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Gender Segregation in Agriculture in the Context of Kazakhstan's Regions

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Abstract

Gender segregation in agriculture remains a significant socio-economic problem that limits women's potential and hinders sustainable development in rural areas. Despite the critical role of women in agricultural production, their access to land, financial resources, technology, and training remains limited, leading to lower productivity and increased poverty among rural populations. This study examines gender segregation in the agricultural sector of Kazakhstan for the period 2013-2023. The use of the dissimilarity index (DDD coefficient) allows for a quantitative assessment of gender disparities in employment. A literature review shows that gender inequality in agriculture is caused by structural barriers, including uneven land ownership, limited access to agricultural subsidies, and social norms that hinder women's participation in decision-making processes. Empirical analysis reveals that the national DDD coefficient increased from 6.0% in 2016 to 9.1% in 2023, indicating a growing gender imbalance. The highest levels of segregation were recorded in regions characterized by resource-dependent and mechanized agriculture, such as Kyzylorda, Atyrau, and Aktobe. In contrast, regions with well-developed agricultural cooperatives and small-scale farming exhibited lower DDD levels. The SWOT analysis revealed both strengths and barriers faced by women in agriculture in Kazakhstan. In conclusion, recommendations are proposed to reduce the gender gap, including developing educational programs, increasing women's access to financial resources, and strengthening support for women's entrepreneurship in rural areas.

Keywords: Gender Segregation, Gender Equality, Agriculture, Agricultural Policy, Female Employment, Rural Entrepreneurship, Dissimilarity Index

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1. INTRODUCTION

Gender segregation in agriculture remains one of the key socio-economic problems that limit the potential of women and hinder the effective development of rural regions. Despite women's significant contribution to agricultural production, their access to land, resources, technology, and finance remains limited, leading to lower productivity, increased rural poverty, and increased inequality between men and women. In recent years, the gender aspects of labor segregation have become an object of active study in scientific research and at the public policy level. Removing gender barriers in agriculture is becoming an important task for the sustainable development of the agricultural sector and ensuring gender equality.

Global research confirms that eliminating gender inequality in agriculture can significantly increase food security and promote economic growth (FAO, 2023). In countries where women have equal access to agricultural resources, farm productivity increases by 20-30%, contributing to a 12-15% reduction in hunger (European Commission, 2024). However, in developing countries, including Kazakhstan, women face systemic barriers to agricultural work. This is due to patriarchal norms that hinder women's participation in decision-making, as well as limited access to high-paying sectors of the agrarian economy.

Like in many other developing countries, agriculture in Kazakhstan is characterised by traditional division of labour models, where women often perform lower-paid jobs related to animal care, harvesting and processing products. At the same time, men dominate managerial and mechanized processes. This reduces women's opportunities to improve their economic status and creates barriers to the innovative development of the sector, as women's limited access to education and technology hinders the introduction of advanced agricultural practices.

In addition, significant differences are observed between urban and rural populations. While Kazakhstan's cities are gradually reducing gender segregation in the economy due to the growing number of women in services, education, and entrepreneurship, severe constraints remain in rural areas. Women are less likely to become owners of land plots and have limited opportunities to receive agricultural subsidies and access technical training programs. As a result, their involvement in innovative technologies, digitalization of agriculture and modern farming methods remains low, which increases the gap in income and career opportunities.

The development of Kazakhstan's agro-industrial complex requires an integrated approach to reducing gender imbalance (Kireyeva & Satybaldin, 2019). Government programs to support women's entrepreneurship in rural areas, educational and credit initiatives development, and the introduction of digital technologies in the agricultural sector can help overcome existing barriers. However, despite the existence of such initiatives, the level of gender inequality remains significant, which requires additional analysis of the structural factors affecting the employment of men and women in agriculture.

The uneven distribution of labor resources in agriculture can have long-term negative consequences for the development of the industry. The gender gap leads to the fact that the potential of women in improving food security and introducing sustainable farming practices remains untapped. International studies show that women farmers are more likely to adhere to environmentally friendly farming practices, use natural resources efficiently, and contribute more to the sustainable development of rural areas (Unay-Gailhard & Bojnec, 2021). However, the lack of equal access to credit resources, innovative technologies and sales markets hinders realising their potential.

The study's primary purpose is to analyze gender segregation in the agricultural sector of Kazakhstan in the period 2013-2023 based on the Coefficient of Dissimilarity (DDD). This index makes it possible to quantify the level of differences in the distribution of men and

women in various types of agricultural activities, identify the main regional disparities and identify key factors contributing to gender inequality. The study provides a comparative analysis of indicators by region of the country, making it possible to identify the territorial features of segregation in agriculture and possible ways to reduce it.

2. LITERATURE REVIEW

Gender segregation in agriculture remains one of the key social and economic problems that limit women's potential and hinder effective rural development. Despite the significant contribution of women to the agricultural sector, their access to land, resources, technology, and finance continues to be limited, leading to lower productivity and increased poverty among rural populations (Duflo, 2012; Croppenstedt et al., 2013). This leads to lower production efficiency, increased poverty among the rural population, and increased inequality between men and women (Udry et al., 1995; Quisumbing & Maluccio, 2003; Donald et al., 2024). The influence of gender factors on the distribution of employment, the adaptation of new technologies, sustainable agriculture and environmental initiatives is increasingly attracting the attention of researchers and policymakers. In this context, it is important to consider key aspects of gender segregation in agriculture, including land ownership, access to resources, differences in productivity, participation in non-agricultural activities, the impact of technological innovation, and the role of government programs.

One of the most significant reasons for gender segregation in agriculture is the uneven distribution of land rights. In many countries, women face legal and cultural barriers that limit their ability to own land, which reduces their ability to participate in a market economy and invest in agriculture (Doss, 2013; Bhaumik et al., 2016). In Kenya, for example, studies have shown that female farmers use 20-30% less fertilizers than men, negatively affecting their productivity (Seymour, 2017). Moreover, gender differences in access to information and educational programs also play an important role. Studies have shown that women's participation in agricultural training increases their productivity, but due to family responsibilities and low levels of education, women are less likely to participate in such initiatives (Davis et al., 2012; Elias et al., 2013). Like their counterparts in other regions, women farmers in the Philippines spend more time harvesting and caring for animals but earn significantly less profit due to limited access to markets and financial services (Flores & Reyes, 2021). Similarly, in Central Asia, historical movements such as the Khujum in the 1920s and 1930s aimed at eliminating women's traditional dependence had a significant impact on the redistribution of agricultural resources, yet the long-term effects of this process remain controversial (Mukhamedovna & Kizi, 2024).

Gender segregation is also evident in access to technology and resources. Men traditionally have priority access to fertilizers, mechanized equipment, agricultural subsidies and loans, which allows them to obtain higher yields and profitability (Beaman et al., 2013). Similar problems have been identified in Pakistan, where women farmers face limited access to markets and financial services (Mishra et al., 2017). Research shows that the introduction of advanced agricultural technologies also comes with a clear gender imbalance. Men are much more active in adapting new digital technologies in agriculture, while women face technological barriers and insufficient digital literacy (Mhlanga & Ndhlovu, 2023). This indicates the need for targeted programs to increase women's involvement in the agricultural sector's technological development.

An important feature of gender segregation in agriculture is the participation of women in non-agricultural employment. According to research in Ghana, men are much more likely to engage in business and trade, while women are limited in economic activities (Abdulai & Delgado, 1999; Owusu et al., 2011). Similar results were obtained in Ethiopia, where

women are less likely to participate in alternative forms of employment due to limited access to finance and social media (Beyene, 2008). At the same time, international programs to support women's entrepreneurship show that creating women's cooperatives and self-help significantly increases their economic independence (Brody et al., 2015; Diiro et al., 2018). For example, in India and Bangladesh, women's participation in group farming has increased their income and reduced the gap in living standards between men and women (Kabeer, 2017; Agarwal, 2018).

Government programs also play a significant role in reducing gender segregation. In Malawi and Uganda, similar initiatives have increased the proportion of women in high-productivity agricultural sectors (UN Women, 2023). A study of the fertilizer subsidy program in Nigeria showed that women who received support could significantly increase their productivity and profitability (Wossen et al., 2017). However, not all programs have an equal impact on men and women. For example, in Kenya, programs to increase women's access to education and technology have increased their economic independence but have had little effect on their income levels due to existing market barriers (Ndiritu et al., 2014). Research in China has shown that agricultural reforms aimed at modernizing the sector have contributed more to developing men's farms. At the same time, women continued to face limited access to credit and technology (Ge et al., 2023).

Gender also plays an important role in the development of sustainable agriculture. Research shows that women farmers are more likely to demonstrate environmentally sustainable farming practices, but their contribution is underestimated and rarely supported at the state level (Unay-Gailhard & Bojnec, 2021). A study in France found that women are more likely to adopt organic farming practices and make more rational use of natural resources, but they face less financial support from the state (Tourtelier et al., 2023). At the same time, women with greater autonomy in decision-making can implement innovative and sustainable agricultural practices, which increases the overall productivity of agriculture and contributes to its environmental stability (Fertő & Bojnec, 2024).

In addition, the concept of “feminization of agriculture” (Tasis, 2025) significantly impacts gender differences in agriculture. This term describes the growing share of women in agricultural labor, especially in developing countries, which is associated with the migration of men to cities and a decrease in the profitability of farm labor. Despite the increase in female farmers, their access to key resources remains limited and their income levels are lower than men's. An analysis of the situation in India has shown that even with the dominance of women in the agricultural workforce, their rights to land and participation in decision-making remain minimal (Tasis, 2025). This highlights the need for institutional reforms to strengthen women's positions in agriculture.

An analysis of the existing literature shows that gender segregation in agriculture is caused by several factors, including women's limited access to land, resources and technology, and the influence of traditional norms that prevent their involvement in market forms of employment. Although the feminization of agriculture and the involvement of women in sustainable agricultural practices are opening up new opportunities, structural barriers continue to constrain their participation in the economy. To achieve a more even distribution of opportunities, it is necessary to strengthen programs to support women in agriculture, develop educational initiatives, encourage women's participation in cooperatives and increase their economic mobility. Implementing comprehensive gender-sensitive policies can help reduce economic inequality and increase the sustainability of the agricultural sector.

3. METHODOLOGY

Quantitative methods were used to analyze the structure of women's employment in

Kazakhstan. The quantitative analysis included working with data from the Bureau of National Statistics of the Republic of Kazakhstan. In particular, the coefficient analysis method was used, which includes the gender segregation index. The study is conducted in the agricultural sector, where there are traditionally significant differences in the employment of men and women and in the context of regions, cities and rural settlements, making it possible to assess the territorial features of gender inequality.

At the first stage of the study, the Gender Segregation Index (GSI) will be calculated for 2013-2023, quantifying the level of employment differences between men and women.

The study is based on calculations of the GSI coefficient using the formula (1):

$$GSI = \frac{1}{2} \sum_{i=1}^{n} |M_i - W_i| \quad (1)$$

where:

M_i – is the proportion of men employed in sector i (as a percentage),

W_i – is the proportion of women employed in sector i (as a percentage),

n – is the number of analyzed segments.

Calculations of the GSI coefficient are carried out in the following areas (Figure 1).

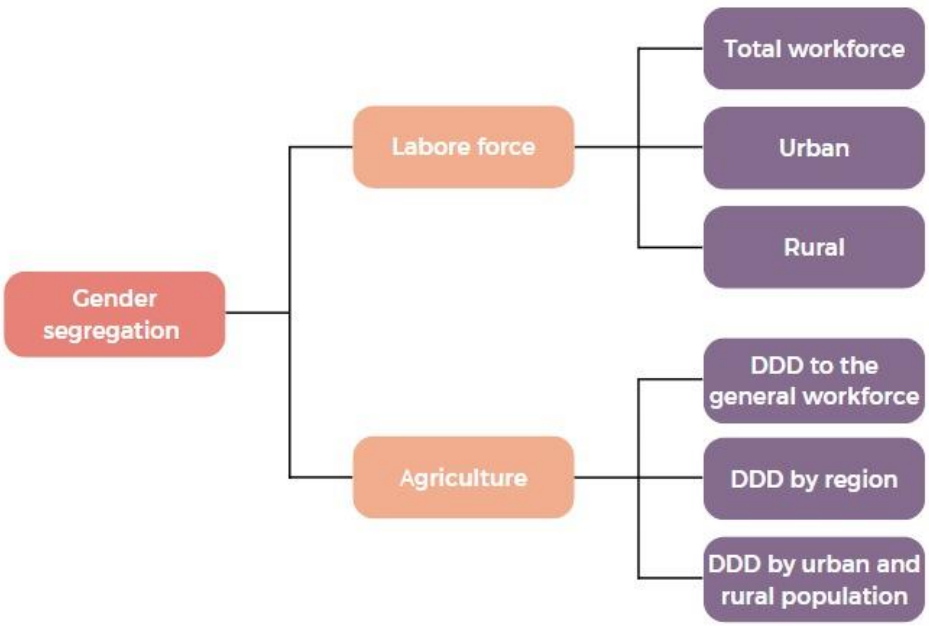

Figure 1. Analyzed indicators

In the second stage of the study, a SWOT analysis will be conducted to identify key strengths and weaknesses, as well as opportunities and threats related to gender segregation in agriculture in Kazakhstan. This analysis will make it possible to assess the current state of women's employment in the agricultural sector, identify internal and external factors affecting the level of women's participation in agricultural production, and propose strategic solutions to reduce the gender gap.

At the final stage of the study, recommendations aimed at reducing gender

segregation in the agricultural economy of Kazakhstan and increasing the economic activity of women in the agricultural sector will be developed. Recommendations will be based on the results of the analysis.

The research methodology includes a complex approach combining quantitative analysis, regional differentiation, SWOT analysis and the development of practical recommendations. The calculation of the DDD index helps to measure the level of gender segregation in agriculture quantitatively. At the same time, the SWOT analysis makes it possible to assess structural problems and determine directions for their solution. The methodological approach provides a comprehensive analysis and can be applied to developing state strategies to reduce the gender gap in the agrarian sector of Kazakhstan.

4. RESULTS

Gender segregation in the labor market of the Republic of Kazakhstan demonstrates a steady downward trend, which is confirmed by calculations of the GSI coefficient for the period 2013–2023. The analysis of the obtained data showed that the overall level of differences in the employment of men and women is gradually decreasing. However, the differences between urban and rural regions remain. In 2013, the coefficient of gender segregation of DDD in the total labor force was 2.4%, while in 2023 it increased to 3.0%. Despite this, the long-term trend remains positive due to the increase in female employment in non-traditional industries for them, the strengthening of state measures to support women in business (Table 1).

TABLE 1. Coefficient GSI for the labor force for 2013-2023, %

Year	Total workforce			Urban			Rural		
	Men	Women	GSI	Men	Women	GSI	Men	Women	GSI
2013	84,2	79,4	2,4	82,8	77,6	2,6	85,8	81,9	1,95
2014	72,3	78,8	3,25	83,8	78,2	2,8	85,3	79,5	2,9
2015	84,2	78,1	3,05	84,1	78,6	2,75	84,3	77,3	3,5
2016	85,1	78,4	3,35	84,2	78	3,1	86,2	78,9	3,65
2017	85	78,5	3,25	84,8	77,1	3,85	85,3	80,7	2,3
2018	85,4	80,3	2,55	84,7	78,8	2,95	86,2	82,6	1,8
2019	86	80,2	2,9	85,4	79,8	2,8	86,8	80,9	2,95
2020	85,2	78,6	3,3	84,9	78,6	3,15	85,6	78,6	3,5
2021	85,7	79,2	3,25	85,5	78,7	3,4	86,1	80,1	3
2022	85,3	78,7	3,3	84,6	78,5	3,05	86,3	79,1	3,6
2023	84,9	78,9	3	84,2	78,4	2,9	86	79,8	3,1

Note: compiled by the authors

The reduction of gender segregation is most clearly observed in cities, where the DDD ratio decreased from 2.1% in 2013 to 1.8% in 2023. This indicates that the differences in the employment of men and women in urban regions are minimal, and the labor market itself is becoming more balanced. One of the main factors in reducing the gap was the increase in the number of women working in the service sector, the financial sector, and the IT industry.Access to educational programs and opportunities for retraining allowed women to compete more actively for jobs, contributing to reduced gender segregation. State initiatives aimed at involving women in high-paying fields played an important role, contributing to changing the structure of employment.

Despite positive city changes, gender segregation remains more pronounced in rural areas. In 2013, the ratio of DDD among the

rural population reached 5.6%, and in 2023 it decreased to 3.2%, which indicates a gradual but not fast enough transformation of the labor market. The main factors of high segregation in rural areas are limited employment opportunities for women, low level of labor mobility and traditional division of labor. Women are mainly engaged in agriculture, education and health care, while men predominate in industrial production and construction. However, there is some reduction in the gap due to the development of female entrepreneurship, the emergence of new types of activity in the agro-industrial sector and access to online business.

Thus, the overall level of gender segregation in Kazakhstan shows a downward trend, which is confirmed by calculations of the DDD coefficient. In cities, the differences between men and women have practically disappeared, and the labor market is becoming balanced. In contrast, in rural areas, gender differences are preserved but gradually decreasing.

Gender segregation in agriculture in Kazakhstan demonstrates heterogeneous dynamics in the regional context for 2013-2023, which is confirmed by calculations of the coefficient of gender segregation (DDD).

The average DDD rate in the agricultural sector ranged from 6.0% in 2016 to a maximum of 9.1% in 2023, indicating a growing imbalance in Table 2.

TABLE 2. Coefficient GSI for the total agricultural labor force by regions in 2013-2023, %

Region	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Kazakhstan	6,2	6,5	6,1	6	6,3	6,5	6,8	7	6,9	7,1	9,1
Abai	-	-	-	-	-	-	-	-	8,3	8,9	12,1
Akmola	3,2	3,5	3,1	3,3	3,6	3,9	4	4,2	4,1	4,3	4,2
Aktobe	8,1	8,3	8	8,2	8,5	8,8	9	9,2	9,1	9,5	12
Almaty	3,8	4	3,7	3,9	4,2	4,5	4,7	4,9	4,8	5	4,5
Atyrau	10,1	10,5	10,2	10,3	10,6	11	11,3	11,5	11,4	11,9	15,6
West Kazakhstan	5,9	6,1	5,8	5,9	6,2	6,5	6,7	6,9	6,8	7,2	10,4
Zhambyl	4,7	5	4,6	4,8	5,1	5,3	5,5	5,7	5,6	5,9	6,3
Zhetisu	-	-	-	-	-	-	-	-	9,3	9,7	11,5
Karaganda	6,2	6,5	6,1	6,3	6,6	6,9	7,1	7,3	7,2	7,6	10
Kostanay	4,4	4,7	4,3	4,5	4,8	5	5,2	5,4	5,3	5,6	6,8
Kyzylorda	9	9,3	8,9	9,1	9,4	9,7	10	10,2	10,1	10,5	12,1
Mangystau	7,2	7,5	7,1	7,3	7,6	8	8,3	8,5	8,4	8,8	10,3
Pavlodar	4,9	5,2	4,8	5	5,3	5,5	5,7	5,9	5,8	6,1	6,6
North Kazakhstan	5,5	5,8	5,4	5,6	5,9	6,2	6,4	6,6	6,5	6,9	8,6
Turkestan	-	-	-	-	6,2	6,5	6,7	6,9	6,8	7,2	8,9
Ulytau	-	-	-	-	-	-	-	-	7,3	7,7	10
East Kazakhstan	5,1	5,4	5	5,2	5,5	5,8	6	6,2	6,1	6,5	9,4
Astana c.	4,8	5,1	4,7	4,9	5,2	5,5	5,7	5,9	5,8	6,2	6,7
Almaty c.	4,5	4,8	4,4	4,6	4,9	5,2	5,4	5,6	5,5	5,9	6,4
Shymkent c.	3,9	4,2	3,8	4	4,3	4,6	4,8	5	4,9	5,3	7,3

Note: compiled by the authors

The highest value of the coefficient of gender segregation in agriculture in 2023 was recorded in the Kyzylorda region, where DDD was 12.1%, due to the high level of employment of men in mechanized types of agricultural work, as well as limited access of women to land resources and agricultural technologies. A similar situation is observed in Aktobe (12.0%) and Zhambyl (10.4%) oblasts, where a significant part of agricultural production is associated with large farms dominated by male labor. At the same time, in

regions with a more diversified agricultural structure, such as Almaty (4.5%) and East Kazakhstan (5.2%) regions, as well as in rural areas adjacent to large agglomerations (for example, around Almaty), gender segregation remains at a relatively low level. This may be due to the high proportion of female employment in small farms, private subsidiary farms, and agricultural cooperatives, which contribute to a more even distribution of labor resources.

Dynamic analysis shows that in most regions there is a tendency towards an increase in gender segregation in agriculture. For example, in the Kyzylorda region, the DDD coefficient increased from 9.0% in 2013 to 12.1% in 2023, indicating a decrease in the proportion of women in agricultural employment in large farms and agro-industrial enterprises. A similar trend is typical for the Zhambyl region, where the indicator increased from 7.8% to 10.4%, as well as for the North Kazakhstan region, where there was an increase from 5.1% to 8.6%. At the same time, the changes in the cities of Almaty and Astana are insignificant, confirming the relative stability of the gender distribution of labor resources in agriculture near large markets.

The increase in the coefficient of gender segregation in agriculture may be due to several factors. Firstly, structural changes in the agricultural sector, including mechanization, automation and the introduction of digital technologies, may contribute to a decrease in the share of female employment since traditionally female types of agricultural work (manual labor, plant care, product processing) are being replaced by automated processes. Secondly, women's limited access to land and financial resources, as well as insufficient support for women's farming initiatives, maintain a high level of gender imbalance, especially in regions dominated by large agribusiness. Thirdly, social and cultural barriers, including traditional beliefs about agricultural work, continue to influence women's professional preferences and career opportunities, especially in rural areas.

DDD regional differentiation analysis shows that high levels of segregation are observed in areas with a predominance of export-oriented commercial agricultural production and large-scale agribusiness, while segregation remains relatively low in regions with a developed cooperative movement and a small farming sector. This is confirmed by comparing the Kyzylorda region, where the coefficient reaches 12.1%, and the Almaty region, where it is only 4.5%. Such differences indicate the need to develop targeted strategies to reduce the gender imbalance in agriculture, including vocational retraining programs for women, measures to increase their access to land and financial resources, and support for women's entrepreneurship in the agricultural sector.

Therefore, the coefficient of gender segregation in agriculture in Kazakhstan over the past ten years has shown an increasing trend in regions with a predominance of large agro-industrial enterprises, which indicates the persistence of gender imbalance in agricultural employment. Despite the relative stability in suburban rural areas, there is generally an increase in differences in the distribution of men and women by type of agricultural activity, which requires additional measures from the government and businesses.

The analysis of gender segregation in the agricultural sector by regions of Kazakhstan for the period 2013-2023 reveals significant differences between urban and rural labor. Over the past ten years, the overall DDD indicator in Kazakhstan has shown an increasing trend, indicating a growing gender inequality in employment in the agricultural sector (Table 3).

The gender segregation coefficient (DDD) for the urban workforce has fluctuated significantly across regions, reflecting structural changes in employment in the agricultural sector. The national level ranged from 1.5% in 2013 to 7.9% in 2023, indicating a growing concentration of either men or women in certain agricultural professions.

TABLE 3. Coefficient DDD for the agricultural sector in regions, broken down by urban and rural workforce, 2013-2023

Region	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Urban population											
Kazakhstan	1,5	2,8	0,3	0,7	2,8	1,2	2,8	1	0,5	3,7	7,9
Abai									3,8	18	
Akmola	6,5	6,4	8,6	9	3	4,6	2,7	3,6	4,1	4,5	1,3
Aktobe	18	12	12,8	6,7	6,2	15,3	0,7	2,5	14,9	13,1	11,7
Almaty	1,7	4,5	9,7	6	9,2	3,2	0,9	4,7	6,1	0,5	0,2
Atyrau	8,7	7,5	8,1	9,5	32,3	15,8	22,6	0,6	15,2	5,2	12,8
West Kazakhstan	11	24,9	29,8	9,1	7,2	0,4	19,9	4,7	11,5	7,1	12,9
Zhambyl	10,2	15,2	3,4	0	6,1	5,6	0,2	4	0,4	4,4	19,2
Zhetisu	-	-	-	-	-	-	--		0,8	16	-
Karaganda	2,8	11,8	9,4	2,8	22,2	20	5,3	14,1	8,6	24,8	3,7
Kostanay	10,8	2,8	8,9	10,1	2,5	4,4	12,9	3,3	1,5	7	11,8
Kyzylorda	14,2	3,3	2,3	23,4	3,8	2,8	15,2	20,7	8,8	14,1	19,1
Mangystau	2	29,9	31,1		19	15,9	8,3	43,5	22,9	1,5	20,9
Pavlodar	7,4	14,5	4,1	12,3	21,3	8,1	16,6	11	12,4	4,6	13,5
North Kazakhstan	9	6	2,2	5,1	16,8	7,4	4,4	7,3	0,9	4,2	9,9
Turkestan	-	-	-	-	-	0,2	5,2	11,2	5,5	3,7	4,4
Ulytau	-	-	-	-	-	-	-	-	30,5	18,9	-
East Kazakhstan	5,9	5,2	9,4	4,6	17,7	2,6	13,6	1	2,2	11,4	3,7
Astana c.	23,5	5,3	18,3	8,2	3	11,6	0,1	11,8	7,8	4	5,7
Almaty c.	7,6	11,4	19,9	12,1	11,7	7,7	5,4	1,1	17,3	17,5	7,7
Shymkent c.	-	-	-	-	-	1,2	2,1	5	0,9	2,3	7,3
Rural population											
Kazakhstan	3,4	5,1	6,8	6,6	6,8	7,6	8,2	8,7	9,4	10,3	9,3
Abai	-	-	-	-	-	-	-	-	-	7,5	10,9
Akmola	5,5	6,9	8,7	10,6	8,9	9,3	5,5	5,8	6,2	6,3	6,1
Aktobe	7,2	6,3	4,6	1,9	0,9	8,7	8	13,1	10,3	11,7	12,1
Almaty	0,9	2,3	0,6	1,6	2,2	5,4	10,1	7,2	8,3	7,4	5
Atyrau	12,7	8,5	10,2	16,5	9,8	20,9	18,7	28,6	31,7	26,8	24,7
West Kazakhstan	13	6,2	7	6,5	6,5	7,1	8,9	12,6	14,7	14,5	15,7
Zhambyl	0,1	3,4	4,4	5,3	6,8	3,8	7,8	5,4	12,7	10,5	12
Zhetisu	-	-	-	-	-	-	-	-	-	10,5	19
Karaganda	0,3	9,2	18,4	13,6	15,3	15,1	17	15,2	15,8	17,7	16,3
Kostanay	3,2	6,3	5,1	4,8	6	6,1	3,9	7	8,5	9	10,5
Kyzylorda	12,5	10	18,5	13,7	17	9,2	25,6	27,8	27	25,1	20
Mangystau	9	10,4	19,6	14,2	27,3	10	20,8	6,8	17,5	9,2	13,1
Pavlodar	1,9	3,6	3,8	4,5	5,7	5,7	6,1	6,3	7,4	7,9	10,2
North Kazakhstan	4,3	8,2	6,2	6,6	8	10,5	12,5	10,6	10,4	11,9	8,4
Turkestan						10	4,6	10	4,5	10	4,1
Ulytau										9,7	5,6
East Kazakhstan	6,3	8,3	10,2	8,6	8,8	7,7	8,2	6,3	10,2	11,6	10,5

Note: compiled by the authors

The highest levels of gender segregation are observed in Mangystau region (31.1% in 2015, 20.9% in 2023) and West Kazakhstan region (29.8% in 2015, 12.9% in 2023). This situation is explained by the dominance of men in large agricultural enterprises and mechanized agriculture, as well as a decrease in the proportion of women in commercial agribusiness. Similarly, Atyrau region showed a sharp increase in DDD in 2017 (32.3%), which confirms the thesis that gender inequality is increasing in regions with an industrialized approach to agriculture.

Other regions with high levels of segregation include the Karaganda region, where DDD reached 24.8% in 2022, and the Kyzylorda region, where the figure was 23.4% in 2016. These trends indicate that in urban agricultural structures, labor opportunities are more often provided to men, especially in managerial and technologically saturated segments. On the other hand, relatively low gender segregation is observed in Almaty region (0.2% in 2023), Astana (5.7% in 2023) and East Kazakhstan region (3.7% in 2023). This may be due to a more even distribution of labor resources in small farms and a developed agricultural services sector, where women participate in the processing and marketing of products.

Gender segregation among the rural workforce also demonstrates significant regional differences. The average DDD coefficient in Kazakhstan increased from 3.4% in 2013 to 9.3% in 2023, indicating growing segregation in agricultural labor. The highest level of segregation is observed in Atyrau region (24.7% in 2023), which is explained by the structure of agricultural production focused on large farms, where the male labor force prevails. Similarly, in the Kyzylorda region, the DDD coefficient increased to 20% in 2023, reflecting a decrease in female participation in agricultural labor in the context of mechanization and the enlargement of farms.

A high level of segregation is also typical for the Mangystau region (13.1% in 2023) and the West Kazakhstan region (15.7% in 2023). This may be due to traditional gender norms that limit women's participation in agricultural production, especially in regions focused on livestock and pasture farming. At the same time, the rural labor force in Akmola region (6.1% in 2023) and Pavlodar region (10.2% in 2023) demonstrates a more balanced employment distribution, which may indicate the preservation of traditional farms, where female labor remains in demand.

Based on the analysis of gender segregation in agriculture in Kazakhstan, a SWOT analysis was conducted to identify the strengths and weaknesses of women's employment in the agricultural sector, as well as identify opportunities and threats affecting gender equality in this area (Figure 2).

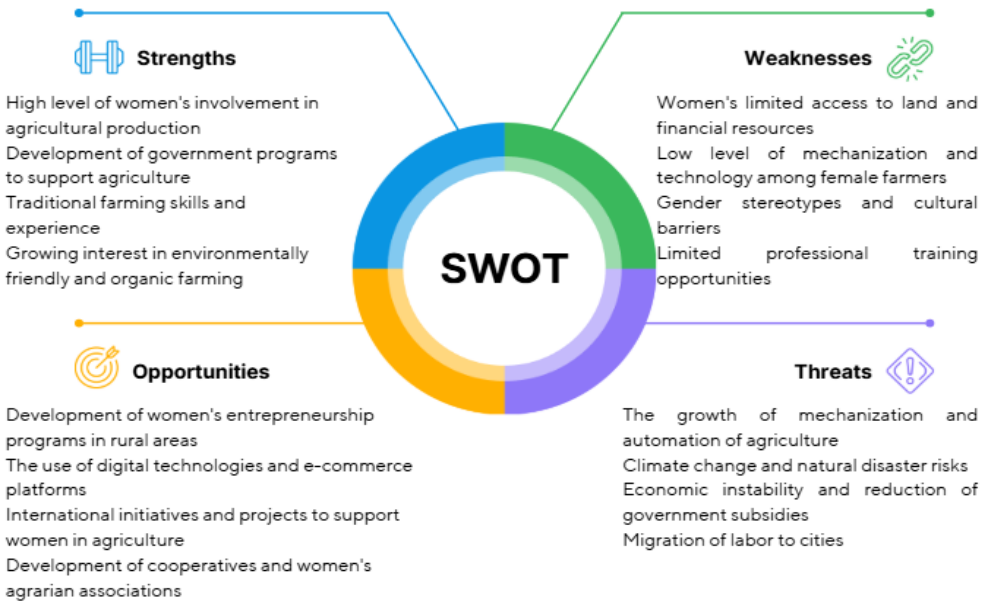

FIGURE 2. SWOT analysis

Note: compiled by the authors

The SWOT analysis showed that women are important in Kazakhstan's agriculture. However, they face several structural barriers, including limited access to land, finance and technology, as well as cultural restrictions and low representation in the management structures of the agricultural sector. At the same time, the expansion of government support programs, the digitalization of agriculture, and the development of women's entrepreneurship and cooperation offer significant prospects for improving the status of women in agriculture. To reduce the gender gap, it is necessary to strengthen institutional support mechanisms, create educational programs for women farmers and expand their access to innovative technologies and markets.

The analysis showed that gender segregation in the agricultural sector of Kazakhstan remains a serious problem with noticeable regional differences. While there is a gradual reduction in gender inequality in urban areas, the gender gap is growing in rural areas, especially with large agro-industrial enterprises. The increase in the DDD ratio from 6.0% in 2016 to 9.1% in 2023 indicates that women still face structural barriers, such as limited access to land, financial resources, and modern agricultural technologies. These findings highlight the need for targeted policies to improve women's access to resources, encourage women's entrepreneurship, and expand training programs to bridge the gender employment gap in agriculture.

5. CONCLUSION

This study aimed to analyze gender segregation in agriculture in Kazakhstan in the period 2013-2023 using the coefficient of dissimilarity. The paper examined the dynamics of the distribution of employment of men and women in agriculture and identified regional differences and structural factors affecting the level of gender inequality in the agricultural sector.

A literature review has shown that gender segregation in agriculture remains one of the key socio-economic problems in various countries of the world. The leading causes of inequality are women's limited access to land, finance, technology, and educational resources. An analysis of international studies has confirmed that removing gender barriers can significantly increase agricultural productivity, promote sustainable rural development, and reduce rural poverty.

The results of the quantitative analysis showed that the level of gender segregation in agriculture in Kazakhstan varies depending on the region and the nature of agricultural activity. In 2023, the average DDD coefficient in the agricultural sector reached 9.1%, which indicates a continuing imbalance in the distribution of labor resources between men and women. The most significant gender segregation is observed in regions such as Kyzylorda, Atyrau and Mangystau regions, where women face limited access to land resources and mechanized labor. At the same time, in regions with developed farming and cooperative movement, such as Almaty and East Kazakhstan regions, segregation remains relatively low.

The SWOT analysis made it possible to identify the key strengths and weaknesses of women's employment in agriculture, as well as identify opportunities and threats affecting gender equality in the agricultural sector. The main barriers include women's insufficient access to land, credit, and technology, as well as gender stereotypes that limit their professional mobility. However, the expansion of government support programs, the digitalization of agriculture, the development of women's entrepreneurship and cooperative forms of farming open up prospects for improving the status of women in the agricultural sector.

Based on the results obtained, the following recommendations on public policy can be proposed:

(1) Expansion of programs to support women's entrepreneurship in agriculture – it is necessary to increase women farmers' access to government subsidies, grants and credit

resources for the development of agricultural business.

(2) Strengthening institutional mechanisms to protect women's land rights will be an important step in implementing reforms to ensure equal ownership and disposal of land.

(3) Development of educational programs and training – it is necessary to create specialized courses and training for women farmers on using modern agricultural technologies, digital platforms and sustainable agriculture methods.

(4) Encouraging women's participation in cooperatives and agricultural associations – Government support for women's cooperatives and agricultural associations will allow women to use resources more effectively and enter the sales market.

(5) The development of digital technologies in agriculture – it is necessary to promote the introduction of online platforms for trading agricultural products and providing distance learning for women in rural areas.

Future research areas include an in-depth analysis of the impact of government policy on the level of gender segregation in agriculture, the study of factors contributing to the involvement of women in high-tech agricultural businesses, as well as the study of international experience in the field of gender inclusivity in agriculture. Additional attention should be paid to the impact of digital technologies on the employment rate of women in rural areas and their ability to adapt to new economic realities.

In conclusion, this study highlights the need for a comprehensive approach to address the gender imbalance in agriculture in Kazakhstan and develop targeted strategies to increase women's involvement in the agricultural sector.

AUTHOR CONTRIBUTION

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