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Impact of the Period of Virgin Lands Development on Modern Kazakhstan and its Economy

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Impact of the Period of Virgin Lands Development on Modern Kazakhstan and its Economy

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Objectives of thesis

The objective of the thesis is found out whether the virgin lands period had an impact on the yields of modern Kazakhstan and its economy. In case if it did have high impact, which is yet to be discovered, there comes a logical question of whether it could be categorized as a positive part of history or a negative experience affecting the country to this day. Using a variety of different sources of information, describe the history of the virgin lands, what goals were pursued and what consequences were gained can be regarded as supplementary objectives.

The sub-goals are comparing what cultures were prevalent during that time period and what has changed today. In addition to that, tracing and describing how the economy of Kazakhstan changed during the virgin lands, what path was chosen after its completion are among the sub-objectives of the thesis. After completion of work in the practical part to draw a conclusion, in what position now the economy of Kazakhstan – how export and import of grain crops, their yield changed. In addition, to identify what judgment about the impact of virgin lands on modern Kazakhstan led to the study.

Methodology

The thesis draws on both approaches – the qualitative and quantitative one, where the first one is used in the literature review to form solid theoretical foundation for the thesis. On the other hand, the utilization of the quantitative methods allows to focus on the dynamics of changes and equally analyze the impact of the virgin area on the modern economy of the Republic of Kazakhstan.

When it comes to specific methods used in the thesis, the thesis utilizes time series analysis represented by graphs and correlation analysis with the emphasis on agricultural and macroeconomic variables.

The proposed extent of the thesis

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Kazakhstan, agriculture, virgin lands, commodities, industry

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Declaration

I declare that I have worked on my bachelor thesis titled " Impact of the Period of Virgin Lands Development on Modern Kazakhstan and its Economy" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break any copyrights.

In Prague on 15.03.2024 _____

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Impact of the Period of Virgin Lands Development on Modern Kazakhstan and its Economy

Abstract

The main purpose of the bachelor's work is to find out whether the period of Virgin Lands in the Kazakh SSR had an impact on modern Kazakhstan and its economy, setting a goal to answer this question through the study of all available statistical data, scientific papers, and other studies and documents of that time, which is a qualitative approach as a basis for theoretical conclusions. Also, a quantitative approach was used in the study of time series, making graphs, and calculating percentages, conducting correlation analyses and related tests for more accurate results, and the main commodity chosen is wheat. All research was made through independent processing based on the World Bank and the National Statistical Office of the Republic of Kazakhstan. The conclusion is that the Virgin Lands period has affected modern Kazakhstan mainly negatively, and now the country is introducing reforms and agricultural programmes to correct the mistakes of the past and improve its future.

Keywords: Kazakhstan, agriculture, virgin lands, commodities, industry, economy, production, wheat, soil.

Vliv období rozvoje panenských zemí na současný Kazachstán a jeho ekonomiku

Abstrakt

Hlavním cílem bakalářské práce je zjistit, zda období panenských zemí v Kazašské SSR mělo vliv na současný Kazachstán a jeho ekonomiku, přičemž si klade za cíl odpovědět na tuto otázku prostřednictvím studia všech dostupných statistických údajů, vědeckých prací a dalších studií a dokumentů z té doby, což je kvalitativní přístup jako základ pro teoretické závěry. Rovněž byl použit kvantitativní přístup při studiu časových řad, tvorbě grafů a výpočtu procent, provádění korelačních analýz a souvisejících testů pro přesnější výsledky, přičemž hlavní komoditou byla zvolena pšenice. Veškerý výzkum byl proveden prostřednictvím nezávislého zpracování na základě údajů Světové banky a Národního statistického úřadu Republiky Kazachstán. Závěrem je, že období panenské půdy ovlivnilo současný Kazachstán především negativně a nyní země zavádí reformy a zemědělské programy, aby napravila chyby minulosti a zlepšila svou budoucnost.

Klíčová slova: Kazachstán, zemědělství, panenská půda, komodity, průmysl, hospodářství, výroba, pšenice, půda.

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1. Introduction

Every person, no matter where he or she lives, will always keep in his or her heart the history of their own homeland, love it, and worry about its successes and failures. In fact, it is by observing from the outside that one can realize the whole situation and give a rational assessment of what is happening, without the pressure of the media and political foundations.

Thus, for example, a painful topic for Kazakhstan is the yield of grain crops, which either corresponds to the annual plan or falls behind it. Grains are of great importance for Kazakhstan; they are the main specialization in the field of crop production in the country. The share of these crops accounts for about 80% of all sown areas in the country (U.S. Department of Commerce, 2021). Grain production occupies one of the key places in the economy of the republic. Besides the fact that the main task is to feed its population, the next important task is to earn extra money on the export of this grain, the result of which can be seen in the fact that it is one of the top 10 exported goods in Kazakhstan (TrendEconomy, 2022). Therefore, since gaining its independence, the issue of increasing crop yields in the country has been one of the most important and frequently discussed. Despite the seemingly huge amount of grain exported, Kazakhstan is only on the verge of unlocking its full potential.

Living in a country, one can sense how changes in cereal production affect the economy, for example, the annual increase in the price of basic food products that are directly related to the success of cereal crops. However, it is not always possible for residents to make this analogy and realize the cause-and-effect connections. Therefore, this paper will be devoted to looking at and analysing the situation from the outside at how Kazakhstan's yields changed year after year, how the export and import of cereals changed, and, therefore, how much the country was selling and buying. The main objective is to identify the cause of the changes. As an assumed reason, the impact of the Virgin Lands period in the Kazakh SSR is put forward, and more precisely its consequences for the lands of Kazakhstan at that time, mainly for the economic and agrarian sphere. In 2024 it will be 70 years since the beginning of the development of virgin lands, and witnesses and participants of that event are getting increasingly less. In its time, the history of that period recorded only events, the

emphasis of which was on achievements and positive moments, and only briefly, a glimpse of failures and failures. More information on the subject of the latter can be found in books, historical notes, or testimonies of people, mostly belonging to the indigenous population. Thanks to their courage, the study of this historical period offers the opportunity to see the full picture, and all sides of the consequences, and to examine the different opinions that eventually come together. History is strong in the hands of those who know it and remember it well enough to take into account all mistakes and draw conclusions in the future. Is Kazakhstan strong enough now, and how well do local experts remember the past of its steppes and arable lands, to ensure that they are properly cared for and move the country towards economic stability?

Whether the impact of the period of development of virgin lands was more of a positive stage or rather a negative experience, or it is practically not noticeable for modern Kazakhstan - this will be put forward in work as the main question, which in the course of collecting and analysing information, addressing and diving into its historical part, studying the development of the economy in that period, as well as in the process of working with all available data, their comparison and identification of results, will have to be answered at the end.

2. Objectives and Methodology

2.1 Objectives

The objective of the thesis is found out whether the Virgin Lands period had an impact on the yields of modern Kazakhstan and its economy. In case if it did have high impact, which is yet to be discovered, there comes a logical question of whether it could be categorized as a positive part of history or a negative experience affecting the country to this day. Using a variety of different sources of information, describe the history of the virgin lands, what goals were pursued and what consequences were gained can be regarded as supplementary objectives.

The sub-goals are comparing what cultures were prevalent during that time period and what has changed today. In addition to that, tracing and describing how the economy of Kazakhstan changed during the Virgin Lands, what path was chosen after its completion are among the sub-objectives of the thesis. After completion of work in the practical part to draw a conclusion, in what position now the economy of Kazakhstan - how export and import of grain crops, their yield changed. In addition, to identify what judgment about the impact of Virgin Lands period on modern Kazakhstan led to the study.

In total, the research questions are:

1) Did the Virgin Lands period have a positive or negative impact on the economy of modern Kazakhstan?
2) Whether the statistical data of grain yields and production were exaggerated during the soviet period?
3) What are the terms of trade of selected commodity?
4) What path modern Kazakhstan chooses for further development of the agricultural sector?

2.2 Methodology

The thesis draws on both approaches – the qualitative and quantitative ones, where the first one is used in the literature review to form a solid theoretical foundation for the thesis. On the other hand, the utilization of the quantitative methods allows to focus on the dynamics of changes and equally analyse the impact of the virgin area on the modern economy of the Republic of Kazakhstan.

After analysing and interpreting all the necessary information and data taken from statistical books, academic literature, scientific articles, and documents, the author conducted a study based on descriptive and comparative methods. For a more detailed analysis, the practical part was divided into 3 parts, each of which has its conclusion on the result obtained.

As for the specific methods used in the thesis, time series analyses presented in the form of graphs are used. For this purpose the following data were used: on employment in agriculture and the share of the primary sector in the real GDP of Kazakhstan for the period 1991-2021 to understand how the role of the agricultural sector in the economy changed, on wheat yields for the whole country and the virgin regions for the period 2004-2022 to compare them, and on fertiliser inputs for the same period to trace their relationship in a correlation analysis. All data were mainly taken by own processing based on World Bank data as well as the National Statistical Office of the Republic of Kazakhstan.

Also, the practical part contains correlation analysis with a focus on agricultural variables. Further for more accurate results hypothesis test is used. After the correlation coefficient for each pair is estimated, then the t-value computation is used to perform the significance test for correlation coefficients. The correlation coefficient's T value is computed as follows (Willard, 2020):

$$T\ value\ =\ t_{r_{xy}} = \frac{r_{xy} * \sqrt{n-2}}{\sqrt{1-r^2{}_{xy}}} \quad (1)$$

$$Significance\ level = 0.05 \quad (2)$$

Additionally, two types of analysis typical within the realm of agriculture economics are performed, namely the self-sufficiency analysis and the terms of trade analysis. Both follow the formulas:

$$Self - Sufficiency = \frac{Domestic\ Production}{Domestic\ Consumption} * 100 \quad (3)$$

$$Terms\ of\ Trade = \frac{Price\ of\ Export\ per\ unit}{Price\ of\ Import\ per\ unit} * 100 \quad (4)$$

3. Literature Review

3.1 History of Virgin Land

3.1.1 Definition of virgin land and its purposes

To give a correct definition of the concept of "virgin land" it is necessary to refer to the sources of that time and explanatory dictionaries of the Russian language. In the Russian language, virgin land sounds like "tselina", this word is derived from the Slavic word "whole", i.e., "whole, unplowed land".

Ozhegov's Explanatory Dictionary (Ozhegov, 2008) gives the following definition - "a place through which no one has passed", as well as "lands in Kazakhstan, Siberia, the Urals and the Volga region in 1954-1960". A more general definition, found in almost every word and encyclopaedia – is "lands that have not been plowed for many years or never plowed, their soils contain an increased amount of humus, nitrogen and other elements of plant nutrition" (Big Soviet Encyclopedia, 1986). Figure 1 presents the map of virgin lands.

Figure 1, the map of virgin lands

Source: Virgin Lands Campaign, 2023

The etymological meaning has been uncovered and is clear, so now it is possible to consider in more detail the concept of "Virgin Lands period" and its essence. The period itself lasted in general from 1954 to 1965. Its beginning was due to the situation after the Second World War, which was difficult. As a result of the terrible war - a huge number of people died, but also suffered greatly agricultural infrastructure - were destroyed grain areas, as well as lack of proper equipment and agricultural machinery, because of the population decline as a consequence, greatly reduced the number of residents in rural areas. Therefore, the issue of increasing grain production became an acute problem, not only to cover the domestic demand of the population, but also not to get into a situation in which it would be necessary to buy grain from " hostile competitor countries ", such as, for example, the United States. The latter in their time (earlier than virgin land in the USSR) had unsuccessful experience of the program of development and plowing of low-grass prairies, which by climatic conditions are very similar to the Kazakh steppes, but few people talk about it. Moreover, few people talked about it then, but comparing these two periods and their similarity, it can be assumed that Khrushchev did not come up with his plan himself, but so to say, looked it up. However, it was not possible to avoid the mistakes of others, as will be shown late (Nagaibayeva, 2023).

So, in 1953, a decision was made to expand the area of agricultural land on plots of land that had not yet been used for cultivation and cultivation of grain or any other crops, i.e. virgin and fallow lands. These were mostly territories covered with grassy vegetation - steppes, or forests, but in general having a great potential for development. It should be said that not everyone was in favour of this idea, citing the fact that the lands might not be suitable enough for growing crops, as well as because of the large investments and possible shortage of agricultural machinery. For example, Zhumabai Shayakhmetov, the first secretary of the Central Committee of the Communist Party of Kazakhstan (indigenous nationality), was a categorical opponent of virgin lands. He claimed that all possible lands in Kazakhstan had already been plowed and did not want his country's lands to be "experimented" with, instead he suggested developing what was already going well - cattle breeding. But Khrushchev was adamant about his ideas for Kazakh lands, so Zhumabai Shayakhmetov was removed from his position for his opposition (Khrushcev,1999).

Khrushchev's plan for the development of fallow lands set the following goals - in a short period of time, that is, by the next year 1954, to increase the volume of harvest by 35-40%, as well as the area of crops by 13 million hectares, to send the maximum amount of labour to the unplowed land and to put as much as possible of the latest domestic agricultural machinery. Pervotselinniki - that was the name of those who came to develop the virgin lands in the first ranks, came from all the republics of the Soviet Union, however, in a voluntary-coercive order. People travelled with a single idea to the area of untouched steppe lands, without any infrastructure and even lived in tents for the first time. Later, in various chronicles and documentaries, people would say that they went not for money or apartments, but for the people, for the common cause, to participate in such a big event and to see everything with their own eyes. The task at hand was inspiring and was able to unite people into a single unit for the common good, thus already realizing part of the expected result of the land development plan (Erley, 2021).

It was considered that for the steppe agro-landscapes of Kazakhstan, to achieve an average yield of 14-15 centners per hectare of virgin lands was a rather high bar, because even in the forest-steppe regions the average yield for the whole period from 1945 to 1953 was 6.3 centners per hectare. And in general, climatic conditions were harsh - droughts, as a consequence of insufficient amount of planting, as well as very cold winters and early onset of frosts. But thanks to the natural fertility of the soil and at that time the latest agrarian technology by 1954 was plowed 5 million hectares in the territory of the Kazakh SSR and in general for that year in the USSR from virgin lands managed to harvest 14.7 million tons of grain. Of course, such a success could not help but rejoice, and motivated for further no less large numbers as expectations of incredible success. The largest harvest from virgin lands was recorded in 1956, when 64 million tons of grain were harvested (Big Russian Encyclopedia, 2004).

3.1.2 Consequences of the Virgin Lands period

After such a marvellous result in 1956, it was expected that the grain crisis would pass and everything would be stable, but by 1957 the increase in ploughed land practically stops, and the drought season comes, which affects the already sown fields. As a consequence, it

is no longer possible to achieve the result of 1956, but that is not the worst of it. (Mutaliyeva, 2020).

Soon after the beginning of the Virgin Lands, severe soil erosion began. Since there was already little time to achieve the goals set by Khrushchev, no one gave much thought to the timely creation of forest-protective strips. In fact, it sounds surprising, because most likely not a few people qualified in the field of agriculture participated in the realization of the project, but the situation was such that they would hardly have been heard. Since strong steppe winds prevailed in these regions, forest shelterbelts were necessary to protect the plowed layer of soil. The strong winds were simply unstoppable, so the high velocity of the air flows lifted up soil particles, resulting in so-called sandstorms (Kraemer, 2015).

Thus, in the absence of protection, storms began to blow out the most important substance for soil fertility - humus. The quality of soil necessary for growing crops fell, the fertile soil layer was destroyed by 15-20 percent. As a result, about 9 million hectares of virgin lands in the Kazakh SSR suffered from wind erosion by 1960 (out of the plowed 25.5 hectares in the period 1954-1960). But it is necessary to add that not few production experiments were conducted over the lands for the North Kazakhstan region. Their results were reduced to the fact that due to climatic features of the region (moderately arid climate and predominance of dry-steppe terrain), protective forest belts, on which so pinned hopes in the form of salvation from winds and subsequent erosion, will be practically ineffective. Conditions for growing the necessary area of forests were unfavourable, they would have the opportunity for their effectiveness only in an integrated approach, with other agrotechnical methods to protect fields from erosion. In the north of Kazakhstan regions are characterized by dark chestnut and chernozem soils, which were also damaged. As a consequence of annual cultivation and plowing of the land, on which annual crops were grown every time without rest, the soil, which was not prone to erosion earlier, began to erode. An example, or rather confirmation of these words is the situation in Kellerovsky rayon (today its lands are part of Taiynshinsky rayon) in North-Kazakhstan oblast. The fact is that before the Virgin Lands period, the rayon had quite good harvests of grain crops, but now it is in the last place in terms of yields. Such deplorable results affected a small number of individual districts (for example, Chkalovsky and Krasnoarmeysky districts), but it would

have been much better if they could have found a reasonable approach and avoided it altogether (Pashkov, 2016).

In addition to sandstorms, vast areas of ploughed virgin lands were dark in colour and, attracted excessive heat and sunshine. Such unaccustomed for these regions phenomena led to a change in the difference between precipitation and evaporation. The process of evaporation began to prevail, so the moisture content of the whole area decreased. Drought began, which not only killed crops but also caused rivers and lakes to dry up. The land of the ancestors of the indigenous people was exhausted - "Kokshetau lakes lost their former beauty, the grass of Saryarka disappeared" ("Egemendi Kazakhstan", December 4, 1992). Animals living in the territory suffered too, some became endangered, and others changed their habitat, but in any case, if to take the overall effect of these consequences - the ecology of Kazakh lands was on the verge of disaster. Along with all of the above, the situation with the harvest was carefully hidden behind the veil of success. A significant share of the harvest was simply lost because the available infrastructure was not designed for such a large amount of grain - there were not enough elevators (where stocks are usually stored). In addition, there were no normal transportation connections, i.e., there were either no roads at all or it was impossible to pass through them, which could have been used to transport grain for processing or to other storage facilities, and there was a shortage of specialists (Mazhitova, 2023).

Since there was continuous plowing of land on steppe agro-landscapes, the quantity of the latter was extremely important for Kazakhstan. Since cattle breeding was one of the main industries, it was necessary to have pastures for cattle. But there was simply not enough steppe terrain, and what was left suffered from overgrazing and faded, as it did not have time to recover. Thus cattle breeding, the traditional branch of the country, was jeopardized and it caused a shortage of all dairy and meat products in the Union (Levykin, 2022).

Indigenous people, eyewitnesses of that time, spoke about the Virgin Lands period as a tragedy that happened to their native lands. Indeed, the virgin lands were developed mainly by newcomers, for whom this land was not their native land, and therefore, from the moral

point of view, it was less valuable, so any consequences would not be so painfully perceived. (Abdiraiymova, 2022).

3.2 Essence of cereal production

3.2.1 Farm development

Before proceeding to a more detailed discussion of the topic of this chapter, it is necessary to define two key concepts - "state farm" which is called "sovkhoz" and "collective farm" which is called "kolkhoz" and explain the difference between them. The concept of kolkhoz comes from two words - collective and farm. However, this collective exactly in the concept of "kolkhoz" means a community or assembly of free peasants who came together of their own free will and chose their chief. In a number of collective farms, peasants were expected to contribute their land, seeds, and livestock to a common collective property. The expectation was that the benefit would be to receive a share of the income of the whole farm. As far as state farms are concerned, it is almost the opposite. This word is also formed from 2 others - Soviet farm. A sovkhoz is a state public association or enterprise, and all people are members of it according to the so-called voluntary-coercive order, but the main thing is that they were hired workers and received a fixed payment for labour. This enterprise was fully financed by the state and issued passports to people (which collective farms did not do). At first glance, one could say that conditions were better in the state farms (Petrick, 2013).

During the Virgin Lands period a great attention was really paid to collective and state farms. With the fact that people from neighbouring republics were moving to Kazakhstan, the number of collective farms did not increase, on the contrary, during the year 1954-1955, about 425 new state farms were added in the country, taking into account that their total number in the whole union barely exceeded the mark of 5000 (USSR State Statistics, 1956, p.100). The reason for such growth was that most of the development of agriculture was given to state farms, which could use various means of production more rationally, and under their disposal was a large amount of equipment in the form of tractors or combines. It was not until 1958 that a decree was issued authorizing the sale of machinery to collective farms, which could be done by cash or credit, which often prevailed (Filev, 2022, p.73). As a result,

the collective farms received the necessary machinery, but it needed proper care. It had to be kept in good condition and repaired from time to time, and in addition, sometimes there was no special place to store the machinery during winter periods. Because of the pace of the whole virgin lands period and the lack of proper personnel, all these factors together led to the collapse of collective farms and the transfer of land to state farms, which in no way solved the problem and which in turn is supported by the fact that the total number of collective farms decreased by almost 2.5 times, from 91 thousand in 1955 to 39 thousand in 1963 (Filev, 2022, p. 75).

With the gradual decrease in the production of grain and other crops, the dissatisfaction of collective farmers regarding labour remuneration grew, because at that time there were no regulations that would be applicable to people who spent sometimes 10-12 hours in the field. Of course, every peasant in the collective farm was expected to get a share of the total income, but the problem was that they sold grain to the state at a very low price and after all the further compulsory expenses, the people themselves were left with practically nothing. Therefore, when the question of buying equipment from state farms arose, it was primarily a question of buying it in instalments, because only a few people had money on hand. Even if they wanted to leave the kolkhoz, it was not so easy to do so, because they did not have passports, and once they appeared, they were still kept in the kolkhoz administration (Mazhitova, 2021).

Over time, many collective farmers ran out of faith in the whole idea of cultivating virgin lands, as a result, young people, who were brought from all over the Union, gradually began to leave back to the cities, provoking the outflow of a large labour force from rural farms. In addition, generally understanding all the circumstances of the situation, people had an active attitude to transform all collective farms into state farms, which in turn was also beneficial to the country (Durgin,1962). All the above-mentioned problems concerning the organisation of the labour process had a great influence on the decline in the productivity of the workers of that time, which in turn led to the confirmation that the Virgin Lands as a project was a failure and that the hasty actions and conclusions of the superiors were a mistake that led to further regression of the whole agriculture in these territories.

3.2.2 Predominant crops today

The collapse of the Soviet Union in 1991 had a negative impact on each of its constituent republics. From that moment on, technology, machinery, and land were no longer perceived as something whole and common. Accordingly, independent Kazakhstan had to take care of all these things on its own. In the first 5 years of independence, agricultural production fell from $16 billion to $7 billion. Only after 30 years, i.e., by 2021, Kazakhstan managed to return to the former figures. This decline was due to the decrease in cultivated land and the fact that agronomists in the republic were changing their vision of what crops should be grown to bring the most money (Saktaganova, 2021).

At present, wheat is still considered a symbol of the successful development of crop production in Kazakhstan. It still meets the needs of not only the domestic market of the country but also the external market. Wheat is also the key for the export of non-commodities such as flour and starch. Despite the decrease in wheat production, its quality has improved compared to what it used to be and it has been in high demand from abroad for many years. In addition, other crops have started to gain popularity, such as barley, oats, rice, buckwheat, millet, and maize. As a matter of fact, barley is firmly in 2nd place in terms of cultivation, just behind wheat. One of the main crops whose production was increased more than 10 times became oilseed crops, thus instead of continuing the tradition of sowing fields with wheat, other crops began to develop. Also, significant areas began to be sown for sugar beet. Among various vegetables and fruits, potatoes, apples, melons, and grapes are very popular. The list is diversified by cotton and flax, which are grown mainly for use in the textile industry (Makenova, 2023).

In general, according to data for 2022, Kazakhstan's total cultivated area reached 23.4 million hectares. In percentage terms, the cropping pattern has remained virtually unchanged, with the top three crops being cereals (16.0 million hectares for 2021), followed by forages (3.1 million hectares) and oilseeds (3.1 million hectares). (Official information source of Prime Minister of the Republic of Kazakhstan, 2021)

These main three held for 2021 almost 95 percent of all sown areas of Kazakhstan at that time. Regarding the rest in the same year - rice accounted for 96.8 thousand hectares, sugar beet - 21.7 thousand hectares, and potatoes - 195.8 thousand hectares. Kazakhstan has chosen the course on diversification, that is, expansion of production by entering the market with new products, which is why it is possible to see such a result in crops that were not previously developed in the country (Saktaganova, 2021).

3.3 Effect of agricultural sector

3.3.1 Kazakhstan's economy during the virgin lands

As mentioned earlier, there was an intensive increase of sown areas by ploughing, which became the largest in the history of the USSR, more and more people arrived (hence, there was an increase in the non-indigenous population), new equipment was supplied, in general - a lot of investments, both monetary and human. Looking in detail at all the changes, one can understand how the economy of Kazakhstan changed during the whole period of Virgin Lands development. (Belov, 2021).

In the Kazakh SSR, between 1953 and 1964, the area of land under cereal cultivation increased about 3.5 times, from 7 million hectares to 24.5 million hectares. This was the nature of the chosen path of extensive agriculture, which meant less investment, low inputs, and low use of resources and fertiliser. By the period 1961-1965, the average annual yield exceeded the first average annual yields only 3 times, not taking into account in comparison the record result for 1956. (Wedelich, 2020). In the development of new lands, the country's leadership invested significant capital in fixed assets such as buildings, plant-like structures, various machines, machinery, and equipment and raised the local infrastructure of state farms from scratch. The state invested about 308.5 million roubles in the agricultural industry of the Kazakh SSR in 1946-1952, but during the entire period of virgin land development, 1953-1965, state investment increased just over as much as 19 times to 5.8 billion roubles (prices are as of 1961).

So, the main and large-scale changes in the economic plan were related to industrialisation, the development of transport infrastructure, the development of agriculture itself and progress in education. The national economy was being modernised. Starting with transport infrastructure, all types of transport and transport connections were developed, which were urgently needed. Railway lines were built, for example, the Mointy-Shu railway made it possible to send virgin bread to the southern regions of the country and Central Asia. The length of railways in the second half of 1950 was about 2 thousand kilometres, of which 1.5 thousand kilometres passed through virgin lands. Thus, many regions that had been isolated finally found transport connections and a more advanced exchange of resources and labour began. In general, the development of railway transport and its infrastructure did not stand still, so the technology improved, and with it its management - instead of Moscow, the centre of management of Kazakh railways separately became Almaty. Motorways were also built between major cities, and the number of radio broadcasting points in the districts increased (Kuznetsova, 2020).

In addition, the metallurgy, energy, machine building, coal mining, ore mining, and chemical industries were developing rapidly. One of the largest metallurgical plants in the country - the Karaganda Metallurgical Plant, or as it was called "Kazakhstan Magnet" - was under construction. The coal basin of Karaganda increased the number of mines and mining factories, opened new oil fields, as well as expanded and built power plants, which led to the growth of the energy capacity of the country. Thus, the Kazakh SSR played an important role in the Soviet Union, becoming one of the main suppliers of energy (Mills, 1970).

As for the sphere of education, its development happened very timely. First-target workers lived in harsh conditions, the roads in the districts were wide but not asphalted. After the beginning of the Virgin Lands programme, about 600 thousand people arrived in the first 2 years. But soon people began to settle down and create settlements, so science and education began to develop. Only for the first decade since the beginning of virgin lands development 44 new secondary educational institutions and 13 higher ones were opened, in 1957 Akmola (Akmola in the future - Tselinograd, today - Astana) Agricultural Institute was opened. Today it is the largest agrarian university in Northern and Central Kazakhstan and the first higher education institution of the present capital, it is called "Kazakh Agrotechnical

University named after Saken Seifullin" in honour of the founder of modern Kazakh literature. A little later branches were opened in Kostanai and Kokchetav, which helped to increase the number of qualified personnel the country needed. There was a need for scientific research to find solutions to problems of agricultural production and, consequently, research centres and institutes were opened (Mussagaliyeva, 2020).

Scientific and technological progress was not far behind, in 1955 the Baikonur Cosmodrome was founded and by 1957 opened its doors, from which the first artificial satellite was launched, and more importantly - the first man with a successful flight into space. This cosmodrome was actively used by the Soviet Union until its collapse in 1991, after which it remains the property of Kazakhstan to this day. In general, people became more educated and were eager to learn more to cope with all the difficulties on the way to the development of their country (Saktaganova, 2021).

All this led to the fact that the Kazakh SSR, having turned into an industrially developed centre, showed its significant role in the all-union balance. The industrial potential of the country increased rapidly and, most importantly, it was based on the extraction and development of its natural wealth and resources.

3.3.2 Results of the virgin lands period

The virgin lands were beautiful as an idea of uniting the people in the name of results, as an economic breakthrough for a land without developed infrastructure, and as an endeavour to achieve results no matter what. The new virgin lands were supposed to serve as a stable safety net in times of crisis at the main grain storage facilities, and to break all records by 1965, reaching a total grain yield of 160-180 million tonnes. But unfortunately, it was this desire to achieve results despite everything that ruined all the good things that had been put into the Virgin Lands program. Blind faith in the result and insufficient assessment of forces and capabilities (equipment, production) led to the fact that the Soviet Union was unable to provide itself with grain and the situation that was so tried to avoid happened - it had to buy grain from the opponent countries. About 10 million tonnes of grain were bought (Brock, 2008).

A clear example of a planned economy is the entire period of development of virgin lands. In a planned economy, all processes have a correspondingly planned character, decisions are taken centrally and must be implemented in an obligatory manner. It also implies an almost complete absence of any private property, which is what happened in the situation with the transformation of collective farms into state farms. All resources were transferred into the hands of the state (Cave, 1981).

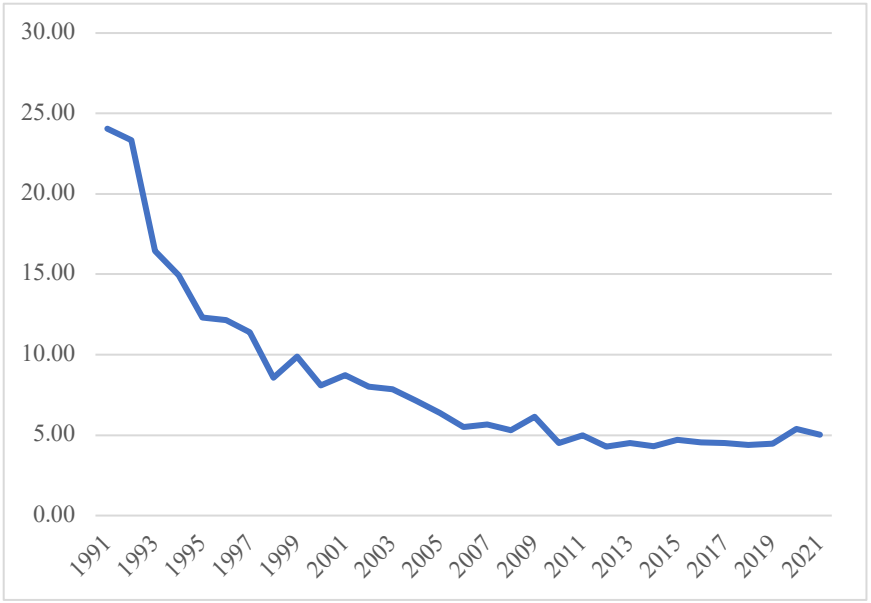
The positive aspects of a planned economy include its resilience (albeit temporary) to the crisis, as all resources are invested in certain industries that need it. If in collective farms peasants did not have any guarantees and rationed wages, the planned economy solved this by fixed wages, as well as with the reduction of collective farms, more and more people found themselves in the same social status. Despite all of the above, there were negative sides too. Over the years it became more difficult to keep and further motivate people, so as a consequence many people left, and the amount of labour force decreased. Since everything was in the possession of the state - it was very difficult to collect, control and analyse data, because there were too many of them, that's why the numbers and statistics for the Virgin Lands period can be slightly different in different works and sources (Kolko, 1988).

4. Practical Part

4.1 Characterisation of agricultural sector of Kazakhstan

Before talking about the statistics of the agricultural sector of the modern Republic of Kazakhstan, its development, and its problems, it is necessary to explain its importance in the economy of the country today. Since Kazakhstan has a large land mass, as well as the climate creates favourable conditions, in sum, these factors provide a great opportunity for successful development in the field of agriculture. That is why the agricultural sector occupies a significant share of the economy - it accounts for about 5.2% of the country's GDP (see Figure 2 for the time series plot of the share of the primary sector from Kazakh real GDP, created on the basis of Table 1 from the list of appendices).

Figure 2, the chart of the share of the primary sector (1991-2021)

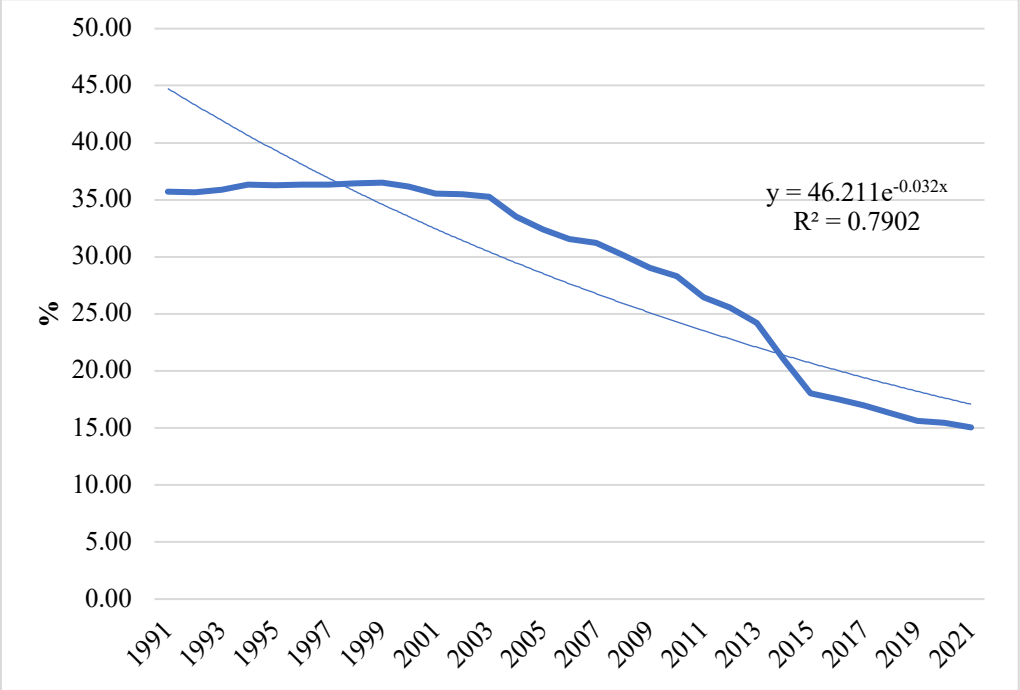


Source: own processing based on the World Bank, 2023

It is also important to note that the percentage of the working population in agriculture out of the total labour force of Kazakhstan was 15% in 2021, and 12.4% in 2023 (National Statistical Office of the Republic of Kazakhstan, 2023). Although earlier the percentage of employment in this sector was more than 2 times higher. As shown in Figure 3 (created on the basis of Table 2 from the list of appendices), between

1991 and 2021, the percentage of total employment in the country decreased from a value of 35.7 to 15.04. The percentage gradually decreased until 2003, and a sharper decline can be observed from 2004 onwards.

Figure 3, the chart of the employment in agriculture (1991-2021)



Source: own processing based on the World Bank, 2023

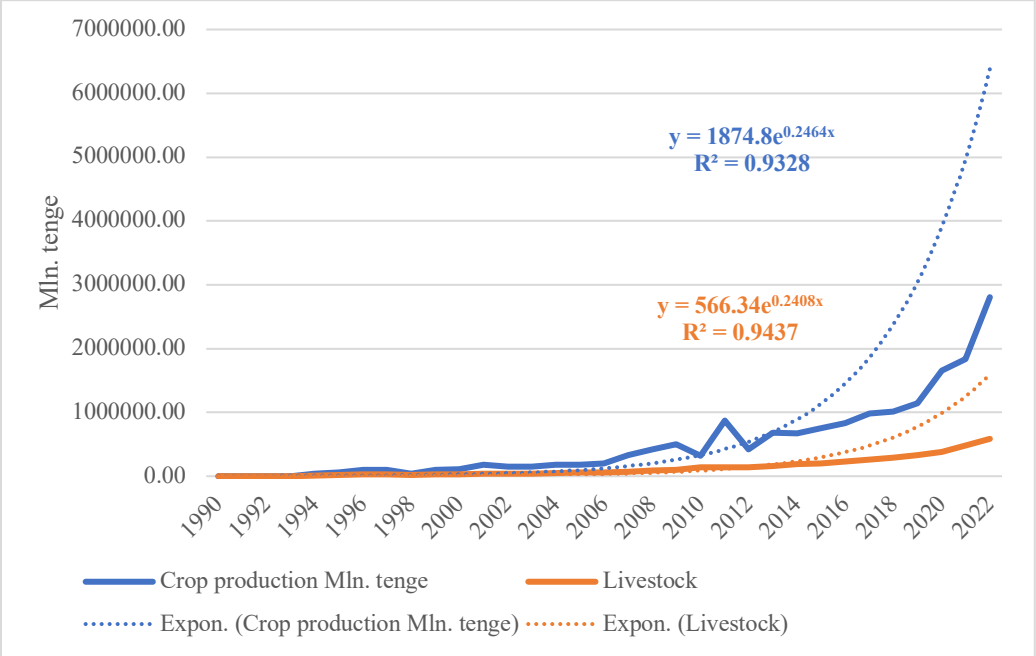
According to the time series plot, the annual decrement in the share of employment in agriculture accounted for 3.2%. The total area of Kazakhstan is 2725 thousand square kilometres, i.e., 272.5 million hectares. More than 40 percent of them are agricultural lands, which occupy 108.563 million hectares. These territories include pastures, hayfields, arable lands, and lands under various agricultural crops. Thus, agriculture in Kazakhstan is divided into two main areas - animal husbandry and crop production. The sown area of main agricultural crops for 2023 consists of 23 940 thousand hectares, which is almost 9% of the area of the whole country (of which almost 5% is occupied by wheat). In the top 3 crops by the size of sown areas, after wheat are fodder crops, and 3rd place is occupied by oilseeds. Barley, rye, oats, potatoes, corn, vegetables, and other crops are also grown in Kazakhstan in smaller

quantities (FAO, 2023). According to the time series plot, the annual decrement in the share of employment in agriculture accounted for 3.2%.

4.2 Importance of Virgin Area

Looking carefully at the ratio of crop and livestock production in the regions of Kazakhstan that were in the Virgin Lands period, it is possible to understand whether there were significant changes in the direction of agriculture in these regions. After all, during the Virgin Lands period, these lands were actively used for planting agricultural crops. These include 4 regions in the north of the country - Akmola region, North-Kazakhstan region, Kostanay region, and Pavlodar region. So, the gross output of crop production for all four regions for 2022 was 2,805 billion tenge, which is 82.7% of the total GDP of livestock and crop production for that year. The graph shows how the GDP for these two sectors of Kazakhstan's agriculture changed from 1990 to 2022. Up to 2006, there was approximately the same growth, but since 2012 the crop sector has been steadily increasing its GDP. Also, the percentage ratio of GDP of livestock and crop production was calculated separately by region. So, for 2022 in the Kostanay and Pavlodar regions the GDP of crop production is 99% of the total, which means that these two regions are still specialised only in growing crops. While in the North-Kazakhstan region, it is 77% and in the Akmola region, it is 70%, which is also quite a high percentage, but these regions do not have an absolute focus on crop production. A table containing the contribution of crop and livestock production to Kazakh nominal GDP in million tenge is presented in Table 3. Figure 4 addresses their development over time, along with the projected trend functions for each.

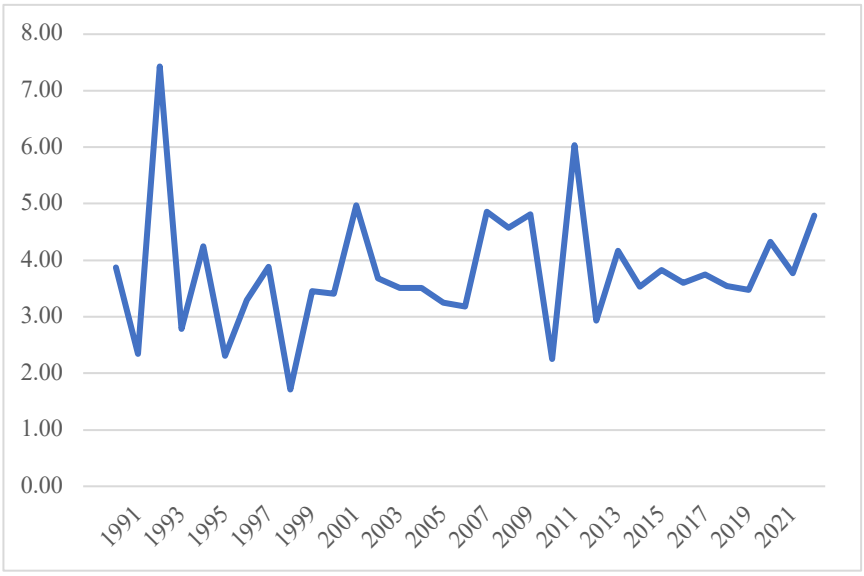
Figure 4, monetary value of crop and livestock productions in the GDP (1990-2022)



Source: own processing based on National Statistical Office of the Republic of Kazakhstan, 2023

Based on the pertinent projected trend plots, it is possible to highlight that the annual increment in the crop's GDP contribution was increasing by 24.64%, while the livestock production was increasing by 24.08%, as per parameters. Evidently, the crop production exceeds the livestock, and the latter is not likely to overpass the former if no fundamental change occurs. Figure 5 introduces the ratio of crop GDP to livestock GDP, which is also based on Table 3 from the list of appendices.

Figure 5, ratio of crop to livestock GDP



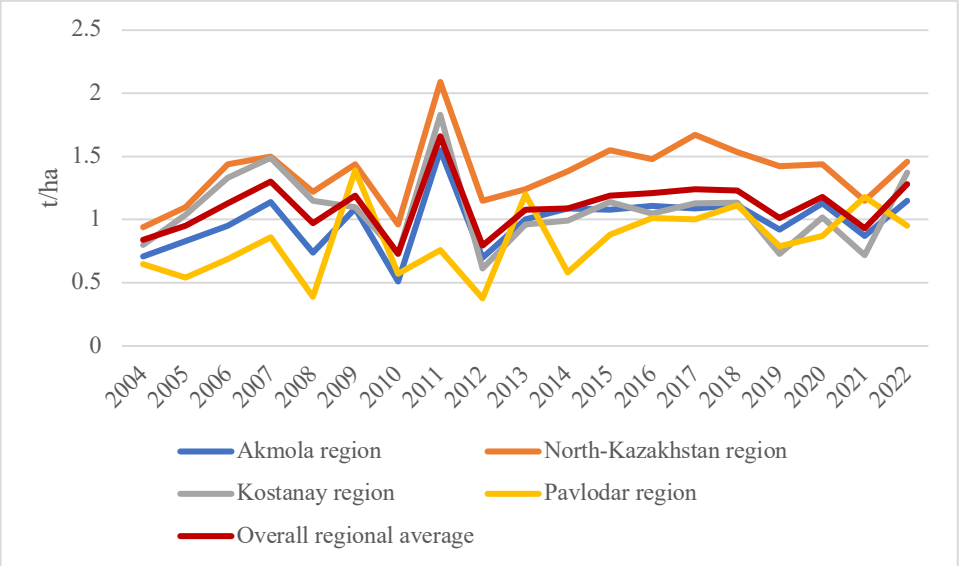
Source: own processing based on National Statistical Office of the Republic of Kazakhstan, 2023

Of all agricultural crops in Kazakhstan, further research will focus on the crop that is in the first place in terms of area under crops and yield - wheat. Wheat is important for the economy first of all as the main source of food for the population. Every person's diet consists of at least a few products made from wheat. They can be, for example, bread, pasta, flour, porridge, and so on. This crop is also used in animal husbandry - as animal feed, in bioenergy production, in the textile industry, and others.

It is important to mention that during the Tselina period, the main goal was not just to increase the sown area of grain crops. Thanks to this, the country had to reach the necessary level of food supply and replenish stable grain reserves. Wheat as the main crop was chosen due to its advantages over other crops. One of its main advantages is its resistance to different climatic conditions, it can adapt to changes and its different varieties are suitable for different climatic regions.

As mentioned earlier, the north of the country was ploughed for wheat during the Virgin Lands period. According to statistical data for that period, the sown area of wheat in the Kazakh SSR in 1956 was 18.3 million hectares, and the harvest was 20.6 million tonnes. Thus, the average yield per hectare was 1.13 tonnes. In comparison, for 2022, the yield per hectare was 1.28 on average for the country. But on the table (harvest tonnes/year) for the period from 2004 to 2022 in the northern regions of the country the yield per hectare is less than for example in Almaty and Zhambyl regions, which were not under the virgin lands period. The table (Cultivated area) shows data for the same regions and for the whole of Kazakhstan. As of 2022, wheat acreage was 12.9 million hectares nationwide. This is less than in the Virgin Lands period, but it may also be due to the change of boundaries during the dissolution of the USSR, or the fact that some areas may have simply become exhausted and unsuitable for use and planting.

Figure 6, the comparison between the selected regions and national average (2004-2022)

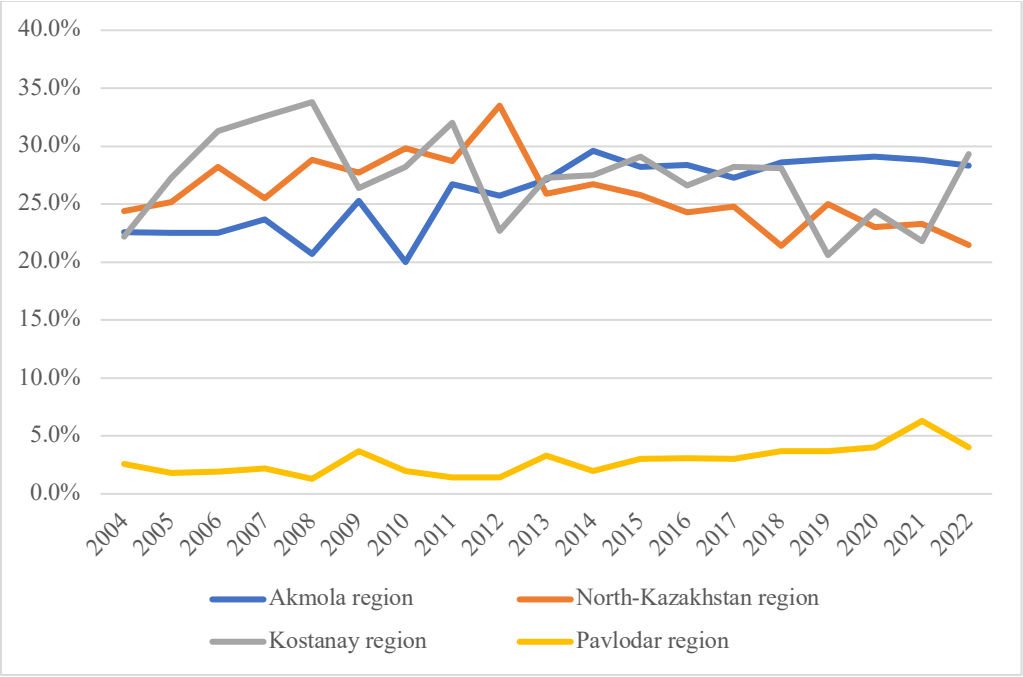


Source: own processing based on National Statistical Office of the Republic of Kazakhstan, 2023

Overall, Kazakhstan's wheat yield for 2022 was 16.5 million tonnes, of which 28.3% was in the Akmola region, 21.5% in North Kazakhstan region, 29.3% in Kostanay region and 4% in Pavlodar region. That is, together these northern regions

give 83% of the country's harvest, which is really quite a lot and confirms the fact that virgin regions remained the main source of wheat for the country. But the harvest for 2022 is still less than in 1956. It would seem that with the advent of new technologies, knowledge, and methods in the field of agriculture, the yields today should be higher, despite the reduction of the cultivated area by almost 30% since 1956. Figure 7 presents the shares based on Table 5 from the list of appendices.

Figure 7, production share of the regions under the virgin area program



Source: own processing based on the National Statistical Office of the Republic of Kazakhstan, 2023

4.3 Correlation analysis

Based on the data analyzed above, the following question arises - whether the decrease in sown areas yields a result of changes in soil quality and climatic factors or whether the data for the virgin lands period are not statistically accurate due to the absence of different sources. For this purpose, a correlation analysis was made between wheat production and the amount of fertilizer applied.

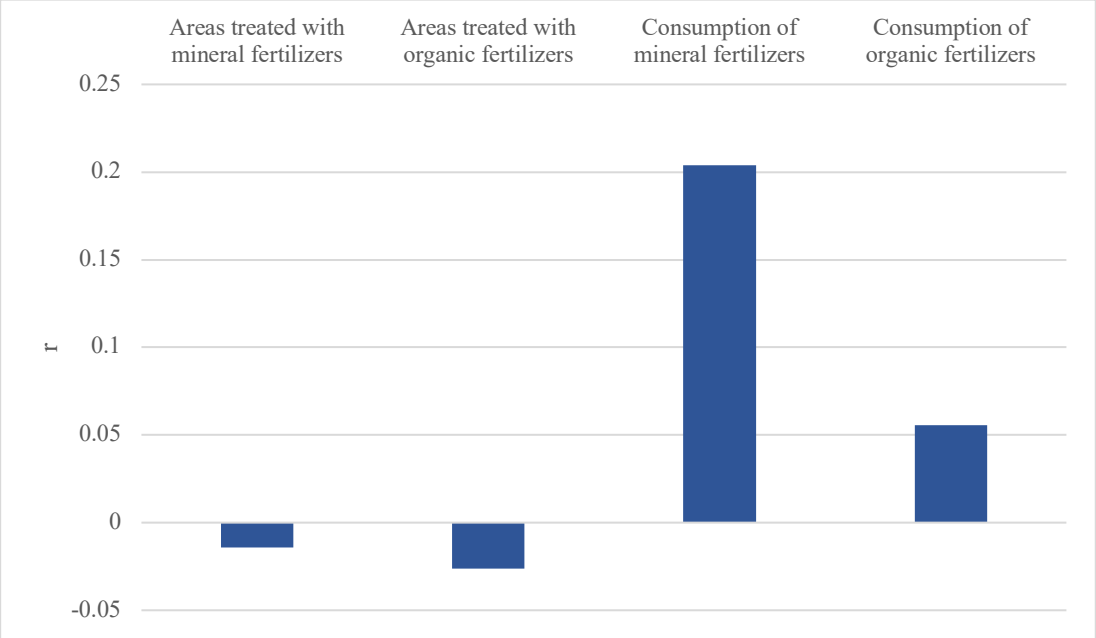
Table 1, correlation analysis

	Production			
	Mineral fertilizers		Organic fertilizers	
	r	t	r	t
Areas treated with fertilizers	-0,01423	-0,24203	-0,02632	-0,44791
Consumption of fertilizers	0,20374	3,61364	0,05546	0,94571

Source: own processing based on the National Statistical Office of the Republic of Kazakhstan, 2023

Before going to the conclusions of a hypothesis test, in Figure 8 it is possible to see a visual representation of the results of correlation analysis, based on which the author concludes that the strongest correlation is observed between wheat production and consumption of mineral fertilizers.

Figure 8, the correlation analysis bar chart (2004-2022)



Source: own processing based on the National Statistical Office of the Republic of Kazakhstan, 2023

Following the successful implementation of the hypothesis testing it becomes clear that the visual analysis confirmed, hence there is a relationship between wheat production in Kazakhstan and the consumption of mineral fertilizers for grain crops in Kazakhstan over the period 2004-2022.

In general, based on the results of the correlation analysis, it can be said that wheat production had the highest values during the Virgin Lands period and similar success has not been achieved in the last couple of decades. Soil quality has rather deteriorated, as the yield per hectare is higher in regions that were not under virgin lands. Additionally, the connection of wheat production with mineral fertilizers is rather weak, and with organic fertilizers there is no connection at all. Therefore, no matter how the soil is fertilized, it will not bring the expected effect on yield. At the same time, the Republic of Kazakhstan today is equipped with modern technologies and resources, which was not the case during the virgin land years. Most likely, statistical data for the years of Virgin Lands development were exaggerated and are not accurate.

4.4 Self-Sufficiency analysis

In order to better understand the context of Kazakh agriculture at last, it is vital to proceed to the self-sufficiency analysis of wheat. Table 2 introduces the dataset with calculations, while Figure 9 introduces the graph.

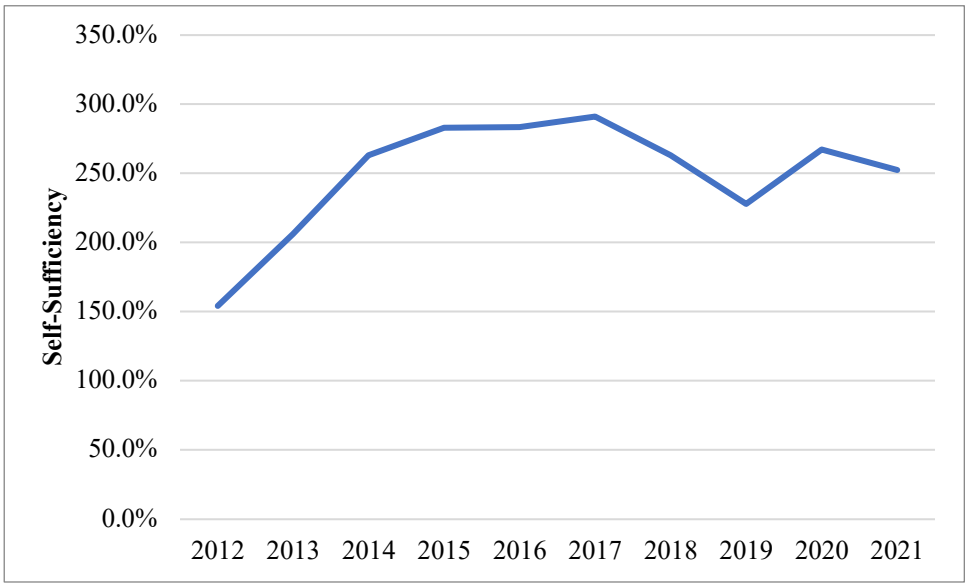
Table 2, self-sufficiency (2012-2021)

Year	Production	Domestic Consumption	S/S
2012	9841	6381	154.2%
2013	13941	6764	206.1%
2014	12997	4936	263.3%
2015	13747	4857	283.0%
2016	14985	5289	283.3%
2017	14803	5085	291.1%
2018	13944	5297	263.2%
2019	11452	5028	227.8%

2020	14258	5337	267.2%
2021	11814	4683	252.3%

Source: FAO, 2023

Figure 9, self-sufficiency graph (2012-2021)



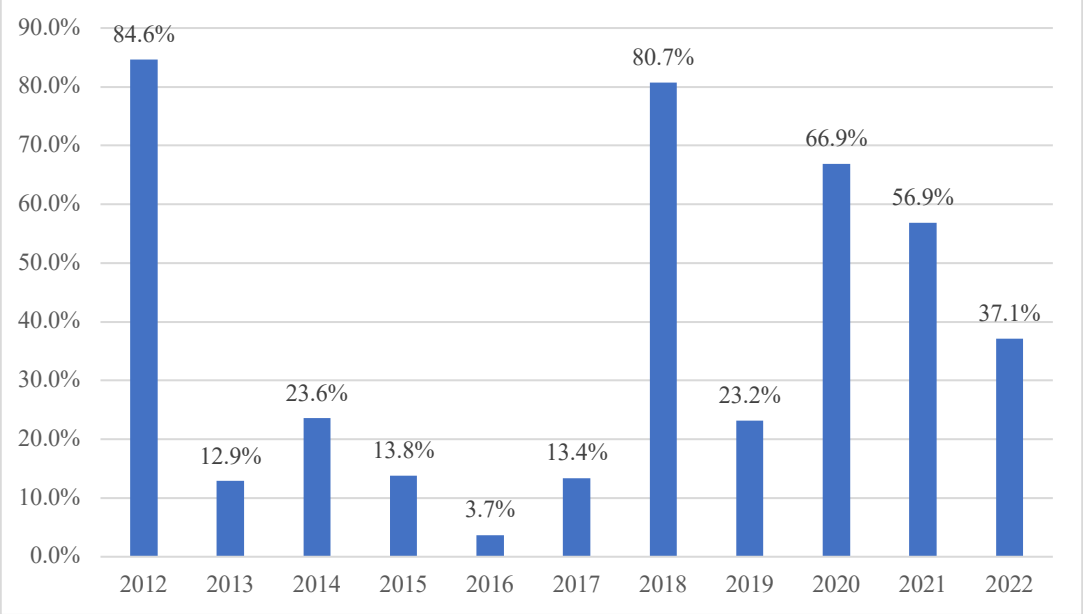
Source: own processing based on FAO, 2023

Effectively, based on the results of the self-sufficiency analysis, it is possible to highlight that when it comes to wheat, the country was self-sufficient every single year as the value of the indicator was higher than 100% for every single year out of the analyzed time period. The next sub-chapter addresses the terms of trade analysis.

4.5 Terms of Trade analysis

Figure 10 introduces the chart with figures representing the terms of trade of wheat for Kazakhstan.

Figure 10, the terms of trade of wheat (2012-2022)



Source: own processing based on FAO, 2023

Compared to the positive situation identified in the earlier chapter related to the self-sufficiency analysis, the dynamic of the terms of trade of Kazakhstan was not optimistic as the value of the indicator was constantly below 100%, indicating that the country was importing wheat for a price significantly overpassing the export price. This is likely explained by the purchases Kazakhstan makes from Russia, while also selling domestic wheat to other neighboring Central Asian republics that buy it for a price from Kazakhstan cheaper than Kazakhstan buys it from Russia, its main trading partner. The next chapter is dedicated to the results and discussion.

5. Results and Discussion

In order to better assess the results obtained and make correct conclusions, the works of other authors on similar topics and studies were analysed. For instance, the authors of Mussagaliyeva's (2020) work pay particular attention to the environmental issues related to the Virgin Lands era. They note that all decisions on actions on virgin lands were made after their approval by scientists of the All-Union Research Institute. Thus, a significant increase in grain crop yield was justified by the fact that in all regions of that period, especially in the acutely arid regions of the Kazakh SSR, there was a comprehensive introduction of all methods of soil-protective farming, which means that the quality of soil was maintained at a stable level. That is, the authors argue that although there were problems after the Virgin Lands period in the form of sandstorms and the threat of wind erosion, still the growth of yields was a natural process caused by the correct introduction of the soil-protective farming system, which gave later more resistant varieties of grain crops, stable yields, and resistance to wind erosion.

In general, the conclusion of this article is that the authors believe that the impact of the Virgin Lands period on the economy of Kazakhstan was positive. This partially echoes the results that were obtained in the practical part of this thesis. The regions that were under virgin land development are indeed sown with wheat varieties resistant to abrupt climatic changes, produce relatively stable yields (especially when judged by the percentage of yields from each region), and generally account for the majority of the country's yield (Mussagaliyeva, 2020). But it's hard to accept that all the success is due to a good conservation agriculture system. Because according to a study done in the practical part of this thesis, out of all 4 Hypothesis tests done on the relationship between yield and amount of fertiliser applied between 2004 and 2022, only one test showed an existing relationship between wheat yield and fertiliser consumption. The correlation coefficient between the two is 0.2. This means that there is a positive relationship, but it is very weak to say that yield changes depend only on the amount of fertiliser applied.

The next article of Orynbaeva (2023) as well focuses on the pros and cons of the irgin lands development period for Kazakhstan. The paper also states that even though the virgin

lands ended the food shortage (which lasted for a very long time), many historians tend to characterise this period as having more negative consequences - such as demographic problems and environmental disasters due to the neglect of specific conditions (subsequently soil erosion and windstorms) - and ultimately consider the economic effect of the virgin lands to be of little significance. The author of the article believes that one of the main problems in the study of this topic is the description of the events and available data only "through the prism of party and government decrees". Many archival data and statistical books, on which research is conducted, are mostly written through the lens of power structures, which may differ from the real data. In such cases, other, diverse sources are very important, which, unfortunately, are very few. Except for the notes of the virgin farmers, who described their life, economic, social, and domestic difficulties, which in turn has little in common with the narrative from larger sources. The author thereby shows that the period is in fact statistically insufficiently studied and calls into question the available data. Regarding changes in the quality of virgin lands, the article mentions that the virgin campaign destroyed the soil cover. A lot of efforts of agronomists were invested to restore the land from erosion because the authorities did not want to take into account the peculiarities of the local climate. Thanks to the contribution of scientists to the soil-protective farming system, the situation has improved, but the author makes an important remark - this topic and the activities of agronomists and soil scientists of those times are very well known through journalists, while scientific research is absent (Orynbaeva, 2023). This all leaves questions for reflection. Orynbaeva's thoughts fully reflect the idea of this thesis, as the main objectives were to investigate the reliability of statistical data of the Virgin Lands period. Of course, it is impossible to come to an exact answer, but thanks to the research in the practical part, it is possible to assume that the data in the Soviet period were not reliable enough, because the yield potential of modern Kazakhstan is lower than in the period of the Kazakh SSR. Orynbayeva writes that the reason for this is both incorrect actions of the government and the influence of various natural factors.

To improve the situation of the agricultural sector, Kazakhstan must think about a new strategy and approach. Consider the participation of farmers and make it more meaningful. So that independent farms have access to all modern technologies and are not afraid of the financial side of the issue. Consequently, the idea of a program for farmers should be considered, so that prices for

equipment and machinery are more affordable, and individual conditions and support from the state are introduced. It is also necessary to develop small collective farms and improve infrastructure for the inflow of new personnel. It is important to pay attention to education in the field of agriculture so that students have the latest equipment and more practical training so that they are better prepared for real conditions. Consider a program of awards for scientific papers and articles that will focus on agricultural research. When the government creates the best conditions for all personnel, analyses the mistakes of the past, then Kazakhstan will stand on a new path of achievements and successes.

6. Conclusion

The goal of this bachelor thesis was to investigate whether the virgin lands period had an impact on crop production and the economy, using available statistical data, analysing time series presented in tables and graphs, as well as correlation analysis and hypothesis testing. The focus of the thesis was the Republic of Kazakhstan, known as the Kazakh SSR during the Virgin Lands period. The study used literature analysis and quantitative methods, the main one being statistical compilations, academic literature, documents, and scientific articles. After analysing the time series, graphs were made as well as correlation analysis with accompanying hypothesis test for more accurate results.

Regarding the impact of the Virgin Lands period on modern Kazakhstan and its economy - the study noted that crop production occupies a significant part of the total area, is one of the main sources of food, and plays an important role in the economy of the country. For a more detailed study, wheat was chosen as the main commodity. Those regions, whose lands were ploughed during the virgin Lands period, have the largest share of yield among all regions and are still the main source of wheat production in Kazakhstan. Wheat is also grown in other regions but in very small quantities. However, by analysing the data it became clear that in general land in regions with less fertile soil yields more wheat per hectare. Correlation analysis and Hypothesis tests were carried out and it was found that wheat production is generally independent or very weakly dependent on fertiliser inputs. This indicates that the soil has little susceptibility to fertiliser. All these results indicate that there was indeed an impact of the Virgin Land period. First of all, there was a negative impact on the soil, then on the reduction of yields, and subsequently on the economy of the country.

It is also possible to assume that the statistical data of grain yields and production collected during the Virgin Lands period is not accurate or reliable. In addition to the research conducted, the main prerequisite for this is the absence of various sources. This is the influence of the centralised economy, all information was presented only through the prism of the government, and other sources simply did not exist.

As for the conclusion in terms of trade question, wheat was selected as the main commodity. The study showed that the indicator value was less than 100% in each year for the period from 2012 to 2022. This means that Kazakhstan imports wheat more expensively than it exports it. This situation is most likely due to the fact that neighbouring Central Asian republics buy wheat from Kazakhstan at a lower price than Kazakhstan buys from its main trading partner, Russia.

So, realising all the consequences, what can or is modern Kazakhstan already doing? Recently, more attention and investments have been made in remote regions of the country, where a large share of wheat is grown, to improve infrastructure and technical equipment that will increase the efficiency of the agricultural sector. To facilitate the modernisation of production and accelerate the growth of the agricultural sector, it is important that independent farmers participate and have access to all modern technologies in the form of financial opportunities. It is for this purpose that the Farmer Support Programme was created, where farmers can receive subsidies for machinery and equipment.

This programin and similar ideas have been incorporated by the government into the reforms to improve the efficiency and competitiveness of the agricultural sector. The main ideas are to build infrastructure and better working conditions, to widely apply new technologies, to improve the education system in agriculture to have highly qualified specialists with professional training, to develop a new approach to production to be less dependent on climate change, as well as farmers are encouraged to actively cooperate with each other to increase income and, most importantly, productivity. These reforms, together with government support and the right strategy, can overcome the mistakes of the past, unlock the potential of agriculture in Kazakhstan, and ensure sustainable development in the future.

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8.3 List of abbreviations

USSR	Union of Soviet Socialist Republics
SSR	Socialist Soviet Republic

GDP	Gross Domestic Product

Appendices

Table 3, employment in agriculture (1991-2021)

Year	Share
1991	24.05
1992	23.34
1993	16.44
1994	14.95
1995	12.33
1996	12.15
1997	11.41
1998	8.57
1999	9.89
2000	8.11
2001	8.72
2002	8.00
2003	7.86
2004	7.12
2005	6.37
2006	5.50
2007	5.66
2008	5.32
2009	6.15
2010	4.51
2011	4.99
2012	4.29
2013	4.50
2014	4.33
2015	4.71
2016	4.56
2017	4.52
2018	4.40
2019	4.47
2020	5.39
2021	5.03

Source: The World Bank, 2023

Table 4, employment in agriculture (1991-2021)

Year	Share
1991	35.70
1992	35.64
1993	35.90
1994	36.30
1995	36.27
1996	36.31
1997	36.35
1998	36.45
1999	36.50
2000	36.18
2001	35.52
2002	35.48
2003	35.25
2004	33.50
2005	32.41
2006	31.54
2007	31.22
2008	30.16
2009	29.02
2010	28.28
2011	26.45
2012	25.54
2013	24.19
2014	20.98
2015	18.01
2016	17.51
2017	16.94
2018	16.32
2019	15.60
2020	15.47
2021	15.05

Source: The World Bank, 2023

Table 5, crop and livestock productions' contribution to the GDP (1990-2022)

Year	Crop production	Livestock	Crop to Livestock
	Mln. tenge		
1990	16.99	4.39	3.87
1991	18.68	7.98	2.34
1992	414.69	55.83	7.43
1993	1670.72	600.81	2.78
1994	39267.10	9249.90	4.25
1995	55560.14	24117.27	2.30
1996	97576.19	29624.59	3.29
1997	96929.21	24952.80	3.88
1998	40303.50	23529.34	1.71
1999	95184.20	27580.82	3.45
2000	106998.30	31363.23	3.41
2001	179166.90	36021.01	4.97
2002	148011.70	40228.24	3.68
2003	153066.20	43543.13	3.52
2004	177461.20	50514.39	3.51
2005	183297.79	56468.97	3.25
2006	201784.40	63435.00	3.18
2007	334876.40	69011.90	4.85
2008	419563.10	91638.20	4.58
2009	501328.50	104075.30	4.82
2010	318457.97	141227.61	2.25
2011	868593.66	143787.68	6.04
2012	418831.94	142922.94	2.93
2013	685688.95	164457.86	4.17
2014	673126.54	190714.49	3.53
2015	752994.01	196901.55	3.82
2016	831041.23	230617.07	3.60
2017	979327.38	260916.87	3.75
2018	1014391.40	285937.16	3.55
2019	1140309.38	328537.33	3.47
2020	1652116.66	381689.05	4.33
2021	1831040.52	485158.50	3.77
2022	2805355.67	585704.24	4.79

Source: National Statistical Office of the Republic of Kazakhstan, 2023

Table 6, yields per selected regions and the country (2004-2022)

Year	Akmola region	North-Kazakhstan region	Kostanay region	Pavlodar region	Overall regional average
2004	0.71	0.94	0.8	0.65	0.84
2005	0.83	1.1	1.04	0.54	0.95
2006	0.95	1.44	1.33	0.69	1.13
2007	1.14	1.5	1.49	0.86	1.3
2008	0.74	1.22	1.15	0.39	0.97
2009	1.09	1.44	1.1	1.39	1.19
2010	0.51	0.96	0.73	0.57	0.73
2011	1.55	2.09	1.83	0.76	1.66
2012	0.69617	1.14989	0.61333	0.37682	0.79294
2013	1.00395	1.23834	0.95961	1.20106	1.07622
2014	1.09	1.38	0.99	0.58	1.09
2015	1.08	1.55	1.14	0.88	1.19
2016	1.11	1.48	1.05	1.01	1.21
2017	1.09	1.67	1.13	1	1.24
2018	1.11194	1.53639	1.1358	1.11559	1.22833
2019	0.91921	1.42365	0.72713	0.79	1.01
2020	1.13	1.44	1.02	0.87	1.18
2021	0.87	1.15	0.72	1.18	0.93
2022	1.15	1.46	1.37	0.95	1.28

Source: National Statistical Office of the Republic of Kazakhstan, 2023

Table 7, shares of production per selected regions (2004-2022)

Year	Akmola region	North-Kazakhstan region	Kostanay region	Pavlodar region
2004	0.226	0.244	0.222	0.026
2005	0.225	0.252	0.273	0.018
2006	0.225	0.282	0.313	0.019
2007	0.237	0.255	0.326	0.022
2008	0.207	0.288	0.338	0.013
2009	0.253	0.277	0.264	0.037
2010	0.2	0.298	0.282	0.02
2011	0.267	0.287	0.32	0.014
2012	0.257	0.335	0.227	0.014
2013	0.271	0.259	0.273	0.033
2014	0.296	0.267	0.275	0.02
2015	0.282	0.258	0.291	0.03
2016	0.284	0.243	0.266	0.031
2017	0.273	0.248	0.282	0.03
2018	0.286	0.214	0.281	0.037
2019	0.289	0.25	0.206	0.037
2020	0.291	0.23	0.244	0.04
2021	0.288	0.233	0.218	0.063
2022	0.283	0.215	0.293	0.04

Source: National Statistical Office of the Republic of Kazakhstan, 2023