T.C.

ISTANBUL SABAHATTIN ZAIM UNIVERSITY

GRADUATE EDUCATION INSTITUTE

DEPARTMENT OF BUSINESS ADMINISTRATION

PREFERENCES AND FACTORS AFFECTING DECISION OF AGRICULTURAL ENTERPRISES IN KAZAKHSTAN TO ADOPT IMPROVED MAIZE SEEDS

Ph.D. DISSERTATION

Gulmira SAMENOVA

Istanbul

January-2024

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January-2024

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DECLARATION OF SCIENTIFIC ETHICS AND ORIGINALITY

This is to certify that this PhD dissertation titled "**Preferences and factors affecting decision of agricultural enterprises in Kazakhstan to adopt improved maize seeds**" is my own work and I have acted according to scientific ethics and academic rules while producing it. I have collected and used all information and data according to scientific ethics and guidelines on thesis writing of Istanbul Sabahattin Zaim University. I have fully referenced, in both the text and bibliography, all direct and indirect quotations and all sources I have used in this work.

Gulmira SAMENOVA

ACKNOWLEDGMENTS

I would like to express my gratitude to different people and organizations who supported me in my journey to research agricultural production in Kazakhstan.

First, I thank our Almighty God who gave me the necessary physical and mental resources to finish this study. Next, I express my sincerest gratitude to my family that encouraged and supported me on every stage of my academical life and especially during my research.

I show my appreciation to Istanbul Sabahattin Zaim University with its wonderful campus, the Graduate Education Institute, my supervisor Prof. Dursun Yener, and all the academic staff that gave lectures or supervised me throughout my studies in Istanbul.

I send my sincere gratitude to all the farmers I met, talked to, and surveyed in Kazakhstan for their patience, hospitality, and respect for my research. I will always remember our long discussions about agriculture, issues you face, and production stories you experience every day while fulfilling your mission of feeding the world.

All my relatives, friends, and colleagues, who helped me to organize my travels through the huge territory of the former Almaty and Zhambyl region, from one village to another, from one field to another, and from one home to another, I thank you all for your understanding and kind assistance. Without your moral and logistical support this research would not be possible.

I thank the agricultural department of the former Almaty region in Taldyqorgan and in Panfilov district, which contributed to this study by providing me with data.

Gulmira SAMENOVA

Istanbul, 2024

ABSTRACT

PREFERENCES AND FACTORS AFFECTING DECISION OF AGRICULTURAL ENTERPRISES IN KAZAKHSTAN TO ADOPT IMPROVED MAIZE SEEDS

Gulmira SAMENOVA

PhD Dissertation, Business Administration

Supervisor: Prof. Dr. Dursun YENER

January-2024, 140 + xiii Pages

Agriculture is an essential element of Kazakhstan's economy. The limited number of academic studies was conducted on maize production in the country. Albeit many growers in southern Kazakhstan rely on this crop as their source of income. About 301 thousand hectares were planted with maize in Kazakhstan in 2021, of which 63% were under grain maize production and silage maize comprised 37%. More than 25 originators sold their maize seeds to Kazakhstani farmers in 2021. 60% of all maize seed was imported. 121 maize growers were surveyed in three regions of southern Kazakhstan in 2021. The survey revealed that Kazakhstani maize growers preferred hybrid seed, none of the respondents used conventional open-pollinated varieties. 51% of farmers planted expensive hybrids of mainly western origin (premium seed), while 49% preferred affordable seeds produced domestically or in developing countries (budget seed). The main attributes of maize seed preferred by agricultural growers in Kazakhstan were potential yield, the opinion of other farmers, price and payment terms, seed quality, and ear drying speed. 46.3% of respondents considered themselves as loyal to the seed brand. Brand loyalty was a significant predictor of purchase intention towards maize seed. However, the study did not indicate any relationship between seed type and education, age, farm size, maize importance, and technological advance.

Keywords: Kazakhstani maize, maize market development, maize cultivation, seed sales, Central Asia, seed attributes, maize seed choice, maize seed brand, maize seed brand loyalty.

ÖZET

KAZAKİSTAN'DAKİ TARIM İŞLETMELERİNİN GELİŞTİRİLMİŞ MISIR TOHUMLARINI KABUL ETME KARARLARINI ETKİLEYEN TERCİHLER VE FAKTÖRLER

Gulmira SAMENOVA

Doktora, İşletme

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Ocak-2024, 140 + xiii Sayfa

Tarım, Kazakistan'ın stratejik ekonomik sektörüdür. Kazakistan'daki mısır üretimi akademik çalışmalarda nadiren aydınlatılmıştır. Ancak bu mahsul güney Kazakistan'daki birçok çiftçi için önemli bir gelir kaynağıdır. Kazakistan'da mısır alanı 2021 yılında 301 bin hektar civarında olup bunun %63'ünü danelik mısır, %37'sini ise silajlık mısır oluşturdu. 2021 yılında 25'ten fazla orijinal üreticiye ait mısır tohumları Kazakistanlı çiftçilere satıldı. Mısır tohumlarının %60'ı ithal edildi. 2021 yılında Güney Kazakistan'ın üç bölgesinde 121 mısır yetiştiricisine anket yapıldı. Anket, Kazakistanlı mısır yetiştiricilerinin hibrit tohumu tercih ettiğini, katılımcıların hiçbirinin geleneksel açık tozlanan çeşitleri kullanmadığını ortaya çıkardı. Çiftçilerin %51'i çoğunlukla batı menşeli pahalı hibritler (birinci sınıf tohum) ekerken, %49'u yurt içinde veya gelişmekte olan ülkelerde üretilen uygun fiyatlı tohumları (bütçe tohum) tercih etti. Kazakistan'daki tarımsal yetiştiricilerin tercih ettiği mısır tohumunun temel özellikleri potansiyel verim, diğer çiftçilerin görüşleri, fiyat ve ödeme koşulları, tohum kalitesi ve koçan kuruma hızıydı. Ankete katılanların %46,3'ü kendilerini tohum markasına sadık olarak görüyor. Marka sadakati, mısır tohumuna yönelik satın alma niyetinin önemli bir göstergesiydi. Ancak araştırmada tohum türü ile eğitim, yaş, çiftlik büyüklüğü, mısırın önemi ve teknolojik ilerleme arasında herhangi bir ilişki gösterilmedi.

Anahtar Kelimeler: Kazakistan mısırı, mısır pazarının geliştirilmesi, mısır ekimi, tohum satışı, Orta Asya; tohum özellikleri, mısır tohumu seçimi, mısır tohumu markası, mısır tohumu marka bağlılığı.

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ABBREVIATIONS

AKM	: Akmola region
ALM	: Almaty region
AKT	: Aktobe region
e.g.	: exempli gratia (for example)
FAO	: Food and Agriculture Organization of the United Nations
GDP	: Gross Domestic Product
GM	: Genetically Modified
GMO	: Genetically Modified Organisms
ha	: hectare
i.e.	: id Est (that is)
IT	: Information technology
KOS	: Kostanay region
n.a.	: not available
OECD	: The Organization for Economic Co-operation and Development
PAV	: Pavlodar region
SKO	: North-Kazakhstan region
SPSS	: Statistic Packets for Social Sciences
TUR	: Turkestan region
USD	: US dollars
USDA	: US Department of Agriculture
USSR	: Union of Soviet Socialistic Republics
VKO	: East-Kazakhstan region
vs	: Versus
ZHA	: Zhambyl region

CHAPTER I
INTRODUCTION

Nearly 20% of the population in Kazakhstan is engaged in farming (FAO, 2022a). Therefore, agribusiness is an essential element of a country's economy. The collapse of the Soviet Union in 1991 had a negative impact on agricultural production in Kazakhstan for more than 10 years (Aimurzina et al., 2019: 1092; Petrick and Pomfret, 2016: 10-16). The main factors of this intense degradation of agricultural production were unstable prices, lack of cash, the decline of central public support, imperfect land reforms, the colossal migration of the population abroad, the disruption of marketing network among former Soviet countries and so on (Espolov et al., 2020: 745; Oralbayeva, 2020: 66). As a result, the country entered the new millennium with a seriously damaged system that had little share in the country's total GDP (World Bank, 2022; Samenova, 2022: 463).

The economic boom of the 2000s was triggered by the increasing prices for oil and other natural resources. As a result, the Kazakhstani government could start re-structuring agriculture. With increasing state supports the government tried to re-build an outdated or disrupted agricultural system and to stimulate growth in agricultural production (Ismailova et al., 2016: 73-74; Temyrbekova et al., 2015: 173-174). These supports were crucial for the course of the agricultural development in the country. However, they have become a subject of intensive discussion in recent years. The modern Kazakhstan targets 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, 2022b). 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 stable yield and market demand. However, the recent trends of the country's agricultural development towards crop diversification stimulated farmers' interest in growing alternative cultivars like maize, oil crops, vegetables, etc.

1.1.Research Questions

Despite the important role of agriculture, huge market potential, and existing problems in the productivity of grown crops, few studies were carried out to understand preferences of agricultural producers in their choice of input resources in Kazakhstan. This research aims to shed light on the complex nature of farmers' behaviour when they choose a particular maize seed in the context of one geographical area in Kazakhstan. To our knowledge this will be the first academic attempt to study farmers' preferences in Kazakhstan from the angle of social sciences. Therefore, the approaches that used in the measurement of farmer preferences in choice of seeds in other countries of the world will be tested in the Kazakh socio-economic environment.

It is hoped that the thesis will reveal the main factors of seed choice among agricultural enterprises in Kazakhstan. This information will be of particular interest to the public and private sector in the development of new appropriate maize hybrid varieties for local growers. Moreover, it is hoped that it will generate interest from the academic community in marketing research on agriculture in Kazakhstan. Thus, it can stimulate similar studies on other crops cultivated in various regions across the country to understand if any geographical, social, structural, and economic differences exist between agricultural growers when they decide about any input or technology adoption.

During the research process, the data about maize growers in southern Kazakhstan were collected and analysed. According to these data a profile of a maize producer was constructed, which included essential demographic, economic, and social information. Consequently, such facts provide more insight into the complex nature of farmers as well as the agricultural sector of Kazakhstan in general. Moreover, through the data collection the segmentation of maize seed market based on seed origin was provided, so that seed developers and sellers will be able to compare their performance regarding other suppliers and see their position in the market.

Furthermore, the research allows to discuss various topics like Kazakh farmers' attitudes, opinions, risk aversion tactics, demographic characteristics, economic environment, and other factors which influence the decision-making process towards a particular maize variety.

- What type of seed does a maize grower in Kazakhstan grow?

- Which seed attributes are critical for farmers in their choice of maize seed?
- Is it only agronomic features that matter?
- How loyal are maize growers in Kazakhstan to their maize seed brands?

These are key research questions addressed by the thesis topic.

In a broader sense, the research will contribute to debates within farmers about the most suitable seeds for them to increase their innovation and adaptation capabilities and, hence, competitiveness. Moreover, this study will provide information that is relevant to policymakers in Kazakhstan in their decisions on how publicity-funded resources should be allocated. Because local seed production and plant breeding programs are presently supported by state subsidies and public funds, the effectiveness of such investments should be questioned. If domestic seed production is feasible, Kazakhstan should attract private companies to enter this sector and develop new maize hybrids from beginning adapted to local soil and climate conditions. On the other hand, if importing seeds is a better option, to what extent is the difference in the support amount between local and foreign seeds justified?

The additional subject of curiosity was the possibility to investigate the differences or similarities in attributes that farmers in other countries have compared to growers in Kazakhstan. Therefore, various research papers contributed to analysis of attributes and factors in maize seed choice among growers in different countries. Various official reports, country comparison data available on, for example, Food and Agriculture Organization of the United Nations, literature analysis were applicable to discuss results obtained during this research. Thus, the demographic profile of a farmer in Kazakhstan and other countries can be debated.

So, the thesis is expected to shed light on the applicability of widely used methods in investigating farmers' preferences and show possible similarities or variances between agricultural producers in different countries.

1.2.Research Methods

To find the answers to the research questions of this thesis, various qualitative and quantitative methods were implemented. First, an extensive literature review of similar studies was carried out. Then, the theoretical and econometric background of various

appropriate models was thoroughly investigated to design the questionary. The evaluation of the designed survey was executed by sector experts, including farmers, in Kazakhstan and necessary corrections were implemented. The final questionary was used when interviewing agricultural enterprises face-to-face in Almaty, Zhambyl, and Turkestan regions. The results of the survey were analysed through statistical and econometrical programs.

Thus, the primary (survey, interview) and secondary (literature review, statistical data) research sources were employed to investigate the study topic of the thesis.

There are several methods that are used in the research on farmers preferences for choice of seeds revealed in the existing literature. The most of them are qualitative, whereas some are quantitative or the mixture of both methods. The broadly applied techniques are validated questionnaires which aim to evaluate variety or trait adoption and correlated farmers features, analysis of revealed or stated preferences by measuring willingness-to-pay(adopt) through contingent valuation, conjoint analysis, choice experiments, auctions, etc. Moreover, participatory research and farmer panels are also implemented in studies of farmer seed preferences.

1.3.Structure

The thesis consists of six chapters. The Introduction gives a general overview of Kazakhstan, its agriculture, and maize production in Kazakhstan. It also aims to briefly introduce the research goals. The second chapter explains the maize production and maize seed market development in Kazakhstan in detail. It gives general and specific statistics and data on the maize sector in Kazakhstan, including topics like production, productivity, distribution, issues, and opportunities, as well as the role of the government in the sector's evolution. This chapter sheds light on the current situation of the maize seed market from its different angles. The third chapter focuses on a theoretical framework and literature review of maize preferences, attributes, and brand loyalty. In the general sense, it illuminates farming buying behaviour and decision-making theories in agricultural research. Then, the concepts of seed preferences and brand loyalty are introduced and previous research on those topics is discussed with a focus on maize seed. The research framework is depicted in the fourth chapter. Based on a theoretical review of the third chapter, the research questions and hypothesis of

this study are suggested. The materials and methods applied in this study are also presented in this chapter. The fifth chapter elucidates the results of the survey carried out within this study in the framework defined in the previous chapter. So, the hypothesis, research questions, and models are tested, and their outcome is scrutinized. The final notes on the current thesis are presented in the conclusion.

CHAPTER II
MAIZE PRODUCTION AND MAIZE SEED MARKET IN KAZAKHSTAN[1]

Kazakhstan has almost 30 million ha of cropland appropriate for plant production (FAO, 2022a). About 22 million ha of this area are covered by different predominantly annual crops. The remaining part is left either as fallow land or unseeded. In this chapter, maize production as well as the maize seed market in Kazakhstan will be discussed.

2.1.Overview of Maize Production in Kazakhstan

The share of maize production is relatively low in Kazakhstan for various reasons. The major cause is climate constraints for effective maize growing. Kazakhstan is a country with harsh weather conditions represented by very cold winters and unstable temperatures in summers (hot on some days and cold on others). Although the modern maize 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, of which ca. 24 million ha were under cereals and pulses (Table 2.1). Maize acreages reached almost 2.5 million ha and were primarily comprised of silage maize because Kazakhstan had large animal husbandry facilities consuming feedstuff. The large pressure from Moscow forced agricultural enterprises in the country to plant crops in areas that were inappropriate or economically ineffective for maize production. In the first years of the transition from planned to the liberal economy (1991-1999) the national agricultural system experienced severe destruction, which

[1] The article, 'Samenova, G. (2022). Corn Production and Corn Seed Market in Kazakhstan. *International Journal of Innovative Approaches in Agricultural Research. 6*(4), 462-485. https://doi.org/10.29329/ijiaar.2022.506.15' was originally published as part of this thesis.

can be seen as a drastic decrease in cropland in Table 2.1. After 2000, the situation was stabilizing and in recent decades, the sown areas have stayed on a constant level (21-22 million ha). A similar development shows maize, the planting area of which drastically decreased in the 1990s, stabilized in the first decade of 2000s, and finally started to increase after 2010. However, maize production areas are not significantly large and were around 1.3% of total sowing area in 2021 (Bureau of National statistics, 2022). The statistical data divide maize into two different categories - grain maize and silage maize, although both types are used mainly in animal and poultry feeding.

Table 2.1: Total, Cereals, and Maize Sown Areas in Kazakhstan (in thousand ha)

Year	All sown areas	All cereals and pulses	Maize for grain	Maize for silage	All maize	Share of total maize 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	69.0	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	168.0	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	0.95%
2002	17756.3	14022.7	106.0	71.9	177.9	1.00%
2003	17454.2	13872.6	102.1	63.1	165.2	0.95%
2004	18036.4	14278.0	103.4	67.6	171.0	0.95%
2005	18445.2	14841.9	104.4	67.3	171.7	0.93%
2006	18369.1	14839.8	90.9	56.0	146.9	0.80%
2007	18954.5	15427.9	93.2	60.7	153.9	0.81%
2008	20119.2	16190.1	97.8	62.0	159.8	0.79%
2009	21424.9	17206.9	100.7	71.3	172.0	0.80%
2010	21438.7	16619.1	97.6	72.2	169.8	0.79%
2011	21083.0	16219.4	98.6	80.2	178.8	0.85%
2012	21190.7	16256.7	101.5	75.3	176.8	0.83%
2013	21271.0	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	139.0	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	15150.0	153.3	98.9	252.2	1.15%
2019	22135.8	15396.6	156.5	97.0	253.5	1.15%
2020	22582.3	15878.4	164.7	110.4	275.1	1.22%
2021	22925.7	16108.0	189.3	113.4	302.7	1.32%

Source: Bureau of National Statistics, 2022

In the Soviet era, Kazakhstan was an agrarian country with enormous animal production facilities. Therefore, many agricultural enterprises grew various feed crops, including silage maize. However, from 1991 to 2000, during the transition period, the animal head numbers drastically fell, as well as silage maize areas. In recent years the maize 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 maize. According to USDA data, Kazakhstan was the 60th nation among 115 countries that produced grain maize in 2021 (Index Mundi, 2022). The total world planting area for grain maize was something about 199 million ha (USDA, 2022).

According to the latest general program Agriculture Development Concept 2021-2030, maize is a strategic crop for Kazakhstan's agriculture (Ministry of Justice, 2022). Consequently, the maize-growing areas will increase in the future. Though, this increase will not be drastic due to existing limitations in maize 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 maize for grain and silage (Figures 2.1 and 2.2). However, grain maize production is largely organized by small farmers and individual entrepreneurs, whereas legal entities focus on silage growing.

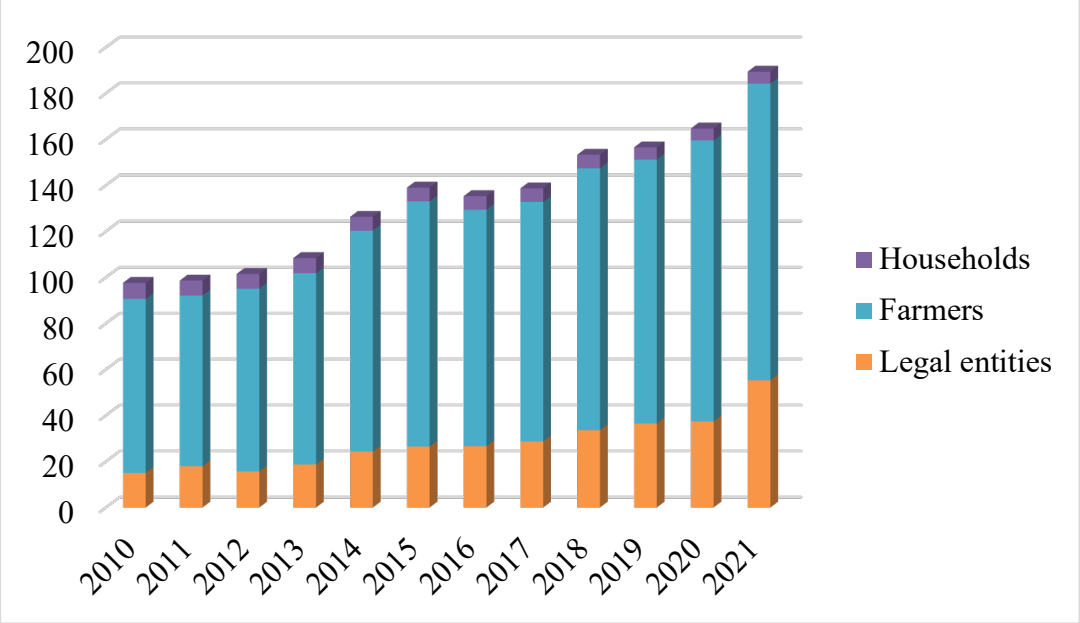

Figure II.1: Grain Maize Areas by Legal Status (in thousand ha)
Source: Bureau of National statistics, 2022

The dominant position of legal entities in silage maize 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 maize.

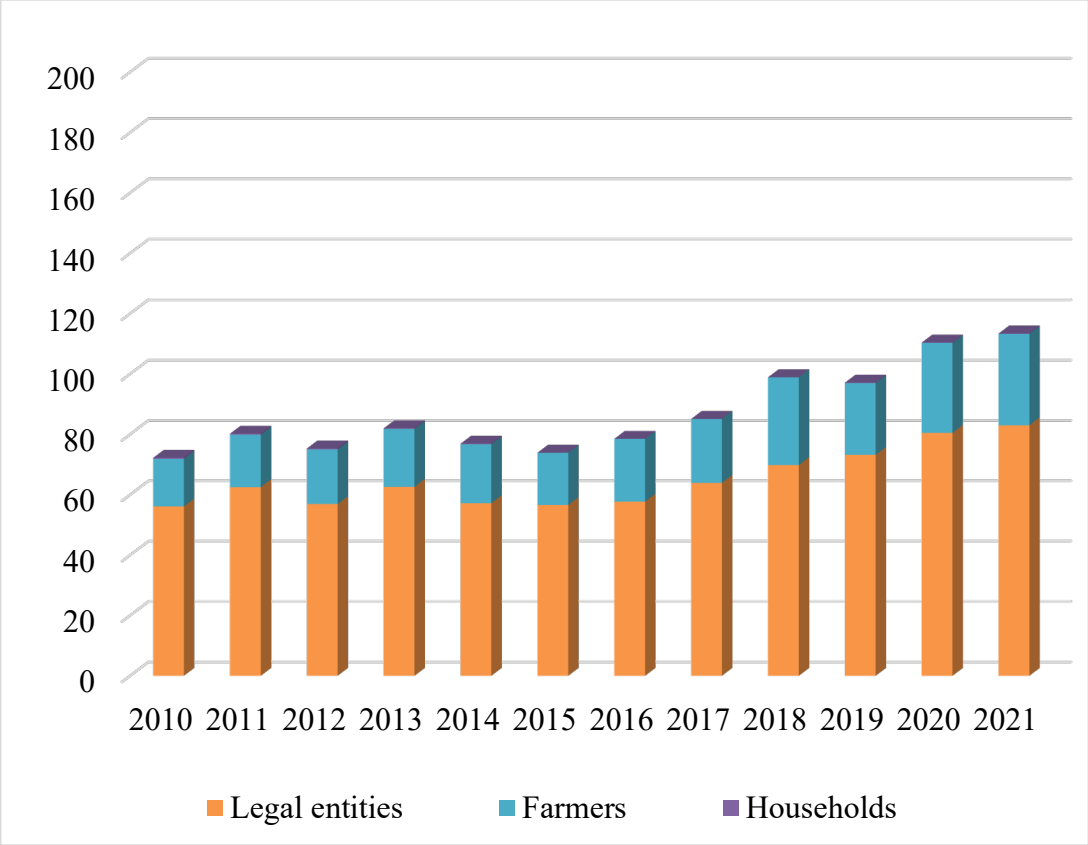

Figure II.2: Silage Maize Areas by Legal Status (in thousand ha)

Source: Bureau of National statistics, 2022

The main target for maize growers is high yield because it directly influences their incomes. The average grain maize yield of Kazakhstani growers was about 6 tons per hectar in 2021, but it was not always at that level. In the 1990s, its value was minimal since independence and began increasing steadily in the new millennium, reaching its maximum in recent years. The overall improvement of growing technologies has resulted in increasing land productivity of grain maize. Though its value was close to

the world's average 5.8 tons/ha in 2020 (FAO, 2022b), Kazakhstan has a strong potential to boost grain yield (Figure 2.3).

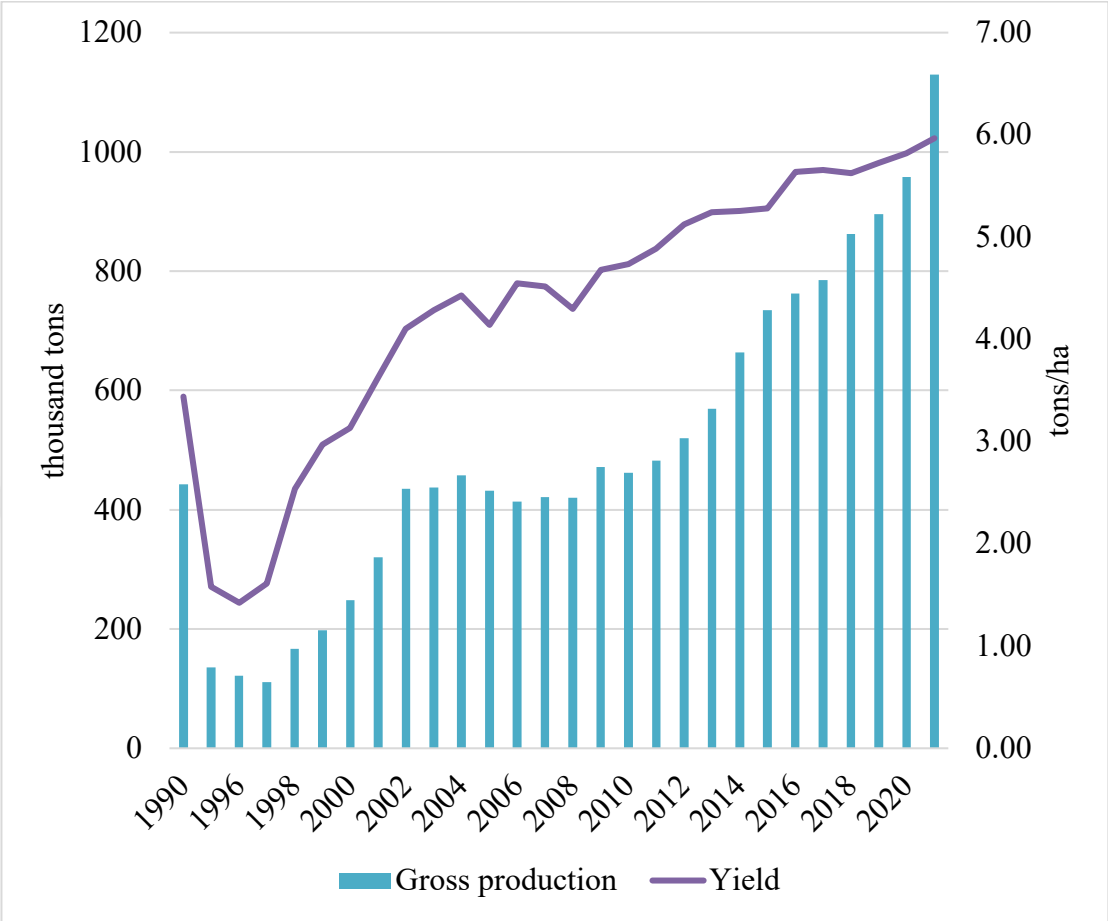

Figure II.3: Gross Production and Yield of Grain Maize in Kazakhstan
Source: Bureau of National Statistics, 2022

The most grain maize growing region in Kazakhstan is Almaty, followed by Turkestan and Zhambyl regions. Almaty region alone cultivated more than 50% of all grain maize in the country, whereas three main regions of grain maize growing covered 85% of the total crop area (Table 2.2). Due to grain maize 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 maize growers get the highest production volume and yield compared to other regions. However, grain maize areas grew in other regions of Kazakhstan too, which is a sign of continuous diversification of crop production in the country.

Table 2.2: Regional Distribution of Grain Maize 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

2.1.1. Almaty Region

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

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

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

All maize area comprised more than 11 % of the total cropland in Almaty region in 2021. The grain maize was the dominant type. Among 20 administrative districts of the region, maize cultivation was concentrated in five of them (Table 2.3). They were Panfilov, Enbekshiqazaq, Uigur, Ile, and Talgar districts. These five districts contributed 77% of maize growing in Almaty region (Figure 2.4). In Panfilov and Uigyr districts, more than half of the total sowing areas were occupied by maize becoming the most important cash crop for growers in these zones.

Table 2.3: Maize Growing in Almaty Region in 2021

Administrative district	Total cropland, ha	Grain maize area, ha	Yield, tons/ha	Silage maize area, ha	Total maize area, ha	Maize share in total cropland	District share in total maize area
TOTAL ALA	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

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, maize was cultivated mainly by peasant farms in 2021 (Bureau of National statistics, 2022).

According to the Bureau of National statistics (2022) grain maize 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 II.4. Maize Belt of Almaty Region (Inside the Red Line Area)

Source: adapted from Wikimedia Commons, 2021

2.1.2. Maize Trade (Commodity)

Kazakhstan was by large a maize exporting country, where Uzbekistan bought more 90% of the total commodity export volume in 2020 (Figure 2.5). The rest of maize was mostly delivered to other Central Asian countries. 99.8% of the maize import volumes came from Russia and covered the demand in northern parts of Kazakhstan.

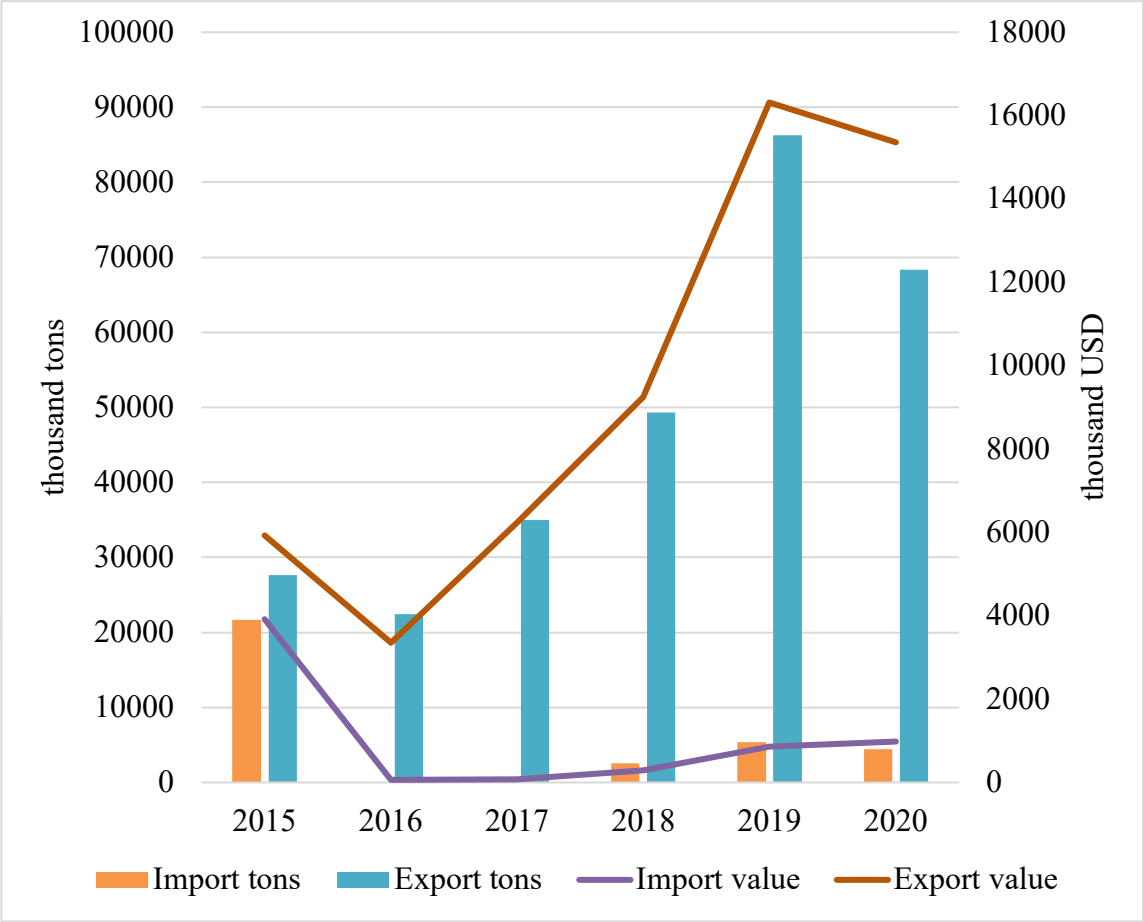

Figure II.5: Maize Trade Balance in Kazakhstan

Source: United Nations, 2022

2.1.3. The Technology of Maize Growing

The maize 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 2.4). In Kazakhstan almost 100 % of used maize 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.

2.1.4. 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: 562). 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 2.5).

Table 2.4: Maize 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
Maize 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

Table 2.5: 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 and 2022

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

Oil crops, feed cultivars, fruits, and vegetables are among the priority crops for diversification in Kazakhstan. Maize as one of the most important feed crops is of particular interest to farmers. Maize areas have been steadily increasing since 2012, but with a low growth rate compared to other crops, for example oil plants. If in the northern part of Kazakhstan maize 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 maize restrict the southern farmers of the country.

The government supports farmers including maize 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 maize areas.

2.1.5. Maize Varieties Used for Planting

The maize 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 (Figure 2.6). According to experts, the hybrid rate within all seeds used for maize planting in recent years is almost 100 percent. Nevertheless, largely farmers prefer cheap local maize hybrids to expensive western hybrids, even if the quality of the latter is higher.

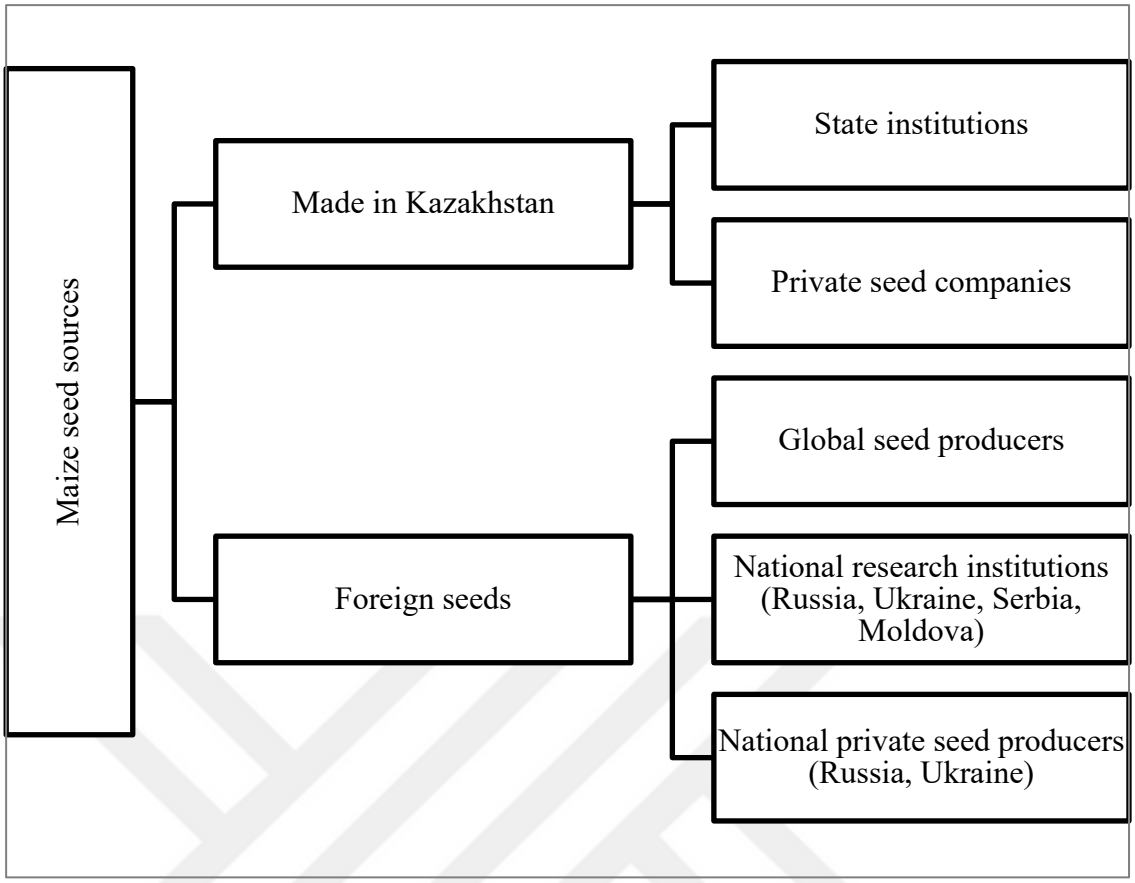

Figure II.6. Sources of Maize Seeds in Kazakhstan

The List of approved varieties or hybrids in Kazakhstan prepared and annually updated by the Seed testing authority contains more than 130 unique maize races as of 2020 (Ministry of Agriculture of the Republic of Kazakhstan, 2023). 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 planted maize seed materials, but several hybrids are recognized as the bestselling (Table 2.6).

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 maize 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 maize and other crops in the country but rarely do they register any new competitive maize hybrids.

Table 2.6: Main Maize Hybrids Grown in Kazakhstan

#	Variety/Hybrid name	Breeder / Country	Main growing regions
1	KAZ ZP 200	Zemun Pole / RS + Budan / KZ	AKM, AKT, KOS, PAV, SKO, VKO
	KAZ ZP 777		ALM, TUR, ZHA
	KAZ ZP 509		ALM, ZHA
	Tulpar 539		ALM, TUR, ZHA
	ZPSK 704		ALM, TUR, ZHA
	Altay 319		VKO
	Marco 419		ALM
2	PR31G98	Pioneer / US	ALM, TUR, ZHA
	P0074		ALM, ZHA
	P0729		ALM, ZHA
	P0937		ALM, TUR, ZHA
	P1570		ALM, TUR
	P7043		SKO, AKM, VKO
3	Pochaevskiy 190 MB	IZKNAAN / UA	SKO, PAV, KOS
	DN Orzhica		SKO, PAV, KOS
4	ROSS-199 MB	KNIISH Lukyanenko / RU	SKO
	Krasnodarsky 194 MB		ZKO, AKM, VKO
5	Kaskad 166 ACB	VNII Kukuruzy / RU	PAV, KOS, SKO
	Kaskad 195		PAV, SKO, AKM
6	Turan 480 CB	KAZNIIR / KZ	ALM, KOS, VKO
	Budan 237 MB		ALM, KOS
7	SI Mayami	Syngenta / CH	ALM, TUR, ZHA
8	LG30215	Limagrain / FR	PAV, VKO, SKO, KOS
9	Rodnik 180	Otbor / RU	PAV, VKO
10	Moldavsky 456 MB	Porumben / MO	ALM, TUR, ZHA

Note: AKM-Akmola, AKT-Aktobe, KOS-Kostanay, PAV-Pavlodar, SKO-North-Kazakhstan, VKO-East-Kazakhstan, ALM-Almaty, TUR-Turkestan, ZHA-Zhambyl, ZKO-West-Kazakhstan regions

Source: Ministry of Agriculture of the Republic of Kazakhstan, 2023 and Information and Accounting Center, 2022

As seen in Figure 2.7 about 25% of maize 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).

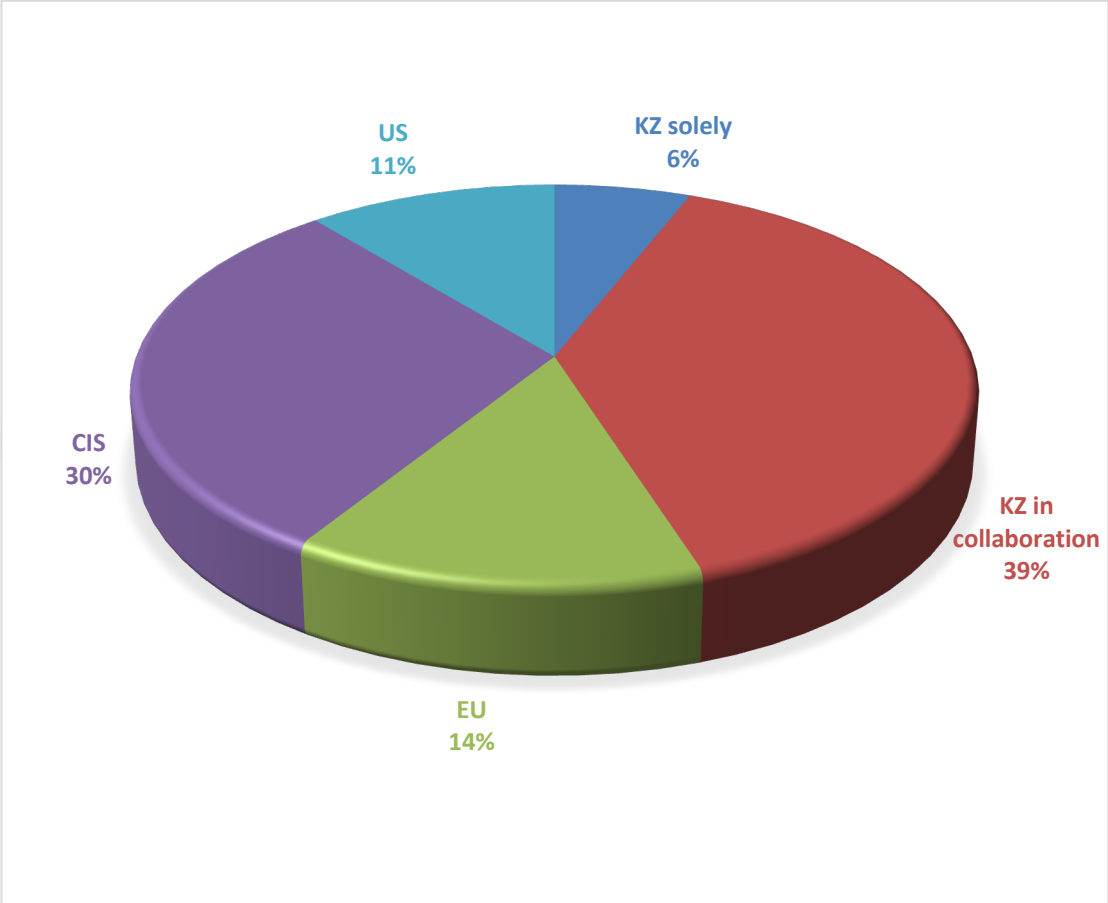

Figure II.7: Breeders' Origin Countries of Maize Hybrids Grown in Kazakhstan in 2020

Source: Adapted from Information and Accounting Center, 2022

2.1.6. Problems of Maize Production

Despite the relatively large areas under crop production, productivity per 1 ha remains lower compared to many maize growing countries in the world (Figure 2.8). The primary reason for low productivity is the weak adoption of modern innovative technologies. Most maize 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 (Barrett et al., 2017: 749), to nourish with fertilizers, and protect plants from weeds, pests, and diseases. Furthermore, the seed quality of currently planted maize 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.

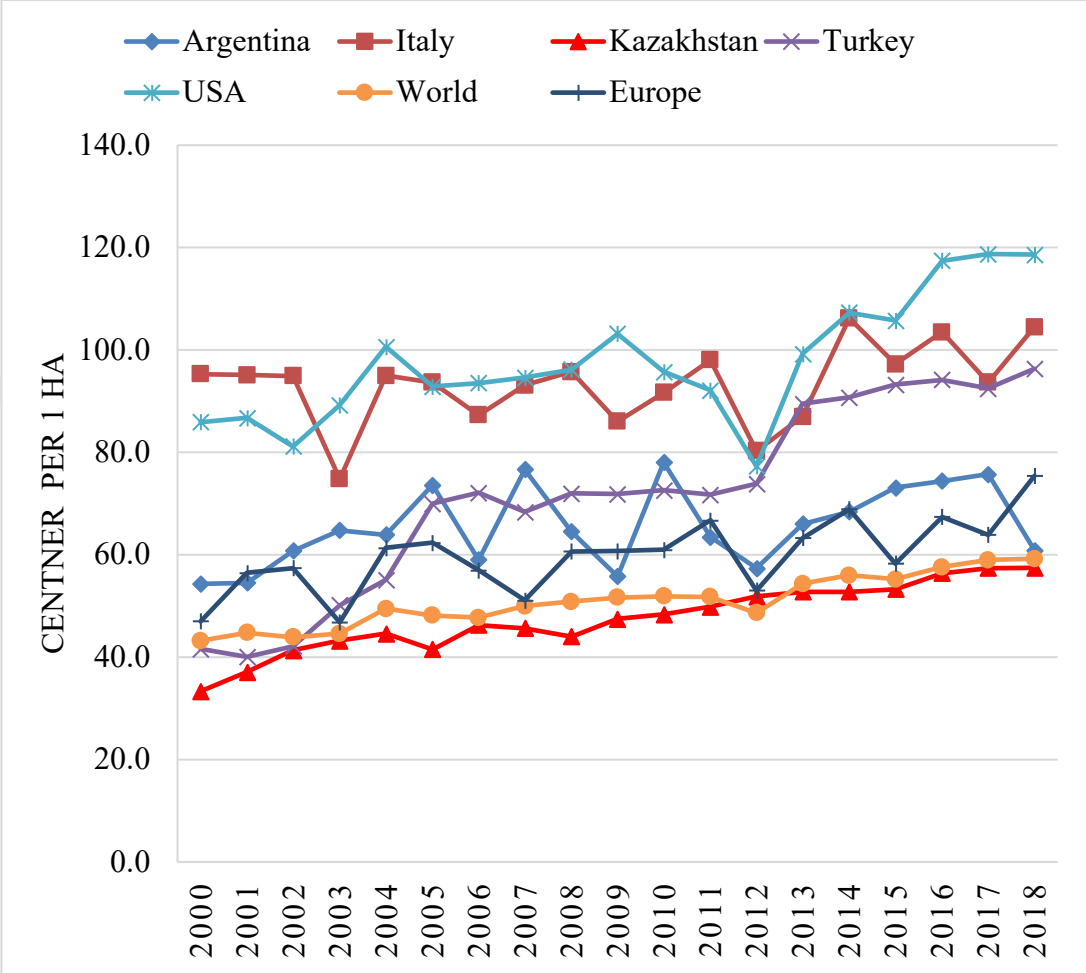

Figure II.8. Grain Maize Yield

Source: FAO, 2022b

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: 1). Thus, to surge the effectiveness of maize 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 labour resources hampered fast agricultural growth in Kazakhstan. Therefore, maize productivity is still below the level of many developed countries (Figure 2.9).

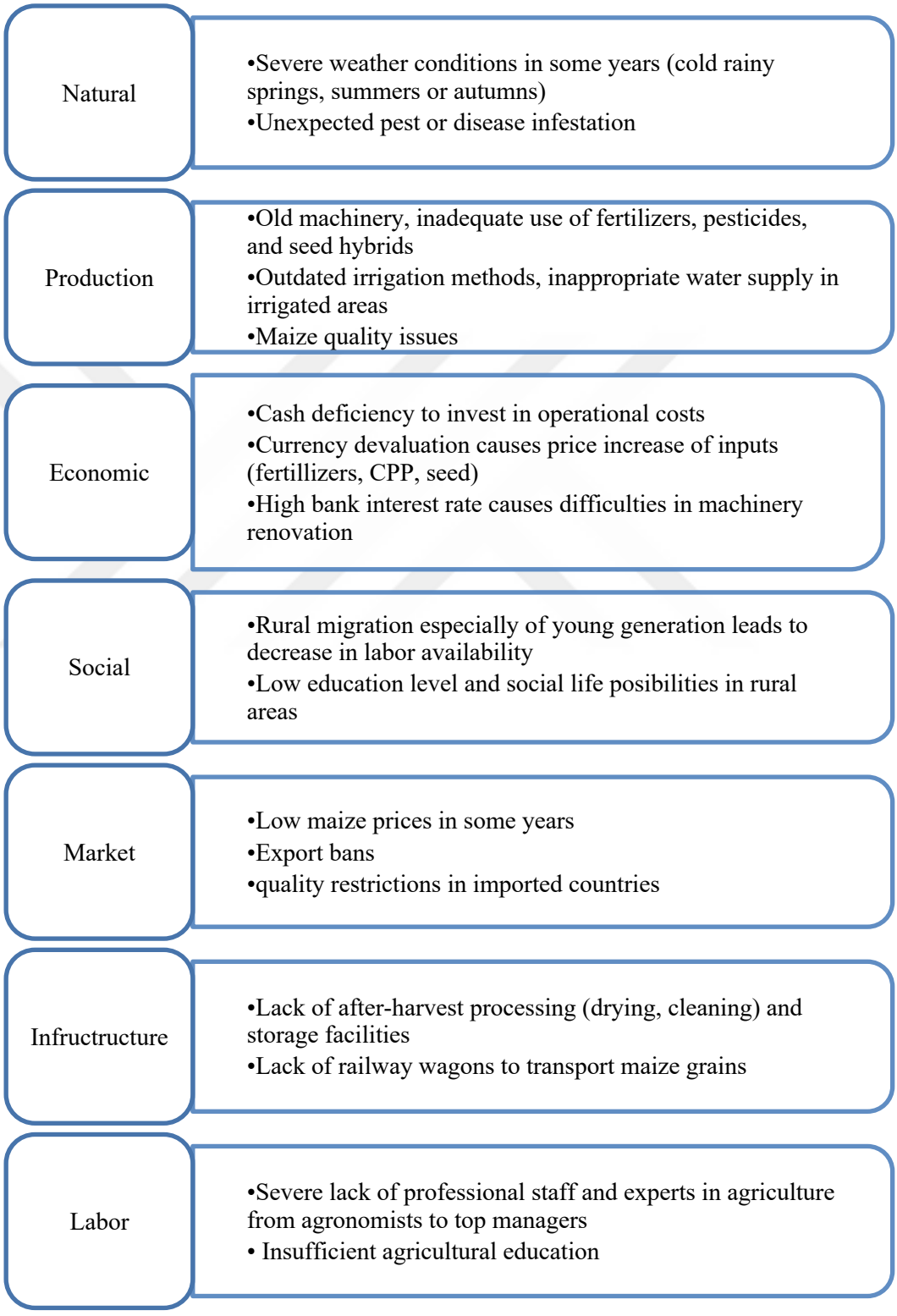

Figure II.9. Main Issues of Maize Production in Kazakhstan

2.1.7. The Future of Maize 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. Maize 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 maize production areas will annually increase by ca.4-5 %. The prognosis is based on domestic as well as main import markets' demand for Kazakh maize as well as production limitations.

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

2.2. Maize Seed Market of Kazakhstan

The collapse of the Soviet Union in 1991 meant a change from a centrally commanded planned economy to a capitalistic liberal market for all sectors of independent Kazakhstan. Agriculture was also involved in this big shift. 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 the 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 maize seed market, is minimal. The lack of appropriate investment into maize seed development as well as of scientists and experienced staff has led to the dominance of imported genetics in maize production.

2.2.1. Main Features of Today's Seed Sector and Maize Seed Market

Cultivating huge plant production areas Kazakhstan experiences enormous demand for crop seeds. Agricultural enterprises either use farm-saved seeds or buy appropriate planting material. Farm-saved seeds are common for wheat, barley, rye, linseed, potato, etc. production where hybrid varieties are absent or not developed in Kazakhstan.

The second option which is to buy seeds is fundamental for seed market development. The seed business is an industry within the agricultural system that develops, multiplies, and sells crop varieties to farmers for whom seed is the main production tool. In the past seed development (breeding), seed multiplication (production), and seed sales (marketing) were generally carried out by separate state and commercial organizations. The development of plant hybridization and bioscience attracted different corporations to including seed businesses in their portfolio. To maximize return on investment seed business was merged into one comprehensive structure starting from breeding and ending by the marketing of developed new varieties. The largest multinational companies offering seeds based on that approach are Bayer (which bought the biggest US seed company Monsanto in 2018), BASF (which acquired some seed business around the world), Syngenta (which is a part of Chinese ChemChina now), and Corteva (cooperation between Dow and DuPont which bought Pioneer in 1999). The most sophisticated seed varieties are developed in the US, Germany, France, and some other European countries. Naturally, all countries aim to secure their seed RandD and finance national state research institutes that are involved in breeding activities. Though not all such activities are successful enough, the seed development of priority crops should be considered as an important element of national security.

The state regulates the seed market by defining the rules for its players. The rules define certification, organization, and functioning criteria for those who wanted to step into the seed business. In Kazakhstan, two organizations are accredited as maize seed breeders: the Kazakh Research Institute of Agriculture and Plant Growing and Budan. They are both located in Almaty region. Eleven organizations are allowed to multiply maize seed or produce maize hybrids. They are also situated in Almaty region because it has favourable soil and weather conditions as well as experienced maize growers.

The maize seed marketing is presented by 38 companies involved in maize seed sales in Kazakhstan according to the official information (Ministry of Agriculture, 2023). The business is not limited by one region and maize seeds are distributed almost in every region of the country. However, the nationwide distributors have their head offices mainly in Almaty city, the financial and business capital of Kazakhstan. Thus, the Kazakh maize seed market is 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 maize seed market is about 11 million USD. Kazakhstan is a net importer of maize seed, and its exports are very limited (Figure 2.10).

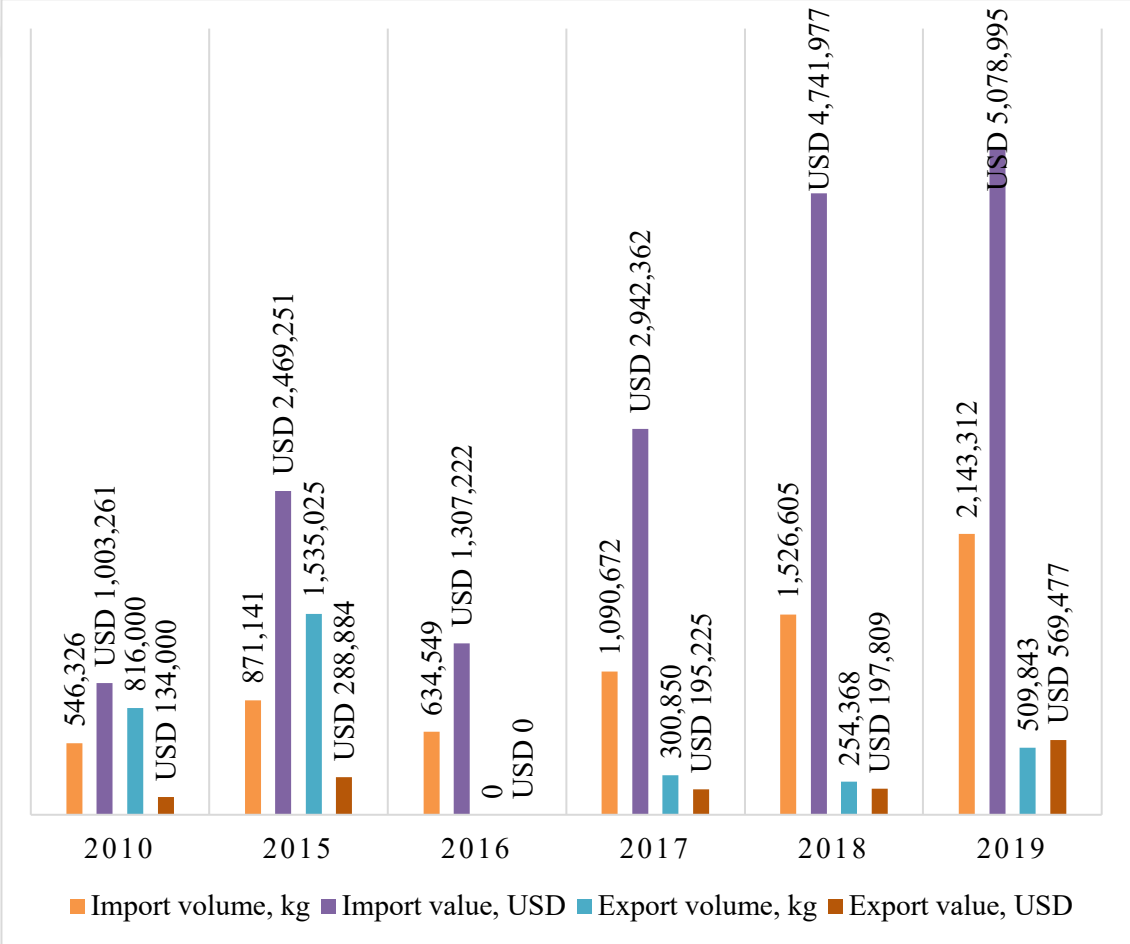

Figure II.10: Maize Seed Trade in Kazakhstan

Source: Adapted from United Nations, 2022

In 2019 Kazakh farmers imported 2143 metric tons of maize seed for a total value of 5.1 million USD which is 40 percent more in quantity and 7 percent more in value

compared to 2018. The faster growth rate in quantity than in value shows that the average maize seed price per kg was lower in 2019 than in 2018.

The maize seeds arrive at large from Russia, Ukraine, and EU countries (Figure 2.11). However, in terms of value, Kazakhstan paid for maize seeds originated in the USA and Turkey the most because the planting material of developed states has usually higher prices compared with seeds produced by breeders in developing countries.

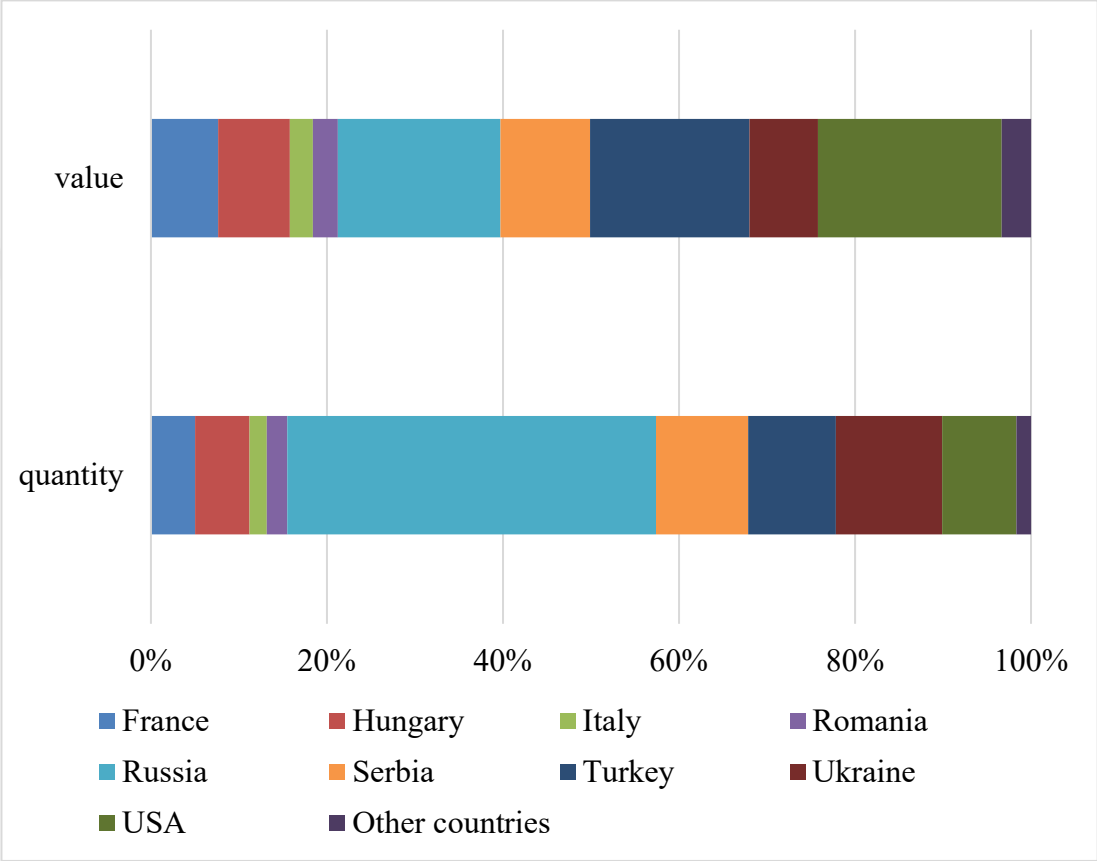

Figure II.11: Main Maize Seed Supplying Countries in 2019
Source: Adapted from United Nations, 2022

The highest price was by the US maize seed and the lowest was by Russian companies (Figure 2.12). Russian maize seed price was 5.6 times lower than this of the US. Maize 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.

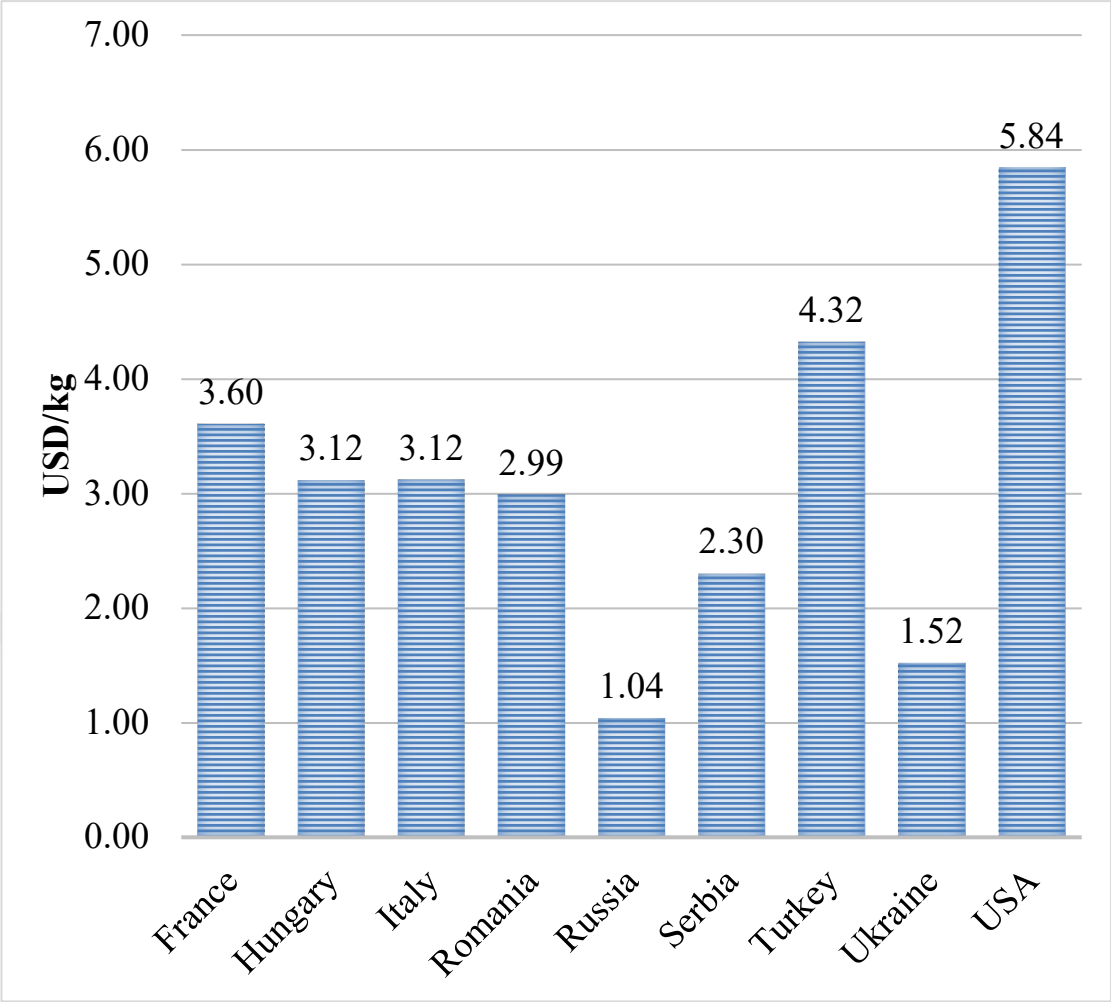

Figure II.12: Maize Seed Import Prices by Country of Origin in 2019

Source: Adapted from United Nations, 2022

2.2.2. 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.

2.2.3. Main Brands and Players of the Maize Seed Market

Domestic and foreign suppliers are the main contributors of maize seed in Kazakhstan. The share of domestic maize seeds offered by KAZNIIR and Budan is close to 45 percent. The remaining 55 percent of the seed maize market is distributed between different brands like Pioneer, DeKalb (Monsanto), Syngenta, Limagrain, etc. (Figure 2.13)

Among the main maize seed suppliers, the domestic company Budan takes the major share (almost 40 percent). Budan was established in 1999 and is located in Almaty region. Through cooperation with the Serbian Institute Zemun Pole, the company provides Kazakh maize 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 maize is cultivated. Some volumes may be exported to the neighboring countries – Kyrgyzstan and Uzbekistan. The company sells its seeds directly to farmers 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 maize hybrids. Usually, the same producers sell seed to maize growers and

pay royalties to KAZNIIR. Therefore, no comprehensive sales department or marketing operations exist.

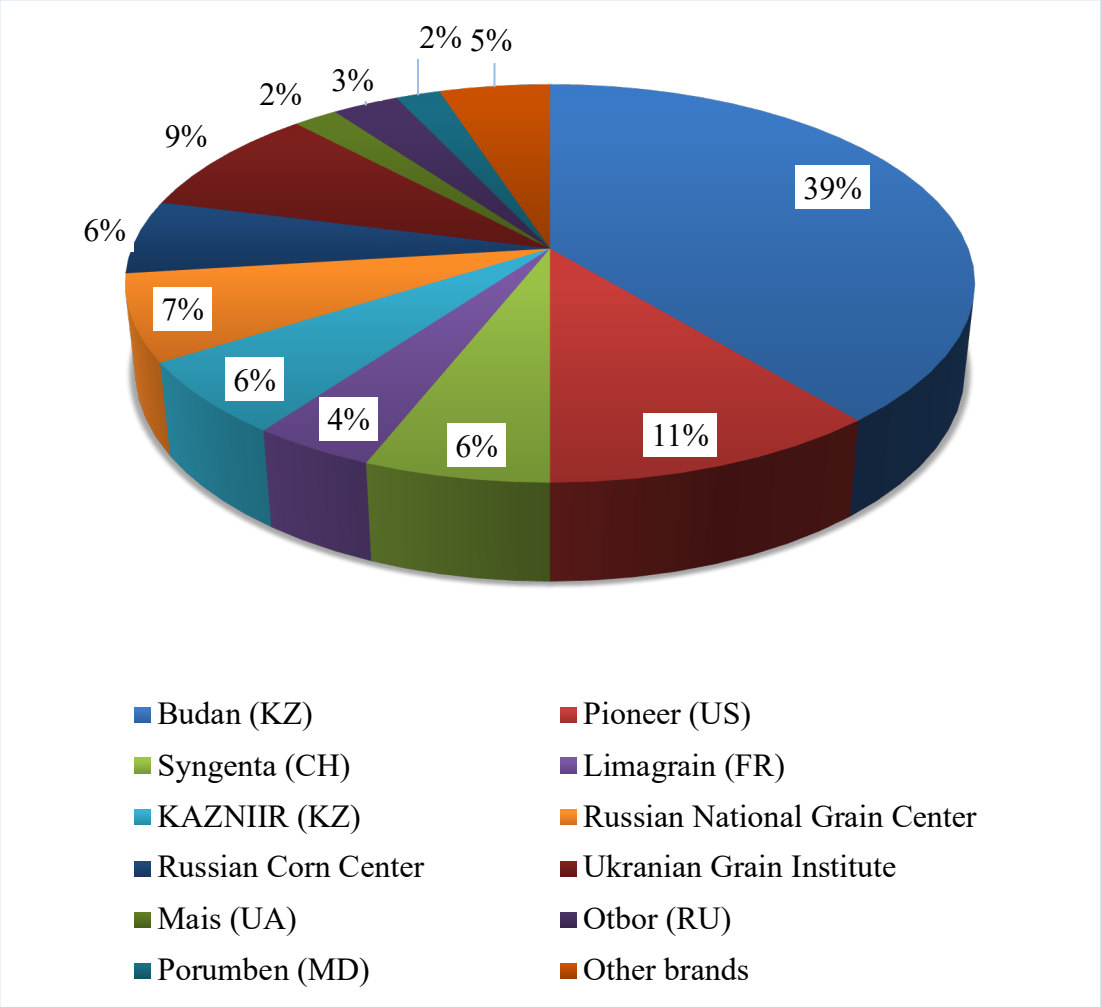

Figure II.13: Different Brands and Their Share in the Kazakh Maize Seed Market in 2020

Source: Adapted from Information and Accounting Center, 2022

The main competitive advantage of locally produced maize hybrids is their low price compared 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 maize seed.

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

One of the oldest international brands cultivated by Kazakh maize growers is Pioneer, which has been a Corteva seed division since 2019. Pioneer is the first brand that produced maize hybrid in the world in 1926. It became the biggest maize seed supplier in the middle of the 20th century until Monsanto with its Dekalb brand and GMO products appeared on the US market in the 1990s. In 1999 DuPont chemical corporation acquired the major share in Pioneer. Then 20 years later two giants of chemical production in the USA, DuPont, and Dow, decided to merge their agricultural divisions into one united brand Corteva. In Kazakhstan Pioneer maize seeds appeared at the beginning of the 2000s. Despite their high prices (Figure 2.14) Pioneer maize seed could enter the Kazakh market and take a position within other suppliers.

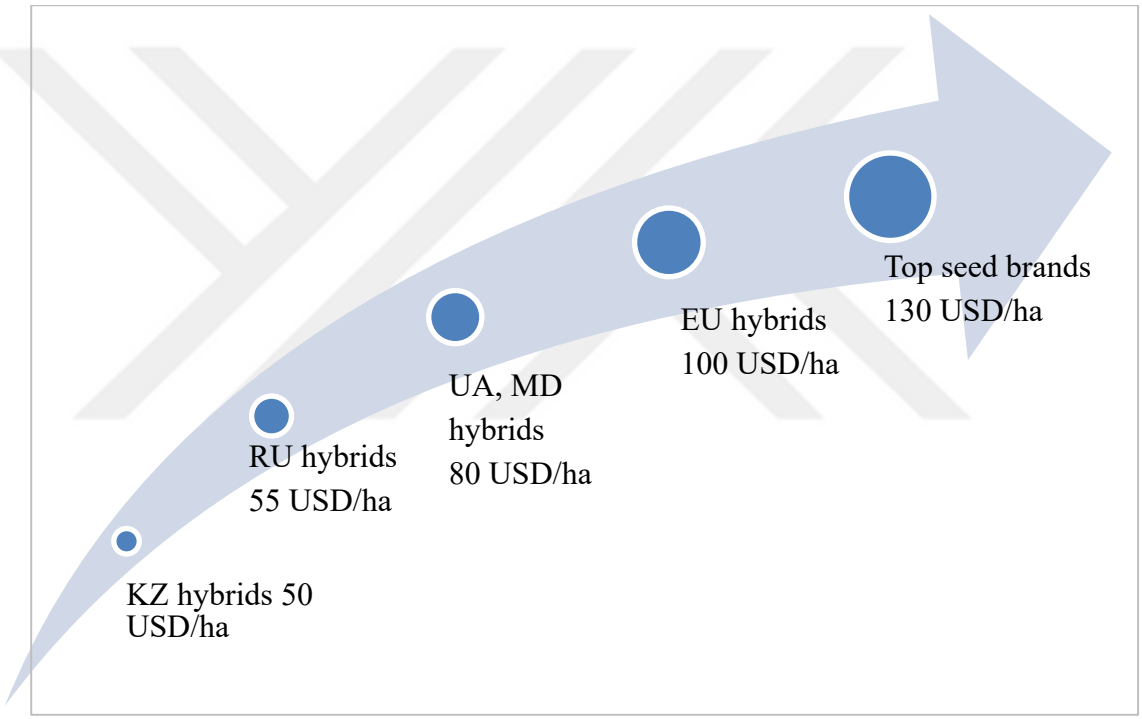

Figure II.14: Average On-Farm Maize Seed Prices in Kazakhstan in 2020
Source: Adapted from Information and Accounting Center, 2022

Top maize seed brands like Pioneer, Dekalb, Syngenta, and Limagrain are present in Kazakhstan with a share of approximately 21 percent (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 percent in 2020).

About 40 commercial companies are involved in maize seed sales and marketing activities in Kazakhstan. Some firms offer products of only one brand exclusively, while others distribute different maize seed hybrids. Overall, seven companies deliver 70 percent of all planted maize seeds in Kazakhstan (2020). The remaining 30 percent is distributed to growers by 31 organizations (Figure 2.15).

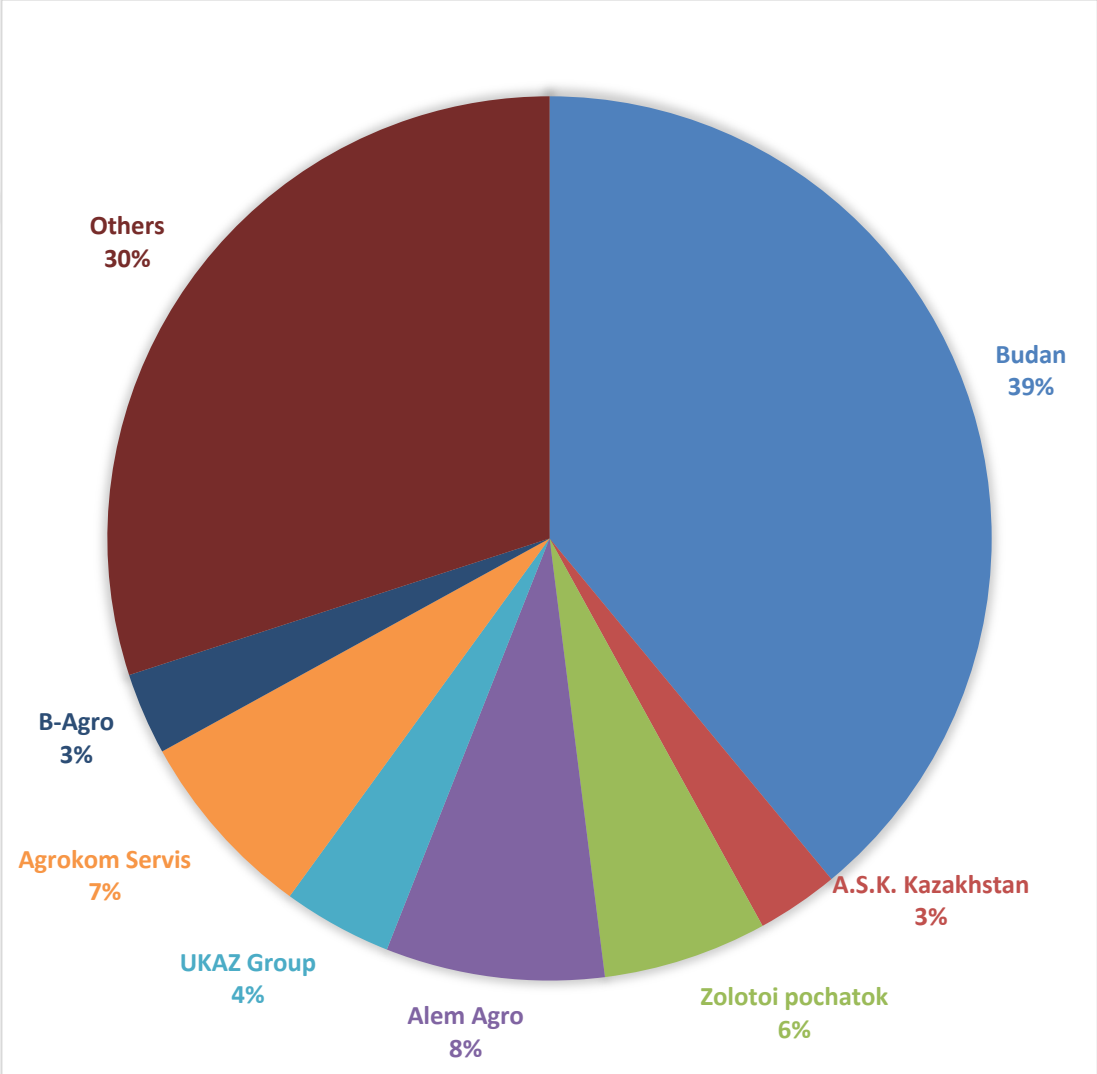

Figure II.15: Main Maize Seed Sellers in Kazakhstan

Source: Adapted from Information and Accounting Center (2022)

2.2.4. Constrains for Further Development of Maize Seed Market

The problems of the maize 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 2.16).

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

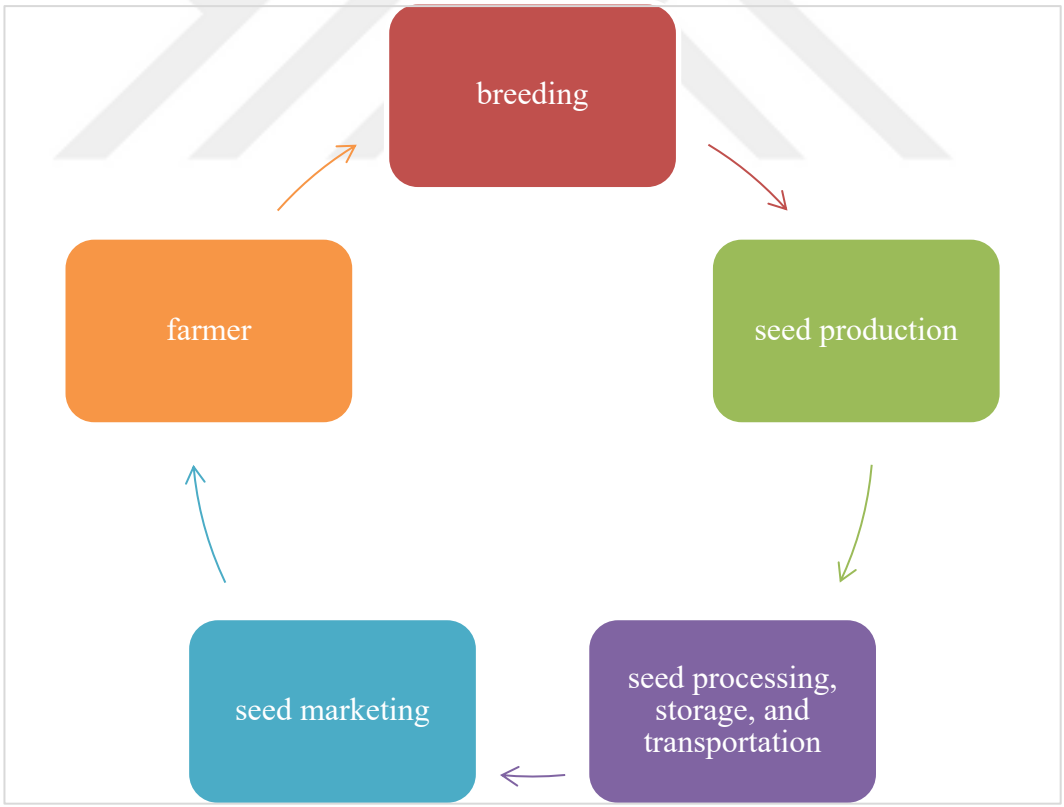

Figure II.16: Seed Cycle

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 maize growers in Kazakhstan.

Because productivity and quality of local maize seed are lower compared to western varieties, an end-user of this seed or a farmer obtains relatively low yields (as for example shown in Figure 2.3) and, therefore, is restricted in profit accumulation. Additionally, the overall farming level in Kazakhstan remains weak, and urgently needs to be re-equipped to be able to produce effectively.

The remote location and non-availability of open-sea ports in Kazakhstan influence the transportation costs of seeds that are higher than in neighbouring Russia. Moreover, import duties up to 6 percent of the border price make western hybrids less competitive compared to local or Russian maize seed.

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 maize growing. Relatively high expenditures for sales staff and general activities result in low profitability of maize seed sales. Additionally, very often maize growers fail to fulfil 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 maize seed market in Kazakhstan. The improvement steps done in the last decades are not enough to cardinally 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 maize or, in general, the agricultural crop seed market in Kazakhstan.

2.2.5. Support of Maize Seed Market

Overall, the support of the maize 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 percent of the seed price is covered by the state subsidy. All other imported seeds are subsidized at a maximum 30 percent rate. The subsidies are essential for the development and increase of seed demand among maize 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.

CHAPTER III
THEORETICAL FRAMEWORK AND LITERATURE REVIEW

The central motivation for this study was the desire to understand which factors impact Kazakhstani agricultural growers in their choice of input products. The choice itself is a result of the complex buying behaviour process. Though different aspects of consumer and industrial/organizational buying behaviour was investigated in many academic and business studies, very limited research was carried out to illuminate farmers' buying mechanism. In this Chapter the general model of farmers' buying behaviour are discussed. Then, a literature review of preference studies, brand loyalty, and supplier loyalty among agricultural producers is described.

3.1. Farmers' Buying Behaviour

The most comprehensive research work on farmers' buying process in the recent decades was performed in the Netherlands (Kool, 1994). In the study the farmers' buying behaviour was defined as a kind of industrial buying behaviour, in which a farmer searches for input factors (e.g., seeds, machinery, services, etc.) to produce his/her commodities (e.g., wheat, sunflower, milk, meat, cotton, etc.). However, due to small scale farming prevalent in the Western Europe, the organizational context of the farmers' buying behaviour was found to be like consumer/ household buying procedures. As a result, the research showed that farmers expressed both industrial buying behaviour (in terms of a buying object) and individual/ household traits (in terms of how the buying process was organized). Moreover, the research author elucidated the buying mechanism of farmers through their income allocation processes influenced by economic and behavioural factors. According to the study the critical precedent of farmers' buying behaviour was the farm income allocation process (FIAP) that consisted of several stages of FIAP:

1. Income distribution between production, (family) consumption, and savings. Thus, in the first stage, a farmer (considering existing income limitation, production, and family needs) decides on income allocation between these three categories.

2. In the second stage, a farmer decides which product group (equipment, fertilizers, pesticide, seeds, services, feed, etc.) is required to fulfil production targets and choose to buy it.
3. In the third stage, a farmer analyses various alternatives within the product group and decides for a particular type, brand, and supplier (Figure 3.1).

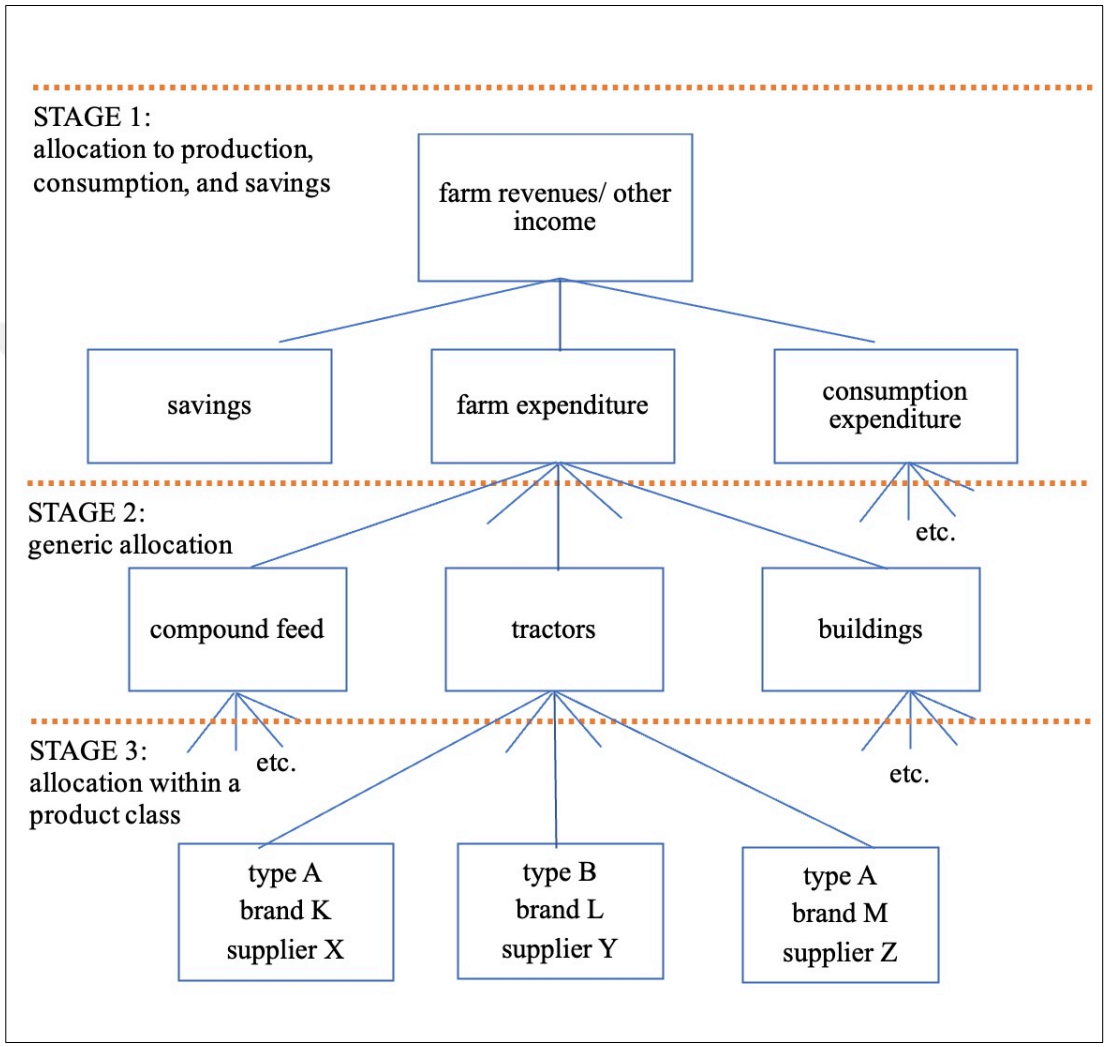

Figure III.1: Farm Income Allocation Process

Source: Adopted from Kool, 1994: 11

Moreover, within the FIAP a farmer confronted three principal decision – in budget (on stage 1), product (on stage 2), and finally on buying (on stage 3). The last (i.e., buying) decision referred to the actual purchasing and materializing of all cognitive thinking made prior the conclusion in to chosen product. Therefore, according to the study the farmers' buying behaviour/decision was a materialized behaviour/decision. The buying process itself may include all stages of FIAP or only one or two depending

on the situation. Marketing studies were mainly focused on the last stage of the FIAP because supplier organizations wished to understand how farmers made their choices of brands or product types within a similar product class.

The next important point mentioned in the study by Kool (1994: 13) was the determination of various features related to the choice making processes on three FIAP stages. For example, during the first stage when a farmer decides how to allocate available income resources (budget planning) the time span for such decision is longer than in other two stages (deciding for a certain product and actual buying). In contrast, the frequency of choice making process related to budget planning processes showed to be lower compared to product choice or buying actions. The value of retrospective expenses was mentioned higher for the budget stage, because any mistake in that stage would mean bigger costs for a farmer. In contrast, the buying of a specific brand would not critically affect a farmer in case of its failure, because these costs could be recovered faster, for example through guarantee. Consequently, outcomes of choice making on the strategic "budget" stage would be fundamental for a farm and less critical for other stages. The first stage was described to involve few alternatives or variables and therefore the research specified the use of deterministic models and economic theories in that step. On the other hand, stochastic models and behavioural approaches better picture the multifarious nature of the third level (Table 3.1).

Table 3.1: Choice Making Process Characteristics

	FIAP stage	Stage 1	Stage 2	Stage 3
	FIAP decision	Budget	Product	Buying
Choice making process characteristics	Time span	Long ……....Short		
	Frequency	Low ……..……..…..High		
	Sunk costs	High ……..…….…….....Low		
	Consequences	Basic …….....Specific		
	Process model	Deterministic ……..Stochastic		
	Approaches	Economic (rational, but bounded)…….....Behavioural		

Source: Adapted from Kool, 1994: 13

Three dimensions of farmers buying behaviour were suggested by the study of Kool (1994: 22) because of the analysis of differences and similarities existed between industrial and consumer buying behaviours. These dimensions were (1) buying process

(problem solving vs. hedonic experiential processes), (2) buying structure (group vs individual decisions), and (3) relationship with suppliers/loyalty to choose alternatives (Figure 3.2 and Appendix 2).

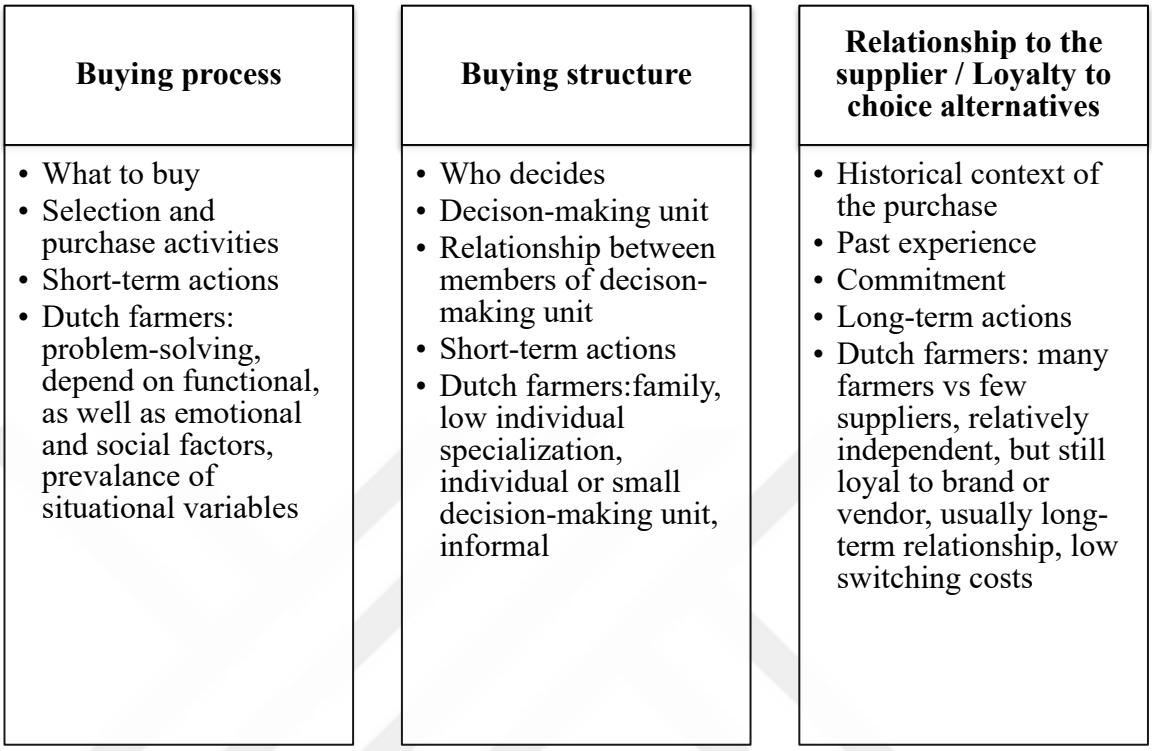

Figure III.2: Farmers Buying Behaviour Dimensions and Their Reflection in Dutch Farmers

Source: Kool, 1994: 22

These three dimensions formed the core of the farmers' buying behaviour (Figure 3.3).

The research identified four major determinants that directly impact on the core of the farmers' buying behaviour: buying task characteristics that are related to (1) product and (2) market attributes as well as buyer characteristics defined by (3) farm and (4) individual properties. Environment influenced the process too, but its affect was considered as comprehensive, complex, and hardly measurable.

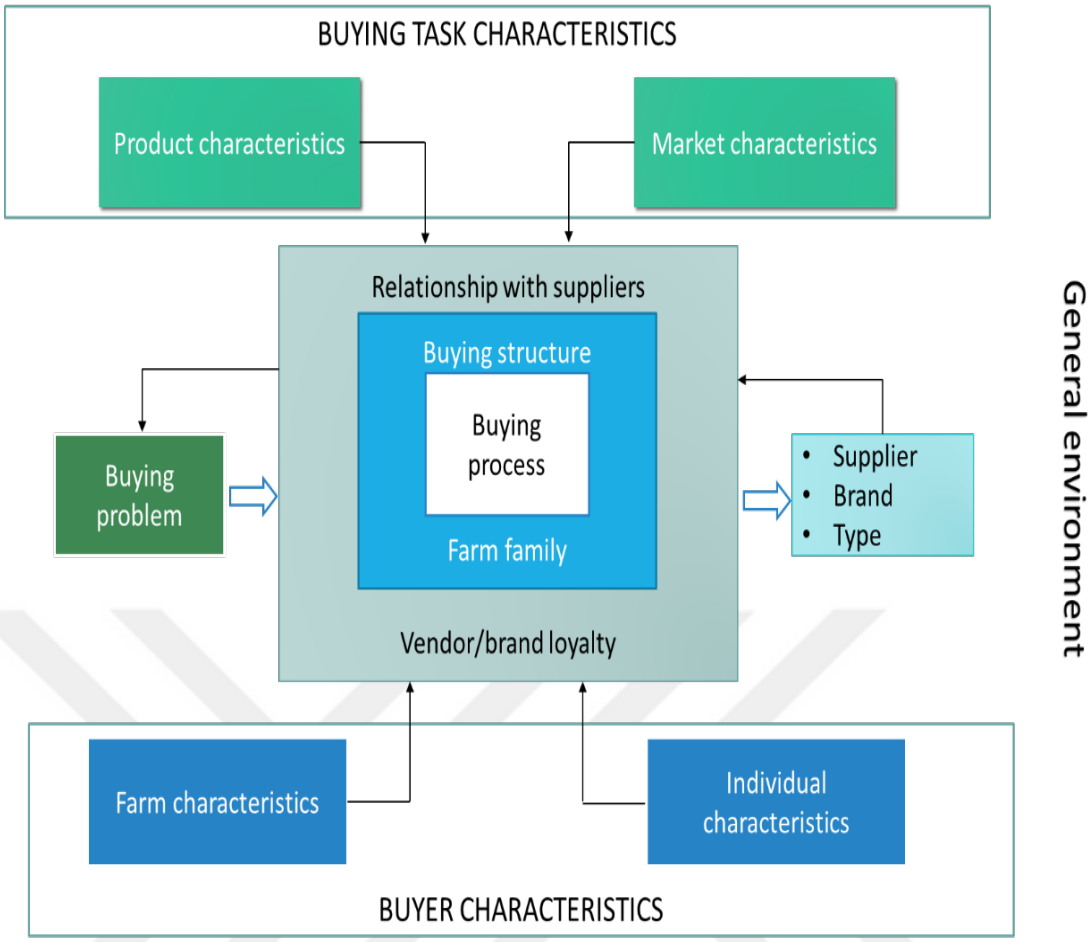

Figure III.3: Famers' Buying Behaviour Model

Source: Adopted from Kool, 1994: 52

In the current study factors affecting farmers' buying behaviour in relation to seed were investigated. Due to complex and multifaced nature of such research as well as limited literature on farmers' buying behaviour in the targeted market (Kazakhstan), the primary focus was on market characteristics discussed in chapter 2, growers' socio-economic data, their preferences, values, and loyalty towards brand and vendor.

3.2.Decision-Making Theories in Agriculture and Their Application in Agricultural Research

Agricultural researchers suggested various approaches for measuring of the decision-making process in a farmer (Edwards-Jones, 2006: 783-787). The decision analysis is a widely used method that is presented in the form of the logical decision tree and compares variations of quantitative choice models with heterogeneous risk

probabilities and subjective expected utility values. The process output is an optimal decision for a farmer maximizing his/her utility and minimizing risks (Hardaker et al. 2004: 266-267). Some studies added to the classic decision analysis model individual, social, and cultural characteristics (Marsh, Pannell, and Lindner, 2000: 576).

According to multidisciplinary approach of Pannell (2006: 120) the decision to adopt or reject new technology was fundamentally controlled by subjective perceptions and believes of landlords rather than by objective logical necessity. In contrast to the decision-making models based on economic risk, sociological studies proposed their alternative risk perception approaches like Tversky and Kahneman's Prospect Theory, Slovic's model, Social Representation Theory of Joffe, and Personal Construct Theory of Kelly (Thompson 2009: 5-9).

Based on the Kelly's Personal Construct Theory, the decision-making process was investigated in Australia (Thompson 2009: 10-19) and following model was suggested (Figure 3.4). This decision-making model included individual characteristics and reactions to uncertainties involved in new technology adoption that should be considered together with logical economic approaches.

A plenty of studies investigated the decision-making process for agricultural products, services, and technology adoption from the angle of the above-mentioned theories. For example, in their study, Feeney, Accursi, and Mac Clay (2019: 499) analysed three different cognitive styles and their impact on decision-making. According to their research, analytic producers tend to be more performance-oriented compared to relationship-oriented intuitive growers. Moreover, analytic farmers were loyal to the product brand and less attached to their suppliers or salespersons.

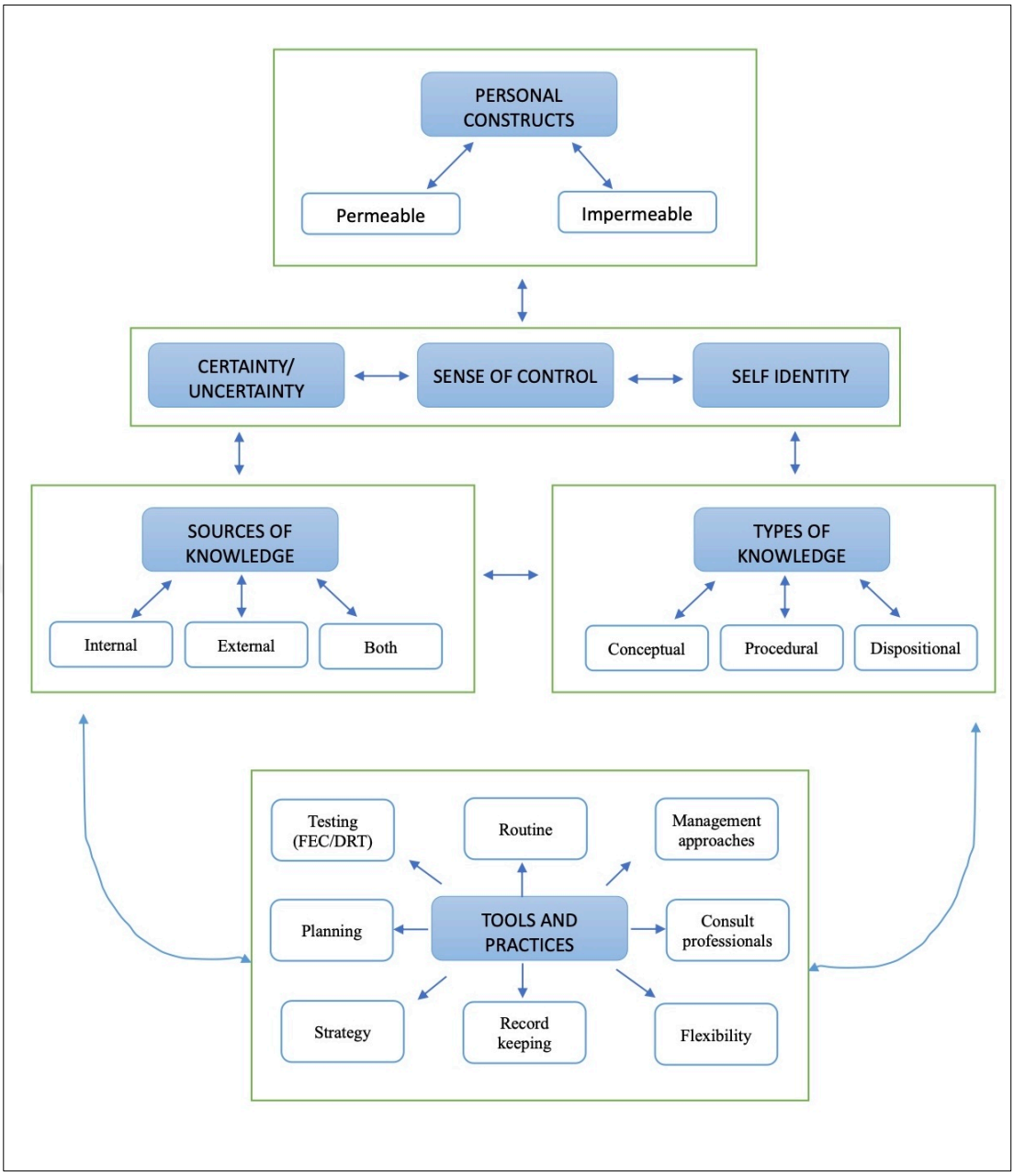

Figure III.4: The Model of Interrelationship of Factors Influencing Farmers Decision-Making

Source: Adopted from Thompson, 2009: 20

3.3.Literature Review on Farmers Preferences

In general sense, farmers preferences are a kind of consumer preferences. Therefore, the theories of the later, to some extent, can be also used for the former. In the economics consumer preferences described as individual tastes related to collection of different goods and measured by their utility value which is an ability of a product to

satisfy human needs (Hauser and Shugan, 1980: 280). This possibility to measure preferences through utility give them a quantifiable nature reflected by an absolute value (cardinal utility) or ranking (ordinary utility) between various bundles of goods. As a result, consumer preferences can be modelled or mapped, for example through indifference curves, econometric assumptions, etc. Consumer preferences are built on product's important attributes. Therefore, the consumer preferences measurement is focused on attributive analysis and judgements of these attributes by product users (Ibid, 1980: 282). In conditions of certainty a consumer strives to maximize his/her satisfaction from product attributes, whereas in the uncertainty most probably he/she tries to minimize risks. Various theories were suggested to illuminate consumer preferences: the multi attributed preference theories (e.g., conjoint analysis), utility theory (e.g., von Neumann-Morgenstern approach), stochastic models (e.g., Bass model), econometric assumptions (e.g., MacFadden's logit model) (Hauser and Shugan, 1978).

The main feature that differentiates farmers' input preferences from those of individual consumers lies in the product usage. Growers utilize inputs to produce and sell agricultural products, whereas an individual consumes a product directly or in the household. Thus, farmers receive income from the sales of final goods rather than satisfy their personal needs.

Various academic studies about farmer seed preferences were carried out in the past. Most of this research concentrated on seed preferences for different crops, whereas several papers considered maize seed attributes.

In Nepal researchers investigated seed attribute preferences of tomato growers implementing discrete choice experiments. Attributes like germination, vigour, purity, and price were examined applying the normal multinominal logit model and random parameters logit model. The study revealed that growers valued vigour as the most important attribute. Germination and purity were also critical for the tomato growers, but the importance level differed between heterogeneous groups (Timsina, Jourdain, and Shivakoti 2016: 368).

In the study for rice seed attributes and adaptation of improved varieties in Sierra Leone, 13 characteristics were investigated using a best-worst experiment and conditional logistic model. The respondents valued potential yield, maturity, seed

viability, and pest and disease resistance as most preferred factors in choice of rice seed varieties. The application of latent class analysis showed that six various classes ("majority farmers", "price sensitive", "conservationists", "sustainable farmers", "output maximisers", and "subsistence") could be distinguished. They main difference lied in their farm characteristics as well as in attitudes towards external factors (Jin et al., 2020: 1193; Mansaray et al., 2018: 9).

In the research carried out by Asrat et al. (2010) in Ethiopia local farmers showed environmental adaptability and yield stability as critical factors in their choice of crop varieties. The preference was measured using willingness to pay approach (WTP) that often used in the similar studies. Ethiopian farmers were willing to pay a premium for varieties that provided stable yield and performed well across different ecological zones (Asrat et al., 2010: 2398).

The research on Indian farmers growing post rainy sorghum revealed that they made their choice towards varieties that gave better yield, bigger grain size, and desired grain colour among seven different attributes measured in the conjoint analysis. The same study showed that farmers preferred yield, grain size, and grain shape as the major factors affecting their choice of pearl millet varieties (Basavaraj et al., 2015: 142).

Much research focused on choice of seeds made by farmers in developing countries where the adoption level of improved seeds remains low despite repeated attempts made by different organizations (Almekinders et al., 2019: 16).

The topic of improved seed adaptation among developing countries was frequently discussed in the academia. One of the recent studies carried out in South Africa (Mukarumbwa and Taruvinga, 2023: 1-15) investigated factors that affected small farmers in choice of landrace and genetically modified maize varieties. The majority of respondents preferred growing Landrace maize cultivars in the studied area over GM hybrids. However, the choice of Landrace varieties had significant negative association with rainfall amount (the more an area received rain the more a chance of a farmer to go for GM maize seed) and education (farmers with more advanced educational level with high probability preferred GM maize cultivars). The livestock number significantly and positively influenced the choice of Landrace varieties. Rainfall, household size (bigger families preferred GM crops), education, and access to cell phones (with increase of cell phone access a farmer tended to prefer GM

varieties) had positive association with the choice of GM maize planting seed. The additional employment option was significantly negative relationship with the selection of GM hybrids showing that farmers with other job positions tended to minimize their costs by planting Landrace varieties.

In the article of Sanchez-Toledano, et al. a proportional choice experiment was used to analyse preferences of farmers in one region of Mexico. The authors applied a WTP criteria as a main factor of farmers' choice of an improved maize hybrid. This study showed that Mexican maize growers preferred improved varieties to local ones to ensure higher yield, disease tolerance, and bigger ear size. It also revealed that maize farmers exhibited heterogeneity in factors affecting their preferences. Therefore, the authors distinguished between three groups: innovators, transition, and conservative farmers. Innovators favoured improved seeds and yield was the major factor for them followed the price. Through using of improved seeds, they probably believed to secure higher yield. Transition farmers put forward the yield, whereas maize ear length was relevant for conservative growers (Sánchez-Toledano, Kallas, and Gil-Roig, 2017: 7-8).

The Mexican farmers preferences towards traditional growing culture vs genetically modified maize hybrids were a subject of interest in the article which applied a latent class approach to find which farmers are likely to adopt new technology (Birol, Smale, and Yorobe, 2012: 176).

There are numerous research papers investigating farmers preferences on maize traits in Africa. In many countries of this continent maize is an essential staple food and income source for families. The topic of restrictions and preferences of farmers growing maize is contemplated in several articles (Lobulu et al., 2019: 734-745; Nyaligwa et al., 2017: 47-51; Abera et al. 2013: 1248-1250). The agronomic features (yield, resistance to diseases and pests, adaptability, ear size, etc.), economic objectives (price, market availability and distance to it, support like subsidies) as well as information distribution (extension services or dealers' efforts) are emphasized as main preference factors for farmers interviewed in these studies.

Furthermore, farmer behaviour and his/her adoption of improved maize seeds was discussed in different contexts like expansion of maize production, resistance to adaptation, influence of drought on preferences, and choice reshaping due to climate

change (Abakemal et al., 2013: 169-170; Fisher and Mazunda, 2011: 3; Fisher and Snapp, 2014: 533-534). The importance of knowing what farmers expect to see in maize seeds while developing new crop races was in the research agenda of several authors (Machida et al., 2014: 196; Sibiya et al., 2013: 32).

The popular topic for discussion of farmer preferences was the issue of genetically modified maize hybrids (Birol, Smale and Yorobe, 2012: 175; Skevas et al., 2012: 251). As might be expected, the scope of the research on farmers preferences is very broad and not limited to maize or seed in general. There are many other valuable studies that are of particular interest in terms of methodology and applied approaches to understand the external and internal incentives of agricultural producers in their choice of a particular input or a product in tractors (Cavallo et al., 2014: 49), precision farming tools (Vecchio et al., 2020: 1), rice varieties (Mansaray et al., 2018: 1-11), maize (Oyinbo et al., 2019: 12-26), tomato (Timsina, Jourdain and Shivakoti 2016: 368), and various crops (Takeshima and Nagarajan, 2015: 131).

Unfortunately, the seed market, and in particular analysis of agricultural enterprises or farmers in terms of their seed preferences in Kazakhstan was not a subject of academic interest for the scientific community. Several attempts to describe the market situation in the seed sector of maize is made by private marketing or seed companies. For instance, one German marketing company providing solutions for agribusiness companies, carried out several interviews with agricultural producers in different regions of Kazakhstan. Their open-access reports share some information on maize and sunflower seed market and used as one of references to elucidate the unresearched parts of the maize seed market in Kazakhstan (Nailkyzy, 2019).

Some overall data on Kazakhstan and country's agriculture as well as studies that review specific issues and developments in the sector that explicitly or implicitly influence the country's seed sector are derived from available academic research works. Baglan et al. (2020: 1344) analyzed certified wheat seed usage among growers in Kazakhstan. The position of Kazakhstan as one of the main grain exporters was discussed in Liefert and Liefert (2015: 27-38). However, the majority of the research papers scrutinized the issues of general and innovative development of agricultural sector in Kazakhstan (Gridneva, Kaliakparova, and Emi, 2020; Lukhmanova et al., 2019; Rustemov et al., 2018: 651; Omarkhanova et al., 2016: 1).

Feeney, Accursi and Mac Clay (2019: 499) distinguished three main attributes necessary for success in the agricultural input market, including seed: price, product performance, and supplier relationship. The research paper on maize seed attributes in the Philippines investigated five main characteristics: price, cash or credit payment, GMO vs. non-GMO hybrid, information origin, and susceptibility rate to a common pest. The study revealed two main segments among farmers concerning GMO technology or Bt maize: reluctant Bt farmers and willing Bt farmers. Furthermore, it showed that poorer and less educated farmers were more open to new technologies like Bt seed maize and willing to adapt it in their practices. The farmers in both groups preferred to receive information about their seed from the input suppliers and to have a credit option as an alternative to cash purchases (Birol, Smale, and Yorobe, 2012: 183).

Three different studies in Türkiye revealed that potential yield was the critical parameter in choice of maize seed among farmers in various areas of the country. Additionally, moisture at harvest, experience of other farmers, resistance to stalk lodging were essential attributes in maize seed choice of growers in Sakariya province (Nogay, 2019: 131-151), disease resistance, oil content, price were crucial for farmers in Thrace province (Saracoglu, 2013: 65), whereas farmers in Diyarbakir highlighted drought and disease resistance (Dikici, 2019).

According to the research carried out in Nigeria, the farmers with a high attitude toward using extension services preferred improved maize seed. At the same time, such farmers were economically strong and less risk aversive (Oyinbo et al., 2019: 21-22). Among product-related attributes of the maize seed, the Ugandan farmers evaluated plant height, plant cycle, grain size, pest and disease resistance, and drought tolerance as the most important (Ajambo et al., 2017: 183-184).

The farmers in another African country, Burkina Faso, favoured characteristics like high yield potential, early maturity, and drought tolerance in their choice of maize seed. However, Striga infestation and low soil fertility had a significant impact on that choice (Dao et al., 2015: 3-5).

The research carried out in Kenya showed that high yield was the key attribute in the choice of a maize hybrid seed, followed by early maturity, drought resistance, and high stalk quality (Rutsaert and Donovan, 2020: 498). High yield was also the primary

attribute for Mexican farmers, alongside seed price and maize ear length (Sánchez-Toledano, Kallas, and Gil-Roig, 2017: 7).

The household and farm size, yield and agro-ecological region were the main factors that had impact on seed preferences of maize growers in Tanzania. The bigger household tended to prefer improved maize seeds. Larger farmers preferred to grow improved maize varieties and potential yield was the significant factor in their seed preferences. The seed preferences of different agro-ecological zones were significantly various from each other. The authors did not reveal any significant influence of other six factors (sex, age, education, marital status, distance to market, and access to extension services) on maize seed preferences (Mutanyagwa, Isinika, and Kaliba, 2018: 59).

Kassie et al. (2017) found that maize growers in Zimbabwe preferred traits like drought tolerance the most, followed by grain yield, husk cover, cob size, and semi-flint texture. The maize growers were ready to pay more for drought-tolerant varieties with high potential yield, covered cob tip, bigger cob size, and desired kernel texture. The importance of drought tolerance in maize was also mentioned in the study of Italian farmers (Barriviera et al., 2023: 6).

Farmers' preferences and motivations for seeds were actively investigated with different research techniques from various disciplines. There were formal surveys to evaluate the variety adoption rates and related farmers' demographic characteristics, contingent valuation, conjoint analysis, auctions, and further studies using games and real money simulations, participatory breeding methods, and farmer panels. The methods were either quantitively or qualitatively oriented and could be an amalgamation of both, with a large number of research participants or few focus groups (Almekinders et al., 2019: 20-21).

3.4.Brand Loyalty in Agricultural Studies

Loyalty is one of the important attributes for businesses, including agribusiness structures. It helps organizations to keep a certain level of sales and usually requires less investment compared to attaining new clients.

The past research distinguished between three categories of loyalty:

1. Behavioural loyalty (Jacoby, Chestnut, and Fisher, 1978: 540) occurs when a customer always prefers to buy the same brand products (there farmers who stay loyal to Pioneer seed, for example and do not consider replacing this brand with other seed brand available on the market);
2. Attitudinal loyalty (Bennett and Rundle-Thiele, 2002: 194) is associated with the consumers positive attitudes towards particular products when they recommend them to others (i.e., a farmer indicates that he/she will always buy Syngenta maize seeds and recommend them to his/her neighbour growers);
3. Composite loyalty (Baldinger and Rubinson, 1996: 32) is a combination of behavioural and attitudinal loyalty. It reflects the repurchase act of a particular product with the encouragement of others to buy this product (for example, a farmer bought, buys, and will buy Limagrain sunflower seeds and recommends buying them to his/her peers).

Loyalty eventually leads to a long-term relationship between consumer and producer/seller/distributor and may strengthen the competitive advantage of a company, decrease marketing costs, and improve profitability (Boniface et al., 2010: 70). Usually, loyalty refers to a preference of particular brands (product, company) and, therefore, brand loyalty became an important research topic in the marketing area. Feeney, Harmath, and Clay (2020:47) summarized various brand loyalty concepts and brand loyalty research in the agricultural input market in their study (Table 3.2).

The research on brand loyalty of agricultural input markets is rare and mainly was carried out in the developed countries. Though, agricultural input sellers operate in the highly competitive environment that requires a strong differentiation strategy to secure and increase profitability (Gazdecki, 2018: 571). Therefore, brand loyalty delivers value to the company and becomes its strategic resource (Bisschoff and Schmulian, 2019: 85-89).

Funk (1972), Kool (1994), Harbor, Martin, and Akridge (2008), Wiese (2014), Feeney, Harmath, and Clay (2020) contributed to the literature on brand loyalty in the agribusiness environment.

Table 3.2. Definitions of Brand Loyalty

Aaker (1991)	As a measure of emotional involvement.
Dick and Basu (1994)	As a relationship between relative favourable attitude and repeated patronage.
Assael (1998)	As repeated purchase under high involvement.
Oliver (1999)	As a multidimensional concept involving cognitive, attitudinal, affective, conative and action disposition towards brands.
Oliver (1999); Bourdeau (2005); Maseshwari, Lodorfos, and Jacobsen (2014)	As a deeply held commitment to a firm/ brand.
Narayandas (2005)	Loyalty defined as increasing stages or rungs: The loyalty ladder.
Jones and Taylor (2007)	As a multidimensional concept applied to services
Harbor (2006); Harbor, Martin, and Akridge (2008)	Assessing agricultural input brand loyalty among US producers.
Moolla (2010); Moolla and Bisschoff (2012 a,b,c); Bisschoff and Moolla (2014)	Brand loyalty measurement of fast-moving consumer goods.
Bianchi, Drennan, and Proud (2014)	Brand loyalty in wines: brand trust, customer satisfaction, and brand loyalty.
Holland, Delgado, Widmar, and Gunderson (2014)	Measuring levels of brand loyalty of US large commercial producers.
Wiese (2014); Bisschoff and Wiese (2014); Hill (2018)	Measuring brand loyalty in agribusiness
Watson, Beck, Henderson, and Palmatier (2015)	As a mix of attitudes and behaviours that favours a firm relative to its competitors.
Ehsan, Warraich, and Sehribanoglu (2016)	Multidimensional brand loyalty in the context of a product.
Mohanty and Kumar (2017)	Measures farmer's satisfaction and brand loyalty toward fertilizer brands.
Bisschoff and Schmulian (2019)	Measuring brand loyalty for chicken brands.
Gajanova, Nadanyiova, and Moravcikova (2019)	Brand loyalty and customer segmentation.

Source: Adapted from Feeney, Harmath, and Clay, 2020: 47

In their article Harbor, Martin and Akridge (2008) investigated the input brand loyalty among U.S. commercial crop producers. The research focused on two product groups: expendable and capital inputs. The authors defined the brand loyalty as *"the commitment of a customer to choose to purchase a preferred branded agricultural input product or service now and in the future, despite situational changes and marketing efforts that may have the potential to cause switching."* (Harbor, Martin, and Akridge, 2008: 18). The research proposed the conceptual framework for the brand loyalty based on the analysis of the previous studies (Figure 3.5). Firstly, farm (land size, turnover, crop type, etc.) and individual farmers features (age, education) together with their beliefs and attitudes were shown to influence brand loyalty. Performance and price of products as well as media exposure influenced brand loyalty in the model.

The survey of 2100 agricultural producers in the USA aimed to measure the brand loyalty towards expandable (seed, crop protection products, fertilizers, feed, etc.) and capital (equipment) inputs. The outcomes of the research revealed that 58% of respondents assess themselves loyal to capital inputs, whereas only 39% of producers would say that they were loyal to their brand of expendable inputs.

The model in the Figure 3.5 was tested and revealed that five variables significantly and positively affect the brand loyalty of capital inputs: not finished high school education, producing maize or soybean, media exposure, perception that brands are not similar among capital inputs, and food safety regulations. The perception that all brands of capital input were same, an attitude to buy the cheapest product, and perception of the farming as a business rather than a lifestyle negatively influenced the brand loyalty among interviewed US farmers.

The loyal farmers of expendable goods valued media as information source, food safety and security, and agreed that brands performed better than generics. On the other hand, higher sales, 35-54 years old farmers, cotton production, online orders, and preference of low-priced products defined the non-loyalty among US farmers (Harbor, Martin, and Akridge, 2008: 52). The most valuable outcome of the investigation was an indication that other parameters like attitudes, beliefs, and activities of US farmers played a bigger role in the definition of loyalty rather than merely demographics.

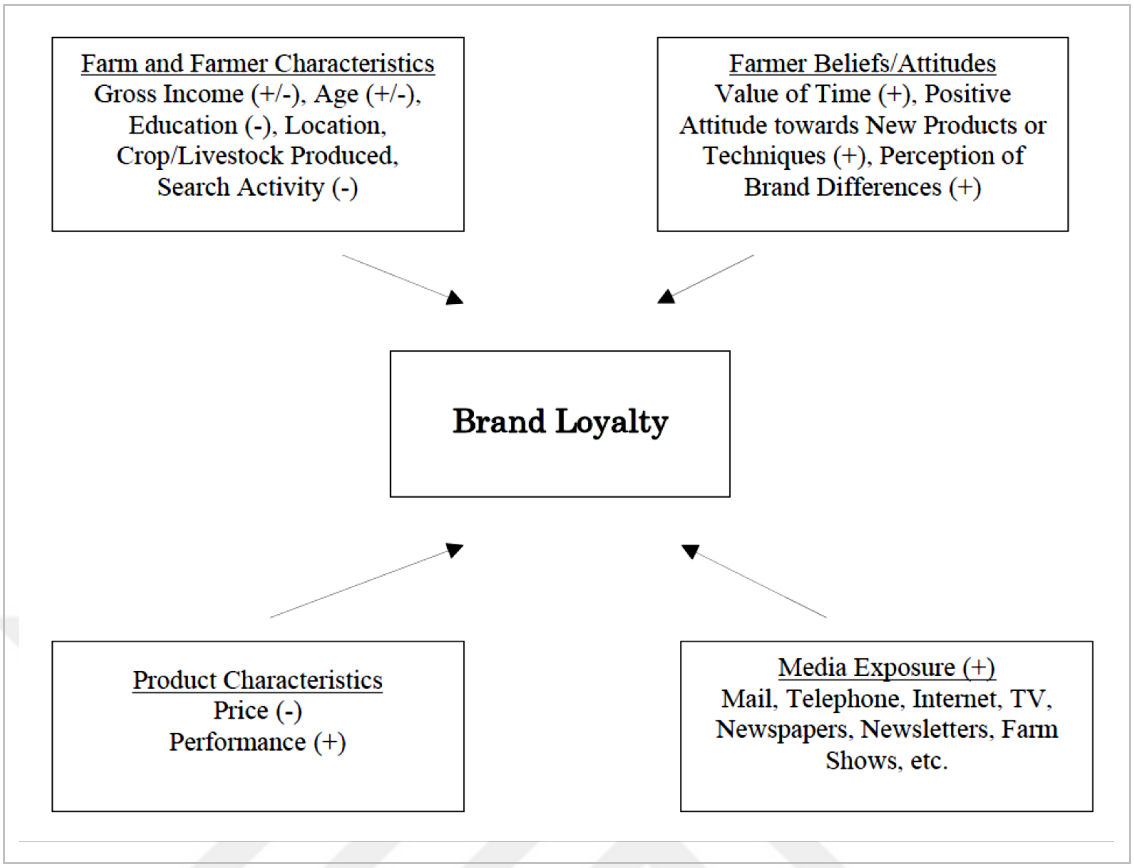

Figure III.5: Brand Loyalty Influencing Factors

Source: Adapted from Harbor, Martin, and Akridge, 2006

Argentinian researchers conducted the most recent study on loyalty towards different seed brands (Feeney, Harmath, and Clay, 2020). Their study indicated that Argentinian farmers assessed themselves more loyal (44%) than disloyal (21%) towards seed brands they used. The major indicator of loyalty was price increase when loyal producers were willing to continue to plant their current seed even if its price increased. In contrast, the disloyal farmers would change the seed brand even with a small price increase.

The weak recognition of intellectual property rights characterized the seed market in Argentina. The similar issue exists in Kazakhstan. Farmers can grow and save seeds they purchased once. Therefore, seed companies are mainly interested in sales of hybrid seeds. However, it is vital to develop sales strategies farmers accept to repeat their purchases. In their previous study, Feeney and Berardi (2013) indicated that Argentinian crop growers were more performance-oriented than US farmers. That means they valued yield the most, and, therefore, were less price sensitive. The authors

analysed 764 questionnaires received from crop producers in Argentina. The cluster analysis performed with the data revealed three groups of farmers: a loyal (44%), a pure disloyal (21%) and an intermediate (35%) cluster that showed both traits of loyal and disloyal groups. The conceptual framework of Harbor, Martin, and Akridge (2008) was applied to characterize these three groups based on 11 variables of four dimensions: farm/farmer and product features, attitudes and beliefs, and media exposure. The table 3.3 shows the results of both studies - the US and Argentine farmers.

Only age influenced brand loyalty differently, while Argentinian farmers tend to be loyal at age 44, American growers showed disloyalty at the same age. Education, farm size, and (larger) sales were negatively correlated to seed brand loyalty among both US and Argentine growers. The perception that brand perform variously positively influenced the seed brand loyalty in both countries. The study on seed brand loyalty in Argentine included other variables that were also measured like location, search activity, differentiation between media sources, etc. Their relevance to seed brand loyalty is represented in the Figure 3.6.

Table 3.3 Brand Loyalty Dimensions for Seed Between US and Argentina Producers

Dimension	Variable	Conceptual model proposed by Harbor et al. (2008)	Results for Argentine Farmer
Farm and farmers' characteristics	Sales	(+/-)	(-)
	Age	(+)	(-)
	Education	(-)	(-)
	Farm Size	(-)	(-)
	Location	(+/-)	n.a.
	Search activity	(-)	n.a.
	Residence (distance to farm)	n.a.	(-)
	% of rented land	n.a.	(+)
Farmers beliefs and attitudes	Value of time	(+)	n.a.
	Positive attitude to innovations	(+)	n.a.
	Perception of brand differences	(+)	(+)
Product characteristics	Price	(-)	(-)
	Performance	(+)	(+)
	Relationship	n.a.	(-)
Media exposure	Exposure to media sources	(+)	(+)
	Traditional media & personal comunication	n.a.	(+)

Source: Feeney, Harmath, and Clay, 2020: 53

The concept of loyalty embraces not only loyalty towards a particular product (seed), but also a vendor/ supplier loyalty. It is a part of relationship between a customer and a seller, and usually negatively influences the product brand loyalty (Feeney, Harmath, and Clay, 2020: 54). Nonetheless, it is an essential concept for the repetitive purchase and relationship marketing.

A customer can express his/her loyalty in various aspects related to the product. It can be a loyalty towards a brand (brand loyalty), either towards place where it is sold (store loyalty) or a company with its employees (vendor loyalty).

In her study Wiese (2014:15) investigated 12 dimensions or influences of brand loyalty of Moola (2010) among agricultural producers in South Africa. The study showed that customer satisfaction is the strongest factor that affects the brand loyalty among agribusiness enterprises followed by brand trust and brand performance.

Repeat purchase, involvement, perceived value, and brand relevance showed the level above defined reliability line (60%) and the author included that these factors are essential indicators of brand loyalty in the agribusiness environment. The least vital influences were culture followed by commitment, switching costs, relationship proneness, and brand affect (Wiese, 2014: 70-71).

The same 12 Moola's criteria were investigated in the study of Bisschoff and Schmulian (2019) in the context of consumers' brand loyalty to poultry products in South Africa. The research put forward brand trust, customer satisfaction, and perceived value as major important dimensions of brand loyalty. On the other hand, as in the study of Wiese (2014: 71) culture and relationship proneness did not significantly influence the brand loyalty of poultry consumers. However, in general, as both studies revealed, the Moola's method can be successfully adapted for measuring brand loyalty in the agribusiness context. However, one study of Bianchi el al. (2014) showed that brand trust did not have a direct impact on the brand loyalty and rather influences it through brand satisfaction.

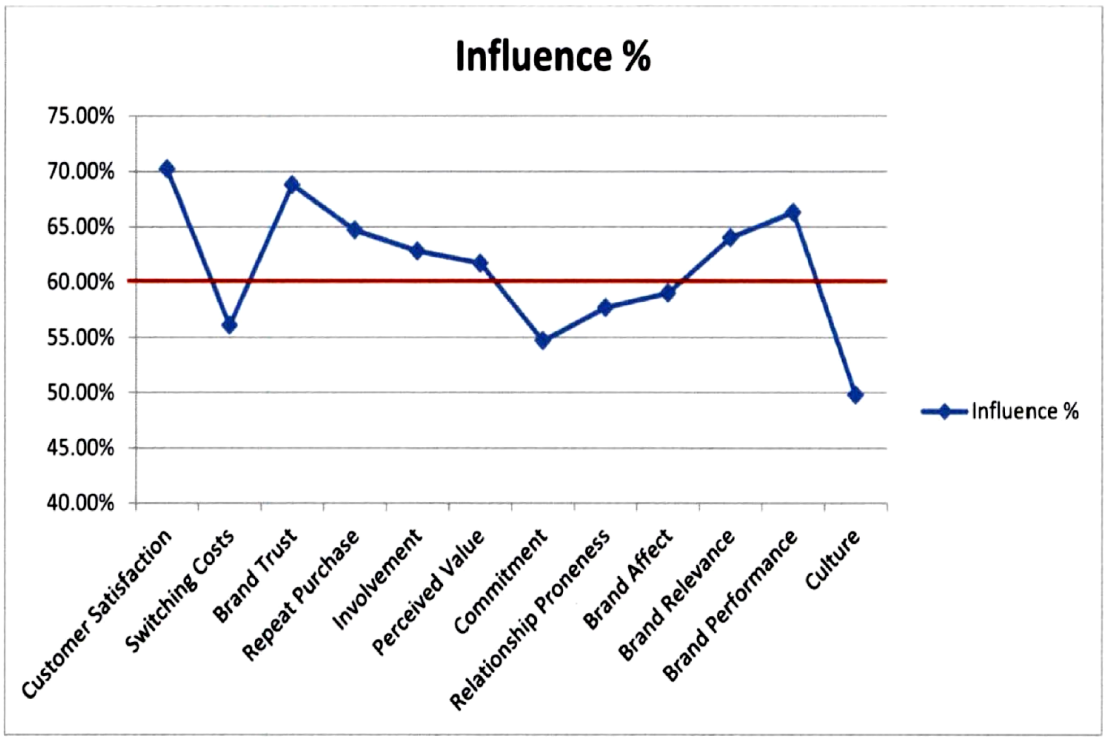

Figure III.6: Factors Affecting Brand Loyalty Among Agribusiness in South Africa

Source: Wiese, 2014: 71

Another study on loyalty of US farmers to agricultural input suppliers was carried out by Holland et al. (2014). In the study the authors measured customer loyalty using the Loyalty Ladder of Narayandas (2005: 137) represented in the Figure 3.7.

The model is mainly applied in B2B relationships and describes different levels of loyalty. The analysis among US farmers revealed that a significant correlation was between various loyalty levels towards seed brands and factors like farm size, gross income, custom fertilizer services hired, and spouse respondent. For instance, the more the farmer tended to use hired custom fertilizer services, the more loyal they would be to their seed products. In contrast, using hired custom harvesting services and higher education negatively influence the seed brand loyalty among respondents. The same was revealed for crop protection products, fertilizers, and capital inputs (Holland et al., 2014).

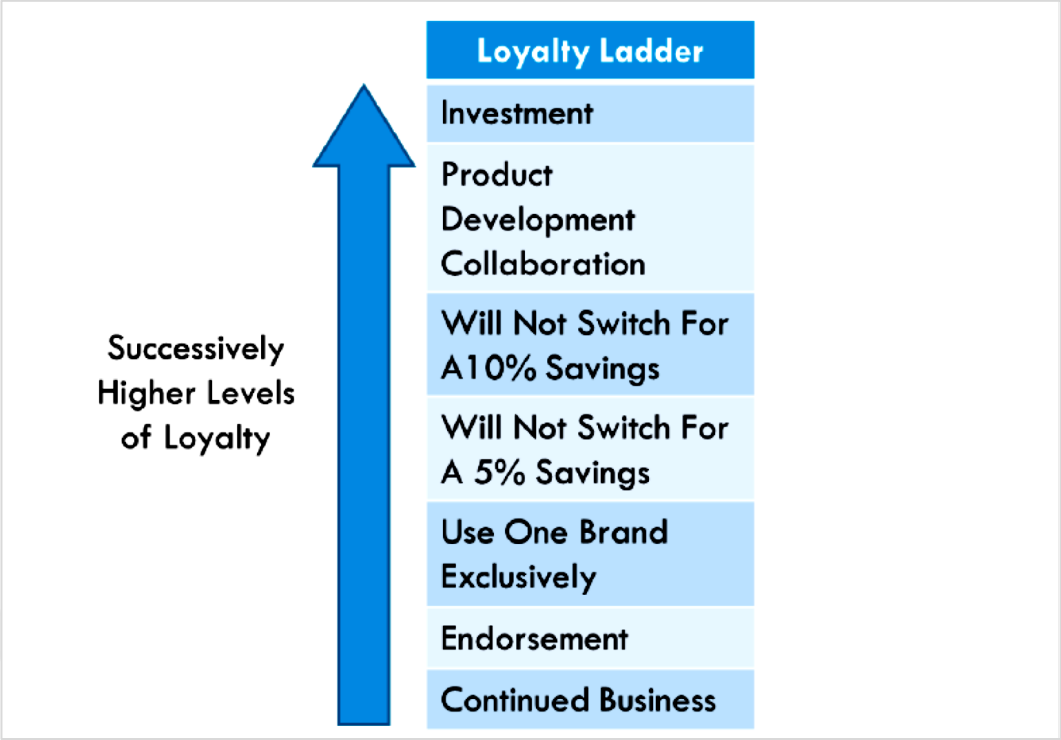

Figure III.7. The Loyalty Ladder of Narayandas

Source: Holland et al., 2014

The desire to identify consumers with different brand loyalty levels defined the focus of loyalty studies towards customers' segmentation according to their loyalty types. For instance, Gajanova et al. (2019: 76-80) tried to differentiate between more and less brand loyal customers based on their demographic and psychographic characteristics. In the agribusiness context Harbor, Martin , and Akridge (2008) investigated factors affecting brand loyalty to agricultural input products applying some ideas of marketing segmentation. They understand brand loyalty as 'the commitment of a customer to choose to purchase a preferred branded agricultural input product or service now and in the future, despite situational changes and marketing efforts that may have the potential to cause switching' (Harbor, Martin , and Akridge, 2008: 53). The study of Borchers et al. (2012) showed that different types of agricultural producers were differently loyal to their seed, crop protection, and capital equipment products. They distinguished between balance-oriented, price-oriented, performance-oriented, and convenience-oriented farmers. Another study on loyalty of Mohanty et al. (2017) tested the relationship between brand satisfaction and brand loyalty to fertilizers in

India. Perceived quality, expectations, perceived value, and the firm's image were major features that impacted farmers' satisfaction to used fertilizer brands.

Few researchers investigated specifically brand loyalty towards maize hybrids. In India it was found that farmers in Guntur District of Andhra Pradesh expressed their wish to reputedly buy the specific brands despite their price (Kowsalya et al., 2022: 276-277). The mixture of behavioural and attitudinal factors affecting brand loyalty was used by the research of brand loyalty in Chiapas, Mexico. This research revealed that Mexican maize growers expressed a high brand loyalty towards brands of multinational companies, especially Pioneer. The study also investigated the impact of brand loyalty towards hybrids of multinational companies on perceived value of hybrids produced by national organizations and this relationship was negative making it difficult for later to be widely adapted by domestic farmers (Mendez, 2022).

3.5.Brand Loyalty and Purchase Intention

The challenges in measuring the actual buying resulted in using of the "purchase intention" construct. Purchase intention does not always transform into actual buying, but it is one of its most precise predictors. The strong purchase intention is expected to reflect strong will to buy a product (Dodds et al., 1991: 315).

According to Spears , and Singh (2004: 56): "purchase intentions are an individual's conscious plan to make an effort to purchase a brand." Several studies revealed either direct or mediating impact of brand loyalty on purchase intention. Yoo and Donthu (2002: 393) suggested that brand loyalty affects consumer's decision to buy a particular product and hinder switching to other brands. Brand-loyal consumers impulsively purchase the product based on their previous experiences. Therefore, brand loyalty positively influences purchase intention (Malik et al., 2013: 170; Danish et al., 2020: 360) and motivates potential buyers to make repurchases (Ahmad et al., 2016: 95).

Malik et al. (2013: 170) had indeed found a strong association between brand loyalty and purchase intention. In their survey of clothing customers brand loyalty and brand awareness predicted purchase intention in 92%. The coefficient of brand loyalty (0.56) was higher than of brand awareness (0.12.) indicating that one unit change in brand loyalty would cause greater shift in purchase intention.

The study of Ahmad et al. (2016) showed that there is a positive impact of brand loyalty on repurchase intention of customers of 5 agricultural products in Pakistan. The study measured the direct relationship between loyalty and repurchase intention. It further expanded the research by exploring brand loyalty as a mediating factor between brand awareness, brand image, fair price, perceived quality, and repurchase intention.

Another study in Pakistan was carried out in the field of Halal milk product. The authors tested brand perceived quality's influence on four branding constructs like brand image, satisfaction, trust and loyalty, and purchase intention. The study observed the significantly positive impact of perceived brand quality on all 5 mentioned constructs. In the same time brand image, brand satisfaction, brand trust, and brand loyalty significantly influenced brand purchase intention. Thus, this study also found a significant and positive affect of brand loyalty on purchase intention (Ali et al., 2018).

The survey performed among car users towards automobile brands revealed the strong positive association between brand loyalty and purchase intention too (Danish et al., 2020: 360). The study carried out in the context of mobile phone brands used a model with integrative relationship between brand loyalty, brand engagement, overall brand equity, and purchase intention. In this model the relationship between brand loyalty and purchase intention was mediated by overall brand equity. Moreover, brand loyalty was itself a mediator between brand engagement and purchase intention (Goyal and Verma, 2022: 1).

Hanzaee and Andervazh (2012: 5395) conducted the survey among female respondents on the cosmetic products in Iran. They did not directly test the relationship between brand loyalty and purchase intention, but the effect of brand loyalty constructs like product quality, promotion, price, design, brand name, store environment, and service quality on the later. The study found that there was a positive relationship between all seven factors of brand loyalty and purchase intention.

Summarizing literature on relationship between brand loyalty and purchase intention, one can conclude that former is a significant predictor of the later. So, higher brand loyalty will reflect in higher purchase intention towards selected brand. However, no

study was found that illustrated the association between two constructs on agricultural seed market or among farmers.

CHAPTER IV
RESEARCH FRAMEWORK

The main aim of this study was to determine seed preferences and the key attributes in maize seed choice among Kazakhstani farmers. The various research papers discussed in the third chapter concentrated on different attributes and factors affecting the farmer's choice. These past studies directed the current study through their methodology and defining the distinct research topics.

4.1.Study Focuses and Hypotheses

The academic research on Kazakhstani farmers was scarce. Therefore, one of the study aims was to collect general information about maize growers in the study area. It was important to collect the primary data and discuss the demographic and socio-economic characteristics of a Kazakhstani maize grower.

Furthermore, the study aimed to investigate the maize seed market, farmers' seed preferences towards existing hybrids in Kazakhstan. In this sense, the study attempted to understand why farmers prefer their maize seeds? Do different farmers show contracting preferences in their seed choice and which factors affecting such differences, if any? What do they expect from their seeds to be ready to buy this product continuously?

The next aspect of interest included the comparison of farmers' preferences between Kazakhstan and other countries. How did current development of farming and farmers reflect on their seed preferences and make them different from other parts of the world?

Additionally, the current study investigated the brand loyalty concept among maize growers in Kazakhstan. Does the concept exist among maize growers in Kazakhstan and what influences its development? Which seeds are widely used among maize growers in Kazakhstan and why?

4.1.1. Farmers' Seed Preferences

The desire to get the maximum yield and quality from the chosen maize hybrid together with increasing demand on agricultural products and environmental pressure in the world strongly affect farmers' preferences in maize seed (Abera et al., 2013:

1248; Lobulu et al., 2019: 738). Seed preferences play an essential role in the seed choice. Simply speaking, a farmer needs to like what he/she buys. This "liking" occurs due to the farmer's personal experience and marketing efforts undertaken by seed sellers and originators. There are cases when the geopolitical situation like pandemic, wars and regional conflicts, bans, and natural disaster impacts farmers' seed preferences. Therefore, the antecedents of seed preferences may vary and affect the seed choice individually or collectively.

The maize seed market in Kazakhstan offers farmers various products. Some growers plant affordable seeds and are satisfied with their performance. On the other hand, other producers cultivate imported maize hybrids that, according to their opinion, overperform affordable segment either by yield or by other characteristics. The Kazakh maize seed market is heterogeneous and, therefore, the aim of this study was to comprehend and analyse this different groups.

The respondents were divided into two segments:

1. Farmers who grew local, Russian, Ukrainian, Moldavian, and similar hybrids had significantly lower prices compared to the second group. The seeds in this segment were called budget seeds,
2. Growers who preferred western maize seed and paid significantly higher price for their choice. The seeds in this group consist of maize hybrids owned and sold by multinational and regional European organizations. They were called as premium seeds.

Then, two groups were investigated in terms of their demographic and socio-economic differences. Moreover, several hypotheses were suggested, and an appropriate analysis was carried out.

According to the model (Figure 4.1) the following hypotheses were proposed:

H1a: Farm size influences the decision of a farmer for seed. So, there is a significant relationship between seed type and farm size.

H1b: Maize overall share in the total farmer's income influences his/her seed choice. Therefore, maize importance will impact the seed type bought by farmers.

H1c: There is a significant relationship between seed type and technological advance coefficient.

H1d: There is a significant relationship between seed type and yield.

H1e: There is a significant relationship between seed type and yield perception by farmers.

H1f: There is a significant relationship between seed type and seed quality.

H1g: There is a significant relationship between seed type and seed price satisfaction.

H1h: There is a significant relationship between seed type and trust towards seed supplier.

H1i: There is a significant relationship between seed type and supplier loyalty.

H1j: There is a significant relationship between seed type and supplier competence.

H1k: There is a significant relationship between seed type and purchase intention.

H1l: There is a significant relationship between seed type and opinion of other farmers.

The conceptual model of the research on seed preference is pictured in the Figure 4.1. The model suggests that farmer and farm characteristics, farmers' beliefs, seed quality, price, other farmers, relationship with seed suppliers influence seed choice between budget and premium maize hybrids.

Figure IV.1: Conceptual Model of Seed Preferences

4.1.2. Brand Loyalty

The concept of brand loyalty was widely investigated in the marketing literature, but not specifically in agriculture or seed. Most of the studies focused on brand loyalty of agricultural growers was carried out in the past century and mainly in the developed countries. Based on one of the recent research papers in this field carried out in the US (Harbor, Martin, and Akridge, 2008) the conceptual model for measuring of brand loyalty towards maize seeds in Kazakhstan was designed and tested (Figure 4.2). The model was used as a benchmark for later study of seed brand loyalty among Argentina farmers (Feeney, Harmath, and Clay, 2020: 48).

Though the model does not include all aspects of brand loyalty, it focuses on many antecedents and factors assisting farmers in forming of loyalty towards a particular brand.

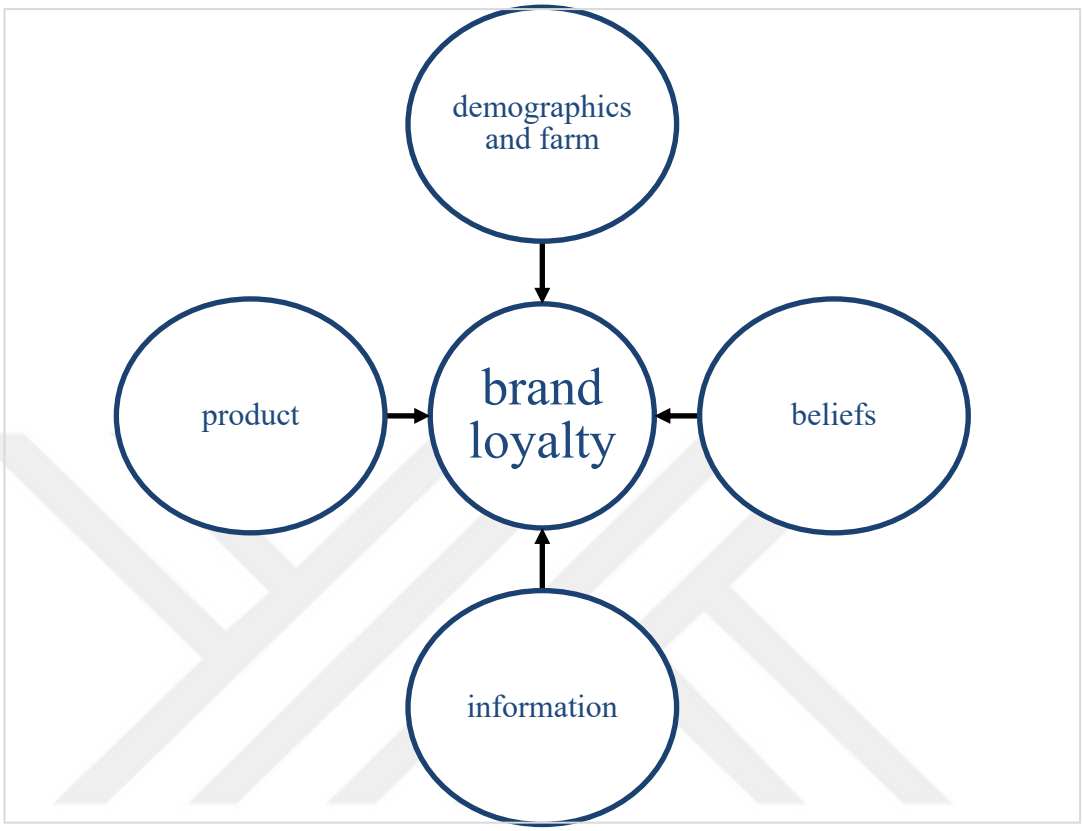

Figure IV.2: Conceptual Model of Seed Brand Loyalty

Demographics or farmer characteristics included parameters like age, education, and farmer's experience in maize growing. Farm considered factors like overall sales size, a share of maize sales in the total agricultural business of a farm, maize growing area, and technical advancement. According to the previous studies of Funk and Vincent (1978) age has a positive correlation with a brand loyalty towards expendable input. On the other hand, Harbor, Martin and Akridge (2008: 29) found that only the group of farmers in the rage between 35 and 54 years old expressed a significantly negative relationship with expendable input brand loyalty. However, other age groups did not show any impact on loyalty. The findings on Argentinian farmers show a negative relationship between age and seed brand loyalty. The younger the farmer the more loyal he/she was. The US as well as Argentinian farmers expressed an inverse correlation, when more educated growers were less loyal to their expendable input

brand products (Funk and Vincent, 1978; Harbor, Martin and Akridge., 2008; Feeney, Harmath, and Clay, 2020). Feeney, Harmath, and Clay (2020: 51) suggested that more educated farmers tended to analyse more information about available products on the market, and therefore, they were less loyal. Gross income or sales depending on their size had heterogeneous relationship with brand loyalty. For example, Harbor, Martin and Akridge (2006) revealed the threshold of one million dollars. The income below this level had positively influenced brand loyalty, whereas higher sales showed negative association with loyalty to expendable input. In Argentina, growers with higher sales showed disloyalty to seed brands more often than those who earned less. Therefore, the relationship between income and seed brand loyalty was negative (Feeney, Harmath, and Clay, 2020: 53). Though income and land size are usually positively correlated, the yield among Kazakhstani farms varied very high. Therefore, the land size was also included in the model (Figure 4.3).

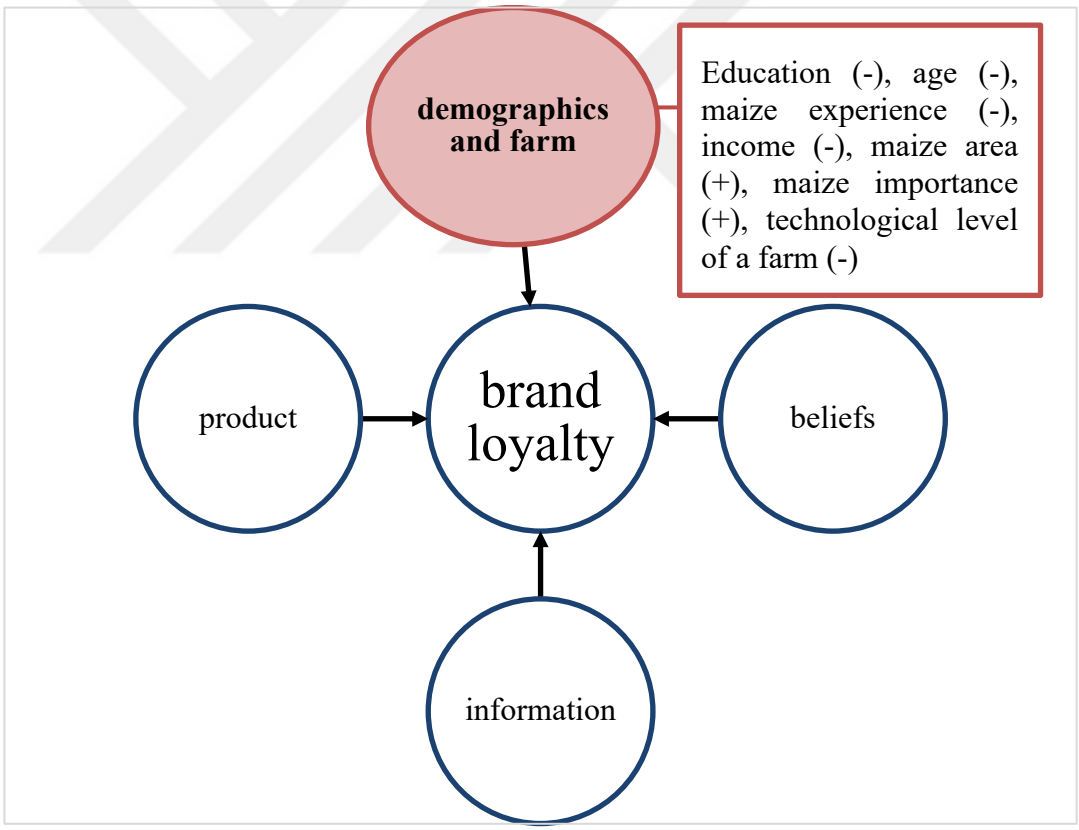

Figure IV.3: Farm and Farmer Characteristics

Additionally, in Kazakhstan many farmers operate with different crops and may have livestock production in their business structure. In this case, the importance of maize

in the total agribusiness may have a positive association with maize seed brand loyalty. Moreover, it was hypothesized that farmer's experience in maize growing will make him/her less loyal to seed brand products. On the top of that, Kazakhstani farmers have various technological levels, i.e., some farmers still do not apply micronutrients on maize or had limited access to watering. Therefore, the research model in this study considered technological advancement having negative impact on seed brand loyalty. The farmers who use all possible technological developments were expected to be less loyal to seed brand products.

Product characteristics such as yield, quality, and price (premium seed) were also included in the model. The perceived yield and quality concepts were a part of the product part of the model (Figure 4.4).

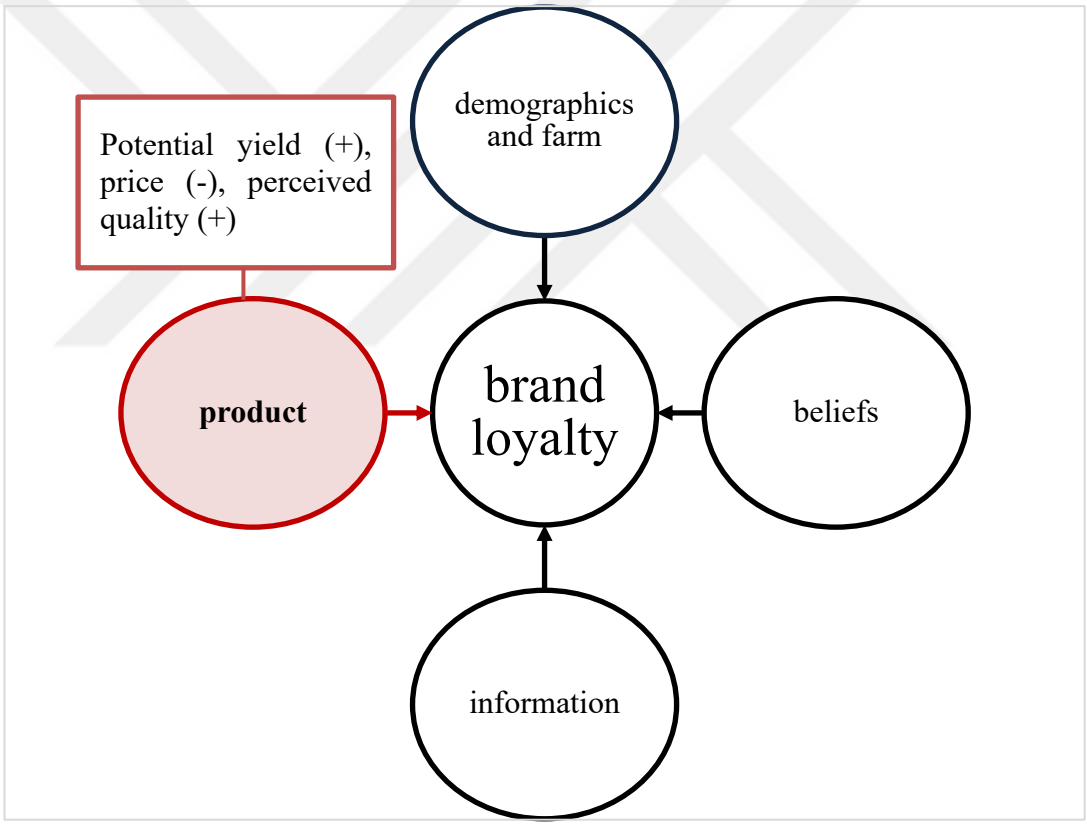

Figure IV.4: Products Characteristics

Indirect factors like individual perceptions and attitudes were found to influence the brand loyalty. The believe that maize seed brands are the same, that purchasing inputs is time consuming, attitudes towards innovations and new products as well as supplier loyalty form beliefs and attitudes implied in the model.

The next pillar of brand loyalty in this research relates to way a farmer is exposed to information about seed brand. It is another farmer's opinion or experience that may influence the brand decision and seed choice of the farmer. From the other side, there are more classic (journal, newspapers, etc.) and internet-based (social media, website, etc.) information sources. So, their correlation with brand loyalty was measured too.

The information received through different channels contributes to the development of new knowledge and determines later farmer's purchase decisions. The study examines the role of different information sources in maize seed brand loyalty.

The information received through different channels contributes to the development of new knowledge and determines later farmer's purchase decisions. The study examines the role of different information sources in seed brand loyalty. In particular, it is aimed to analyse if any relation exists between different information sources (traditional media, social media and internet, and influence of other farmers) and seed brand loyalty or purchase intention (Figure 4.5).

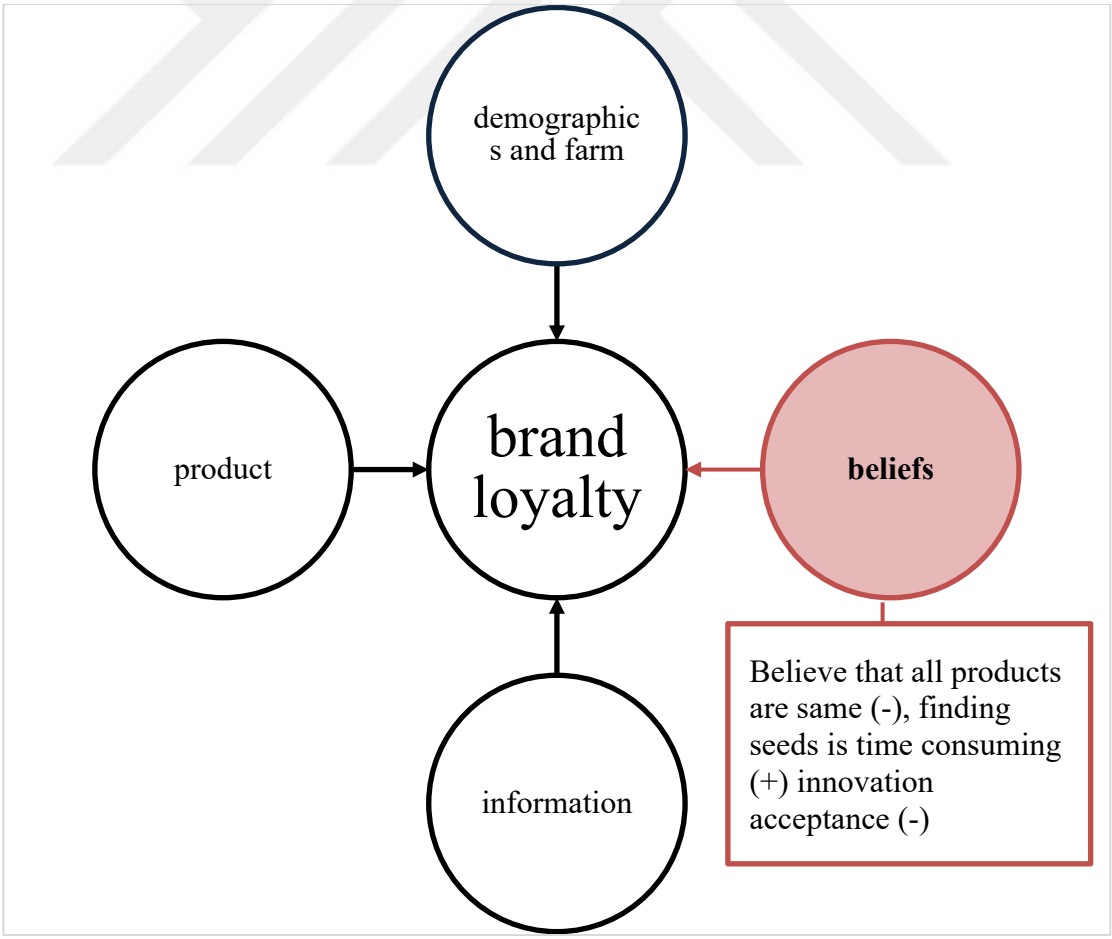

Figure IV.5: Beliefs of Farmers

Some of information sources may increase brand loyalty, while others can weaken its influence. Usually, that happens when the source of information is another farmer that has experienced in growing of a particular product. The progressive maize growers with strong reputation have a critical role in forming of brand loyalty (Figure 4.6).

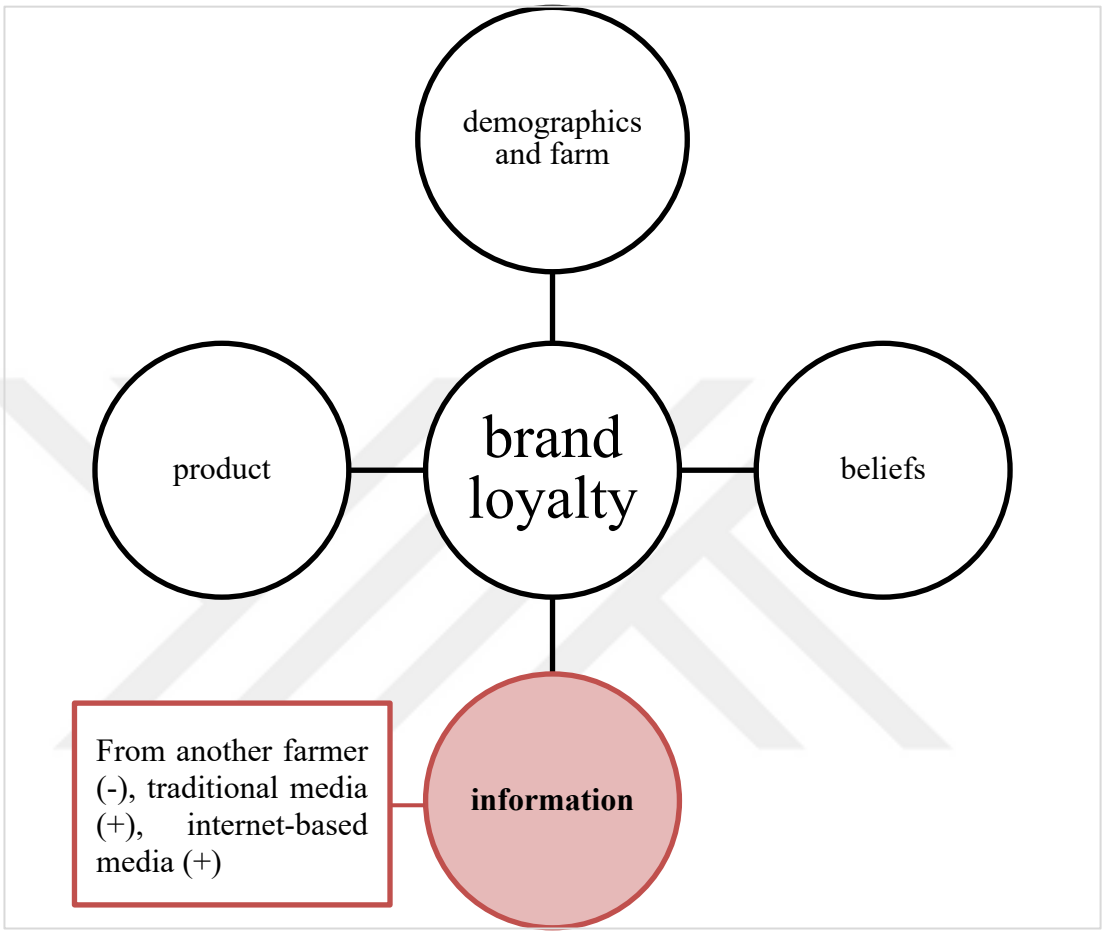

Figure IV.6: Brand Loyalty and Information

Noticeably, seed brand loyalty among maize growers is influenced by various factors with a different amplitude and direction. These factors regulate the seed choice of agricultural producers. They also contribute to their brand loyalty. This thesis will show how these parameters influenced seed brand loyalty of maize growers in southern Kazakhstan.

Based on the research carried out for the topic (Feeney, Accursi, and Mac Clay, 2019; Harbor, Martin, and Akridge, 2006), the following hypotheses are suggested (Table 4.1):

Table 4.1: Brand Loyalty Hypotheses

Hypothesis	Definition	Expected relationship
$H2_a$	The higher education will negatively influence brand loyalty	Negative
$H2_b$	The older the farmer the less loyal he is	Negative
$H2_c$	The longer maize experience is the less loyal a farmer is	Negative
$H2_d$	Higher income will be associated with lower brand loyalty	Negative
$H2_e$	The bigger the maize area is the more loyal is a farmer	Positive
$H2_f$	The more important is maize in the total agricultural production the more loyal a farmer is	Positive
$H2_g$	The more advanced a farmer is the less loyal he is	Negative
$H2_h$	The higher the potential yield the more loyal a farmer is	Positive
H2i	Using of premium seed has a positive effect in loyalty	Positive
$H2_j$	The higher farmer's perception of seed quality the more loyal he is	Positive
$H2_k$	The higher is the belief that all brands are same the less loyal a farmer is	Negative
$H2_l$	The higher is the belief that finding seeds is time consuming, the more loyal a farmer is	Positive
$H2_m$	The higher is the acceptance of new products the less loyal a farmer is	Negative
$H2_n$	The more often a farmer relies on other farmers' opinion the less loyal he is	Negative
$H2_o$	The more often a farmer relies on classic media the more loyal he is	Positive
$H2_p$	The more often a farmer uses an internet-based media, the more loyal he is	Positive

4.1.3. Brand Loyalty and Purchase Intention

Purchase intention is an abstract that can be applied in measurement of consumers' attitude, desire, or tendency to buy a product. It is expected that higher level of purchase intention leads to higher probability of actual purchasing. In other words, the stronger the purchase intention, the more a consumer wants to acquire a product. Several constructs are often used to define purchase intention that indicate the nearest intention to purchase a product.

Based on the previous studies on interaction between brand loyalty and purchase intention, the following hypothesis is tested:

H3: There is a positive direct relationship between brand loyalty and maize seed purchase intention.

The final model of the thesis is illustrated on Figure 4.7.

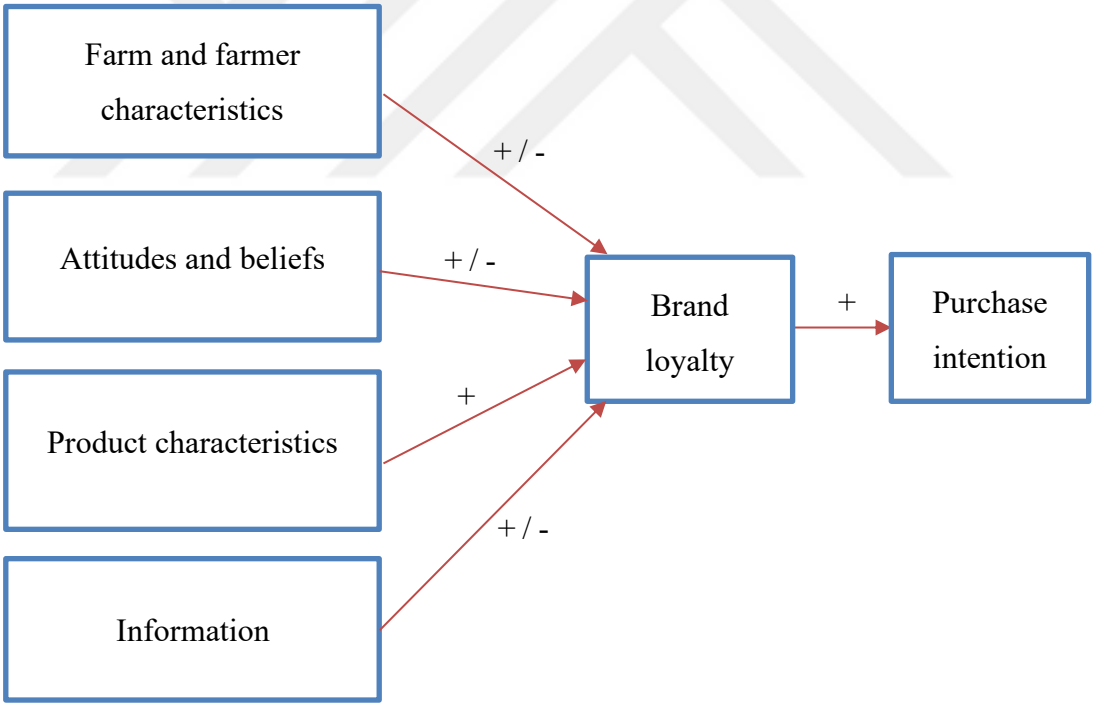

Figure IV.7: Conceptual Model for Brand Loyalty-Purchase Intention Interaction

In the following chapter the influence of these factors on seed brand loyalty among maize growers in Kazakhstan will be investigated and discussed.

4.2. Material and Methods

The cross-sectional data from the structured questionnaire distributed between maize producers in Kazakhstan formed the research. The multistage sampling design method was employed while choosing farmers. The major maize growing areas were included in the study to embrace as many places as possible. To increase the precision and value of the study both formal and informal approaches were used while collecting data. Before visiting Kazakhstan, agricultural departments of different regional government offices were contacted to receive a list of maize growers in their regions. Moreover, the questionnaire with detailed instructions was sent to several officials as well as maize seed dealers who could distribute it in their WhatsApp groups or fax to subdivisions in villages. However, very few filled questionnaires were received from these sources. As survey via mail or phone was expected to have no return, the physical visit of farmers was considered as the best option to collect data (Figure 4.8).

Figure IV.8: With the Farmer in Almaty Region

4.2.1. Study Area

The questionnaire was conducted in three southern regions of Kazakhstan: Almaty[2], Zhambyl, and Turkistan[3] (former South-Kazakhstan region) between July and November 2021 (Figure 4.9).

These three regions contribute 70% of the total gross output of maize grain in Kazakhstan. The questionnaire was prepared in two languages spoken in Kazakhstan – Kazakh and Russian.

Due to the broad distribution of maize farmers in the country, long distances between villages, and the pandemic that enabled collective gatherings, the respondents were visited in their fields, offices, or homes. One interview lasted about one hour on average. In total, 121 maize growers agreed to complete the questionnaire.

Figure IV.9: Research Area (Three Regions in the South Kazakhstan)
Source: Astana Times, 2022

[2] In 2022 Almaty region was reorganized and divided in two regions: Almaty and Zhetysu. In this study Almaty region means the territorial area before separation.

[3] Former South-Kazakhstan region without Shymkent city

4.2.2. Survey Structure

The questionnaire consisted of several parts. The first part covered general information about farmers (age, education, maize experience), farm data (size, location, maize area, and importance, etc.), and farm management (seed use, input use, sales).

The second part included a list of 18 attributes/ factors that defined farmers' preferences for maize seed. The farmers must choose the most relevant five of them. These attributes were derived from different preference research papers (Table 4.2) and preliminary dialogues with farmers and seed sellers in Kazakhstan.

Table 4.2: Reference studies for questions in the survey

	Attribute name	Reference studies
1	Supplier reputation	Batt, 2001: 81
2	The opinion of other farmers	Nogay, 2019: 131-151
3	Potential yield	Ajambo et al., 2017: 185
4	Complete solution /All in one buying (seed + CPP + fertilizers)	Sánchez-Toledano, Kallas, and Gil-Roig, 2017: 7-10
5	Resistance to drought and salinity, high response to fertilizers	Dao et al. 2015: 2-6, Ajambo et al., 2017: 183
6	Price and payment terms	Birol, Smale, and Yorobe, 2012
7	Relationship to supplier or salesperson	Oyinbo et al. 2019: 19-22
8	Seed quality (purity, germination)	Timsina, Jourdain, and Shivakoti, 2016: 368
9	Competence and professionalism of the supplier and his employees	Oyinbo et al. 2019: 19-22
10	Your positive experiences with the hybrid in years past	Sánchez-Toledano, Kallas, and Gil-Roig, 2017: 7-10
11	Brand	Mendez, 2022
12	Country of origin	Ehmke, Lusk, and Tyner (2008): 280
13	Seed production year	Sánchez-Toledano, Kallas, and Gil-Roig, 2017: 7-10
14	Kernel size	Dao et al. 2015: 2-6
15	Social media	Lee, 2020: 98
16	Seed availability at the time of sowing	Ajambo et al., 2017: 182
17	Maturity duration	Rutsaert and Donovan, 2020: 499
18	Drying speed	Nogay, 2019: 131-151

The attributes referred to product characteristics, economic factors, relationship with a seller or supplier company, macroeconomic regulations, brand preferences, and influence of other farmers.

The next part of the questionnaire asked for attitudes while seed choice process; beliefs; maize seed brand loyalty; supplier loyalty, trust, using of different information sources in seed purchase decision and some other questions relevant to this study.

The respondents were divided into two major groups: premium seed and budget seed growers. The premium seed users planted seeds originated from multinational or international breeding companies (Bayer-Monsanto, Corteva-Pioneer, Syngenta, Limagrain, and Semillas Fito), whereas budget seed growers used seeds produced by Kazakhstani, Russian, Ukrainian, Moldavian, Serbian, and similar public, or private organizations. Both seed types were broadly marketed in Kazakhstan, and usually, the premium seed had a significantly higher price compared to the budget seed.

4.2.3. Methods

The demographic and socio-economic data of respondents were analysed using statistical instruments where frequency showed the distribution of the farmers by region, age, education, land area, maize yield, experience, etc. Data were analysed with SPSS 28. The statistical significance was assessed at $\alpha = 0.05$. Descriptive statistics (Chi-square association tests, independent sample t-tests, and one-way analysis of variance (ANOVA)) were applied to test hypotheses and compare hybrid attributes and consumer profiles.

Following the conceptual model of seed brand loyalty discussed in the chapter 4 the descriptive data analysis was conducted, and the binomial logistic regression analysis was applied. The survey included statements concerning attitudes and beliefs of respondents towards their used seed maize brand products. Maize growers responded to these statements using a 5-point Likert scale and indicated that they: 1) strongly disagreed, 2) disagreed, 3) neither disagreed nor agreed (undecided), 4) agreed, or 5) strongly agreed with each statement. Responses to each statement represent a discrete variable with five response categories. Moreover, for the questions that reflected information sources farmers must choose one of the following options on a 5-point Likert scale: 1) never, 2) rarely, 3) sometimes, 4) often, and 5) always.

Responses to the brand, loyalty, and other statements are collapsed into two categories. Strongly agree and agree or often and always responses are treated as one response. Strongly disagreeing, disagreeing, and neither agreeing nor disagreeing (never, rarely, sometimes) comprise the second category. This classification allows for a dependent variable with **two discrete response categories: yes or no, 0 or 1, good or bad**. The **binomial logistic model (BLM)** is ideal for estimating and testing hypothesized relationships of this study. The logistic regression is a suitable tool to analyse categorical responses variables and to predict the probability of their levels. Among two levels of response in BLM one is considered as the level of interest. Every dependent variable depicted by two possible variants has its separate models. The later can be represented as follows:

1. Any chosen dependent variable consists of J categories with the running index j=0,….,J
2. p (y_i=j) is the probability that a separate i falls into the class j.
3. The model is then

$$p\ (y_i = j) = \frac{e^{\beta jxi}}{1 + \sum_{k=1}^{J} e^{\beta kxi}}$$

For j=1,2,3, …., J

4. $p\ (y = 0) = \frac{1}{1+\sum_{k=1}^{J} e^{\beta kxi}}$

where x_i is a column vector of variables depicting separate i;

β_g is a row vector of coefficients for category j (Harbor, Martin and Akridge, 2006).

Each category is compared with the lowest category. By using differentiation, one can determine the marginal effects (change in Pj with respect to a change in xi) as follows:

$$\frac{\partial P_j}{\partial x_i} = P_j(\beta_j - \sum_{k=o}^{J} P_k\beta_{k)} = P_j\ \ (\beta_j - \ \beta).$$

Dependent variable

The brand loyalty was measured by one question: “I am loyal to my maize seed brand” with answers ranging from 1 – strongly disagree and 5 – strongly agree.

Explanatory variables

The explanatory variable **AGE** was divided into two categories with 1 if a respondent was younger than 45 and 0 otherwise. Age was defined with one item and divided in four groups: 1) below 30, 2) 31-45 years old, 3) 46-60 years old, and 4) more than 60 years old. In the survey, predominantly male participants were interviewed. Therefore, the gender difference was not evaluated.

Education information identified by one question was divided in 4 answers: 1) only school 9 or 11 years, 2) technical college, 3) university degree, and 4) MSc and higher. However, few respondents attained MSc or higher were few and 2nd and 4th groups were combined as university and higher.

The variable education had 3 levels:

1) **EDU1** was chosen as 1 if farmers completed high school, and 0 otherwise;
2) **EDU2** with 1 if respondents completed special technical education, and 0 otherwise;
3) **EDU3** with 1 if a grower attended university or higher, and 0 otherwise.

The single item measured the income, and four groups were identified: 1 being less than 5 mio KZT, 2 - 5-20 mio KZT, 3 - 21-50 mio KZT, 4 - more than 50 mio KZT (1 USD=420 KZT). The growers with the annual total turnover (sales, income) of 50000 USD and more comprised the first **SALES** category (1), whereas the second “0” category included farmers with income below 50000 USD/year.

Growers’ experience with maize growing (**MAIZEEXP50plus**) was divided into 1 with respondents having more than 10 years of experience, and 0 if less.

The respondents with more than 50 ha of total maize (**MAIZEAREA**) were considered as the first group (1), whereas smaller farms were in the second discrete group (0).

If respondents received 80% and more of their income from maize cultivation (**MAIZEIMP**), they were included in the first category (1). Otherwise, they comprised the second category (0).

The farmers with high tech coefficient (**TECHCOFF**) were related to the first group (1), whereas those with lower coefficient belonged to the second group (0).

The model included following categories of farmer beliefs and attributes variables:

- **EXPSAME**, farmer belief that maize seed brands are similar. 1 if believed that maize seed brands are more or less the same; =0 otherwise
- **TIMECONS**, time conscious maize growers. 1 if believed that purchasing inputs is time consuming; =0 otherwise
- **FIRSTADOPT**, first adopters. 1 if very first or among first to try new products; =0 otherwise

Product characteristics

- **SUPLOYALTY** =1 if loyal to a supplier; =0 otherwise
- **PRICE** =1 if bought premium seed; =0 otherwise
- Performance **YIELD** =1 if more than 80 tons/ha; =0 otherwise
- **PERQUALITY** =1 if agrees that has high quality; =0 otherwise

Perception of premium seeds as having higher yield and quality was measured using four items adapted from James et al. (2019: 208). The higher the average value, the greater is the perception that premium seeds deliver higher yields and have better quality.

Maize growers in Kazakhstan use informal (other farmers) as well as formal (media) information sources to receive data about their maize seed. Therefore, the model included two variables:

1) **OTHERFARMERS**, with information received from other farmers, 1=always, 0=otherwise
2) **MEDIAINDEX**, summing responses for the nine media sources and then dividing by the highest possible sum (45). The information source parameter measures various sources of information farmers used when buying maize seeds on a five-point Likert scale with 1 as “never” and 5 as “always” (Appendix 1). Higher average values of this parameter show increasing role of an information source in farmers’ purchase behaviour.

The statistical analyses were carried out using IBM SPSS 28 software, with a 5% margin of error.

Brand loyalty-purchase intention

For the measurement of proposed interaction between brand loyalty and purchase intention a linear multivariate regression model was applied, whereas farmers' purchase intention of premium seeds was a dependent factor.

Purchase intentions of premium maize seeds were measured using three items adapted from organic food research (James et al., 2019: 208; Thøgersen and Zhou, 2012: 320) on a five-point Likert scale with 1 as "strongly disagree" and 5 as "strongly agree" (Appendix 1). The higher average indicates greater purchase intention.

The factor analysis was applied to indicate the relationship.

Factor analysis is a statistical method used to understand the underlying structure among a set of observed variables. Its primary goal is to identify underlying factors, or latent variables, that explain patterns of correlations within a dataset. It's a dimensionality reduction technique that aims to simplify data by reducing a large number of variables into a smaller set of underlying factors.

CHAPTER V
RESULTS AND DISCUSSION

In this Chapter the detailed results of the study will be highlighted and discussed. According the to the questionnaire results 121 farmers interviewed in this study cultivated maize on 14413 ha. In 2021 there were 302.7 thousand hectares of maize planted in Kazakhstan. That means the current study covered almost 5% of the total maize area in the country.

5.1.Socio-Demographic Analysis of the Interviewed Farmers

The analysis of the survey data showed that the vast majority of respondents were from Almaty region, followed by the farmers from Turkestan and Zhambyl regions. Almaty region is the leading maize production area in Kazakhstan with the largest number of maize growers (Bureau of National Statistics, 2022); therefore, the response rate there was higher (Table 5.1). In total, the farmers from 23 districts participated in the survey (Figure 5.1). The districts (audans) are smaller administrative divisions within a bigger region (oblysy). The main area of maize growing, especially for grain, in Kazakhstan is situated in Panfilov, Enbekshiqazaq, and Uygur districts of Almaty region, Qorday district in Zhambyl region, and Otyrar and Ordabasy districts in Turkestan region (Bureau of National Statistics, 2022).

Table 5.1. Distribution of Respondents by Regions

	Region	Frequency	Percent	Cumulative Percent
Valid	Almaty region	83	68.6	68.6
	Turkestan region	19	15.7	84.3
	Zhambyl region	19	15.7	100.0
	Total	**121**	**100.0**	

Most farmers produced maize for grain and only few used it for silage. Because the main research purpose was to characterize farmers in relation to their seed preferences, the difference between grain and silage maize producers was not included in the study.

Very few female farmers did participate in the survey. Therefore, the gender difference or significance was not evaluated in the research.

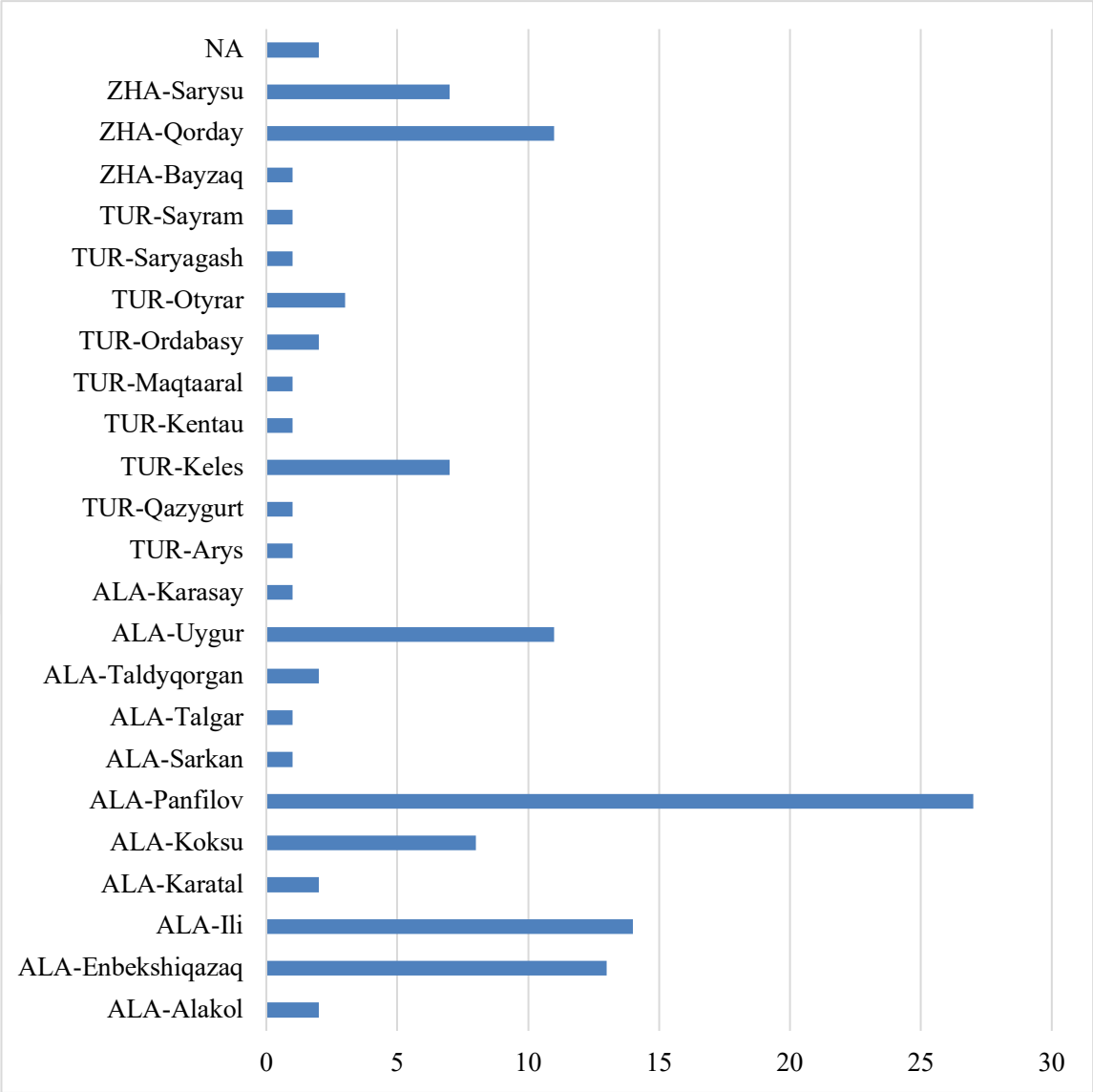

Figure V.1: Distribution of Respondents by Districts

The climatic conditions in the district defined the development of maize cultivation at first. Then, the willingness to introduce and adapt this crop in the current rotation system played a big role in the popularization of maize growing. While maize was a traditional crop cultivated for a long period of time in several districts, many farmers of other districts started to grow maize in recent years due to good demand and return on it. Good ecological adaptability of maize is important for its further area expansion in Kazakhstan.

The farmers between 46 and 60 years old were the biggest group among respondents, closely followed by 31-45 years old ones (Table 5.2). Sufficiently fewer young farmers were involved in the research and the number of 60 plus maize growers was less than

20%. The relatively new independent country as Kazakhstan provides opportunities for business development in all sectors. Agriculture was always a business field that attracted young entrepreneurs in 1990s and 2000s. These farmers are now in their fifty and sixties being in the process of business transferring to the next generation. Therefore, the survey showed the large group of 31-45 years old representing either second generation or new wave of agribusinessmen appeared in the last decade.

Table 5.2: Respondents' Age

	Age	Frequency	Percent	Cumulative Percent
Valid	Less than 30 years old	10	8.2	8.2
	31-45 years old	44	36.4	44.6
	46-60 year old	46	38.0	82.6
	More than 60 years old	21	17.4	100.0
	Total	**121**	**100.0**	

The lion's share of the interviewed maize producers had at least a university degree or did special technical education (Table 5.3). This is one of the unique features of Kazakhstani farmers. Compared to maize growers in many developing countries, the Kazakh farmers receive full-term school and professional education. Their professional education is not always related to agriculture but helps farmers to better organize their production and sales. There is a positive effect of education on an increase in agricultural productivity (Reimers and Klasen, 2013: 132). Therefore, the Kazakh growers have a significant potential to improve their yield and overall productivity in their farms.

Table 5.3. Education Level of Respondents

Education	Frequency	Percent	Cumulative Percent
School 9-11 years finished	22	18.2	18.2
Technical college finished	36	29.7	47.6
University finished	57	47.1	95.0
MSc, PhD and higher finished	6	5.0	100.0
Total	121	100.0	

Among interviewed farmers, the biggest group was the large maize growers having more than 100 ha of sown area (40.5%) followed by those who had 10-50 ha (21.5%) and 5-10 ha (20.7%). Few growers were less than 5 ha (9.79) and the smallest group comprised farmers with 50-100 ha (Table 5.4). The biggest farm was 2000 ha, whereas the smallest one was 2 ha with the average planted area 119 ha. Compared to the northern parts of Kazakhstan, farmers in the south manage smaller areas. The high population density, higher land prices, better climatic conditions, and longer vegetation season differentiate southern farming system from northern regions. Many small farmers operate family-owned up to 20 ha agricultural areas. However, middle and big farmers provide the main input for overall maize production in Kazakhstan.

Table 5.4: Farmers Crop Area

	Total planting area	Frequency	Percent	Cumulative Percent
Valid	less than 5 ha	12	9.9	9.9
	5-10 ha	25	20.7	30.6
	10.1-50 ha	26	21.5	52.1
	50.1 - 100 ha	9	7.4	59.5
	more than 100 ha	49	40.5	100.0
	Total	121	100.0	

26% of respondents operated 100 and more hectares of maize. On the other side, small farmers with 5 or less hectares of maize area comprised 23% of all respondents. These data revealed that maize was cultivated by different type of farmers: small peasant farms as well as bigger growers (Figure 5.2).

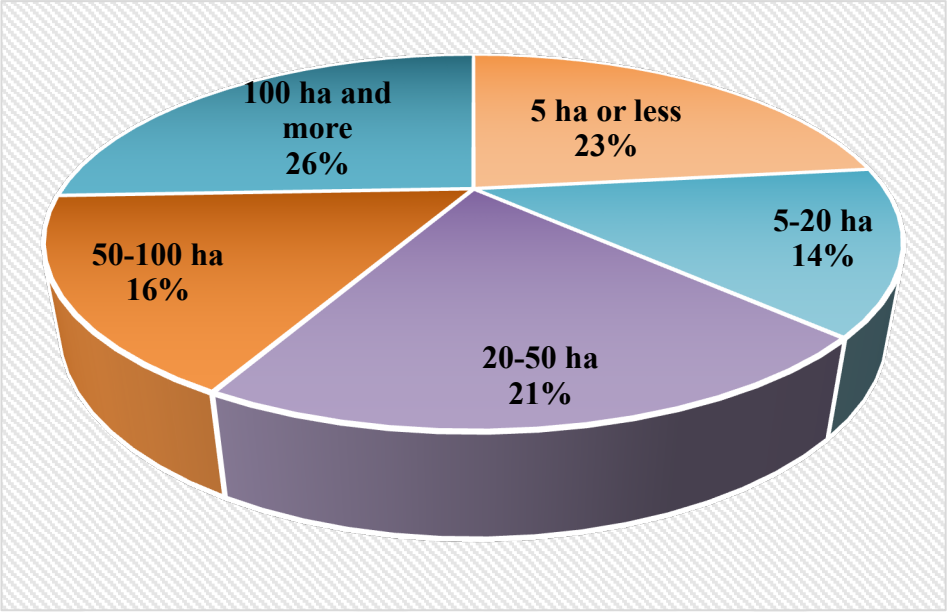

Figure V.2: Maize Area Among Respondents

Furthermore, 36.4% of interviewed farmers answered that they usually earned more than KZT 50 million, or USD 120 000 in 2021, from crop production. However, for most of the farmers, the income was lower than that (Table 5.5).

Table 5.5: Annual Turnover from Agriculture Among Interviewed Farmers

	Turnover	Frequency	Percent	Cumulative Percent
Valid	less than 5 mio KZT	26	21.5	21.5
	5-20 mio KZT	27	22.3	43.8
	21-50 mio KZT	24	19.8	63.6
	more than 50 mio KZT	44	36.4	100.0
	Total	**121**	**100.0**	

Maize was the main crop for 52.1% of the interviewed farmers, while for almost 34.7%, it provided at least 50% of their income from all agricultural activities (Table 5.6). Few respondents considered maize production as less significant in the overall company's activities, and they were mainly the farmers involved in the livestock business.

Table 5.6: The Share of Maize in Total Turnover

Maize sales importance		Frequency	Percent	Cumulative Percent
Valid	80-100%	63	52.1	52.1
	about 50%	42	34.7	86.8
	30% and less	16	13.2	100.0
	Total	121	100.0	

40.5% of interviewed farmers declared that they received between 8.1 and 12 t/ha on average, whereas 43% obtained 5.1-8 t/ha. Seven farmers informed that they had yield less than 5 t/ha. 13 growers, in contrast, outperformed all other farmers and could reach more than 12 t/ha as an average yield in their farms (Table 5.7). The average maize yield in the country achieved 6 t/ha with higher amounts harvested in the South. Because northern parts where maize is also grown are limited by the weather, farmers there grow short-cycle maize hybrids that have lower output compared to hybrids planted by southern growers. Therefore, higher values revealed in the research represented the southern parts. The data also showed that the proportion of maize producers achieved more than 12 t/ha.

Table 5.7: Average Maize Yield

	Average yield	Frequency	Percent	Cumulative Percent
Valid	5 t/ha or less	7	5.8	5.8
	5.1-8 t/ha	52	43.0	48.8
	8.1-12 t/ha	49	40.5	89.3
	more than 12 t/ha	13	10.7	100.0
	Total	**121**	**100.0**	

The farmers in the southern Kazakhstan mainly owned their equipment used for agricultural production (44.6%). However, almost one third of respondents rented all major machinery to produce maize (Table 5.8). Usually, farmers in the South do not possess their own harvesters, because limited production area is not enough to compensate high capital investments. Therefore, the number of maize farmers that

owned all necessary equipment was less than a half. Some farmers, on the other side, preferred to rent all major machinery to grow their maize (30.6%).

Table 5.8: Machinery Ownership

	Machinery	Frequency	Percent	Cumulative Percent
Valid	mainly owned by you	54	44.6	44.6
	some are owned, partly rented	30	24.8	69.4
	all rented	37	30.6	100.0
	Total	121	100.0	

The current law does not allow private land ownership in Kazakhstan. However, there was a short period when Kazakh citizens could buy agricultural land in the country. However, due to public severe critics the private ownership of agricultural land was prohibited in 2021 again. According to the survey only few farmers operated on their owned land. The land used for maize, or agricultural production in general, was owned by only 15.7% of respondents. Usually, farmers rented the cropland from the state for 49 years. 16.5% of interviewed growers rented land from other individuals, plot owners, and 19.8% had their land in mixed ownership structure (Table 5.9).

Table 5.9: Land Ownership

	Land ownership	Frequency	Percent	Cumulative Percent
Valid	100% owned	19	15.7	15.7
	rented from the state (for 49 years or more)	58	50.0	63.7
	rented from individuals	20	16.5	80.2
	Mixed	24	19.8	100.0
	Total	121	100.0	

Several questions about maize growing technology were also included in the survey. The particular focus related to the usage of macro-, microfertilizers, crop protection products, and irrigation. Though the application rate was high for macrofertilizers, pesticides, and irrigation, the use of microfertilizers showed the lowest application level (Figure 5.3). The critical point in input application is the quantity of product as

per hectare, quality of used products, and their effectiveness (yield increase) which could not be measured in this research. According to the official statistical data, Kazakhstan has very low application rate for macrofertilizers (Bureau of National Statistics, 2022). Even if a farmer declares the application on all maize areas, the rate per hectare usually remains below the recommended volume. Moreover, the quality of applied products like active ingredient content, water solubility, and plant acceptability is lower than in developed countries. The same problem exists in application of microfertilizers and crop protection products (pesticides). Poor quality and reduced application of pesticides and fertilizers directly influence maize yield and quality. In recent years, irrigation became the big issue for maize growers in the South Kazakhstan. Maize plant is very susceptible to water stress and requires sufficient irrigation up to 5-6 times in the conditions of southern Kazakhstan. However, during the survey, many farmers informed that they could irrigate their fields only 2-3 times per growing season. Even if they could get good yield, the real potential for Kazakhstani growers is much higher.

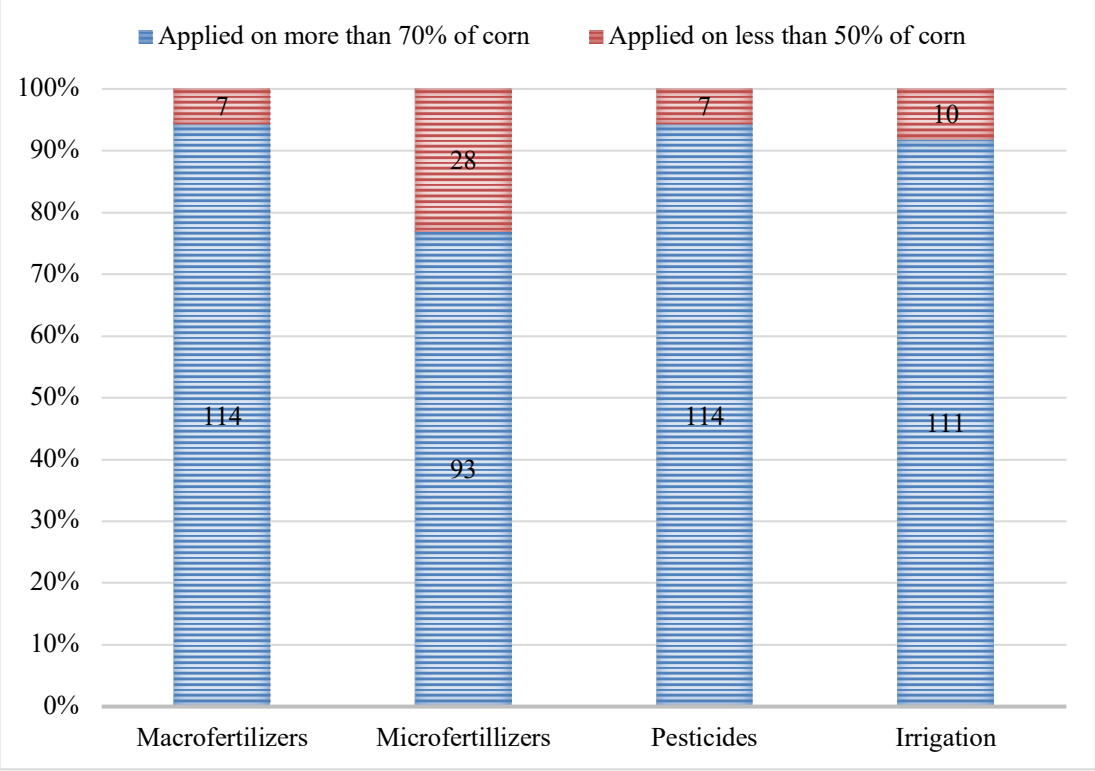

Figure V.3: The Application of Major Inputs Among Kazakhstani Maize Growers

To combine several technological parameters in one universal factor, a tech coefficient was introduced and calculated. The tech coefficient defined the degree of land and equipment ownership (1 for own/ long-term rented and 0 for short-term rented), pesticide, macro-, microfertilizers application, and irrigation sufficiency (1 for applied on 70% and more, 0 for otherwise). The maximum value of this coefficient was 6, and the minimum was 0. Table 5.10 illustrates the segmentation of farmers according to their tech coefficient. Many of the interviewed farmers (42.9%) were "advanced," while the second biggest group was "strivers" (30.6%). Those who received the maximum value of the tech coefficient represented the "elite" group (17.4%). They wholly owned or rented their land for 49 years, owned all necessary equipment, regularly used macro-, microfertilizers and pesticides for at least 70% of their maize areas, and had no problem with irrigation. The "strivers" usually had a short-term land rent and entirely or partly rented mandatory equipment, but they tried to apply pesticides and fertilizers on almost all maize areas and could irrigate it properly too. The small or even medium size maize growers in southern Kazakhstan can hardly afford the capital investment required to buy equipment or to rent land for an extended period. They typically use available resources to buy required inputs for proper maize production and obtain the highest yield. The least technological group, "survivors", comprised 9.1%. It is interesting to notice that premium seed users were more in "elite" and "advanced" groups and less among "striver" and "survivor" groups compared to the farmers that used budget seeds.

Table 5.10: Different Groups of the Tech Coefficient

Group name		Tech coefficient value	Number of farmers in the group	Percent	Among which using	
					Premium seed	Budget seed
Valid	Elite	6	21	17.4	11	10
	Advanced	5	52	42.9	30	22
	Striver	4	37	30.6	17	20
	Survivor	3 and less	11	9.1	4	7
	Total		121	100.0	62	59

The experience with maize growing (maize experience) ranged between 1 year and 50 years. The average value was 13.85 or approximately 14 years (Figure 5.4). There were maize growers who cultivated this crop from the Soviet time. They are those who worked in Soviet kolkhozes and sovchozes. In the independent Kazakhstan they could organize their own private farming and continued to grow maize. Attractive maize price motivated other farmers that traditionally grew other crops or just started agricultural business to cultivate maize. From 2007 maize production areas were mainly increasing due to growing demand for feed.

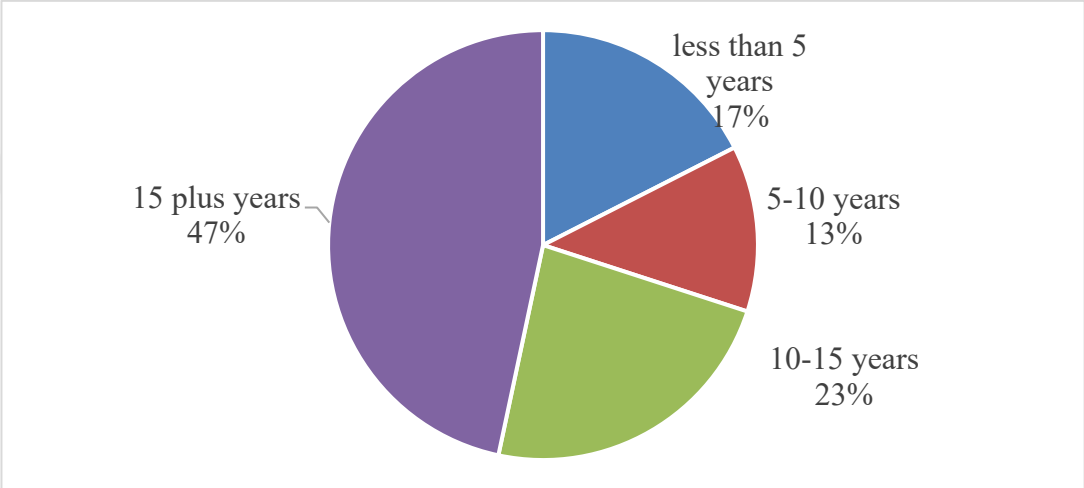

Figure V.4: Maize Growing Experience of Respondents

5.2.Maize Seed Preferences

Among all respondents, 51% were farmers who grew predominantly premium hybrid seeds (Figure 5.5). Other maize growers preferred more affordable budget seeds. This shows that both seed types were requested by maize farmers in southern Kazakhstan. Among premium hybrid seed brands of Pioneer, Monsanto, Syngenta, Limagrain, Fito Semencis were available and planted by respondents. On the other hand, budget seed segment was presented by local Budan, Ukrainian Mais, and other hybrids with lower price (Figure 5.6). Among premium hybrids Corteva's Pioneer was the most planted maize seed brand, while Budan hybrids were widely used within a budget segment. The most sold brand of all planted maize seed was Budan. The seeds of this brand are produced domestically, but the germplasm is mainly coming from Serbia. The governmental support of domestically produced seeds significantly influenced their unit price making them affordable for farmers in Kazakhstan. However, some farmers

expressed their doubts concerning quality of seed production and the fast-dry feature of Budan maize hybrids. Moreover, the expansion of seed production requires sufficient capacity in land, labour, and processing facilities. Instead, the local producers struggle with deficit of all that factors which restricts them from growing of production capacities.

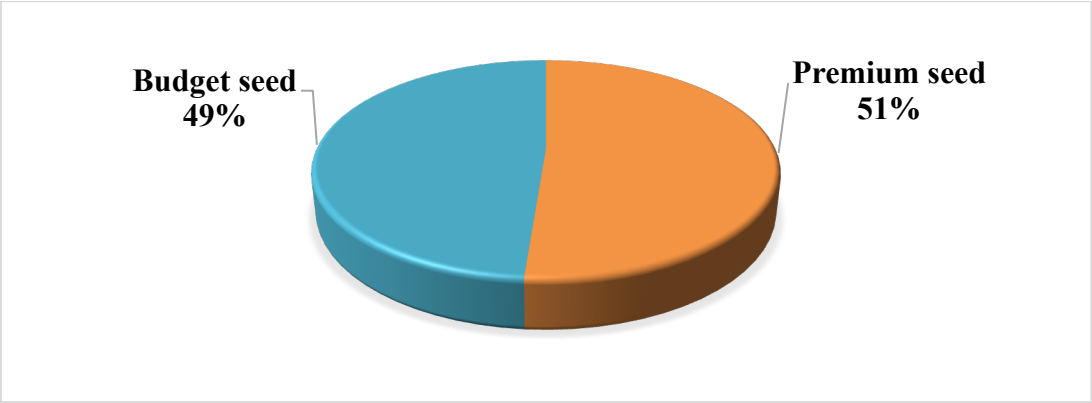

Figure V.5: Seed Type Preferences

In the situation when domestic seeds are unavailable or lack the required quality farmers rely on other suppliers. The strong brand image of multinational seed companies attracts many maize producers to buy their seeds. Many respondents were very happy with their quality and yield potential and expressed their wish to continue to use these brands even if their price was considerably higher than that of budget seed. On the other hand, there were farmers who preferred Ukrainian, Russian, or Moldavian maize seeds either due to their more affordable price compared to global brands or because they believed in higher value for the price of these seeds. In general, the research revealed that the Kazakhstani maize seed market is very heterogenous despite its small volume in comparison to many countries of the world where maize growing area is considerably higher than in Kazakhstan.

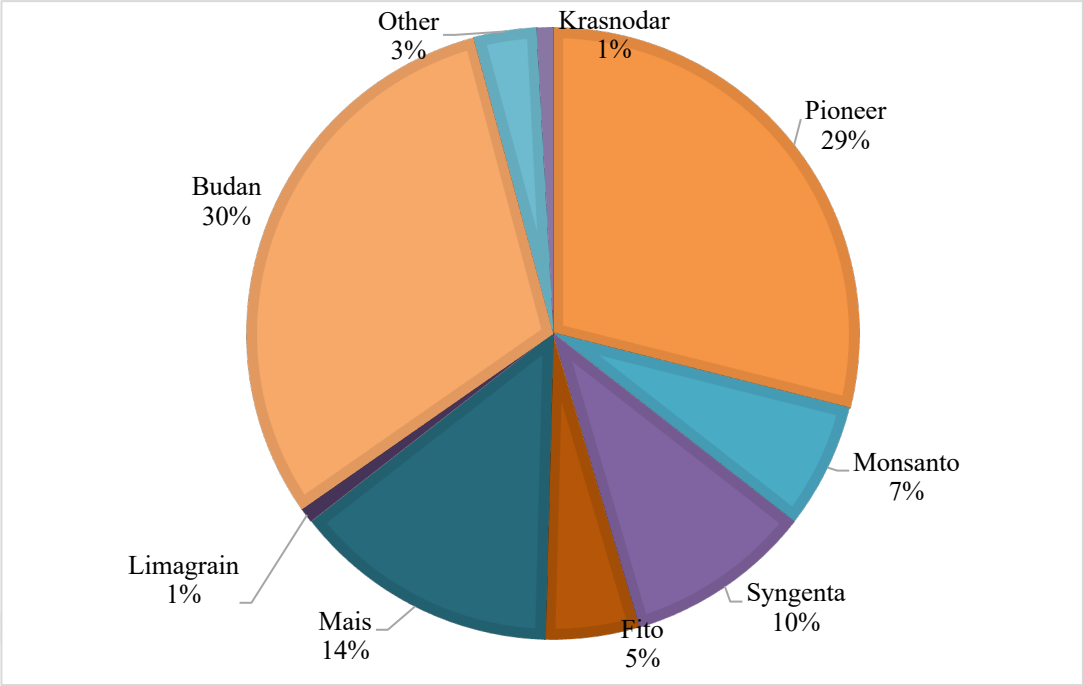

Figure V.6. Maize Seed Brands Planted by Respondents

The research revealed some demographic and economic differences between farmers who used premium seed and those who preferred budget seed (Table 5.11). The premium seed users were younger (larger share in the group of 31-45 years old) than budget seed users (larger share in 46-60 years old). The seeds of global companies are continuously improved through their extensive breeding programs and RandD investment. Therefore, their seeds bring higher quality yield especially in high input production environments (Mendez, 2022; Alvarez, 2020). The young farmers in Kazakhstan strive to get the maximum yield and therefore invest into other input products like fertilizers and pesticides. They also search for information in different internet resources and learn modern trends in agricultural production. Therefore, they are most likely to prefer the most improved varieties that multinational seed companies offer.

The farmers who preferred premium seeds had more frequent university degrees compared to the budget seed users.

Table 5.11. Socio-Demographic Characteristics of Interviewed Farmers

	Characteristics	Range	If applicable percentage of total	Total number / average	Budget seed users	Premium seed u Sers
1	Region	Almaty	68.6	83	50	33
		Turkestan	15.7	19	1	18
		Zhambyl	15.7	19	8	11
2	Age	18-30 years	8.3	10	6	4
		31-45 years	36.4	44	15	29
		46-60 years	38.0	46	26	20
		more than 60 years	17.3	21	12	9
3	Education	School 9-11 years	18.2	22	13	9
		Technical college	29.7	36	19	17
		University	47.1	57	24	33
		MSc and higher	5.0	6	3	3
4	Cropland area	less than 5 ha	9.9	12	5	7
		5-10 ha	20.7	25	15	10
		10.1-50 ha	21.5	26	17	9
		50.1 - 100 ha	7.4	9	2	7
		more than 100 ha	40.5	49	20	29
5	Maize sales in annual turnover	80-100%	52.1	63	27	36
		about 50%	34.7	42	24	18
		30% and less	13.2	16	8	8
6	Maize yield	5000 kg/ha or less	5.8	7	5	2
		5100-8000 kg/ha	43.0	52	36	16
		8100-12000 kg/ha	40.5	49	17	32
		12000 kg/ha and more	10.7	13	1	12
7	Income overall	under USD12000	21.5	26	14	12
		USD12 000-48 000	22.3	27	18	9
		USD48001-120 000	19.8	24	12	12
		more than USD 120 000	36.4	44	15	29
8	Seed type			121	59	62
9	Av. tech coefficient			4.65	4.54	4.76
10	Av. maize area in ha			119.12	59.23	176.08
11	Av. maize experience in years			14	15	13
12	Av. brand using, years			7	9	5
13	Other brands use			0.44	0.34	0.53

The respondents who preferred premium seeds cultivated more cropland compared to farmers that grew budget maize hybrids. The average maize growing area for premium seed farmers in Kazakhstan was about 176 ha, whereas a budget seed growers

cultivated about 60 ha. That means bigger growers were for the premium seed, because they were able to operate their maize planting area with an optimum care package. So, they did not want to risk the potential yield and quality with local or other budget seed producers. The research papers of maize seed preferences in developing countries revealed similar results: Bigger producers preferred more expensive seed brand of multinational companies to local or less expensive varieties (Mendez, 2022; Nogay, 2019: 131-151).

The share of maize production in general turnover of a farmer was higher for those respondents who were the premium seed users. They mainly relied on maize production in their income and, therefore, strived to increase the output from land unit by using the best brand available on the market without compromising the price. On the other hand, the respondents that planted budget seed had other income sources, mainly livestock, and were satisfied with the yield they received with their maize seeds. Interestingly, the maize yield of premium seed users was considerably higher compared to yield declared by budget seed users. The share of those premium seed customers who got more than 8 t/ha was higher than for budget seed users. 12 growers of premium maize seed received even more than 12 t/ha, whereas only one farmer of budget seed could achieve the same high result. As a result of bigger cropland and higher yield, the farmers of premium seed showed higher general turnover than farmers in the budget seed group. 47 % of premium seed growers declared their income level at more than 120 000 USD while among budget seed respondents this percentage was 25 %.

The farmers of premium seed in Kazakhstan had on average 13 years of experience in maize growing in general and 5 years of experience in growing of their maize brand. The budget seed users among respondents had 15 years of experience in maize growing and 9 years in their brand seed growing. So, the farmers with longer experience in maize growing were more conservative and preferred to continue growing their budget seeds mainly represented by locally produced hybrids. The maize growers in Kazakhstan started to widely use premium hybrids in the recent two decades, while domestic, Russian, Serbian, and Moldavian cultivars were available for longer time. The introduction with these premium western hybrids was slow due to their high price, limited technological ability of the farmers in the South Kazakhstan, as well as unfavourable market price of maize commodity. From 2010 the demand for

western brand seed had been growing with Pioneer and Syngenta leading the race. Therefore, it took time until farmers had chosen their seed type through test and trials.

The farmers of premium seed in the survey were slightly better in their technology use because their mean tech coefficient was higher. The study revealed that premium seed growers applied on average more macro and micro fertilizers and crop protection products on their crops. In the other hand, budget seed farmers were on average more equipped, having more long-term land lease, and more often receiving enough water for irrigation (Figure 5.7). However, the study did not research for equipment modernity and quality, or for effectiveness of applied fertilizers, pesticides, and irrigation sufficiency in general.

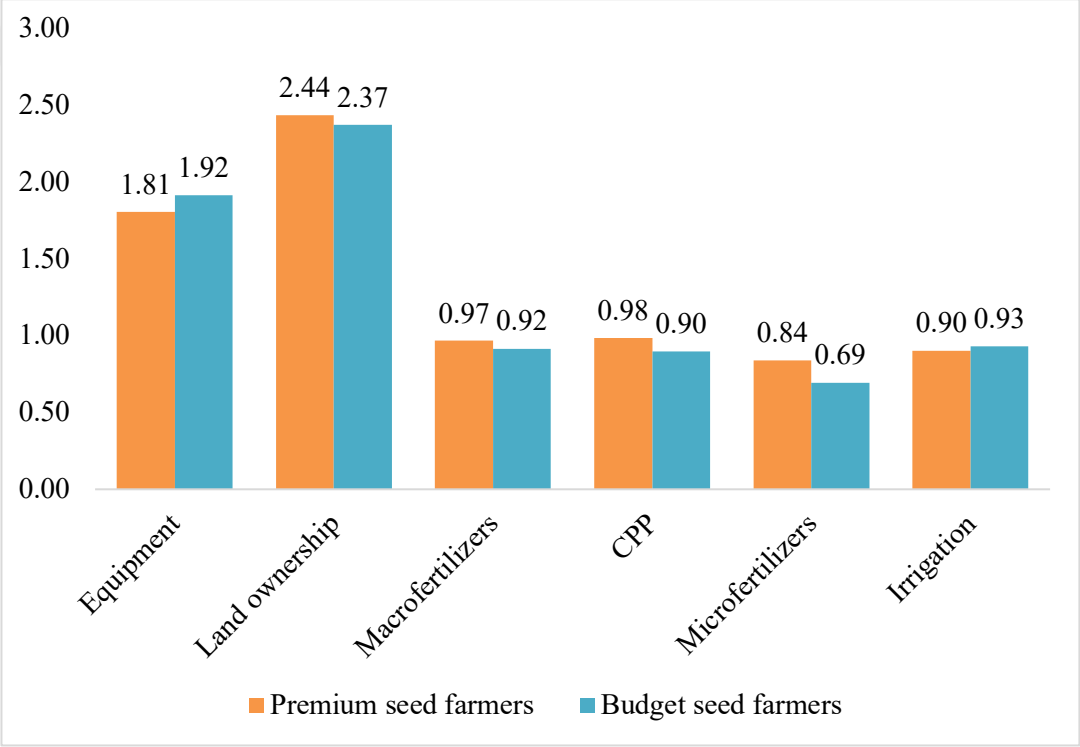

Figure V.7. Technology Use by Farmers in Southern Kazakhstan

Compared to budget seed users, premium seed growers were more likely to switch between brands within the same segment. One of the important reasons for that frequent change lies in the fact that the companies representing the premium seed segment often introduce new and improved maize hybrids, and their range of products is upgraded faster. In contrast, there are few hybrids with the required characteristics developed in the budget seed segment. Consequently, the farmers within this segment rarely change their hybrids.

The rapid development of the premium maize seed market in Kazakhstan took place because of the large percentage of new agricultural producers that were inexperienced and young and lacked information about the performance of different maize seed brands. In markets with imperfect information, the budget seed can be associated with lower product quality because the price is rather a sign of quality. When experience is lacking, price and brand are those few attributes that a consumer uses to evaluate a product at the time of purchase (Rutsaert and Donovan, 2020: 500). In addition, young entrepreneurs occupying the agricultural input market of the 2000s were interested in pushing the sales of western hybrids due to their high retail margin. However, the most crucial driver was the excellent performance of many maize hybrids developed by multinational companies.

5.3.Maize Seed Main Attributes Important for Growers

One of the focal points of this research was to investigate the main factors that define farmers' preferences for maize seeds. The respondents should indicate their top five attributes among 18. The table 5.12 illustrates the frequency that each attribute was selected from the list as the first, second, third, fourth, and fifth important one among maize growers in southern Kazakhstan. Moreover, the table shows which attributes were ranked the highest within their groups. The potential yield was a number one attribute among all others chosen as the 1st most important and the 2nd most important factors in maize seed choice. Price and payment terms were indicated as the most important 3rd, 4th, and 5th attribute among Kazakh maize growers. The opinion of other farmers about a particular maize hybrid was ranked as number two factor in the group of the 1st and the 2nd most important attributes, while supplier reputation, resistance to drought and salinity, and seed quality were also essential for the farmers choosing the 3rd most important factor. Other major attributes in the choice of maize seed were drying speed, farmers' positive experience with the hybrid in the past, relationship to supplier or salesperson, and competence and professionalism of supplier and his employees.

Table 5.12 The Number of Times Each Factor Was Chosen as Important

	Attribute name	1st factor (rank)	2nd factor (rank)	3rd factor (rank)	4th factor (rank)	5th factor (rank)
1	Supplier reputation	7	2	**11 (2)**	4	11
2	The opinion of other farmers	**16 (2)**	**17 (2)**	7	8	3
3	Potential yield	**61 (1)**	**25 (1)**	9	4	3
4	Complete solution /All in one buying (seed + CPP + fertilizers)	0	4	9	2	2
5	Resistance to drought and salinity, high response to fertilizers	1	**14 (3)**	**11 (2)**	9	8
6	Price and payment terms	0	**14 (3)**	**16 (1)**	**24 (1)**	**15 (1)**
7	Relationship to supplier or salesperson	3	5	9	8	**13 (3)**
8	Seed quality (purity, germination)	**13 (3)**	6	**11 (2)**	**15 (2)**	8
9	Competence and profession-nalism of the supplier and his employees	0	3	4	10	14 (2)
10	Your positive experiences with the hybrid in years past	6	2	6	**12 (3)**	11
11	Brand	5	4	2	2	4
12	Country of origin	0	2	1	1	2
13	Seed production year	1	0	2	5	4
14	Kernel size	0	4	3	2	2
15	Social media	0	0	1	0	2
16	Seed availability at the time of sowing	0	1	2	2	5
17	Maturity duration	4	7	7	3	5
18	Drying speed	4	11	**10 (3)**	10	9
	TOTAL replies	121	121	121	121	121

To define the top five attributes in maize seed choice among Kazakh farmers the first most important attributes obtained a 5-point score. The second most important attributes received a 4-point score, the third a 3-point, the fourth a 2-point, and the fifth a 1-point score (table 5.13). Then, the total point value of each selected attribute (TS) was calculated by multiplying the number of responses (N) to corresponding point (P):

$$TSi = Ni(fi) * sPi(fi),$$

Where i is the order number of an attribute in the table (1-18), s is a score for each factor (1-5), and f is the order number of a factor (1-5).

Table 5.13: Maize Seed Attributes and Their Importance

	Attribute name	1st choice 5 point	2nd choice 4 point	3rd choice 3 point	4th choice 2 point	5th choice 1 point	Total points
1	Supplier reputation	35	8	33	8	11	95
2	The opinion of other farmers	80	68	21	16	3	**188 (2)**
3	Potential yield	305	100	27	8	3	**443 (1)**
4	Complete solution	0	16	27	4	2	49
5	Resistance to drought and salinity	5	56	33	18	8	**120 (5)**
6	Price and payment terms	0	56	48	48	15	**167 (3)**
7	Relationship to supplier or salesperson	15	20	27	16	13	91
8	Seed quality (purity, germination)	65	24	33	30	8	**160 (4)**
9	Competence and professionalism of the supplier and his employees	0	12	12	20	14	58
10	Your positive experiences with the hybrid in years past	30	8	18	24	11	91
11	Brand	25	16	6	4	4	55
12	Country of origin	0	8	3	2	2	15
13	Seed production year	5	0	6	10	4	25
14	Kernel size	0	16	9	4	2	31
15	Social media	0	0	3	0	2	5
16	Seed availability at the time of sowing	0	4	6	4	5	19
17	Maturity duration	20	28	21	6	5	80
18	Drying speed	20	44	30	20	9	**123 (5)**

The potential yield was the most important factor affecting the maize seed choice of the Kazakhstani farmers. This result goes in line with many studies on maize seed preferences (Ajambo et al., 2017: 185; Nogay, 2019: 131-151; Rutsaert and Donovan, 2020: 498-501; Sánchez-Toledano, Kallas, and Gil-Roig, 2017: 7-10). Directly affecting farmers' income, the high potential yield was universally selected by growers as the top attribute for maize seed (Table 5.14).

The research also showed that Kazakhstani growers often valued the opinion or experience of other (usually neighbour leader) farmers. Nogay (2019) obtained the

similar result for Turkish maize growers. The desire to minimize the risks of the wrong decision forces the Kazakhstani growers to rely on the experience of other farmers. Moreover, social interaction and communication play an essential role among farmers and their technology adaptation (Freeman and Qin, 2020: 11-14; Tamako, Chitja, and Mudhara, 2022: 3, 11-12), and the study supports this concept.

The seed price and payment terms were the third main indicator in choice of maize hybrid among Kazakh farmers that goes in line with the study of Birol, Smale and Yorobe (2012) for the Philippines. Indeed, for developing countries the price is a vital attribute in the variety choice among growers. Especially in the situation when farmers cannot afford the best growing practices due to technological, land, market or other constrains, they go for a most affordable option on the market.

Due to weak regulations and control mechanisms in developing countries like Kazakhstan, product quality can be an issue. In these markets, growers can experience seed impurity, low germination, and counterfeit and fake products (Lee, 2020: 98-99). For that reason, Kazakhstani farmers ranked seed quality as one of the essential factors in choice of their seed variety. Counterfeit and fake products were not a big issue in Kazakhstan, at least it was not declared by any official publication or academic study.

In many regions of Kazakhstan, an early frost is a significant risk factor in maize production. Moreover, the lack of drying facilities impelled farmers to choose hybrids with high drying speeds cautiously. Therefore, Kazakhstani farmers valued drying speed as one of the most major characteristics of maize seed to buy. The Turkish farmers (Nogay, 2019: 131-151) showed similar results where they preferred maize seed with less moisture at harvest. The choice of early matured hybrids in Kenya (Rutsaert and Donovan, 2020: 499) or in Burkina Faso (Dao et al., 2015: 3-5) may reflect the farmers' desire to gain dry seeds short after physical maturity.

Table 5.14. Comparison of Main Attributes in Choice of Maize Seed

Country	Maize grower characteristics					Major attributes	Reference
	Age	Education (years)	Maize experience	Maize, ha	Yield (grain), t/ha		
Kazakhstan	45.5	Mainly university degree	13.9	100	6.5	Potential yield, opinion of other farmers, price and payments terms, seed quality, and drying speed	Current study
Turkey	55.5	Mainly primary school	N.a.	3.3	9	Yield, moisture at harvest, experience of other farmers, resistance to stalk lodging	Nogay 2019: 131-151
The Philippines	44.2	9.6	13.1	1.7	N.a.	Lower prices, reduced yield loss from the Asian maize borer and Bt trait, + the option to pay with credit for reluctant Bt farmers and to receive information from the input supplier instead of another farmer for willing Bt farmers	Birol, Smale and Yorobe, 2012: 181-184
Nigeria	44.7	5.16	19.11	0.82	2.05	Higher yield, low risk of yield loss, site specific information	Oyinbo et al. 2019: 19-22
Uganda	38	Mainly primary school	12	0.6	N.a.	High yield, plant height, short-medium maturity period, seed market prices and owned land size	Ajambo et al., 2017: 181-185
Burkina Faso	N.a.	N.a.	N.a.	N.a.	N.a.	High yield, early maturing, tolerance to drought, grain colour, and grain size	Dao et al. 2015: 2-6
Kenya	48.14	Mainly lower than secondary	17.9	0.6	N.a.	High yield, early maturity, good stalk quality, and drought resistance	Rutsaert and Donovan 2020: 498-499
Zambia	45.85	4.26				Good seed availability, high yielding, good intercrop	
Ethiopia	41	Mainly primary	N.a.	N.a.	N.a.	High yield, resistance to disease and insect pests, lodging resistance, ability to perform well under low soil fertility, fair seed costs	Abera et al. 2013: 1248-1250
Mexico	58.4	Mainly no school education at all	34	4.9	3.9	High yields, resistance to diseases, and big cob size	Sánchez-Toledano, Kallas, and Gil-Roig, 2017: 7-10

N.a. not available data

Though the five most important factors were potential yield, opinion of other farmers, price and payment terms, seed quality, and drying speed, the Kazakhstani maize growers found it was essential for a seed hybrid to be drought-resistant, salinity tolerant, and responsive to fertilizer application. The importance of these additional traits in a maize seed received almost the same score as drying speed among Kazakhstani farmers. That means maize growers started to pay attention on additional seed traits. Kazakhstan's vast area of agricultural land suffers from the water deficit (Issanova et al., 2018: 183; Rosa et al., 2020: 1). The issue is more prominent for irrigated maize in the study area, namely southern Kazakhstan. Therefore, drought tolerance was a desired trait among respondents and will get more importance in the future due to climatic changes. The importance of drought resistance for a planted maize seed was mentioned in Kenya (Rutsaert and Donovan, 2020: 499-501), Burkina Faso (Dao et al, 2015: 6), Uganda (Simtowe et al., 2019: 10), and eastern and southern Africa in general (Fisher et al., 2015: 284). Moreover, the extensive irrigation methods agricultural producers apply lead to gradual soil salinization in some areas of Kazakhstan (Merembayev et al., 2022: 61; Saparov, 2014: 72; Tokbergenova, Kiyassova and Kairova, 2018: 1930) and salinity-tolerant maize hybrids are an imminent solution for farmers there (Shahbaz and Ashraf, 2013: 237). So, the maize growers responded positively to a seed hybrid that might have a salinity tolerant trait.

Besides central maize seed attributes mentioned above, the growers indicated following qualities as important in their seed choice: previous experience with a hybrid, supplier reputation, and relationship to a supplier or salesperson. The research revealed that supplier reputation, relationship to the supplier or salesperson, and perceived competence of seed sellers were important seed attributes for the Kazakhstani maize growers, whereas the seed brand was ranked low. This result demonstrated that the personal relationship between a seller/supplier and a buyer influences product choice. When all other product quality parameters are perceived to be similar, and the performance gap between different hybrids is low, supplier reputation and relationship will be vital in the success of a particular maize hybrid. Therefore, relationship marketing (Gummerus, von Koskull and Kowalkowski, 2017: 1-5; Payne and Frow, 2017: 11) should develop into a powerful strategy for Kazakhstani seed suppliers.

5.4.Hypothesis Analysis

The next step in analysing the survey data was to investigate the hypothesis structured in the fourth chapter. The independent t-test was run to compare various factors' means among budget and premium seeds users (Table 5.15).

There was a significant difference between the mean yields of budget and premium seed farmers ($t(119) = -5.006$, $p < 0.001$). The mean yield of budget seed respondents was closer to 5.1-8 tons/ha interval, whereas premium maize seed farmers were closer to 8.1-12 ton/ha band.

The believe that the used seed are of high quality was significantly different between premium and budget seed users ($t(106) = -4.694$, $p < 0.001$). The mean quality perception of budget seed respondents was closer to 3 that indicated that they were not sure if they can describe their seeds like that. In contrast, premium seed farmers mean value was above 4 showing that they believed in high quality of their maize seeds.

Other two factors the mean value of which showed a significant difference between users of budget and premium seeds were supplier trust and supplier competence. Both values showed negative t-value indicating that budget seed users scored trust in supplier as well as believe in competence of their suppliers lower than this did premium seed farmers. Indeed, the mean value of these factors among premium seed users was 4.45 (trust) and 4.71 (competence), while budget seed growers had 4.00 (trust) and 3.93 (competence).

All other hypotheses suggested in the chapter 4 were rejected and other factors did not show any significant mean differences in their mean values. This result may occur due to the limited size of respondents involved in the survey. On the other hand, both type of seeds were improved hybrids. The farmers in Kazakhstan did not confront the usage of open-pollinated, farm-saved varieties to the usage of hybrids.

The general perception of farmers was that growing premium seeds requested more investment in other inputs like fertilizers and crop protection products. The domestic hybrids had an advantage of being first adapted in Kazakhstan on a large scale. The governmental support in type of direct subsidies also played a big role in the market expansion of domestically produced maize hybrids. Farmers were also satisfied with yield and quality improvements they received with these hybrids compared to varieties used in the 1990s.

Table 5.15: Group Statistics

	Seed type	N	Mean	Std. Deviation	Std. Error Mean
Age	Budget	59	2.75	.902	.117
	Premium	62	2.55	.823	.105
Education	Budget	59	2.29	.872	.114
	Premium	62	2.48	.805	.102
Total HA	Budget	59	3.29	1.390	.181
	Premium	62	3.66	1.482	.188
Maize Sales	Budget	59	1.68	.706	.092
	Premium	62	1.55	.717	.091
Tech Coefficient	Budget	59	4.54	1.023	.133
	Premium	62	4.76	.862	.110
Maize Yield	Budget	59	2.24	.625	.081
	Premium	62	2.87	.757	.096
Purchase intention	Budget	59	3.69	1.405	.183
	Premium	62	4.00	1.241	.158
Yield perception	Budget	59	4.15	1.080	.141
	Premium	62	4.47	.987	.125
Seed quality	Budget	59	3.19	1.383	.180
	Premium	62	4.23	1.015	.129
Other farmers opinion	Budget	59	4.69	.793	.103
	Premium	62	4.55	.761	.097
Supplier loyalty	Budget	59	3.92	1.418	.185
	Premium	62	4.06	1.213	.154
Supplier trust	Budget	59	4.00	1.300	.169
	Premium	62	4.45	.918	.117
Supplier competence	Budget	59	3.93	1.530	.199
	Premium	62	4.71	.776	.099
Price	Budget	59	4.58	.875	.114
	Premium	62	4.47	.695	.088

Between 1991 and 2001 the average maize yield was less or equal to one ton per hectare. In the decade after the mean value doubled (Figure 2.3). The large part of

budget seed growers indicated their maize grain yield between five and eight tons per hectare. That is a huge difference with the data of 1990s and early 2000s. It also means many farmers started to harvest more grain maize from their fields. Many maize growers had experienced the significant yield shift with domestically produced hybrids that were additionally supported by the government. So, they are satisfied with their 5-8 tons gained with minimum seed costs. Another part of maize growers wanted to gain more yield through massive investment in maize production knowing that farmers in developed countries achieved 20 tons per hectare and even more (Liu et al., 2023: 2). Therefore, they switched to premium hybrids and many of them achieved the yield above eight tons and even higher. As a result, the maize seed market of Kazakhstan had two groups of farmers: those who preferred budget seeds and others who consume premium seeds.

The most profound difference between two types of maize seed was related to the price. As revealed in this and many other studies yield is the most crucial characteristics influencing farmer's decision in seed choice. This study also showed the significant association between yield and seed type. However, the relationship between farm size, age, education, maize importance, and technical advance and preferred seed type was not significant for Kazakh maize growers in this study (Table 5.16).

In the previous studies the impact of factors like age, education, and farm size on choice of maize seeds was not homogeneous. For instance, the recent research of Mukarumbwa and Taruvinga (2023: 1-15) did not find any significant relationship between age and selection of landraces or GM maize crops. On the other hand, education was a strong predictor for a choice of seed type, being positively related to the choice of GM maize and influenced negatively on selection of landrace varieties. The importance of land size was revealed only at 10% level of confidence and was positively related to only choice of GM maize crops (no influence on selection of landrace varieties).

Table 5.16. Independent Sample Tests

Attributes	Levene's Test for Equality of Variances		t-test for Equality of Means			Comments
	F	Sig.	T	Df	Sig. (2-tailed)	
Farm size	1.030	.312	-1.427	119	.156	H1a rejected
Maize importance	.077	.781	1.001	119	.319	H1b rejected
Technological advance	2.534	.114	-1.256	119	.211	H1c rejected
Yield	.795	.374	-5.006	119	**.000**	**H1d accepted**
Opinion of other farmers	1.406	.238	1.03	119	.302	H1l rejected
Price	.044	.835	.758	119	.450	H1g rejected
Quality	15.060	.000	-4.694	106.167	**.000**	**H1f accepted**
Perceived yield	.105	.747	-1.677	119	.096	H1e rejected
Purchase intention	3.246	.074	-1.267	119	.208	H1k rejected
Supplier loyalty	1.869	.174	-.623	119	.534	H1i rejected
Supplier trust	4.002	.048	-2.198	103.843	**.030**	**H1h accepted**
Supplier competence	24.921	.000	-3.498	85.062	**.001**	**H1j accepted**
Age	.066	.798	1.258	119	.211	
Education	.584	.446	-1.284	119	.202	

As in this research, Mutanyagwa (2017: 45) did not reveal any significant influence of age and education on choice of improved hybrids in Tanzania. However, farm size was an important factor in comparison to the findings of the current study.

In the Philippines age was not significant predictor while measuring farmers' preferences for Bt vs non-Bt maize varieties. Education had significant impact in choice of Bt maize hybrids only in one site, whereas it did not influence farmer's choice in another district. Farm size (maize area) was significant indicator of seed preference in one district but was not important in the other site. The income (maize income) was a strong indicator of seed preferences in both sites. The land ownership

and pest management score among Bt vs non-Bt maize growers was significant in one district (Birol, Smale and Yorobe, 2012: 184).

Yield was a strong predictor of seed type choice according to different studies.

5.5.Maize Seed Brand Loyalty

The interviewed farmers self-assessed themselves in terms of their brand loyalty in maize seed. 46.3% of respondents considered themselves as loyal and the remaining growers were either disloyal or neutral ("do not know"). The pure loyalty expresses the desire to buy and to repeatedly use a particular product (seed brand). Therefore, the respondents were asked to define if they bought maize brand hybrids/ varieties different from the primarily used brand in the same year. The interception of self-assessed loyalty and planting of other varieties could reveal various loyalty types (Table 5.17).

Table 5.17: Seed Brand Loyalty among Kazakhstani Maize Growers

	I am loyal to my maize seed brand				
	1 Completely disagree	2 Disagree	3 Do not know	4 Agree	5 Absolutely agree
Do you plant other varieties? The answer was **YES**	20 D	10 D	5 P	12 S	6 S
Do you plant other varieties? The answer was **NO**	11 P	10 P	9 P	18 L	20 L

Note: D stands for Disloyal 30 (24.8%), P for Passive/ latent/ neutral 35 (28.9%), L for Loyal 38 (31.4%), and S for Spurious / multi loyal 18 (14.9%) farmers

The biggest group (38 farmers) or 31.4% of respondents could be characterized as maize seed brand loyal, whereas 30 farmers (24.8%) expressed disloyalty towards maize seed brand. These two groups were pure loyal or disloyal towards planted maize seed brands. Furthermore, the research revealed two intermediate groups. For instance, 35 maize growers (28.9%) were passive, latent or neutral towards seed brands that indicated those growers who assessed themselves as disloyal but still planed only one seed brand. These farmers might stick on the only hybrid due to, for example, budget constraints or desire to minimize the risk of yield failure by using of more accustomed brands. Among respondents 18 farmers (14.9%) could relate to spuriously or multi

brand loyal customers who assessed themselves loyal but used different brands (alone or in combination with the primary brand) either because they preferred several brands or because they did not fully believe in the used brand. However, in some cases the use of other brands might be influenced by factors like late delivery or simply lack of desired seeds which were not measured in this study.

To better understand factors that may influence the self-assessed brand loyalty the descriptive data analysis was conducted, and the binary logistic regression analysis was applied. The descriptive statistical findings related to the research data and the significance of the independent variables in the logistic regression model for the categorical dependent variable, brand loyalty, based on these variables is presented in the Table 5.18. The statistical analyses were carried out using IBM SPSS 28 software, with a 5% margin of error. The dependent and explanatory variables were described in the fourth chapter.

Table 5.18 reports the descriptive results of the research variables. The findings show that 46.3% of the farmers were loyal to their maize seed brand, while 53.7% were not. The loyal farmers tended to be younger (44.6% were under 45), more educated (29.8% attended technical college and 52.1% attended university or higher), had higher sales (56.2% have more than USD 50 000), had less maize experience (31.4% have more than 10 years and 46.3% have more than 50 ha of maize area), and had lower maize size (13.2% had maize as 100-80% of their total sales).

They also tended to believe that maize seed brands were not the same (86.8%), that purchasing inputs was not time consuming (51.2%), and that they were among the first to try new products (58.7%). They were also loyal to their supplier (78.5%) and perceived their maize seed as having high quality (71.9%). They were influenced by other farmers (95.9%) and had a higher media index (0.536 ± 0.136), which means they used media sources as information source to learn about their hybrids a lot.

Table 5.18: Descriptive Findings of the Variables

Variable	Group	N	%
SEEDLOYAL	0	65	53.7
	1	56	46.3
AGE	0	67	55.4
	1	54	44.6
EDU1	0	99	81.8
	1	22	18.2
EDU2	0	85	70.2
	1	36	29.8
EDU3	0	58	47.9
	1	63	52.1
SALES	0	53	43.8
	1	68	56.2
MAIZEEXP	0	38	31.4
	1	83	68.6
MAIZEAREA50plus	0	65	53.7
	1	56	46.3
MAIZEIMP	0	16	13.2
	1	105	86.8
TECHCOFF	0	48	39.7
	1	73	60.3
EXPSAME	0	105	86.8
	1	16	13.2
TIMECONS	0	59	48.8
	1	62	51.2
FIRSTADOPT	0	50	41.3
	1	71	58.7
SUPLOYALTY	0	26	21.5
	1	95	78.5
PRICE	0	59	48.8
	1	62	51.2
YIELD	0	59	48.8
	1	62	51.2
PERQUALITY	0	34	28.1
	1	87	71.9
OPINIONOTHER	0	5	4.1
	1	116	95.9
MEDIA INDEX		0.536 ± 0.136	

Findings for categorical variables are presented as n (%). Numerical data are presented as Mean ± Standard deviation. 0: Yes, 1: No.

To define the impact of information sources on purchase intention several media were assessed. The mean values of these items are illustrated in the table 5.19.

Table 5.19: Information Sources and Media Exposure

Information / media sources	Mean	Std. Dev.	N
I have seen info about my seeds in Instagram/Facebook / VK	2.50	1.19	121
I have seen info about my seeds on the internet (company / distributor website, online blogs, or magazines)	3.09	1.25	121
I have seen info about my seeds in Telegram/ WhatsApp groups	2.64	1.25	121
I learn info about my seeds on YouTube	3.26	1.32	121
I have seen info about my seeds in newspapers and agri-magazines	1.60	0.79	121
I have seen/heard info about my seeds on TV/ radio	1.17	0.30	121
I learn about seeds on field days / seminars	3.12	1.15	121
I get information from exhibitions	2.17	1.14	121
I get information from the representative of the seed seller	4.58	0.63	121
I get information from other farmers	4.62	0.57	121

Among internet-based sources and social media, YouTube and official websites were among the often viewed by farmers when searching for maize seeds. Newspapers, professional magazines, TV, and radio advertisement was rarely used to look for planting maize seeds. Field days and seminars were still the information source sometimes used by farmers in their search for maize seed. Nonetheless, in their seed choice the interviewed farmers relied on information received from other farmers as well as sales representatives.

Table 5.20 shows the results of the logistic regression model for the self-assessed brand loyalty variable.

Table 5.20: The Results of the Logistic Regression Model for Predicting the Self-Assessed Brand Loyalty

Coefficient	OR	Wald	P	95% GA	
				Lower	Upper
AGE	0.541	0.010	0.920	0.328	2.732
EDU1	0.414	1.333	0.248	0.093	1.849
EDU2	0.420	2.016	0.156	0.127	1.391
SALES	0.075	9.376	**0.002**	0.014	0.393
MAIZEEXP	2.382	2.369	0.124	0.789	7.193
MAIZEAREA50plus	1.656	0.415	0.520	0.357	7.685
MAIZEIMP	0.555	0.590	0.443	0.124	2.494
TECHCOFF	1.766	1.151	0.283	0.625	4.989
EXPSAME	0.999	0.000	0.999	0.230	4.336
TIMECONS	0.768	0.243	0.622	0.269	2.193
FIRSTADOPT	1.499	0.497	0.481	0.486	4.621
SUPLOYALTY	3.550	3.053	0.081	0.857	14.707
PRICE	0.591	0.757	0.384	0.181	1.930
YIELD	1.617	0.764	0.382	0.551	4.748
PERQUALITY	15.170	13.032	**<0.001**	3.466	66.400
OPINIONOTHER	0.257	1.076	0.300	0.020	3.348
MEDIA INDEX	0.709	0.024	0.877	0.009	56.296
Constant	0.522	0.173	0.678	-	-

OR: Odds ratio, Accuracy: 0.537, Nagelkerke R^2=0.467, Cox-Snell R^2=0.350

According to the findings, the variables AGE, EDU1, EDU2, MAIZEEXP, MAIZEAREA50plus, MAIZEIMP, TECHCOFF, EXPSAME, TIMECONS, FIRSTADOPT, SUPLOYALTY, PRICE YIELD, OPINIONOTHER, and MEDIA INDEX did not have a statistically significant effect on self-assessed brand loyalty. When looking at the significance of the coefficients in the model, the variables SALES and PERQUALITY had a statistically significant impact on self-assessed brand loyalty. According to the odds ratios, the likelihood of having brand loyalty for those who perceived their seeds to have high quality is approximately 14.2 times higher than those who did not perceive that. When looking at the significance of the SALES variable, the likelihood of having brand loyalty for those with sales amounts exceeding

50000 USD was approximately 0.93 times lower compared to those with less than 50000 USD.

The study of brand loyalty in the USA (Sellars and Gunderson, 2018) did not reveal any significant relationship between seed brand loyalty and age, education, and farm size. Among 13 explanatory variables two showed the significant influence at 5% and 1 % level: price and analytical decision making. The growers who expressed that they apply for the analytical decision-making style when making purchasing decisions showed negative relationship to brand royalty. The more farmers used analytical decision-making style the less they were seed brand loyal. Their seed brand loyalty was also significantly affected by price importance factor. The more farmers though that price was the most essential aspect in product choice, the less loyal they were towards brands. However, the current research did not demonstrate any significant relationship between price and maize seed brand loyalty. One of the reasons for that might be the fact that the research on US farmers comprised seeds of different crops (maize, soybean, cotton, wheat, barley), whereas currently study was focused only on maize. Cotton, soybean, and cereals are standard varieties that can be farm saved and re-used. In contrast, maize is a hybrid crop produced by implementing various technologies (GMO, herbicide-resistance, salt-tolerance, etc.). Therefore, operating with high-tech maize seed and targeting high sustainable yields growers tend to value quality rather than price. The US agricultural producers did not show any significant relationship between seed brand loyalty and sales, whereas Kazakhstani maize growers' seed brand loyalty was significantly influenced by sales volume. Bigger farmers were more brand loyal than smaller. Here again, the crop mixture used in the survey of the US growers, might be the main reason why the farm size defined by turnover or sales was not significantly important in relation to seed brand loyalty. In Kazakhstan only maize seed brand loyalty was included in the model. The turnover or sales volume had statistically significant impact on seed brand loyalty. The higher the sales the more brand loyal was a maize grower in Kazakhstan. In Argentine, however, the relationship was negative, indicating that bigger farmers there tended to demonstrate low or no seed brand loyalty (Feeney, Harmath, and Clay, 2020: 53). As in the USA, the respondents were evaluated in terms of seed loyalty to different crops: maize, soybean, and wheat – that might affect the direction of relationship between sales and seed brand loyalty.

The research revealed the significant relationship between seed brand loyalty and perceived quality. The higher is the perceived quality of a maize seed, the more loyal is the farmer towards the related brand. Seed performance which is strongest indicator of quality was also positively and significantly related to seed brand loyalty in the USA (Harbor et al., 2008) and Argentine (Feeney, Harmath, and Clay, 2020). So, high seed quality is a strong factor of brand loyalty among growers in different countries.

5.6.Maize Seed Supplier Loyalty

The interviewed maize growers usually bought their seeds from either individuals/ private sellers (35 farmers or 28.9%) or legal companies (86 respondents or 71.1%) as illustrated in the Figure 5.8.

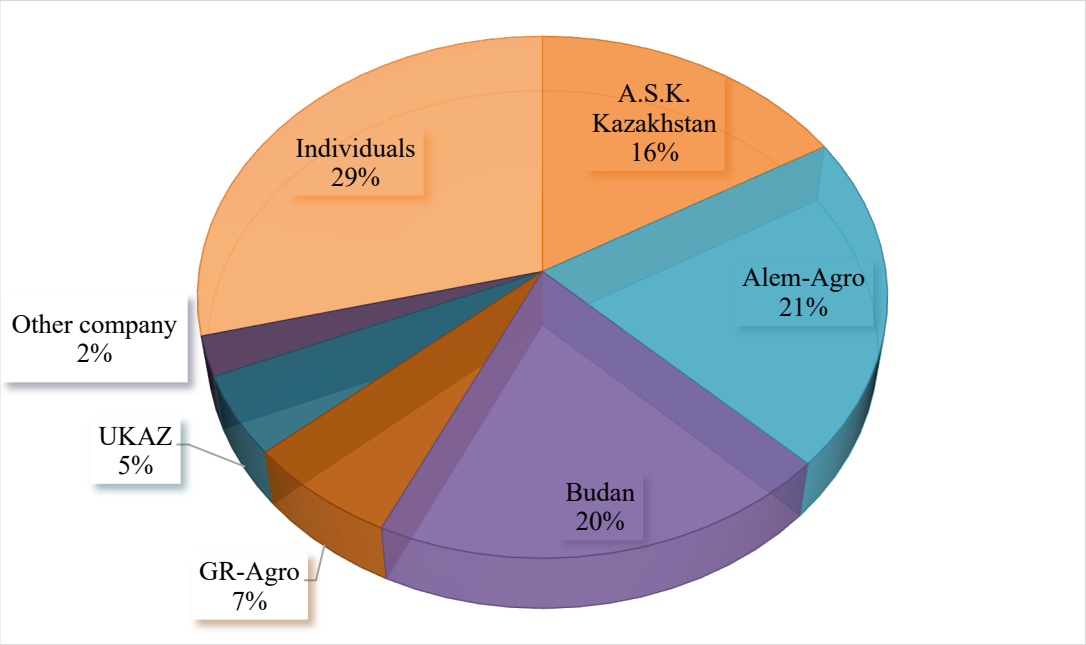

Figure V.8: Main Seed Suppliers

The mean supplier experience of respondents was 6 years, with a minimum of one year and a maximum of 22 years. The 15+ years of relationship was only mentioned for the local seed producer. The relative short supply history of differentiated maize brand products in Kazakhstan described in the Chapter 2 was the main reason of the shorter relationship period between farmers and seed sellers of imported seeds.

74.4% of maize farmers bought multiply products from the seed supplier (seeds of other crops, pesticides, or fertilizers), and only 25.6% purchased only maize seed. It

was convenient for maize growers to obtain the maximum number of necessary input products in one "shop" due to opportunity to receive the highest discount or better payment options for the bundle, to avoid possible delivery issues, and to minimize quality problems. Budan is a solely seed company, therefore farmers did not have any option to buy something else in this case. 8 maize producers bought only maize seed from their non-Budan suppliers, while all other respondents declared to buy the bundles.

The general statistics of the survey concerning seed suppliers indicated that 95 maize growers (78.5%) agreed that they preferred to always buy seed from their current vendors (Figure 5.9). On the other hand, 26 farmers (21.5%) did not agree with this statement or did not know the exact answer. The first group was defined as vendor loyal and the second one as vendor disloyal.

The differentiation concept applied in the analysis of brand loyalty in chapter 5.5 was adapted to the supplier loyalty too.

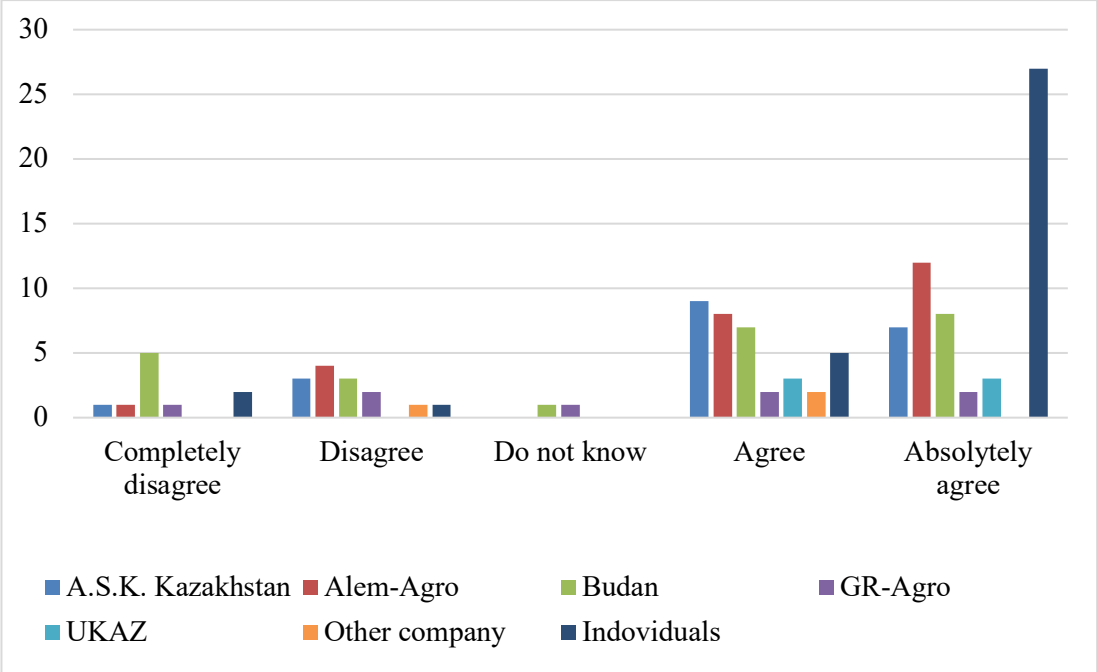

Figure V.9: Distribution of Responses To "I Prefer to Always Buy Seeds from My Current Supplier"

The self-assessment of "I prefer to always buy seeds from my current supplier" was matched with the following two statements: "Will you switch to another supplier if they offer you same maize hybrid seed for the 5% lower price?" and "Will you switch

to another supplier if they offer you same maize hybrid seed for the 10% lower price?" (Table 5.21).

Table 5.21: Supplier Loyalty of Maize Growers in the Southern Kazakhstan

	I prefer to always buy seeds from my current supplier				
	Completely disagree	**Disagree**	**Do not know**	**Agree**	**Absolutely agree**
Switching 5 %	**4 DL**	**6 DS**	**2 PLN**	9	9
Not switching 5%	**6 PLN**	**8 PLN**	0	27	50
Switching 10 %	5	9	2	**12 PS**	**9 PS**
Not switching 10%	5	5	0	**24 L**	**50 L**

Note: L is loyal, PS is price sensitive, DS is disloyal, PLN is passive/ latent/ neutral

The vendor loyal farmers were those who answered that they would nor switch their supplier even for higher price increase (more than 10%) and at the same time preferred to always buy maize seed from their current supplier. Thus, 61.2% of interviewed farmers could be described as loyal. Those who declared that they would switch the current supplier if the seed price increased on 10% could be described as price sensitive (17.4%).

Some farmers expressed passive, latent, or neutral attitude towards their maize seed suppliers (11.6%). They did not agree or were unsure if they preferred to buy seeds from their current supplier but at the same time were not willing to switch them in case the price increased at 5%.

Disloyal farmers (8.3%) were those who (completely) disagree with the statement that they preferred to buy seeds from their current supplier and ready to switch them even if the price increase was small.

Premium seed buyers were slightly more loyal compared to budget seed farmers. Moreover, budget seed users were more likely to switch their seed suppliers if the prices increased even at a smaller 5% (Table 5.22).

The supplier in agricultural context is not only a seller of the product but also provides additional values to a farmer. The farmers are very dependent on environmental conditions and therefore strongly rely on suppliers' knowledge and professionalism. Several research papers and industry reports studied or reported vendor loyalty among

agricultural producers (Feeney et al., 2022; Ag Equipment Intelligence, 2018; Harbor, Martin and Akridge, 2006; Kool, 1994: 203). For instance, Feeney, et al. (2022) found that dealer loyalty and brand loyalty of Argentinian farmers towards agricultural equipment had significant influence on each other. Vendor / supplier or dealer / store loyalty is usually influenced by product, farmer, and farm characteristics like complexity of a product, size of a farm, distance to the store, etc (Feeney et al., 2022; Kool, 1994: 207).

Table 5.22: Mean Value of Vendor Loyalty Measuring Parameters

Questions	Budget seed farmers	Premium seed farmers
I prefer to always buy seeds from my current supplier	3.9	4.1
Will you switch to another supplier if they offer you same maize hybrid seed for the 5% lower price?	2.3	2.0
Will you switch to another supplier if they offer you same maize hybrid seed for the 10% lower price?	2.5	2.4

5.7.Brand Loyalty and Purchase Intention Relationship Analysis

According to the research model suggested in chapter 4, brand loyalty is a predictor of purchase intention where high value of the former positively influences the higher value of the later. The first step was to measure the purchase intention of farmers towards consumed maize seed (Table 5.23). The average intention of interviewed maize growers was in favour of their currently used seeds. Therefore, it can be concluded that the interviewed farmers were willing to continue growing of currently used maize seed brand.

Table 5.23: Purchase Intention

Purchase intention	Mean	Std. Dev.	N
I will buy my currently used seeds in the future	3.93	1.29	121
I am willing to buy only my currently used maize seed hybrid	3.74	1.31	121
I prefer to buy my currently used maize seed hybrid	3.77	1.27	121

Furthermore, the reliability statistics for the purchase intention items was carried out. The Kaiser-Meyer-Olkin (KMO) test determined all data as suitable for the factor analysis and Barlett coefficients were lower than 0.05. The Cronbach's alpha of all criteria showed the sufficient reliability of 0.922 (Table 5.24).

Table 5.24: KMO, Bartlett's Test and Reliability Statistics of the Model

Coefficient/ test name		**Value**
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.798
Bartlett's Test of Sphericity	Approx. Chi-Square	320.326
	Df	3
	Sig.	**.000**
Cronbach's Alpha		.922
N of Items		3

The factor analysis of three purchase intention items was conducted and showed that 2 items explained more than 97% of the factor.

To define the possible correlation between purchase intention and all other items, the factor analysis was carried out. Different criteria were used to test if the data was appropriate for the factor analysis. Therefore, due to acceptable internal consistency all parameters were included in the model (Table 5.25 and Table 5.26).

Table 5.25: Factor Analysis for Purchase Intention (Total Variance Explained)

Compo-nent	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.594	86.469	86.469	2.594	86.469	86.469
2	.328	10.924	97.393			
3	.078	2.607	100.000			

Extraction Method: Principal Component Analysis.

Table 5.26: Component Matrix[a]

Factor parameters	Component 1
I will buy my currently used seeds in the future	.879
I am willing to buy only my currently used maize seed hybrid	.962
I prefer to buy my currently used maize seed hybrid	.946

Extraction Method: Principal Component Analysis.

[a.] 1 components extracted.

In the model purchase intention was the dependent variable and brand loyalty was independent one. The performed regression analysis revealed the significantly positive association between brand loyalty and purchase intention. R^2 value indicated that almost 72% of the variation in purchase intention was explained by brand loyalty. The variance inflation factor (VIF) which was lower than 5 signalled that there was no multicollinearity issue between two independent variables and the model is statistically sound (Table 5.27). The brand loyalty had a positive influence on purchase intention and its p-value was statistically relevant for the model. The "better yield" factor showed a bigger beta or its impact on seed purchase intention would be greater than for "consumer ethnocentrism".

Table 5.27: Regression Analysis (Model Summary)

Model		1
R		.848[a]
R Square		.718
Adjusted R Square		.716
Std. Error of the Estimate		.68369
R Square Change		.718
Change Statistics	F Change	303.726
	df1	1
	df2	119
Sig. F Change		**.000**

a. Predictors: (Constant), Brand Loyalty

The ANOVA test was carried out to reveal the association between purchase intention and brand loyalty (Table 5.28). The results indicated that there was a statistically

significant relationship between two parameters ($p<0.05$). The independent variable "brand loyalty" was an important predictor of the dependent variable "purchase intention".

Table 5.28: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	141.973	1	141.973	303.726	.000[b]
	Residual	55.625	119	.467		
	Total	197.598	120			

a. Dependent Variable: Purchase Intention
b. Predictors: (Constant), Brand Loyalty

Furthermore, the regression analysis showed that one unit increase in brand loyalty increased purchase for 0.715 unit (Table 5.29). Therefore, the linear regression formula can be represented as follows:

Purchase intention = 1.484 + 0.715 Brand loyalty + e

Table 5.29: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Const)	1.484	.138		10.769	.000		
	Brand Loyalty	.715	.041	.848	17.428	.000	1.00	1.00

a. Dependent Variable: Purchase Intention

The beta coefficient for brand loyalty had a high value indicating its positive significant influence on purchase intention. This finding goes in line with the literature review presented in the chapter 3.

CONCLUSION

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

Maize does not comprise a large area in Kazakhstan compared to spring wheat and oil crops, but it is an essential cultivar in agricultural production for farmers in the southern parts of the country. Compared 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 maize seed market offers various conventional hybrids from improved lines of well-known brands to local hybrid seeds. Local production is more affordable for Kazakhstani farmers but does not always meet their expectations (protein content, stay green, dry speed, etc.). Furthermore, domestic producers are still limited in maize seed production areas. Therefore, Kazakhstan annually imports up to 60% of maize seed. The seed system in Kazakhstan requires improvements on every level of its maize production chain and innovative solutions are core stones of effective modernization. The production area of maize in Kazakhstan has a big potential to grow due to increasing domestic and regional (Central Asia) demand for maize products. Therefore, Kazakhstan should develop its own maize breeding and seed production sector by creating appropriate conditions either for its own research entities or for collaboration with foreign organizations interested in expansion of their R&D activities.

The comprehensive research on maize 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 maize sector in Kazakhstan.

The current research demonstrated that Kazakhstani maize growers used improved maize hybrids of both multinational companies (“premium seeds”) as well as more affordable seed from the local producer and organizations of the former Communist Bloc (“budget seeds”). In contrast to many developing countries, farm-saved landrace

seed and/ or open-pollinated varieties were not so prevalent among Kazakhstani farmers. Maize is an “imported” crop for Kazakhstani farmers that was massively introduced in the 1960s. Just before the collapse of the Soviet Union, Kazakhstan cultivated almost 2.5 million hectares of maize, which was further significantly reduced to the minimum area of less than 150 thousand hectares in 2006. Compared to the soviet era, the grain maize prevails over silage maize in the independent Republic of Kazakhstan.

The choice of seed depends on the different contexts a farmer faces when deciding on a particular hybrid (Almekinders et al., 2019: 17-18). They can be an ecological zone where farmers operate, their access to technologies and markets, the importance of maize growing in the whole production organization, social status, and others. Consequently, every grower has his/her list of preferences that he/she may find essential in choosing a particular maize seed. According to this research carried out in southern Kazakhstan, interviewed farmers preferred maize seeds with high yield potential, positive reviews from other farmers, affordable price and easy payment terms, good seed quality, drought and salinity tolerance, and high drying speed. Their choice of factors reflected Kazakhstan's natural, economic, and social environment that shaped farmers' seed preferences.

The study did not reveal any significant relationship between use of budget and premium maize seed hybrids and factors like age, education, farm size, maize importance, and technical advance. Both seed types are widely used by Kazakhstani maize growers despite the price difference existing between these two groups. Compared to many developing countries dealing with Landrace varieties, Kazakhstan did not face this issue. In many cases, the yield does not vary between both types, because lots of farmers grow their maize with low input levels like fertilizers or crop protection products. The planting of more improved seeds is mainly justified in intensive growing technology where a farmer applies the necessary amount of nutrition and protection products. These hybrids may be more sensitive to irrigation constraints too. Many farmers in Kazakhstan tried to cultivate premium maize hybrids. However, they could not provide either watering in critical growing stages or the necessary protection of plants against weeds and pests. Therefore, they could not achieve the maximum potential yield of premium hybrids. They preferred to stay with budget seeds and to rely on standard yield volumes they receive with their low input

technology. The same situation occurs in many African and several South American countries where maize is a traditional crop in the daily dietary. Despite the efforts of different organizations, the adaptation of improved maize hybrid varieties remains low there (Mukarumbwa and Taruvinga, 2023: 1-2). Better adaptability of landraces to local growing conditions is one of the major factors affecting especially small farmers in their choice of seeds in these countries. Moreover, better storability and taste of local landraces are also counted by farmers as important features. The taste was also mentioned in another study carried out in South Africa where it was the most important factor in seed choice of maize landraces. The attributes like possibility to recycle seed (farm save for next year), tolerance to abiotic stresses, and yield stability were also considered as important for respondents in South Africa (Sibiya *et al.,* 2013: 46-47). Additionally, other attributes like high yield, disease resistance, early maturity, white grain colour, as well as drying, and shelling qualities were mentioned among preferred maize seed qualities.

In Kazakhstan most of maize yield is further processed in industry plants or used in poultry and livestock sector. So, taste is not measured.

The knowledge of the desired attributes of maize growers in Kazakhstan will be of particular interest to public and private sectors, which are involved in developing new appropriate maize hybrid varieties for the country. Secondly, the research can help shape seed distributors' sales and marketing strategies by focusing their effort on opinion leaders among farmers, building a good relationship with growers, and increasing the professional competence of their staff. Moreover, this study may provide information relevant to Kazakhstan's policymakers in their discussion of the allocation of publicly funded resources. State subsidies and public funds are used to support local seed production and plant breeding programs; however, the effectiveness of such investments should be questioned. If domestic seed production is reasonable, Kazakhstan should improve the sector and attract international companies to develop new maize hybrids locally. On the other hand, if importing seeds is a better option, to what extent the difference in the support amount between local and foreign seeds is justified? Last, the research will generate interest in the academic community in marketing research on the agriculture of Kazakhstan. Thus, it can stimulate similar studies for other plants cultivated in various regions across the country to understand

if any geographical, social, structural, and economic differences exist between agricultural growers when deciding on any input or technology adoption.

The current research demonstrated that the variation existed at statistically significant level between budget and premium seeds in the parameters like yield, quality, supplier trust, and supplier competence. This was an interesting finding to see that differences occurred in how maize premium and budget seed growers valued vendor trust and competence.

More than 30% of the respondents were loyal to their maize seed brand and did not intend switching the brand even at 10% price increase. The most important factors that significantly influenced seed brand loyalty in this study were farm size in terms of its annual sales value and perceived quality.

The Kazakhstani maize growers showed their high loyalty towards seed suppliers. More than 60% indicated that they would continue to buy their maize seeds from the current vendors and would not switch them even if they had increased the price by 10%. Premium seed users demonstrated higher vendor loyalty compared to budget seed growers. The percentage of vendor loyal farmers was higher than of brand loyal ones. This indicates that relationships with suppliers are equally important as product performance and price for maize growers in Kazakhstan.

The model investigated the relationship between brand loyalty and purchase intention. It illustrated that indeed brand loyalty is a strong predictor of purchase intention among maize growers in Kazakhstan.

The topics illuminated in the current research have various implications. For seed producers, it showed that yield and quality are superior factors defining the seed choice of growers in Kazakhstan. However, attributes like pest, drought, salinity resistance will earn more and more attention due to ecological and climate constrains. For seed suppliers, the research demonstrated that farmers value their competence and reliability. Therefore, it is worth for them to invest in development of companies' positive image and personnel's training to strengthen their professionalism and product knowledge. For scientific community, the research opened various topics for further research in seed preferences, brand loyalty, supplier relationship, and others. The study can be extended to different crops, agricultural products (for example,

fertilizers), regions, and countries. Other methods to measure abstracts and variables in this research can be tested in same market to define the optimal one.

Limitations

The study's period coincided with the COVID-19 outbreak, which significantly affected the research flow. It limited the possibility of meeting and questioning farmers collectively and traveling from one village to another was challenging due to the considerable distances between them. Therefore, the number of respondents was limited. This fact should be considered when generalizing the study's results.

The study of the farmers' preferences is not free of bias because it embraces only limited parameters included in the research (Birol, Smale and Yorobe, 2012: 186). It does not contain trade-offs and thoughts growers have in an actual situation. The context or environment in which farmers decide on a particular input product, such as seed, is vital because, usually, farmers' choices may be affected by situational factors that are not part of this study (import/export bans, devaluation of local currency, etc.).

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APPENDICES

Appendix 1: Questionnaire

Demographics and general farm data

a. Farm region and district.
b. How many years have you been farming maize? _____ years
c. Your Age: _____ years
d. Education:
    1. School 9 years
    2. School 11 years
    3. Technical or not finished high
    4. University
    5. MSc and higher
e. Total planting area:
    1. less than 5 ha
    2. 5-10 ha
    3. 10.1-50 ha
    4. 50.1-100 ha
    5. More than 100 ha
f. From which maize planting area _____ ha:
g. Annual turnover from agriculture:
    1. less than 5 mio KZT
    2. 5-20 mio KZT
    3. 21-50 mio KZT
    4. More than 50 mio KZT
h. Total share of maize sales in your annual turnover:
    1. 80-100%
    2. Close to 50%
    3. 30% and less
i. Average maize yield in your farm:
    1. 50 dt/ha or less
    2. 51 - 80 dt/ha
    3. 81 - 120 dt/ha
    4. More than 120 dt/ha
j. The equipment (tractors, planting machine, combine, sprayer, soil preparation) in your farm is:
    1. Mainly owned by you
    2. Some are owned; partly rented
    3. All rented
k. Land on your farm (multiple answers can be checked):
    1. 100% owned,
    2. Rented from the state (for 49 years or more)
    3. Rented from individuals
    4. Other

l. When you grow maize,

	Yes, 100% on all maize area	Yes, up to 70% of all maize area	Yes, but less than 50% of maize area	No
Do you regularly /every year use macro fertilizers?				
Do you regularly /every year use foliar micro fertilizers?				
Do you regularly /every year use plant protection products?				
Do you usually properly and in time receive your water for irrigation?				

m. What is the distance between your place of residence and the household (approximately in kilometres)? _____ km.

n. From the list below, select the top five factors that influence your choice when buying maize seeds?

	Criteria / attributes	1	2	3	4	5
1	Supplier reputation					
2	The opinion of other farmers					
3	Potential yield					
4	Complete solution /All in one buying (seed + CPP + fertilizers)					
5	Resistance to drought and salinity					
6	High response to fertilizers					
7	Grain quality (high protein)					
8	Price and payment terms					
9	Distance to seed warehouse					
10	Relationship to supplier or salesperson					
11	Aftersales support of supplier					
12	Subsidies					
13	Seed quality (purity, germination)					
14	Competence and professionalism of the supplier and his employees					
15	Your positive experiences with the hybrid in years past					
16	Brand					
17	Country of origin					
18	Seed production year					
19	Kernel size					
20	Social media					
21	Seed availability at the time of sowing					
22	Distance to supplier office and seed warehouse					

o. Which brand of maize seed do you plant the most (more than 80% of your planting area)?
    1. Pioneer
    2. Syngenta
    3. Limagrain
    4. Golden West
    5. Mais or other Ukrainian hybrids
    6. Krasnodar or other Russian hybrids
    7. Budan
    8. Others

p. How many years do you plant your current maize seed brand? _____ years

q. To what extent do you agree or disagree with the statements below (in each line it is possible to mark (with a tick, a cross, a dash) only one option on a scale from 1 to 5):

	1 (strongly disagree) to 5 (strongly agree)	1	2	3	4	5
1	Intention to buy (DV): I will buy my currently used seeds in the future					
2	I am willing to buy only my currently used maize seed hybrid					
3	I prefer to buy my currently used maize seed hybrid					
4	I am loyal to my maize seed brand					
5	I am willing to pay a higher price for my brand (10% or more) than for seeds from other companies					
6	Better yield (IV) My currently used maize seeds have higher yields					
7	My currently used maize seeds have higher yields than other varieties					
8	My currently used maize seeds have better quality than other seeds					
9	My currently used maize seeds are a high-quality product					
10	All brands of maize seeds are the same in terms of yield (it makes no difference which brand to sow)					
11	It takes time to me to choose a proper hybrid seed					
12	I always try to be one of the first to try new hybrids					

r. To what extent do you agree or disagree with the statements below (in each line it is possible to mark (with a tick, a cross, a dash) only one option on a scale from 1 to 5):

	1 (strongly disagree) to 5 (strongly agree)	1	2	3	4	5
8	Rich farmers choose to plant Pioneer/Syngenta seeds					
9	If I plant Pioneer/Syngenta seeds I would feel important					

10	Rich people prefer Pioneer/Syngenta seeds					
11	Pioneer/Syngenta seeds are a symbol of status					
12	Ethnocentric behaviour Only those products that are unavailable in Kazakhstan should be imported					
13	Kazakh products, first, last, and foremost					
14	A real Kazakh should always buy Kazakhstan-made products					
15	Kazakhs should not buy foreign products, because this hurts Kazakh business and causes unemployment					
16	It may cost me in the long run, but I prefer to support Kazakh products					
17	Kazakh consumers who purchase products made in other countries are responsible for putting their fellow Kazakhs out of work					

s. Which source do you use to get information about your seed brand?

	1 (never) to 5 (always)	1	2	3	4	5
18	I have seen info about my seeds in Instagram/Facebook / VK					
19	I have seen info about my seeds on the internet (company / distributor website, online blogs, or magazines)					
20	I have seen info about my seeds in Telegram/ WhatsApp groups					
21	I learn info about my seeds on YouTube					
22	I have seen info about my seeds in newspapers and agri magazines					
23	I have seen/heard info about my seeds on TV/ radio					
24	I learn about seeds on field days / seminars					
25	I get information from exhibitions					
26	I get information from the representative of the seed seller					

t. Who is your current maize seed supplier:
    1. A.S.K.
    2. Alem-Agro
    3. GR Agro
    4. Budan
    5. Ukaz Group
    6. Another private person
    7. Other company

u. How many years do you buy your maize seed from your current supplier?
_____ years

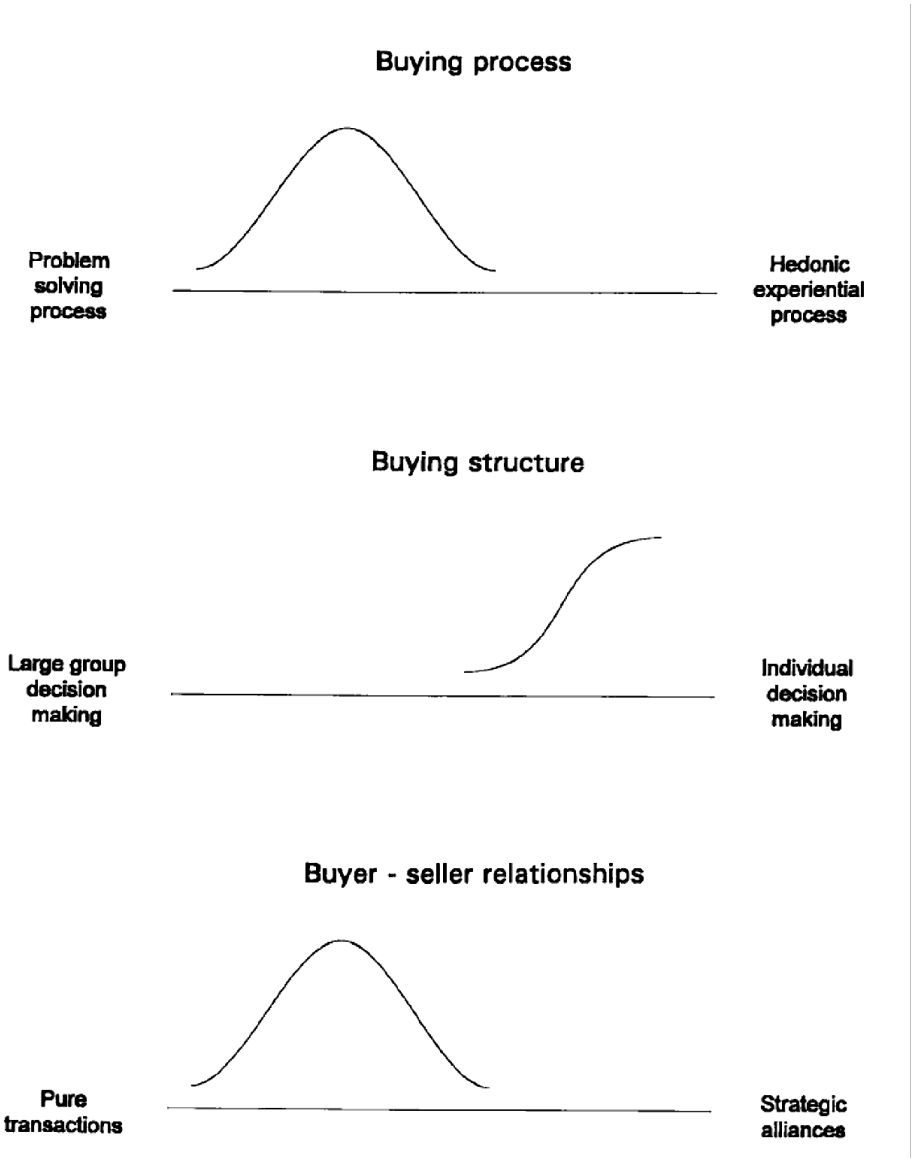
v. What do you buy from your maize seed supplier?
    1. Maize seeds only
    2. Other seeds
    3. CPP
    4. Macrofertilizers

5. Microfertilizers
6. Equipment
7. Parts
8. Others

w. To what extent do you agree or disagree with the proposals regarding your maize seed supplier below (in each line it is possible to mark (tick, cross, dash) only one option on a scale from 1 to 5):

	1 (strongly disagree) to 5 (strongly agree)	1	2	3	4	5
1	Consumer supplier loyalty (DV): I prefer to always buy seeds from my current supplier					
2	Will you switch to another supplier if they offer you same maize hybrid seed for the 5% lower price?					
3	Will you switch to another supplier if they offer you same maize hybrid seed for the 10% lower price?					
4	Trust (IV): My supplier really takes care of my needs as a customer					
5	I trust completely my supplier					
6	Commitment I feel involved with/ committed to my supplier's company					
7	I defend my supplier in front of other farmers					
8	I am very proud to have this company as a supplier					
9	Services and communication My supplier provided you with adequate consultation before proposing the best solution					
10	My supplier respects his/her promises					
11	My supplier contacts me often					
12	Orders are delivered/confirmed on time					
13	The terms of contracts signed are always clear					
14	I feel well-advised by my supplier's sales representatives					
15	My supplier is aware of my needs concerning maize growing					
16	Loyalty I would continue buying maize seeds from my current supplier					
17	I would recommend my supplier to another farmer					
18	Satisfaction All in all, I am strongly satisfied with my seed supplier					
19	In comparison to other companies my supplier of maize seed offers a good price (price satisfaction)					
20	If there are changes in the seed delivery time or quality, my supplier considers our interests					
21	Switching costs I would not be keen on searching more often for a new supplier					
22	There are enough other suppliers from whom I can buy my maize seeds*					
23	Today, finding a good supplier is very difficult.					

Appendix 2: Tentative position of (Dutch) famers buying behaviour on the three dimensions of the buying behaviour from Kool (1994: 32)



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Samenova, G. "Maize Production and Seed Preferences of Farmers in the Southern Kazakhstan" *III. İZÜ Sosyal Bilimler Lisansüstü Öğrenci Kongresi Özet Bildiri KitapçığI,* 04-05 June 2022, Özgenel: Istanbul Sabahattin Zaim University, 2022: 196.