2020). Supply chain logistics in agricultural sector-Assessing opportunities for competitiveness increase. *International Journal of Supply Chain Management*, 9(2).
- Ismailova, A., Balkibayeva, A., Shahrjerdi, R., Palmieri, A., & Nukesheva, A. (2016). Overview on state support of development of agriculture in Kazakhstan (Akmola region evidence). *Economia Agro-Alimentare*, 18(1). <https://doi.org/10.3280/ECAG2016-001005>
- Index Mundi, 2022. *Corn Area Harvested by Country in 1000 HA*. [Dataset]. IndexMundi. Available at: <https://www.indexmundi.com/agriculture/?commodity=corn&graph=area-harvested> (Accessed 15 December 2022).
- Information and Accounting Center (2022): *Seed statistics*. [Dataset]. Information and Accounting Center. Available at <https://subsidies.qoldau.kz/en/subsidies/seed/stats/summary> (accessed Nov 30, 2022).
- Madiyev, G., Kerimova, U., Yespolov, A., Bekbossynova, A., & Rakhimzhanova, G. (2018). Macroeconomic aspects of innovation-driven growth of agribusiness in the Republic of Kazakhstan. *Journal of Advanced Research in Law and Economics*, 9(2). [https://doi.org/10.14505/jarle.v92\(32\).20](https://doi.org/10.14505/jarle.v92(32).20)

- Ministry of Agriculture of the Republic of Kazakhstan (2021). National List of Breeding Achievements Approved for Use in Kazakhstan. Ministry of Agriculture of the Republic of Kazakhstan. <https://sortcom.kz/>
- Ministry of Justice of the Republic of Kazakhstan (2021). Agriculture Development Concept of the Republic of Kazakhstan 2021-2030. [Dataset]. Ministry of Justice of the Republic of Kazakhstan. Available at <https://adilet.zan.kz/rus/docs/P2100000960#z12> (accessed Dec. 3, 2022).
- Ministry of Justice of the Republic of Kazakhstan (2022). Agriculture Development Concept of the Republic of Kazakhstan 2017-2021. [Dataset]. Ministry of Justice of the Republic of Kazakhstan. Available at https://adilet.zan.kz/rus/docs/P100001052_ (accessed Dec. 3, 2022)
- Oralbayeva, A. K. (2020). Problems and Improvement of State Regulation in Agriculture of the Republic of Kazakhstan. *Reports*, 2(330). <https://doi.org/10.32014/2020.2518-1483.33>
- OECD (2022). *Agricultural Policy Monitoring and Evaluation 2022: Reforming Agricultural Policies for Climate Change Mitigation*. OECD Publishing, Paris, <https://doi.org/10.1787/7f4542bf-en>.
- Petrick, M., Pomfret, R. (2016): *Agricultural policies in Kazakhstan*. IAMO Discussion Paper No.155, Leibniz Institute of Agricultural Development in Central and Eastern Europe, Halle. <https://www.econstor.eu/handle/10419/130714>
- Temyrbekova, A. B., Temyrbek, E. B., Tastandieva, N. B., Jandosov, K. Z., & Aldabergenov, N. A. (2015). Impact of Kazakhstan's integration into the Eurasian economic community on the competitiveness of the country's agriculture. *Review of European Studies*, 7(7). <https://doi.org/10.5539/res.v7n7p173>
- United Nations (2022). *Trade Statistics*. UN Comtrade Database. [Dataset]. The United Nations Available at <https://comtradeplus.un.org/> (accessed Nov. 18, 2022).
- USDA (2022). *World Agricultural Production*. Circular Series. Global Market Analysis, FAS, USDA <https://apps.fas.usda.gov/psdonline/circulars/production.pdf>
- World Bank (2022). *Statistics for Agriculture & Rural Development*. [Dataset]. The World Bank Food and Agriculture Organization of the United Nations (FAO). Available at <https://data.worldbank.org/topic/agriculture-and-rural-development?view=chart> (accessed Nov. 18, 2022).
- Zhang, Q., Dong, W., Wen, C., & Li, T. (2020). Study on factors affecting corn yield based on the Cobb-Douglas production function. *Agricultural Water Management*, 228, 105869. <https://doi.org/10.1016/j.agwat.2019.105869>