CHALLENGES OF WHEAT CLUSTER FORMATION IN GEORGIA

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Abstract

The aim of this paper is to reveal the main challenges of wheat cluster formation in Georgia. For this purpose, the author reviews the challenges of global production of wheat, its demand, the opinions of acknowledged researchers about the wheat cluster challenges, etc. Subsequently, emphasis is placed on the scale of wheat production in Georgia. The government policy of Georgia to promote wheat production is discussed. Wheat is a special grain for Georgia. According to the artefacts found in the country, its domestic use has a history of 8000 years. The author discusses the wheat cluster in Georgia by M. Porter's and O. Sölvell's approaches. The most important part of the paper is devoted to the research, where 507 respondents were surveyed. As a result of the research, the respondents' awareness of the governmental policy of wheat production in Georgia, wheat varieties, and international recognition of wheat scientific research was revealed.

Keywords: Cluster, wheat production, wheat cluster, Georgia

JEL Classification Codes: O38; P25; Q13

1. Introduction

Supply chains and previously established economic ties are now at risk because of the COVID-19 pandemic and contemporary armed conflicts worldwide (Moosavi et al., 2022, 1–2; Tsang et al., 2024, 1; 12).

In such conditions, it is particularly important for any country's government to continuously supply the population with products of inelastic demand (Gvelesiani et al., 2024, 114–115; Vatcharadze, 2023, 27). Wheat and bread products produced from it are among the goods in this category that are essential to life.

Providing country with wheat is important because it can even become one of the political tools to gain influence over the country. This is confirmed by current armed conflicts. Complete reliance on wheat imports, which is frequently justified by the low cost of goods, does not always imply lower production costs in a particular country. Damping prices are mostly intended to capture new markets and eliminate domestic production (Götz et al., 2015, 232; Iskender, 2023, 32). This then eliminates competition and the wheat producing country can raise the price and recoup the loss. In such situation, the task of any government should be the development of local production.

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The above-mentioned occurrences prompted the governments of many countries to consider raising the amount of wheat production in their countries. Georgia is the country of origin of grapes and wheat. As a result of archeological excavations in the Western (Kolkheti) and Eastern (Shulaveri) parts of the country, samples of the 5th–4th millennia BC were found. Similar to wine production, these artefacts suggest that wheat cultivation and consumption in Georgia has a history of 8000 years. Out of the 27 species included in the wheat genus in the world, 14 have been described in Georgia. Among them, 5 (Makha, Kolkhur Asli, Chelta Zanduri, Hexaploid Zanduri, Dika) are completely Georgian endemic species and are not found in other countries. In 2018, "Georgian wheat culture" was defined as a category of national importance and was granted the status of a monument of intangible cultural heritage. Furthermore, efforts have begun to add the Georgian wheat culture to the list of intangible cultural heritage of UNESCO that requires immediate conservation (Gamtenadze, 2023). Georgian company called "Lomtagora" was able to raise 11 tons of wheat per hectare, which is an example of carrying on such a great tradition in a new and appropriate method. This is the indicator of the leading wheat producers in the world. According to the founders of this company, Georgia can fully meet its demand for wheat, which is possible with the development and implementation of the appropriate policy (Lashkhi, 2023).

Thus, the author's decision regarding the selection of the research issue was conditioned by several circumstances: 1) Wheat is a product of inelastic demand and it is important to increase its production capacity in Georgia; 2) The world's oldest artifacts of wheat production and consumption in Georgia indicate that the production of this product is essentially important for the country; 3) One of the companies operating in Georgia, "Lomtagora", has registered three new wheat grain patents in the European Union, which shows the great potential of the development of the industry with the results-oriented policy.

In the paper, the author tried to study the current state of wheat production in Georgia and the possibilities of increasing productivity. As one of the ways to achieve this goal, the author considers the formation of a strong wheat cluster. In order to explore the challenges of forming this cluster, the author conducted a survey using the Google platform in the period from June 29th to August 10th and received 517 responses, among them, 507 were fully completed. The research results were processed with SPSS computer program.

The structure of the presented paper is as follows: The methodology of the conducted research is explained after the introductory part; In part 3, the main trends in world wheat production and demand are analyzed. Part 4 presents the analysis of the wheat cluster in Georgia using M. Porter's and O. Sölvell's approaches. Part 5 includes an overview of the results of the research conducted by the author. The paper ends with conclusions.

2. Methodology

For the preparation of this paper, the author reviewed the relevant scientific literature and studied documents, reports, surveys, and reviews from the international institutions, organizations and established research centers. A wide range of issues is discussed in the paper. As a result, a separate section for literature review is not allocated.

Wheat cluster research is the novelty for the scientific research space of Georgia. The present condition of the global wheat market is analyzed to evaluate the existing situation of the wheat market in Georgia and determine its future prospects. Subsequently, a number of statistical data are presented. The author examines the price and amount of imported wheat in addition to the fluctuations of wheat prices in Georgia. The study of the wheat cluster was carried out with a double approach, namely, with the Porter's (1990) approach (wheat cluster tree scheme developed by the author). This model is universal and focuses on describing the internal and external links of the cluster. Later the author presents Sölvell's (2009) cluster actors for the case of Georgia. In addition, the author developed a questionnaire consisting of 21 questions and interviewed 507 respondents. Based on these data, it can be noted that the survey indirectly reflects answers of 1962 individuals. (We multiplied the number of families with 4–5 members by 4, 4X225=900, and we multiplied the number of families with "6 and more" members by 6. 6X177=1062 individuals, i.e. 900+1062=1962). Here are included answers to only certain (and not all) questions, such as the amount of consumed bread in the family, the consumer's taste, the dependence on the quality of bread may be generalized to the number of family members (here it was meant as a family, people living together). In addition, it should be noted that the author of the article took into account the smallest among families with 4–5 members and more than 6 members, namely, responses of families with 4–5 members were multiplied by 4, and the number of families with more than 6 members was multiplied by 6. Accordingly, the approximate number of respondents to some of the above-mentioned questions (and not the complete survey) was named. Which can be considered as more than 507 respondents. The author did not generalize the results to other questions of the survey, since all the members of the families did not/could not know (meaning children and teenagers of the families, non-specialist respondents) about the state policies and challenges of wheat production. The research results were analyzed by SPSS computer program.

Based on the conducted study the author formulates the main research question: **How do respondents rate the state's policy for raising wheat production and increasing the availability of quality bread for the population? (subsidies are implied).**

3. Briefly about main tendencies of the world wheat market: production and consumption

A number of international organizations, authoritative journals, and famous scientists familiar with the agriculture, have been warning the whole world about the challenges of the food supply problem aggravating (Koghuashvili & Archvadze, 2023).

The global production of grains, including wheat, is particularly important for food security. Numerous causes contribute to the global wheat market's problems. Naturally, the following issues vary depending on the nation, its stage of development and on economic policy priorities.

Some common problems of wheat world production are: problems caused by natural conditions and climate change, small cultivated areas (which determines the existence of smallholder farmers), low wheat production, small average yield, obsolete technologies, a lack of modern inputs, insufficient access to credit services, low quality of wheat, low purchase and sale prices, lack of output market for agro-processing firms, low rate

of self-sufficiency in wheat and accordingly, import dependence on global wheat market (Rafiee et al., 2022, 8; Yigezu et al., 2021, 1359; Syme et al., 2024, 828). There are various ways of solving these obstacles in different countries, among them is the cluster approach. Cluster based wheat production is discussed in the USA and Canada. American scientists claim that the wheat cluster contributes to a large part of the Washington's economy and the agriculture industry in particular (Nadreau & Fortenbery, 2016, 23). The Canadian Wheat Research Coalition (CWRC) aims to increase the net relative profitability of wheat for farmers in western Canada. The CWRC supports a cooperative approach to producer funding of regional and national research projects in variety development and agronomy (CWRC, 2024).

To address climate change problems, the Ethiopian government has implemented climate-smart agriculture strategies, such as agricultural cluster farming. Research study found that cluster farming is economically viable for small, resource-limited, and socially disadvantaged farmers (Ergando, 2023). Cluster-based production and commercialization of another grain, sorghum is also introduced in Ethiopia (Tadesse et al., 2023, 62).

In the Philippines, lack of water significantly impacts farmers' technical efficiency. Accelerating irrigation service areas are promising for reducing inefficiencies (Mamiit et al., 2020, 9).

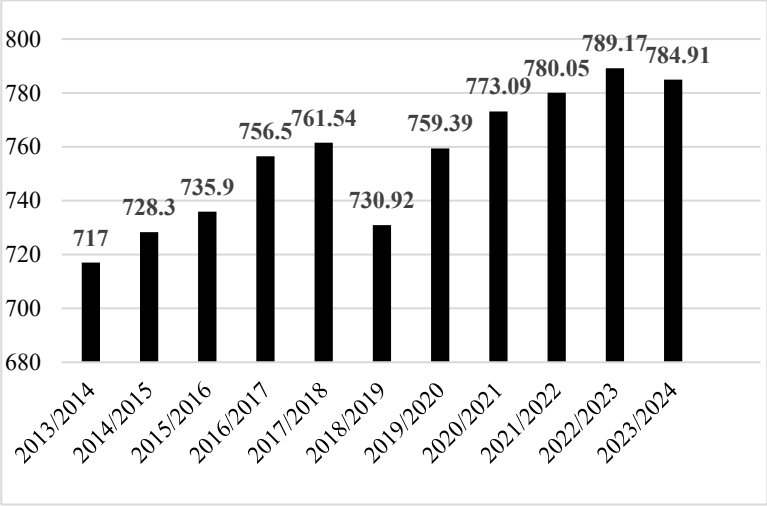


Figure 1. Global wheat production from 2013/2014 to 2023/2024 (in million metric tons); Source: www.statista.com

As Figure 1 shows, the global production volume of wheat came to almost 785 million metric tons in the marketing year of 2023/24. This was a decrease of about four million tons compared to the previous year. Wheat stocks are forecast to increase to about 281.7 million metric tons worldwide by 2023/2024. China was the top ranked wheat producing country in 2022/23 and is expected to remain as the top producer in 2023/24. The

European Union is the second ranked wheat producing region. It is forecast that the region would yield more than 137.5 million metric tons of wheat by 2032, accounting for about one-fifth of the world wheat production. Wheat is the second largest grain worldwide based on grain acreage and second largest based on total production volume.

Almost every U.S. state is involved in the nation's wheat production, with North Dakota and the "Wheat State" Kansas producing the largest volume. Many developing countries are highly dependent on the Ukraine and Russia's wheat imports. As of June 2022, Armenia and Mongolia fully relied on Russia for meslin and wheat imports. Laos reported the most significant dependence on meslin and wheat supplies from Ukraine, at over 98 percent of total imports of these commodities (Shahbandeh, 2024).

Briefly about the wheat consumption in the World. In their recent studies, Kapoguzov et al., (2021, 1782), Mukhametzhanov & Zholaman (2023, 98) discuss the problems of wheat production and the possibilities of increasing it. The Russian Federation, a major grain exporter, has set a goal to double agricultural product and raw material exports by 2024. Market factors increase export probability, while production potential factors reduce it. Development of primary and deep grain processing in regions could decrease exports, while the "free" grain market and increased wheat reserves could increase Russian grain exports. Commercial grains and elite seeds are also discussed and compared for wheat production in North Kazakhstan. However, researchers concluded that combined production approach could achieve predictable profitability and reduce initial investments. As one of the most important staple foods, a large variety of different products contain high amounts of wheat. As figure 2 illustrates, global consumption of wheat saw a slight increase over the last year, with just under 791 million metric tons consumed in the 2022/23 trade year. In the 2023/2024 trade year, it is expected that about five million metric tons more will be consumed.

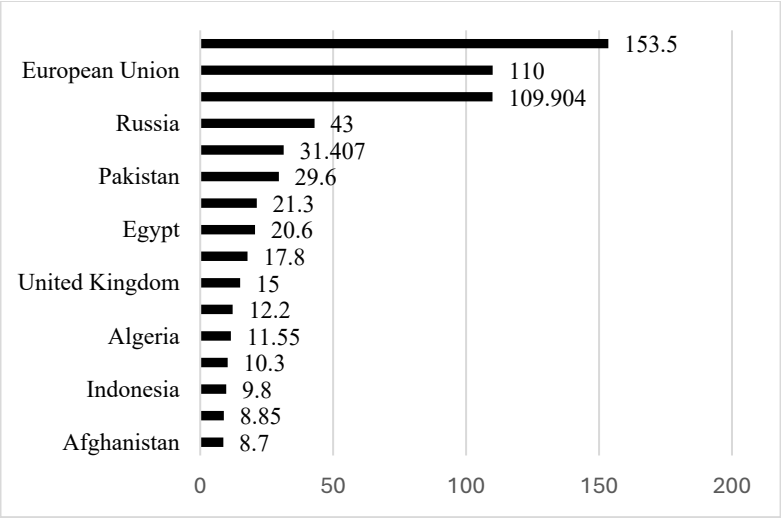


Figure 2. Wheat consumption worldwide in 2023/2024, by country (in 1,000 metric tons); Source: www.statista.com

In 2023/24, it is expected, that China will consume about 153.5 million metric tons of wheat. The global per capita food use of wheat generally stood above 66 kilograms per year in the last decade (Shahbandeh, 2024).

Figure 3 illustrates the stocks of wheat worldwide from 2012/2013 to 2022/2023, in addition to a forecast for the 2023/2024 season.

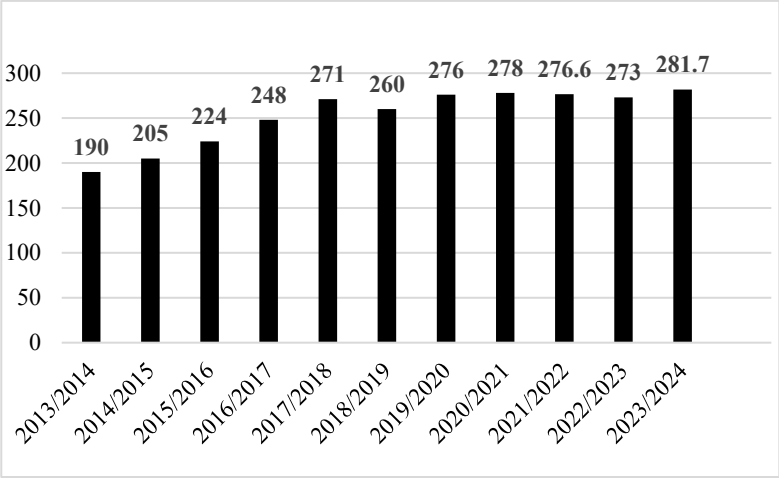


Figure 3. Global stocks of wheat from 2012/2013 to 2023/2024 (in million metric tons); Source: www.statista.com

In crop year 2021/2022, the global stocks of wheat amounted to about 276 million metric tons. Wheat stocks is forecast to increase to about 281 million metric tons by 2023/2024.

As known, the largest amount of the world's grain reserves is owned by only a few countries (mainly the USA, Canada, EU countries). Among these countries, the USA stands out, with 5% of the world's population and 47–50% of the grain reserves while around 120 countries import grain in different volumes (Koghuashvili & Archvadze, 2023).

Table 1 illustrates, that in the last decades the world has been marked by a permanent high level of grain prices, with food prices rising on a global scale. It may be safe to say that the era of cheap food in the world, including the era of cheap bread, is actually over.

Table 1. The world price of wheat in 1980–2022 (According to the Chicago Mercantile Exchange, at the end of the year; USD)

Year	1980	1990	2000	2010	2015	2020	2021	2022	2023
One bushel	4.91	2.66	2.74	7.94	4.68	6.41	7.71	8.96	6.59
One ton	113.5	61.5	63.4	183.6	108.2	148.2	178.3	207.2	152.2

Source: Prepared by the author according to the data from: www.macro-trends.net/2534/wheat-prices

The global consumption of wheat increases, while the global production slightly decreases. As a result, price of wheat in the world market increases permanently. Therefore, it is very important to promote local production.

4. Wheat production and its cluster in Georgia based on Porter's and Sölvell's approaches

4.1 The current situation in the wheat market of Georgia

Wheat has been cultivated in Georgia since ancient times. Based on the goals of the research, it is interesting to consider the production of wheat from the historical perspective as well as in the modern period. According to the data of the National Statistical Service of Georgia, in 1913 the wheat harvest in Georgia was 118.2 thousand tons. At the end of the 30s of the last century it was 102.7 thousand tons. Lately, it amounted to 176.7 thousand tons. In 1985, the average yield per hectare exceeded 2.3 tons, and in 1990, this indicator increased to 2.93 tons, which was one of the best indicators in the post-Soviet countries. Afterwards in 2003, bountiful harvest of wheat was 225 thousand tons, when the rate of self-sufficiency in wheat amounted to 24%. After 2003, the volume of production decreased sharply: in 2007, the wheat harvest was only 75 thousand tons (the rate of self-sufficiency of wheat decreased to 18.9%); in 2008, farmers harvested 80 thousand tons of wheat. In 2010, the rate of wheat self-sufficiency decreased to 9%.

Georgia, as a grain-producing country, has lost its position in recent decades. For example, wheat production per capita in 2022 was 5.3 times lower than the rate of 1950; 2.9 times lower than the rate of 1980 and 3.6 times lower than the rate of 2003 (Koghuashvili & Archvadze, 2023). Grain production is one of the main factors determining the food security of the country. The solution to the food security problems is equal to maintaining the political and economic independence of Georgia. Agribusiness development and provision of self-produced food should become the main task of the government of Georgia (Koghuashvili et al., 2022, 111; Kharaishvili & Suknishvili, 2021, 29). It is increasingly difficult to meet the demand for fresh and healthy agricultural products with traditional methods of cultivation. Therefore, development of innovative methods in agriculture requires special importance (Samadashvili et al., 2020, 45; Vatcharadze, 2021, 88; Gechbaia et al., 2021).

Based on the objectives of the research, it is necessary to consider statistical data about wheat production, wheat import and wheat prices in Georgia.

Table 2 illustrates the volume of wheat production according to the regions of Georgia in 2016–2023. It can be seen that the Kakheti region is distinguished by the volume of wheat production in Georgia.

Table 2. Wheat production by regions of Georgia in 2016–2023 (1000 tons)

Year	2016	2017	2018	2019	2020	2021	2022	2023
Georgia	126.6	97.9	107.1	100.6	102.4	135.9	156.8	147.0
Kakheti	102.8	80.4	86.1	83.5	80.7	101.3	120.7	103.4
Kvemo Kartli	6.9	7.2	8.3	6.8	9.8	17.4	15.6	16.1
Shida Kartli	10.2	7.3	6.7	5.2	7.2	12.3	11.7	17.9
Samtskhe-Javakheti	5.3	2.4	5.0	4.8	4.0	4.3	6.2	7.2
Other Regions	1.5	0.5	0.9	0.4	0.7	0.5	2.4	2.4

Source: Geostat.ge

In the last 8 years, the lowest rate of wheat production in Georgia was recorded in 2017, and the maximum was in 2022. In 2023, wheat production decreased compared to the previous year. Wheat production per capita decreased in comparison with the previous year and was 39.3 kg.

Together with the actual indicators, it is interesting to consider the potential of wheat production in Georgia. The average yield rate of wheat in Georgia in 2016–2023 is stable and, on average, is 2.5 tons per hectare. Compared to the countries of the region, yield per hectare is low in Georgia.

Georgia heavily depends on wheat imports from abroad. This is caused by several factors, including the low price of imported wheat, the small amount of local production, etc. Wheat import price in Georgia increases every year, but it is still less than the price of locally produced wheat. The low price of locally produced products clearly reduces farmers' motivation to grow and sell wheat. On the other hand, it is less expensive for the government to import wheat than to purchase it from local farmers. As a result, according to the National Statistics Office of Georgia, on average 16.5% of locally produced wheat cannot be sold. It must be mentioned, that wheat import price in Georgia increases every year, but it is still cheaper than locally produced wheat.

The government of Georgia periodically implements various supporting programs for farmers; for example, to increase farmers' access to small-scale agricultural machinery, the Rural Development Agency is implementing the "Co-financing Program for Agricultural Machinery in mountainous regions". The budget for the program is 5 million GEL. Because most people in mountainous regions possess small pieces of agricultural land, there is a considerable demand for hand tractors (moto blocks). The government's goal is to make contemporary harvesting techniques available to more farmers and agribusiness workers, ensuring that harvesting occurs throughout the harvest period and, as a result, maintains good quality. Implementing the international practice of applying contemporary techniques in agricultural activities will increase the efficiency of the harvesting process.

To enhance volume of production and productivity, collaboration between the public and private sectors is required. The best illustration of this is the company "Lomtagora". The company "Lomtagora" is a multi-sector agricultural enterprise located in the Kvemo Kartli region of Georgia. The main direction of the company's activity is wheat and corn selection, breeding, and production of field crops. The company cooperates with higher and vocational education institutions of Georgia, as these ties ensure the

commercialization of scientific research (Gogorishvili & Zarandia, 2021, 110; Lekashvili & Bitsadze, 2021, 80; Seturidze & Topuria, 2021, 1670; Papachashvili et al., 2021, 181; Polodashvili, 2022, 18). Through cooperation with scientific and educational institutions, agricultural research centers, and international organizations, this company has achieved great success both in breeding new varieties and in introducing advanced agrotechnologies. „Lomtagora" has produced and patented high-yielding and disease-resistant varieties of wheat and corn. Within the scope of preferential financing, the firm finished building and installation of grain storage silos equipped with contemporary technologies, thus, "Lomtagora" now provides grain drying and storage services to farmers. Another innovation that this company offers to farmers is wheat seeds processed with the latest German (PETKUS) technologies. Due to its multi-profile activities, "Lomtagora" formed a "micro cluster", involving all the actors identified by O. Sölvell. Therefore, in order to achieve success and self-sufficiency throughout the country, it is necessary to develop and implement a cluster policy.

Along with the implementation of the local cluster policy, it is interesting to consider the issues of cooperation between Georgia and EU countries. On July 1, 2016, the Association Agreement between the European Union and Georgia entered into force, which, together with the Agreement on the Deep and Comprehensive Free Trade Area (DCFTA) lays the foundation for Georgia's far-reaching political and economic integration with the European Union. On the other hand, the DCFTA increases access to the EU market based on the relevant regulations, and contributes to the diversification of the Georgian economy. However, it should also be noted that the EU's export goods in Georgia are mainly non-agricultural products, while the EU's imports from Georgia mainly include industrial products (Delegation… 2023).

Accordingly, the volume of trade in agricultural products between the countries of the European Union and Georgia is small. Over the centuries, the wheat market changes (access to modern agricultural equipment, development of farmers' skills, use of modern approaches to cultivation, irrigation, maintenance, etc.) provide comparative advantage of Georgia. Although there are various substitute products for wheat as a grain (including corn, barley, etc.), wheat is the main cultivated grain for Georgia in both historical and economic context. Wheat is an important attribute of Georgian cuisine. For this purpose, wheat is the focus of the author's research.

Parallel to the European integration process, the Georgian government has set a target of enhancing wheat self-sufficiency and, as a result, lowering import dependence. The government's goal is to expand wheat self-sufficiency to 50% within a few years. Experts in the field believe that with adequate changes and promotion, this aim can be achieved. In the future, wheat must be sown on at least 150 thousand hectares in Georgia, meeting around 50–55% of local demand (Tsulaia, 2022). As a result, the remaining local wheat demand (40–45%) should be met by imports. The expanding statistics of tourism should be considered, which will boost the demand for wheat.

In 2024, the average yield of wheat production per ha in Georgia increased by almost 1 ton compared to last year, which is a significant improvement and the result of effective policy (Gelashvili, 2024). Among individual farmers, this indicator was 7–8 tons per ha this year. The total amount of wheat produced in the country as a whole has increased by 20% compared to the previous year (Agrosphere, 2024). It should be noted that the price of 1 kg of imported wheat in September 2024 is 0.74–0.75 GEL, while the wheat

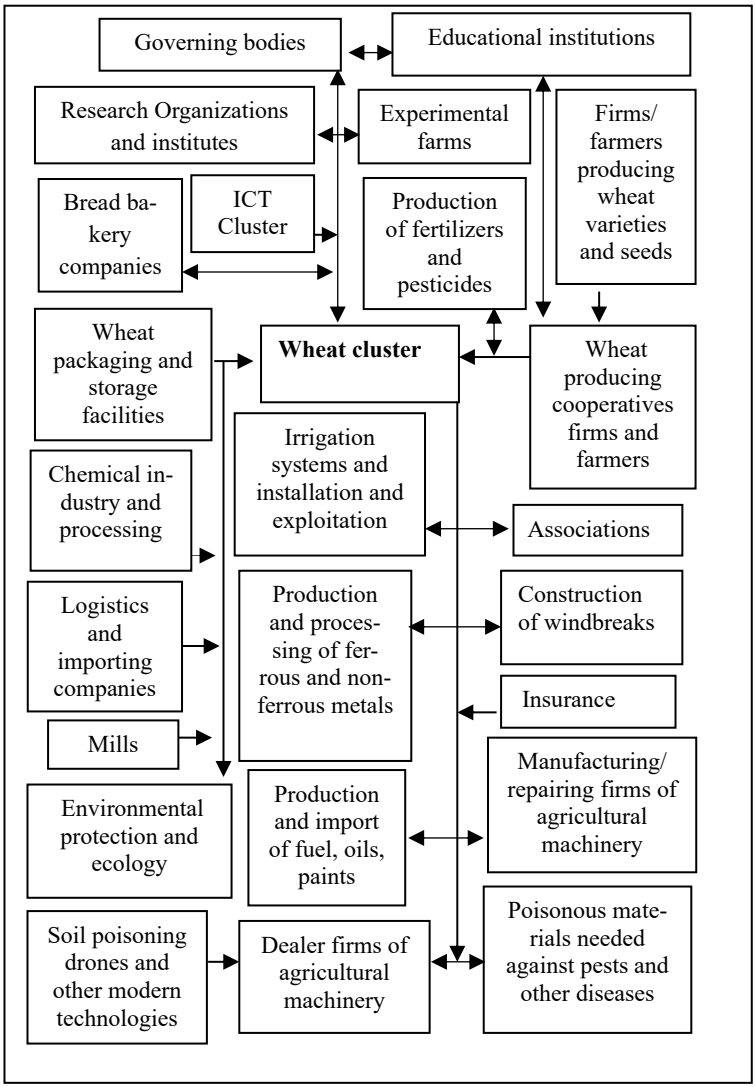
grown in Georgia is bought by the factories for 0.60–0.65 GEL (Mghebrishvili, 2024). This means that as a result of the full implementation of the potential of the wheat-producing regions, wheat production in Georgia will become competitive, and the state subsidy policy will no longer be necessary. In addition, we will mention the competitiveness of wheat itself. Consider at least one Georgian endemic variety, "Chelta Zanduri" (Triticum timopheevii). Its advantages are: low content of gluten in grain; high content of protein; resistance to six leaf and two arthropod pests; resistance to adverse conditions – "Chelta Zanduri" (Triticum timopheevii) is known for drought and frost resistance; high immunity against fungal diseases; unique G gene content (Khetsuriani, 2020).

4.2 Wheat cluster in Georgia based on Porter's approach

Clusters have been the subject of extensive global research for more than 40 years. Clusters were first introduced by Marshall (1890). He described the "advantages of agglomeration of economic activities in terms of availability of a qualified workforce and specialization". Similarly, Schumpeter (1939) referred to the swarming or clustering of industry. Based on Alfred Marshall's concepts, Becattini raised the issue of the importance of place-based economic development with the notions of external economies that changed the approach to industrial policy. More recently, the concept of clusters has been popularized and implemented by Porter (1990) (COM (2008) 652 final, 7). According to Porter (2008), "a cluster is a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities. They constitute a forum in which new types of dialogue can, and must, take place among firms, government agencies, and institutions (such as schools, universities, and public utilities)" (Porter, 2008, 215). Although Porter predicted the disappearance of clusters, they have managed to exist successfully. This resulted from an increase in the quantity of goods produced in the cluster and a modification of a university model operating in the cluster (Vesperi & Gagnidze, 2023, 440). The uncertain future caused by the Covid-19 pandemic and the process of digital transformation have relatively reduced cluster research. Many researchers, however, predicted that clusters would continue to be successful in the digital era. Götz (2019, 77) tried to find ties between the concepts of Industry 4.0 and clusters. According to Gagnidze (2023, 2279), the cluster is a structure and a network that provides the best foundation for success in the in the age of digitization. Jankowska et al., (2021) emphasized the importance of social capital, which is developed in a cluster and helps individuals overcome challenges together.

Georgian scientists have been investigating clusters since 2007. For some of them, this is one of the main directions of scientific research, in particular: Baratashvili, E., & Baratashvili, I. (2019, 535), Gagnidze (2018, 419), Sepashvili (2018, 219), etc.

It is interesting to consider the wheat cluster in Georgia according to Porter's model: Scheme 1 shows the structure of the wheat production cluster in Georgia which is developed based on M. Porter's cluster's tree approach. According to Porter's model, some components of the production (value) chain inside the wheat cluster in Georgia are: bread bakery companies, experimental farms, wheat producing cooperatives, firms and farmers, firms/farmers producing wheat varieties and seeds, Manufacturing/repairing firms of agricultural machinery, etc.



Scheme 1. Wheat production cluster developed by the author based on Porter's cluster's tree approach

The governing bodies are crucial to the cluster's successful operation because they should create an agriculture-focused policy and function as a mediator to guarantee that the entities within the cluster cooperate with one another. Research organizations and institutes included in the cluster, educational institutes, which play an important role in

the training/retraining/certification of qualified personnel, are significant. Furthermore, when discussing wheat production, the author should not lose sight of the fact that the existence of insurance organizations is particularly important in the agricultural sector.

According to Porter's model, the constituent parts of the production (value) chain outside the wheat cluster in Georgia are: ICT cluster, logistics and importing companies as well as dealer firms of agricultural machinery, etc.

4.3 Wheat cluster in Georgia based on Sölvell's approach

Örjan Sölvell is undoubtedly one of the world's most famous researchers of clusters. He successfully led the European Cluster Observatory (a project of the European Commission). Under his guidance, research was conducted there on hundreds of clusters in Europe, including: Sölvell et al., (2003), Ketels et al., (2006), Lindqvist et al., (2013), etc.

According to Sölvell, the author would like to describe the actors of the wheat cluster in Georgia. Sölvell (2009) identified six main types of cluster actors: Firms (Industry – Buyers, Suppliers, Related industries, SMEs, Services), financial actors (Banks, Venture capital, Business angels), public actors (Regional authorities Agencies), universities (Colleges, Tech transfer offices, Laboratories, Technology parks), organizations for collaboration (Formal and informal networks, Trade associations, Cluster organizations), and media.

1) **Industry:** The wheat cluster industry in Georgia unites: Major, large wheat producing firms, including: "Lomtagora", "Aspria seeds Georgia", "Chirina", "Agrosphere" (LTD Noblex), etc. Bakeries of bread – as the main product of wheat: "Ipkli", "Ipkli Dighomi", "Lithuanian bakery", "Margi", "Pane", etc. Bakeries of hypermarket chains in Georgia (Goodwill, Carrefour, Fresco, Universam, etc.) Also the actors of the industry are: Grain processing factories located in Tbilisi and Poti, up to 15 milling companies, flour producing companies, including LLC-s: "Bevrili Group", "Baraka Group", "Geomill", "Karmen", etc. Major wheat importing companies in Georgia: "Poti Grain Terminal", "Bevrili Group", "Geomill", etc.

2) **Financial actors:** The funds allocated by the national budget of Georgia, which provide farmers with the essential material and technological base, production equipment, and other merchandise. To encourage wheat and bread production, the government of Georgia periodically implements various target programs, including: "State Program of Wheat Flour Subsidy".

The public agency "Produce in Georgia" implements various programs, for example, the "Credit Guarantee Mechanism Program". "State program for the promotion of micro and small entrepreneurship" intends to assist micro and small business activity. "Rural Development Agency" implements the "Preferential Agrocredit Project", which includes: preferential agrocredit for working capital; preferential agrocredit for fixed assets and preferential agroleasing.

LEPL "The Shota Rustaveli National Science Foundation of Georgia" implements state grant calls, targeted programs and projects. Among them, grant projects submitted in agrarian fields are financed.

International partners of Georgia are: The United States Agency for International Development (USAID); The European Union (Via the "EU4Business" program); The European Bank for Reconstruction and Development (EBRD).

3) Governmental agencies: The Ministry of Environmental Protection and Agriculture of Georgia and its public agencies: NNLE "The Rural Development Agency", NNLE "The Agency for Management of Agricultural Projects", LEPL "The National Food Agency", LEPL "The Agricultural Scientific-Research Center", LEPL "The State Laboratory of Agriculture of Georgia", LEPL "The National Agency for Sustainable Land Management and Land Use Monitoring"; The department of economic policy of the Ministry of Economy and Sustainable Development; The revenue service of the Ministry of Finance of Georgia; The ministries of the Autonomous Republic of Adjara: The Ministry of Agriculture and its public agencies: NNLE "The Agro Service Center"; LEPL "The Laboratory Research Center"; Departments of environmental protection and natural resources; The Ministry of Finance and Economics of Adjara.

4) **Universities:** For the wheat cluster in Georgia to function successfully, wheat producers (farmers) must receive suitable agricultural education, which includes one-year crops, wheat cultivation, horticulture, planting, and so on. Based on the research objective, the author describes higher/professional educational institutions in Georgia that offer the aforementioned fields.

Agriculture, horticulture, and wheat production are taught through 28 Bachelor's, Master's, and PhD programs at nine different higher education institutions of Georgia. In addition, six vocational education institutions provide seven distinct agricultural programs.

5) **Organizations for collaboration**: "Firm Lomtagora" has close cooperation with both local and international organizations, including: International Maize and Wheat Improvement Center (CIMMYT); International Center for Agricultural Research in the Dry Areas (ICARDA); Association of biological farms "Elkana", International agrichemical company "Syngenta".

One of the largest agribusiness companies in Georgia is "Noblex LTD", which is represented in Tbilisi and Kakheti by the chain of stores "Agrosphere". Their product line comprises plant protection products, mineral fertilizers, agricultural technologies, seed material, drip irrigation systems, labor tools, and other farmer supplies. More than 20 companies of the world are represented by "Noblex LTD" in Georgia: Plant protection products – "Bayer AG"; Mineral fertilizers – "Yara"; Agro machinery – "Claas"; Seed material – "Saatbau", "Nunhems"; Drip irrigation systems – "Irritec". In order to provide various types of products and services, "Noblex LTD" has partnerships with more than 80 companies around the world.

Insurance institutions and access to insurance benefits are especially crucial for reducing harvest hazards. Currently, the following licensed insurance companies participate in the government program of agro-insurance: "Tbc insurance", "Ardi", "New vision insurance", "Aldagi", "Prime", "Insurance group of Georgia".

6) **Media:** In the current period, there are 49 television broadcasting stations in Georgia. Two of them, "Agro TV" and "Agrogaremo", are directly agricultural televisions. TV-radio broadcasts, as well as the existing digital/print press, effectively provide information to the population about the main focuses of agricultural and cluster policy.

5. Electronic research analysis

The survey was conducted in order to study the challenges of wheat cluster formation in Georgia. Respondents were interviewed online, through Google Form. The survey questionnaire included 21 quantitative and qualitative questions, among which there were closed, open and mixed-type questions, some of which could be marked with multiple answers.

The survey was conducted from June 29 to August 10 of this year and 517 responses were received. As a result of processing the data in the SPSS program, the answers of 507 respondents were completely filled.

The developed questionnaire was evaluated as reliable and consistent since Cronbach's alpha was 0.737.

During the research, it was found that the majority of the respondents are from the 31–35 age group – 85 individuals (16.8%). The 36–40-year-old age group ranks second in terms of quantity – 71 (14.0%), and the smallest number of respondents are under the age of 20 – 12 (2.4%). In terms of gender, the majority of respondents are female – 264 (52.1%), and 243 (47.9%) are male. According to the level of education, individuals with higher education predominate – 423 (83.4%), the next largest group are those with vocational education – 46 (9.1%). Those with complete general education were in the minority – 8 (1.6%). The distribution of respondents according to marital status is as follows: married people make up the majority of 333 (65.7%), followed by the marriageable group – 99 (19.5%), the smallest group is widowed – 4 (0.8%). According to the number of family members, representatives of families consisting of 4–5 members prevail – 225 (44.4%) and families consisting of "6 and more" members – 177 (34.9%), and the smallest number of single-person families is 28 (5.5%).

Based on these data, it can be noted that the survey indirectly reflects the consumption volume, taste and choice of 1962 individuals. (We multiplied the number of families with 4–5 members by 4, 4X225=900, and we multiplied the number of families with "6 and more" members by 6. 6X177=1062 individuals, i.e. 900+1062=1962).

According to the employment rate, most of the respondents are employed in the public sector, 179 (35.3%), the next largest group is employed in the private sector – 126 (24.9%), and the minority is represented by immigrants – 3 (0.6%). The distribution of respondents according to monthly income is as follows: 161 families have an income of "5001 GEL and more" (31.8%), 94 families have 4501–5000 GEL (18.5%), and the smallest are families with an income of up to 500 GEL – 5 (1.0%). In the study, we analyzed the distribution of income according to the number of family members by cross-tabulation and investigated which bread was chosen by families with higher incomes. It turned out that "Ipkli" was in the first place, both in the choice of all respondents, as well as among those with high incomes per family member. It should be noted that "Ipkli" is the most chosen by 62.1% (in the conditions when they had the opportunity to choose 5 answers). To the question of which wheat producing firm the respondents knew, the answers were distributed as follows: "Lomtagora" – 203 (17.5%), "Flour producing association" – 142 (12.2%), etc. It must be mentioned, that the share of respondents who found it difficult to answer is high, such an answer was 175 (15.1%). When asked which varieties of wheat were known to the respondents (provided that they had the opportunity to mark a maximum of 5 answers), it was found that "Ipkli" was

known to 186 (11.3%) respondents, “Javakheti’s Dika” – 127 (7.7%); “Kartli’s Dika” – 123 (7.5%), “Chelta Zanduri” – 118 (7.2%), “Dolis Puri” – 104 (6.3%) and others. The majority of respondents believe that Georgia can produce wheat at world prices or cheaper. Their number is 351 (69.2%), only 31 (6.1%) think otherwise. And the second big group has difficulty answering the question 104 (20.5%). According to 256 respondents (50.5%), the average yield of wheat in Georgia is 3–4 tons, and 124 respondents (24.5%) – find it difficult to answer. 62 respondents (12.2%) mention the average yield of 5–6 tons. 244 (48.1%) respondents were informed about the cultivation of 11 tons of wheat per 1 ha by the firm “Lomtagora”, while 238 (46.9%) respondents did not have this information. The answers about the patenting of several new wheat grains in the European Union by the firm Lomtagora are almost similar, namely, 256 (50.5%) respondents know about this fact, while the rest have not heard this information – 239 (47.1%) and some respondents think that this fact is not true 12 (2.4%). Regarding the quality of bread, it is “very important” for the vast majority of respondents – 403 (79.5%) and “important” – for 99 (19.5%) respondents. When asked which bread the respondents buy, 190 (37.5%) of them answered that they choose the one prepared without yeast, and 151 (29.8%) choose the one baked with yeast. The third largest group is those who “would buy bread without yeast (and without chemical additives) if their income increased” – 71 (14.0%). Depending on the number of family members, the largest group of bread consumers is 170 (33.5%) who consume “2001 grams and more” per day, while 95 (18.7%) of the respondents consume less (from 1001 grams to 1.5 kg). The lowest consumption (from 1501 grams to 2 kg) was reported by 76 (15.0%) respondents. To the question of which type of bread they prefer, the majority of respondents answered that “more often white than other types” – 192 (25.4%), 115 (15.2%) emphasized all types of bread, 102 (13.5%) respondents chose rye bread. When asked which type of bread they prefer (under the conditions that a maximum of 5 answers could be selected), the majority chose brick oven bread – 335 (24.5%), plain bread loaf – 313 (22.9%), tortilla wrap – 246 (18.0%), brick shaped bread – 245 (17.9%), and the lowest response was found in case of crispy bread – 101 (7.4%). When asked which firm of bread they preferred to purchase, (provided they were able to tick several options), the majority of respondents chose “Ipkli Dighomi” – 315 (19.5%), “Lithuanian Bakery” was chosen by 172 (10.6%) respondents, and “Margi” by 171 (10.6%). This question revealed that the questionnaire was filled out by representatives of the regions, however, their number was very small, namely: Khashuri – 1 (0.1%), Shindari’s Bread – 1 (0.1%), Khelvachauri – 1 (0.1%). Regarding the state policy to promote wheat production, most of the respondents 224 (44.2%) believe that more support is needed to increase the yield of wheat and to subsidize bread. Among the respondents, 147 (29.0%) positively evaluate the implemented policy, while 105 (20.7%) think that it is difficult to answer due to insufficient information. 31 (6.1%) respondents consider the state policy ineffective in both directions.

By processing the results of the research, it was found that there is a reliable relationship (Chi-Square Tests – 0.000) between the amount of bread consumption in families and the evaluation of the state’s policy (it means promoting the increase in wheat production and increasing the access to quality bread for the population). The result is shown in the Table 3.

Table 3. Result of Chi-Square test between the amount of bread consumption in households and the evaluation of state policies

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	51.466[a]	12	.000
Likelihood Ratio	53.082	12	.000
Linear-by-Linear Association	41.751	1	.000
N of Valid Cases	507		
a. 2 cells (10.0%) have expected count less than 5. The minimum expected count is 4.65.			

Also, with Chi-Square Tests, there is a reliable relationship between the incomes of families and the evaluation of the state policy (it means promoting the increase in wheat production and increasing the access to quality bread for the population). See Table 4.

Table 4. Result of Chi-Square test between the incomes of families and the evaluation of state policies

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	74.907[a]	30	.000
Likelihood Ratio	74.998	30	.000
Linear-by-Linear Association	10.569	1	.001
N of Valid Cases	507		
a. 14 cells (31.8%) have expected count less than 5. The minimum expected count is .31.			

It was found that there is a reliable relationship (Chi-Square Tests = 0.000, 0.000, 0.001) between the attitude towards the quality of bread and demographic variables of the respondents. The results are shown in Table 5.

Table 5. Results of Chi-Square Tests between attitude towards bread quality and demographic variables of the respondents

How important is the quality of bread to you?	Pearson Chi-Square
1. Your age	.015
2. Your gender	.014
3. Your educational level	.000
4. Your marital Status	.001
7. What is the average monthly income of your family?	.192

Conclusions

As a result of the analysis of the world market, it was revealed that the world production of wheat is characterized by more or less stability. On the other hand, stable production along with the permanent growth of the world population cannot fully meet the world demand for the vital grain, wheat.

It is easy to predict that with increased demand and stable (slightly reduced in recent years) supply, the price of wheat in the world will rise. In addition, recent events (Covid pandemic, Russia–Ukraine war and other armed conflicts) have a negative impact on world wheat trade and prices.

Georgia has a long history of wheat cultivation. Nevertheless, there are many challenges to wheat production in Georgia today, including: complete import dependence on wheat; low production and average yield rates, lack of access to the modern agricultural machinery, and consequently, low quality of a certain parts of the produced wheat.

In the author's opinion, a golden means should be found in the process of international trade between Georgia and EU countries. On the one hand, the government of Georgia is responsible for reducing unemployment and poverty and increasing GDP per capita, which requires supportive policies at the initial stage. This is because private, profit-oriented investments are inefficient given the small scale and uncoordinated activities of farmers. On the other hand, it is in the interests of the European Union to join to an economically strengthened country, which is a goal that can be achieved by 2030. By that date, the subsidy policy will no longer be necessary in Georgia. Eventually, the COVID-19 pandemic and armed conflicts have disrupted supply chains. As a result, the author considers the most effective use of wheat production opportunities in Georgia to be one of the ways to ensure unforeseen risks.

To solve the challenges of wheat production in Georgia, the state implements various targeted programs. However, these are short-term programs and according to farmers, are ineffective. In such conditions, it is necessary to conduct a long-term, result-oriented state agrarian policy. Among them is the implementation of cluster policies promoting wheat production.

Analyzing models of Porter (1990) and Sölvell (2009) discussed in the paper, it can be seen that many actors are involved in Sölvell's (2009) model, although intensive dialogue and discussion of problems between them is either not taking place or is quite weak (only one firm initiates).

Porter's model focuses directly on intra-cluster links and shows the main directions of cluster policy, which should primarily be focused on strengthening already existing networks. It should be noted that the intersection of the two abovementioned models made possible a twofold and comprehensive analysis of the internal space of the cluster, which is especially important for the initiation, formation, and effective functioning of the cluster.

The research questionnaire developed by the author was assessed as reliable and consistent, since Cronbach's Alpha was 0.737.

As a result of the research, it was found that there is a reliable relationship (Chi-Square Tests = 0.000, 0.000, 0.001) between the quality of bread and the demographic variables of the respondents.

This is a sign for the government that it should promote wheat production in Georgia more and implement an effective policy through the formation of a cluster. It is known that clusters are formed by geographical and historical preconditions (Sölvell, 2009, 54–55). It was above mentioned that wheat is of special importance for Georgia and the formation of its cluster has historical and geographical prerequisites.

Analysis show that it can be considered that the answer to the RQ is positive, since only 6.1% (31) of the respondents evaluate the policy negatively. The answers to this question revealed the need for a more intensive information campaign on the current policy from the government (since insufficient awareness among the respondents is high – 20.7%).

Despite the wide range of issues discussed. The article still has limitations. In the future, the author will try to increase the number of interviewed respondents in two directions: 1) increasing the total number of respondents and 2) focusing on increasing the number of respondents from the regions (an additional reason for this is that they may be producers themselves and are more familiar with the challenges of wheat production).

Based on all above, the author thinks that this paper will have an important theoretical and practical value for people working in this field, as well as for strategic policy makers and the business sector.

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