



СЕЛСКОСТОПАНСКА АКАДЕМИЯ
ИНСТИТУТ ПО АГРАРНА ИКОНОМИКА
СЪЗДАДЕН ПРЕЗ 1935

**Department of Economics and Management of Agriculture, Food, and Agrarian
Policy**

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COMPETITIVENESS OF DAIRY CATTLE BREEDING IN BULGARIA

AUTHOR'S ABSTRACT

of a doctoral dissertation submitted for the award of the educational and scientific
degree Doctor (PhD)

Professional field: **3.8 Economics**

Doctoral programme: **Economics and Management (Agriculture)**

Scientific Supervisor:

Prof. Dr. Bozhidar Antonov Ivanov

Sofia, 2025

I. GENERAL CHARACTERISTICS OF THE DISSERTATION

RELEVANCE OF THE STUDY

Competitiveness is one of the most important and fundamental characteristics of a market economy. A substantial part of economic theory is devoted to elucidating the concept of competitiveness and to shedding light on the causes and factors that give this concept substantive meaning. Competitiveness is regarded as a key criterion in assessing economic performance, both at the level of individual producers and at the macro level, when referring to sectors or national economies. Various authors and researchers conclude that competitiveness does not have a single, universally accepted definition within economic theory, as evidenced by the multitude of definitions found in the theoretical literature. There are also scholars who identify the very purpose of economics as contributing to the enhancement and achievement of higher competitiveness. It can be unequivocally stated that the place and role of competitiveness in economic theory and practice are highly significant, and it is difficult to envisage a decline in the relevance of this topic in applied economics and research agendas. The relevance of competitiveness as a subject of study stems primarily from the need to measure it and to identify the causes and factors that influence its level.

When competitiveness is examined through the prism of the ability to compete with other participants in a given market and to successfully market a product to consumers, a number of questions arise, both regarding the assessment of this achievement and the identification of the reasons underlying the observed outcome. Competitiveness is also associated with the ability to survive in the market and to coexist with other suppliers, which presupposes a capacity for adaptation to a changing environment. The very dynamics of markets and the conditions under which producers and economic sectors operate within the external regulatory and institutional environment make the assessment of competitiveness important, necessary, and imperative at all times and at all levels.

In the present dissertation, the analysis of competitiveness is conducted with reference to dairy cattle breeding in Bulgarian agriculture. Dairy livestock farming is not only a structurally defining sector of Bulgarian agriculture, providing food and raw materials for the population, but also plays a significant role in the overall performance of the agricultural sector. It contributes to feed consumption from crop production, generates income for employed farmers and their families—most of whom operate family farms—and fulfills an environmental function by preserving and maintaining grassland ecosystems. The importance of dairy livestock farming for agriculture, consumption, rural areas, and agroecology makes research and scientific development in this field necessary and sought after, not only by public decision-makers but also by sectoral organizations and private producers.

An integral part of research on the challenges facing the dairy sector and cattle breeding is directly related to competitiveness. Conducting successful and systematic studies of competitiveness in dairy cattle breeding requires a clear definition of the concept, as well as a precise delineation of the boundaries and scope of the analysis. In this study, competitiveness is understood as the ability to maintain and increase market share and to achieve sustainably value added. This definition is not original or author-derived; rather, it is adopted from the scientific literature as appropriate and, in substance, the closest to the immanent semantics of the concept. Applying a systems approach in the research, competitiveness is appropriately assessed as an outcome, while the causes and factors underlying the obtained assessment are subsequently identified and analyzed. The logic of the scientific inquiry is based on evaluating the competitive performance of the dairy cattle breeding sector and, on this basis, identifying

the determinants of that performance, as well as formulating projections regarding future competitiveness.

It should be noted that the topic of competitiveness and competitive performance has been addressed extensively by numerous authors, both in Bulgaria and internationally. The originality of the present study lies not only in the integrated approach that combines the assessment of competitiveness, the identification of its determining factors, and the attempt to develop future projections, but also in the applied methodology. The research methodology is grounded in neoclassical concepts of competitiveness and is implemented through a variety of methods, including index methods (for assessing competitiveness), determinative methods (CPR), and extrapolative methods (trend extrapolation). The study constitutes a significant contribution, both in terms of the applied scientific toolkit and from an applied perspective, as it derives a number of relevant and valuable conclusions, particularly with regard to the factors determining the competitiveness of dairy cattle breeding.

***The aim of the dissertation** is to assess the competitiveness of dairy cattle breeding in Bulgaria and to measure the influence of internal and external factors affecting the sector's competitiveness, thereby enabling the development of scenarios for future development.*

Based on the formulated aim, the following specific tasks are defined:

Tasks:

- To clarify the theoretical framework and identify the factors with the greatest influence on the competitiveness of dairy cattle breeding in Bulgaria;
- To apply an index-based method for assessing the competitiveness of Bulgarian dairy cattle breeding through integrated components (production, value, composite), in comparison with the global performance of the sector;
- To conduct a quantitative factor analysis through the selection of 30 potential factor indicators, structured into six groups, subdivided into internal and external determinants for the sector;
- To classify and rank the factors influencing the state and competitiveness of the sector according to their significance, and to identify the key determinants with the greatest potential impact;
- To examine the impact of support under the Common Agricultural Policy (CAP) and national top-up schemes on the development of cattle breeding farms;
- To analyze the dairy supply chain and the degree of horizontal integration of the Bulgarian market for cow's milk in comparison with other EU Member States;
- To test an analytical approach and develop scenarios for changes in and development of competitiveness up to 2030, and to compare the projected competitiveness indices with trends in the identified key competitiveness indicators;
- To formulate well-grounded assumptions regarding the effects and manifestations of future competitiveness projections in the context of overall agriculture and dairy product consumption, and to develop proposals for improving support policies.

In the context of accession to the EU Single Market and integration into the Common Market Organisation (CMO), it is necessary to analyze both the level of competitiveness at a given point in time and the factors influencing competitiveness, as well as to trace their development over time. Identifying trends in competitiveness makes it possible to formulate recommendations and undertake actions aimed at mitigating negative effects and supporting

positive developments. The analysis of competitiveness in dairy cattle breeding, conducted through the developed systems approach encompassing assessment, identification of key determinants, and scenario simulation for the future, allows for the application of diverse methodological tools.

The object of the scientific research comprises dairy-oriented cattle breeding farms in Bulgaria. The competitiveness of the dairy sector is examined at the sectoral level, while the analysis of internal factors affecting competitiveness also takes into account and observes microeconomic farm-level variables.

The subject of the research is based on a systems approach to assessing the achieved competitiveness of dairy cattle breeding through changes in market share and value added, as well as through the identification and measurement of the influence of a range of factors and determinants, represented by relevant indicators affecting competitiveness.

Data Sources

The primary statistical information and data used in the development of the dissertation are derived from secondary, official statistical databases. The main data sources include the National Statistical Institute (NSI), the Farm Accountancy Data Network (FADN), the agricultural accounting and information systems, livestock and milk processing surveys conducted by the “Agrostatistics” Department of the Ministry of Agriculture, as well as data from the Ministry of Agriculture. Information on trade flows is obtained from the Trade Map database of the International Trade Centre (ITC). Additional sources include annual situational and outlook analyses of the dairy sector published by the Ministry of Agriculture, Food and Forestry, relevant regulatory documents, research outputs of scientific institutes affiliated with the Agricultural Academy, scientific publications by Bulgarian and international scholars, and information from other institutions, organizations, and experts related to the subject of the study. The temporal coverage of the data spans the period from 2007 to 2022. This historical timeframe serves as the basis for the necessary measurements and assessments, as well as for the development of scenario-based projections.

Working Hypotheses:

- Bulgaria’s accession to the EU Single Market has a positive impact on the competitiveness of Bulgarian dairy cattle breeding, with the value component of competitiveness expected to increase.
- The factors exerting the greatest influence on the competitiveness of dairy cattle breeding are expected to originate from the internal production-related group and the external market-related group.
- The weaknesses and crisis in dairy cattle breeding observed during the period following the country’s EU membership are expected to persist, with positive expectations for increasing competitiveness arising only under the optimistic scenario.
- Support provided through various policy instruments, primarily payments under direct payment schemes, contributes mainly to the restructuring of the sector but is insufficient to overcome the negative development trends in dairy cattle breeding.

Limitations of the Study:

The research includes a factor analysis; however, for a number of identified significant and potential determinants, suitable indicators and corresponding statistical data are not available. The identified factor determinants are expressed through various indicators, while for

the majority of institutional factors of a normative and regulatory nature, proxy quantitative measures are employed, due to difficulties in collecting and assessing qualitative indicators. The use of production technologies, changes in technologies, and technological innovations falls outside the scope of the study. The research focuses on sectoral development at the national level, without descending to the regional (NUTS 2) level or lower.

Policies and measures related to the adoption of the Paris Agreement on Climate Change (2015) and the European Green Deal (2019), as well as subsequent related legislation, are also excluded from the scope of the study. In developing the scenarios, a mathematical extrapolative trend model is applied, simulating changes based on stochastic error. Accordingly, the differences between the optimistic and pessimistic scenarios are derived from variations observed during the historical period, corresponding to the upper and lower bounds of deviations from average values. This model is functional and appropriate under the assumption of *ceteris paribus*, which in this case is considered to replicate historical dynamics and evolution. The model does not incorporate projections generated by explicit causal relationships or factor-based determinants upon which the projected indicators depend.

STRUCTURE OF THE STUDY

The present study is structured into four chapters: a theoretical chapter, a methodological chapter, an analytical-research chapter, and a constructive chapter. The total volume of the dissertation amounts to 214 pages, including 40 figures, 18 tables, and 226 information sources.

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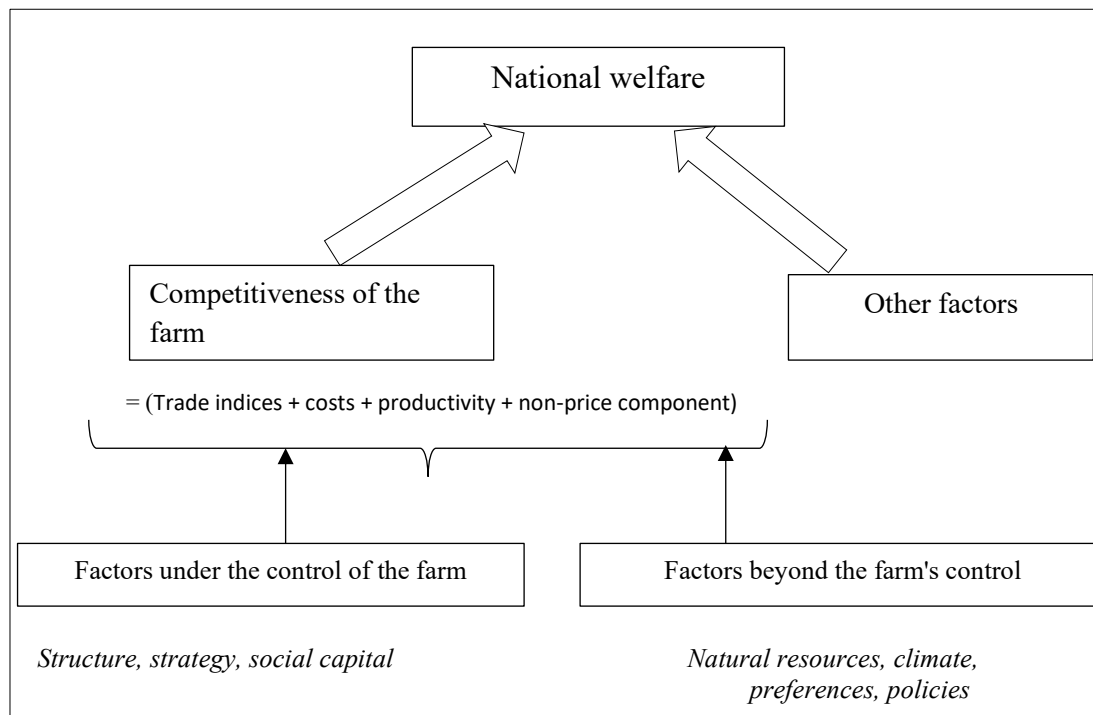
CHAPTER ONE THEORETICAL AND METHODOLOGICAL FOUNDATIONS OF COMPETITIVENESS IN DAIRY CATTLE BREEDING

There are relatively few topics in contemporary economic theory that provoke debate as intense as the concept of competitiveness of production within the national economy. This is most likely due to the multiple dimensions of the concept, which may encompass phenomena ranging from the activity of an individual or a firm to the performance of countries or even supranational entities. Indirectly, competitiveness is also of key importance because of its effect on the allocation of resources within the economy, influencing employment and the achievement of higher levels of societal welfare. Competitiveness is constrained by available resources and markets (consumers) and is dynamic in nature, subject to continuous change. The modern term *competition* originates from the Latin word *concurrentia*, meaning contest or rivalry. In the Cambridge Dictionary of the English language, the term *competition* is defined as “the situation in which people or companies are trying to be more successful than each other, for example by making more sales in a particular market.”

The Organisation for Economic Co-operation and Development (OECD), as cited in Latruffe (2010), defines competitiveness as “...the ability of firms, industries, regions, nations,

and supranational regions to generate, while being and remaining exposed to international competition, relatively high factor income and employment levels on a sustainable basis...”.

Figure 1. Measurement, effects, and determinants of competitiveness



Source: Latruffe (2010), adapted

According to Liftits (2009), “competitiveness is the ability of a product to meet the requirements of a given market over a specified period, in comparison with competing analogues.” He argues that various composite indicators can be used in measurement, such as quality indicators, the level of product competitiveness, competitive positioning, competitive advantage, and others. Quality assessment is conducted from the perspective of the product and consumer preferences: when choosing a product, the consumer compares its characteristics and makes a rational choice. Borisov (2022) notes that quality assessment is a strictly subjective economic category, as there is no universally accepted measure and it depends on customer perceptions. In the process of consumption, consumers assign different weights to product characteristics, resulting in differences in perceived utility.

According to Freebairn (1986), “competitiveness is a measure of the ability to supply goods and services at the place and in the form and at the time they are sought by buyers, at prices that are as good as or better than those of other potential suppliers, while earning at least the opportunity cost of returns on the resources employed.” Expanding on this definition, Frohberg (1997) distinguishes two types of competitiveness embedded within it. First, competitiveness in domestic and international product markets, reflected in the ability to gain and maintain market shares; and second, competitiveness in resource markets, whereby the resources used in the production of goods must generate profits at least equal to their opportunity costs.

Other authors, such as Martin et al. (1991), propose a theoretical framework for examining the competitive performance of a given country or industry, based on the definition developed by the Canadian Task Force on the Competitiveness of Agri-Food Production, namely: “the ability to sustainably gain and maintain market share.” This definition embeds two core concepts—profit generation and market share—and furthermore implies that competitiveness assessment must be comparative in nature. The use of value added represents

an indirect method for measuring profit at the macroeconomic level. Such data are readily available and allow for comparisons both across sectors and across countries, normalized by indicators such as the number of employees, sales volume, wage costs, and the number of enterprises.

Angelov (2005), in his analysis of the economic challenges associated with Bulgaria's integration into the European Union, defines competitiveness from a macroeconomic perspective as "the degree to which a country is able to produce goods and services that withstand the pressures of external competition under conditions of an open market, while simultaneously increasing real gross domestic product." This definition overlaps to a considerable extent with that of Martin et al. (1991). In her study of national competitiveness, Zaharieva (2007) distinguishes between firm-level and sectoral competitiveness. Unlike firm competitiveness, sectoral competitiveness, according to the author, can be defined as the ability to export goods to external markets. Performance in foreign markets depends on a wide range of factors, including the availability of natural resources, a skilled labor force, geographical location, international demand, technological development, and others. Lagging behind other countries in terms of productivity and/or technology is likely to result in a decline in competitiveness and the emergence of future crises.

According to Koteva et al. (2011), competitiveness is a process inherent to viable farms and may therefore be defined as: "the internal capacity of agricultural holdings to sustain durable competitive advantages leading to high economic performance, through continuous improvement and adaptation to changes in the market, natural, and institutional environment."

Bris and Caballero (2015) present a holistic approach to the analysis of competitiveness, grounded in sustainable value creation and environmental impact. In their view, this approach "analyzes how nations and enterprises manage all their competencies in order to achieve prosperity and profit." In the appendix to their work, the authors also present thirteen additional definitions of competitiveness.

Based on the range of definitions presented above, it can be concluded that the concept of competitiveness in the economic literature is not unambiguously defined. Differences among authors may be observed both within domestic markets—between individual firms, clusters of firms, or industries—and across international markets, including competition among supranational entities organized in economic blocs. Measurement approaches vary according to both the object of analysis and its scope, which may range from the market performance of a specific product attribute, through the market position of a particular firm, to comprehensive assessments encompassing multiple dimensions of the competitive performance of a given industry or sector in their holistic entirety.

The development of international trade and the formation of national production competitiveness constitute central themes in economic theory, with scholarly interest driven by their significance for economic growth and by the measurability of trade flows. A historical overview of theoretical approaches begins with mercantilism, which dominated European economic thought from the fifteenth to the eighteenth century. Mercantilism viewed the international economic system as a zero-sum game and advocated active state intervention to accumulate precious metals through trade surpluses. In opposition to this paradigm, the liberal school—represented by thinkers such as Boisguilbert, Petty, and later the Physiocrats—advanced the principles of free trade and limited state intervention. Adam Smith laid the foundations of classical international trade theory by arguing that wealth creation arises from the division of labor, market competition, and absolute advantages among nations. His ideas were further developed by David Ricardo, who formulated the concept of comparative advantage, explaining the gains from trade even when a country lacks absolute advantage in any good.

In the early twentieth century, Heckscher and Ohlin developed the factor-proportions model (HO), according to which trade patterns are determined by the relative abundance and prices of factors of production. The Heckscher–Ohlin–Samuelson (HOS) model, extended by Samuelson, introduced the factor price equalization theorem but encountered substantial empirical criticism, most notably in the form of the Leontief paradox. Traditional trade theories explain inter-industry trade flows through differences in natural resources, technologies, and factor endowments. Modern theories emerging in the 1970s and 1980s, including new trade theory and endogenous growth theory, emphasize economies of scale, imperfect competition, product differentiation, and technological gaps. These approaches explain intra-industry trade and the dynamic evolution of competitive advantage driven by innovation and knowledge accumulation. Observed specialization in the agricultural sector and global trade flows increasingly underscore the relevance of these modern theoretical perspectives.

The debate on measuring competitiveness at the national level remains open. Critics, among them Krugman, highlight the lack of conceptual rigor associated with the use of the term in a macroeconomic context. Nevertheless, authors such as Dunning (1993) argue that national differences in competitiveness are empirically observable and economically meaningful.

Contemporary international trade theory is multi-layered and integrates elements from both classical and modern approaches. It recognizes the central role of technology, innovation, and global interconnectedness as key determinants of trade patterns and national competitiveness. Neoclassical explanations based solely on factor differences are complemented by dynamic, endogenous, and structural interpretations. The strategic management school examines competitiveness primarily at the firm, sectoral, and regional levels, treating them as “building blocks” for explaining national competitiveness. In his seminal work „The Competitive Advantage of Nations“, Michael Porter (1990) shifts the focus from abstract national characteristics to the strategies and structures of firms and clusters. He identifies two fundamental types of competitive advantage at the firm level—differentiation and low cost—which essentially represent manifestations of higher productivity: either through higher revenue per unit of output (via quality, unique features, and service) or through lower cost per unit of output. Within Porter’s theoretical framework, national competitiveness is analyzed through the “diamond of competitive advantage,” encompassing factor conditions, demand conditions, related and supporting industries, and firm structure, strategy, and rivalry. Competitiveness is empirically revealed through performance indicators such as costs, profitability, productivity, and efficiency, while firm-level strategy—both static and dynamic—is considered a key determinant, particularly through the lens of technology and productivity.

Dunning (1993) further develops and refines Porter’s theory, particularly with regard to small open economies, in which the external economic environment and regional markets play a more significant role than domestic conditions. This gives rise to the concept of the “double diamond,” whereby the national diamond is closely intertwined with the “diamonds” of other countries and with the activities of multinational corporations. This approach extends the analysis of competitiveness beyond national boundaries and links it to processes of international integration and global value chains.

At the sectoral level, the analysis of national competitiveness employs conceptual models such as the “LEI Competitiveness Monitoring” framework developed by LEI Wageningen UR. This model comprises three groups of factors: environmental factors, production factors, and downstream value-chain output factors. It is based on secondary statistical data and allows for comparability over time and across countries. The primary analytical focus is placed on dynamics—changes in trends, shifts in patterns, and comparative analysis with main competitors. The final assessment of competitiveness relies on four key indicators: dynamics of the sector’s share in the global market; growth in labor productivity

along the value chain; changes in the Balassa index; and increases in value added across stages of the supply chain. The theoretical framework of the model integrates elements from standard economic theories, Porter's matrix, and the industrial–regional approach, enabling a multi-layered assessment of competitiveness.

In the Bulgarian academic literature, specific methodologies for assessing competitiveness in the agrarian sector have been developed. Koteva and Bashev (2011) conceptualize competitiveness as a relative measure, enabling comparisons among farms and groups of farms at both national and international levels. They propose a systemic approach based on criteria such as economic efficiency, financial viability, adaptability, and sustainability, alongside procedures for indicator selection, data collection, evaluation, and weighting. Empirical studies by Harizanova-Metodieva (2014) identify low productivity, limited incomes, weak financial capacity, and consequently low investment potential and scale as critical weaknesses of Bulgarian dairy cattle farms, materializing in low competitiveness. Borisov et al. (2019) emphasize that young farmers are constrained less by motivation than by structural factors—small scale, insufficient capital, and weak market positioning. Research by Bashev (2018) demonstrates that livestock farms, particularly those specializing in grazing animals, are highly dependent on state subsidies and investments in technology and infrastructure, with improvements in sustainability being closely linked to enhanced competitiveness. In a more recent study, Bashev et al. (2023) apply a holistic approach and find that farms managed by cooperatives and corporate structures exhibit the highest levels of competitiveness, followed by sole traders, while individual farmers lag behind. Ivanov (2022) employs econometric modeling to assess the competitiveness of Bulgarian agriculture in the post-EU accession period, concluding that the weaker competitiveness of livestock production particularly affects small and medium-sized farms; although adaptation to the common market is evident, low productivity and structural imbalances exacerbate negative trends. In this context, the competitiveness of dairy cattle farming can be viewed as a dynamic relative concept, reflecting farms' capacity to generate sustainable income under conditions of open markets and import pressure; the index-based approach enables quantitative measurement and comparability, while multifactor analysis reveals causal relationships between internal and external determinants.

Against this background, state policy emerges as a key external factor influencing competitiveness. The state, as the principal form of social organization and governance, exercises public authority through various instruments. According to J. Galbraith (1993), power is exercised through coercive, compensatory, and conditioning mechanisms, while Dimov (2017) argues that any effective policy must have clearly defined objectives, principles, and mechanisms for addressing social problems; their absence implies the servicing of narrow group interests.

Agrarian policy represents a specific form of state intervention aimed at regulating economic and social processes in agriculture and the food chain, with the objective of ensuring sustainable and steady supply of high-quality food to the population. It encompasses objectives, principles, and instruments for overcoming problems in agricultural production and trade, as well as for correcting market failures arising from monopolistic structures, shortages of public goods (information, services, infrastructure), and negative externalities (e.g., environmental pollution). In contemporary terms, agrarian policy addresses not only farmers' incomes and food security but also biosecurity and food sovereignty, whereby agricultural producers and consumers are placed at the center of decision-making on food systems, inevitably linking agrarian policy to trade policy and protectionism.

Within the European Community, the Common Agricultural Policy (CAP) has evolved from a strongly protectionist, price-linked support system toward a more market-oriented and

multifunctional model. The initial focus on guaranteed prices and intervention purchasing led to overproduction and surplus accumulation, necessitating the introduction of quota regimes, including those for raw cow's milk. Gradual reforms—decoupling of support, the “Milk Package,” abolition of milk quotas, and increased integration into global markets—aim to enhance competitiveness, reduce market distortions, and support the sustainable use of natural resources, while maintaining protective mechanisms (intervention, storage, market monitoring) for risk management and income stabilization.

Bulgaria's agrarian policy after 1989 developed against the backdrop of parallel processes of political and economic transformation, decollectivization and land restitution, the collapse of traditional markets (CMEA), integration into the WTO, and later accession to the EU single market. Harmonization with the CAP led to the adoption of area- and animal-based support in the absence of a sufficiently active land policy, accelerating land concentration in large farms and constraining the development of smaller, labor-intensive productions, including dairy cattle farming. The sector faces a combination of low productivity, structural constraints, intense competition for resources, high quality and safety requirements, unfavorable market relations along the value chain, and demographic pressure in rural areas. In this context, the competitiveness of dairy farms after EU accession should be considered a dynamic relative measure, dependent on their capacity to adapt production, investment, and organizational structures to the conditions of the common market and internal competition for resources.

Bulgaria's integration into the EU requires full implementation of the Common Agricultural Policy (CAP) and the Common Market Organization (CMO) into national legislation, including for the raw cow's milk sector. Milk quotas were introduced in 2007 through the Accession Treaty, establishing individual quotas for deliveries and direct sales administered by the State Fund “Agriculture.” Subsequently, amendments to the CMO associated with the “Milk Package” (Regulation (EU) No 1308/2013) were transposed through the Law on the Organization of Agricultural Product Markets in the EU and secondary legislation, aiming to promote more sustainable development of raw milk production, strengthen the bargaining position of milk producers, and ensure fairer distribution of value added along the chain. A regulatory framework enabling collective negotiation of contract terms through producer organizations was established. In parallel, EU quality standards for raw cow's milk (Regulation (EC) No 853/2004) were introduced, with Bulgaria granted repeatedly extended derogations until the end of 2015, during which milk not meeting the standards could be used only for products matured for more than 60 days for the domestic market. After 2017, systematic quality control was introduced through Ordinance No. 2 and the information-based “Milk Module” within VetIS information system of Bulgarian Food Safety Agency, with clear sanctions for persistent non-compliance with standards.

After 2007, national agrarian policy combines instruments of the Common Agricultural Policy (CAP) with specific state aid measures targeting vulnerable sectors, including dairy cattle farming. Initially, targeted subsidies for quality milk and transitional national aid were applied, followed by a set of coupled support schemes and national top-up payments for cattle and buffaloes. Over time, the share of production-linked support within direct payments increased, and after 2015 the maximum allowable percentage for vulnerable sectors (livestock, vegetable production, and permanent crops) was fully utilized. The schemes were differentiated by farm type (vulnerable farms, farms in disadvantaged and mountainous areas, and farms under breeding control), modulation in favor of small and family farms was introduced, and proof of marketed production became a requirement in order to direct support toward genuinely market-oriented producers. In parallel, investment, compensatory, and breeding-related state aid, as well as de minimis support for feed and risk management, were implemented, creating a complex but sectorally significant network of financial instruments.

The historical development of dairy cattle farming in Bulgaria progressed from the rearing of local primitive breeds (such as the Iskar and Bulgarian Rhodope cattle) within traditional kinship-based structures, through a period of post-liberation modernization marked by the importation of foreign breeds and the establishment of the first private dairies, to a phase of collectivization, vertical integration, and targeted breeding (notably of the Black-and-White breed) within large state and cooperative farms. After 1990, the liquidation of collective farms, land restitution, and the collapse of CMEA markets led to a sharp contraction of production, the elimination of a substantial share of breeding herds, and the loss of accumulated genetic and organizational potential. Since the mid-1990s, the sector has evolved as a dualistic structure: on the one hand, a large number of small farms with limited capital, low productivity, and diversified marketing channels; on the other, a limited number of larger, specialized farms with a higher degree of integration with processors. In this context, key determinants of modern dairy cattle farming are improvements in efficiency and productivity, access to investment, and adaptation to the requirements and incentives of the CAP and the Common Market Organization (CMO).

The level of technology and production conditions in Bulgaria's dairy sector is determined by a combination of natural-climatic, resource, and agronomic factors. The country has an average EU level of arable land per capita and a diverse topography, with more than one-third of its territory being mountainous or semi-mountainous—conditions favorable for pasture-based cattle farming with relatively weaker competition from crop production. At the same time, the climate is drier, with cold winters and frequent summer droughts, which constrains extensive grazing and necessitates housing during winter and part of the year. This places Bulgaria in a less favorable position compared to countries within the so-called “milk belt” of Western and Northwestern Europe, where abundant rainfall and mild winters enable lower-cost pasture-based dairy production. In this context, meadows, pastures, and fodder crops (wheat, barley, maize, and grain legumes) play a key role, serving both as feed resources and as contributors to soil fertility, ecosystem services, and production sustainability.

From the perspective of production technologies, conventional systems dominate, while environmentally friendly and organic systems remain niche, albeit expanding under the influence of European policies for sustainable agriculture. Within the conventional model, two main systems prevail—extensive and intensive. Milk productivity is determined by a complex set of factors, including genetics, physiological status, housing conditions, milking technology, and milking frequency; however, under Bulgarian conditions, feeding remains particularly critical. The limited adoption of modern ration-balancing systems and productivity-based group feeding results in significant losses of potential and lower milk yields. These challenges are compounded by labor shortages and low skill levels in rural areas, the need for skills modernization, and the requirement for more effective breeding and selection activities—a task assumed after 2007 by the Executive Agency for Selection and Reproduction in Animal Breeding through the development of breeding control organizations, a genetic bank, and support for breeding associations.

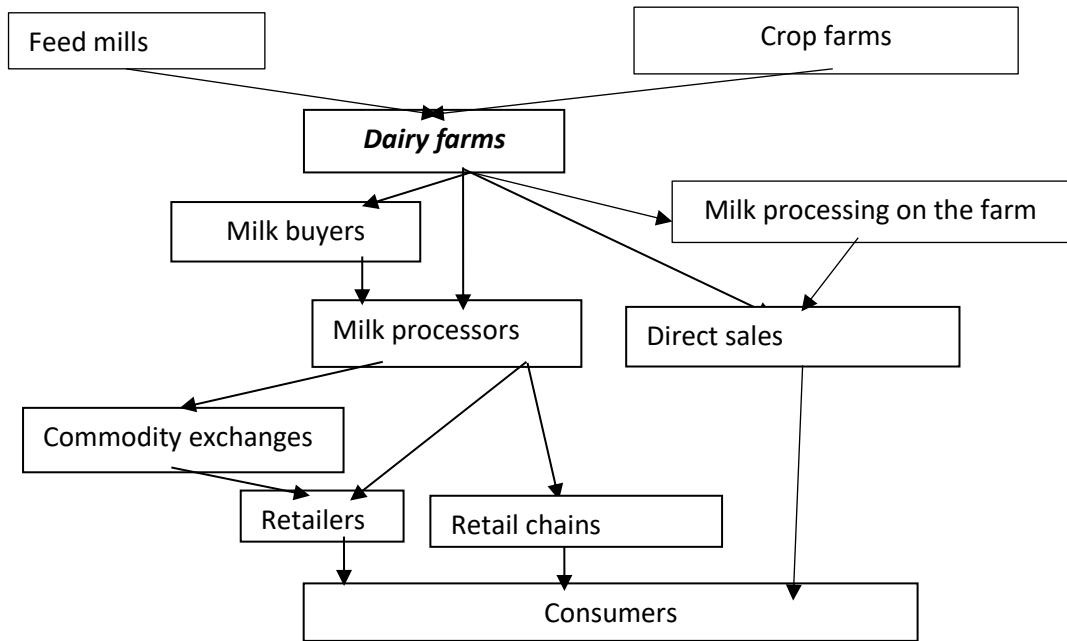
Price and market conditions in the dairy sector are characterized by high volatility and asymmetric responses along the value chain. Farmers respond with delays due to the long biological cycle, asset specificity, and reliance on family labor, leading to cyclical periods of overproduction and low prices. Against this backdrop, a set of risk management policies has emerged—subsidies and direct payments, state aid, insurance, and income support schemes—which enhance economic resilience but simultaneously dampen market signals. Within the integrated dairy value chain—from input supply through farms to processors and exchange-based trade—this places dairy farms in a weaker bargaining position, making the analysis of

value-added distribution between farmers and processors a key element in assessing sectoral competitiveness.

Regulation of relations between raw milk producers and processors aims to enhance transparency and predictability. Within the EU, two models are applied: voluntary agreements and mandatory contracts. Bulgaria employs mandatory written contracts specifying duration, volumes, minimum prices, and termination conditions, all of which are officially registered. These contracts provide security for farmers and improved planning capacity for processors. In the EU, milk volumes exceeding contracted quantities are traded on spot markets, where prices reflect current market equilibrium. In parallel, producers may organize into producer organizations and groups, which improve market access, reduce risk, and compensate for limitations of individual resources.

The scenario method serves as a tool for strategic planning in agriculture, particularly under uncertainty related to climate change, resource constraints, and global market trends. By developing alternative future trajectories—baseline, optimistic, and pessimistic scenarios—it supports policy formulation and the identification of key risks. Approaches may be intuitive-logical, foresight-based, or grounded in modified trend analysis, with the primary objective of improving decision-making processes and establishing a framework for early warning and sectoral adaptation.

Fig. 4 Dairy chain structure



CHAPTER TWO METHODOLOGICAL TOOLKIT AND RESEARCH APPROACH

Quantifying the competitive performance of Bulgarian dairy cattle farming requires a universal approach applicable across EU Member States, given the structural differences between farms in Western Europe and those in Bulgaria. In this study, competitiveness is defined through the sustainable market share of raw milk and dairy products and through the value added generated by the sector. A sector is considered competitive when it maintains or increases its market share and generates stable value added. This conceptualization integrates

both production-based and value-based dimensions and enables comparisons across countries and sectors.

Methods for measuring revealed (ex post) competitiveness are grounded in two economic schools of thought: the neoclassical school, which evaluates international trade performance, and strategic management, which focuses on firm behavior. At the international level, export-based indices are widely used, most notably the Balassa index (RCA) and its variants, which indicate whether a country possesses a comparative advantage in a given product. Despite certain limitations—such as sensitivity to expanding markets and small conytrolnational market shares—the Balassa index remains a standard instrument for assessing specialization and competitive performance.

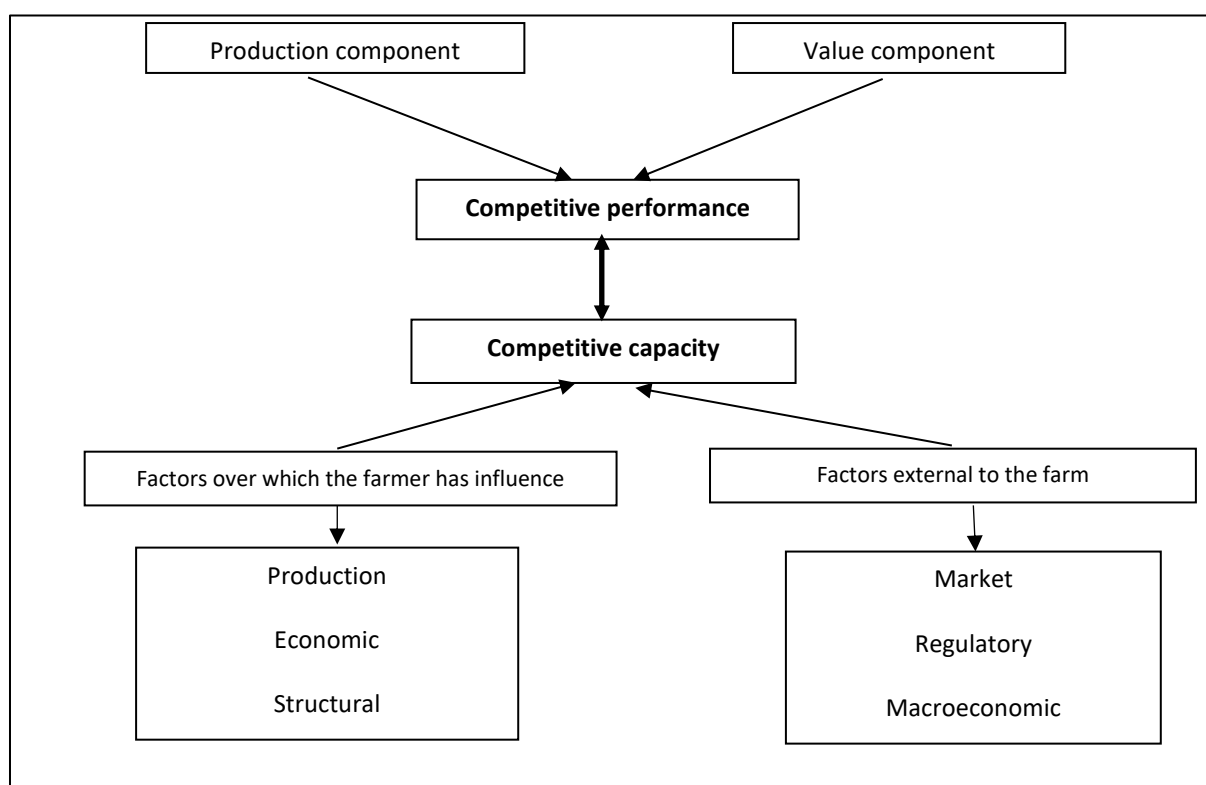
At the farm level, competitiveness can be measured through profitability, productivity, and efficiency. Profitability reflects firms' ability to generate profits and maintain or expand market share, while productivity (including total factor productivity) measures the effective use of resources and development over time. Efficiency manifests itself in the form of scale efficiency, technological efficiency, and allocative efficiency—respectively associated with optimal farm size, technology adoption, and cost minimization under given price conditions. Taken together, these indicators provide a comprehensive assessment of the competitive position of dairy farms in Bulgaria.

Methods for identifying the determinants of competitiveness encompass several analytical approaches. Multiple regression analysis enables the assessment of the impact of multiple factors on competitive performance through quantitative estimation of causal relationships. Correlation analysis identifies the strength and direction of relationships between key variables and allows their ranking as determinants. Competitiveness can also be assessed through sample-based comparisons of farms by specialization, technology, or organizational form, using statistical tests, including dynamic analysis to evaluate policy or technological changes. Cluster analysis groups farms according to similar characteristics or performance outcomes, comparing their average results in order to identify patterns and factors shaping competitive positions.

The developed competitiveness index measures the performance of Bulgarian dairy cattle farming through two equally weighted components—a production component and a value-added component. The production component assesses the share of Bulgarian milk protein production relative to domestic and global consumption, taking into account whether the country is self-sufficient in dairy products or a net importer. The value-added component reflects changes in gross value added relative to global gross value added, recalculated on a per capita basis to ensure comparability. The final index is the weighted average of the two components and ranges from 0 to 1, with higher values indicating greater competitiveness; values below 0.2 indicate non-competitive production, while values above 0.81 signify excellent competitiveness.

By its nature, competitiveness is a multidimensional economic category. Representing it solely as changes in market share and profitability leads to simplification and the loss of valuable information about the agricultural production under study. To capture its full scope, the concept of *competitiveness capacity* is introduced, representing the set of indicators influencing cattle farms. Through this concept, changes are examined dynamically. The theoretical framework of competitiveness capacity is based on the premise that changes in this set can be accurately represented by analyzing the relationships among groups of factors influencing the developed competitiveness index at the macro level.

Fig. 5 Determinants of competitiveness and competitiveness capacity



The hierarchical structure of the analysis applies a holistic “top-down” approach, whereby competitiveness is assessed through the successive decomposition of the research into domains, factors, and specific indicators, selected according to criteria of relevance, sensitivity, measurability, and spatial neutrality. The indicators are grouped into six main categories—production, structural, economic, market, regulatory, and macroeconomic—of which the first three reflect farm-internal determinants, while the remaining categories represent external environmental factors.

Production indicators – These include the number of dairy cows as a core indicator, cow productivity measured in tonnes of milk per lactation, as well as the main factors of production—labour, land, and capital—expressed per cow. They include key elements such as animal productivity, efficiency of resource use, technological level, and labour organisation, which directly determine the cost of production and the quality of the milk produced.

Economic indicators – These include total farm revenues and specific costs per livestock unit. Labour (wage) costs and the level of indebtedness per cow are also taken into account. This group enables an analysis of financial sustainability, profitability, and the dependence of dairy farms on external financing.

Structural indicators – These characterise the organisation of the sector through the number of farms with dairy cows, the average herd size, and the share of farms with cows kept in indoor systems (100 or more cows). They also include the average age of the farm manager and the share of non-productive herd, which affect farm sustainability and the potential for herd development.

Market indicators – These include the farm-gate price of raw milk, the quantity of milk purchased on average per processor, and the average price in the European Union. They also include the Balassa index as a measure of comparative advantage and the share of cheese produced with vegetable fat relative to produced cow’s milk cheese. These indicators reflect

market conditions and concentration, competitive performance on external markets, and changes in product structure.

Regulatory indicators – These include total subsidies for dairy farms per livestock unit, the share of subsidies, taxes paid, and the balance between taxes and investment subsidies. Administrative costs per farm are also included. These indicators allow an assessment of the role of agricultural policy, regulatory burden, and the level of support for the sector.

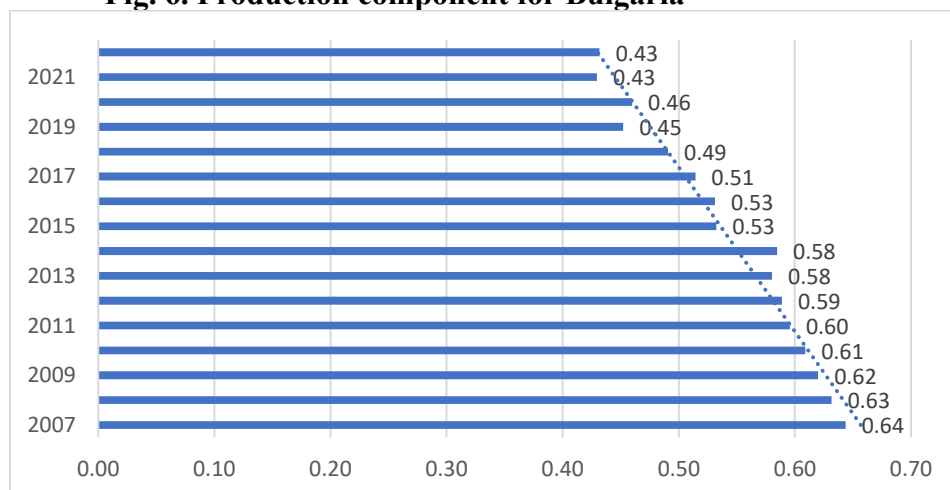
Macroeconomic indicators – These include average income per capita, GDP per capita, the consumer price index, the unemployment rate, and population size. These indicators outline the overall economic environment in which the dairy sector operates and are key for analysing final product demand, consumers’ purchasing power, and long-term consumption trends.

The methodology for ranking and evaluating indicators is based on the CPR approach (Ivanov, 2023), which combines correlation analysis, regression impact, and factor robustness with respect to the competitiveness index. The relationship between each indicator and the index is assessed using correlation coefficients, while the strength of influence is determined by regression coefficients ranked according to their intensity. Robustness measures the stability of each factor’s effect through the variance of regression residuals, with lower variance indicating higher significance. The final ranking is obtained as the average value of the three coefficients, and the significance coefficient determines whether a given factor exerts a substantive effect: a value above 1 indicates that its impact on competitiveness is meaningful.

CHAPTER THREE ANALYSIS OF THE STATE AND COMPETITIVENESS OF DAIRY CATTLE FARMING

In accordance with the approach of Martin et al. (1991) presented in chapter one and the methodology for constructing a composite indicator outlined in chapter two, the calculation of the competitiveness index is based on changes in market share on domestic and international markets and on the value added generated in the production of raw cow’s milk, forming a composite indicator.

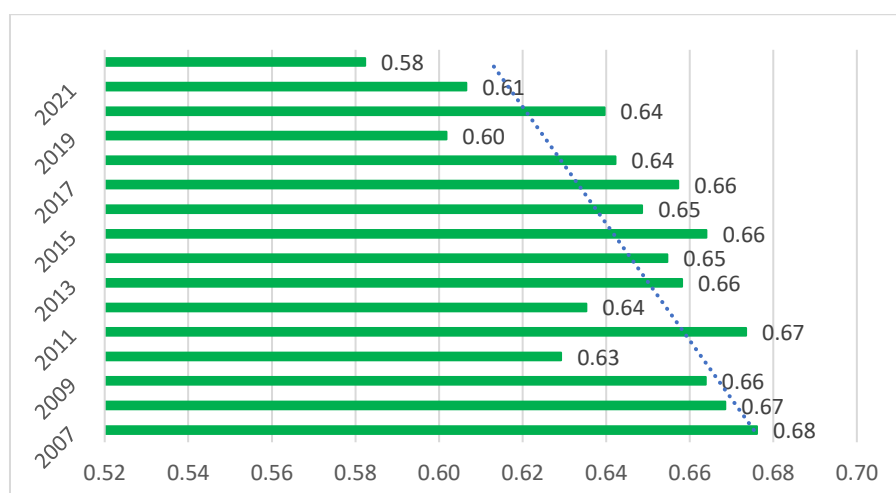
Fig. 6. Production component for Bulgaria



Sources: ITC Trade Map, UN Population division, EUROSTAT, NSI, own calculations

Figure 6 presents the dynamic evolution of the production component for Bulgaria. For Bulgarian milk and dairy production, a sustained decline in the value of the production component is observed over the analyzed period (with the exception of 2014), decreasing from 0.64 to 0.43 (–32.8%). This trend can be attributed largely to the reduction in volumes of raw cow’s milk produced and the subsequent decline in the share of milk delivered for processing.

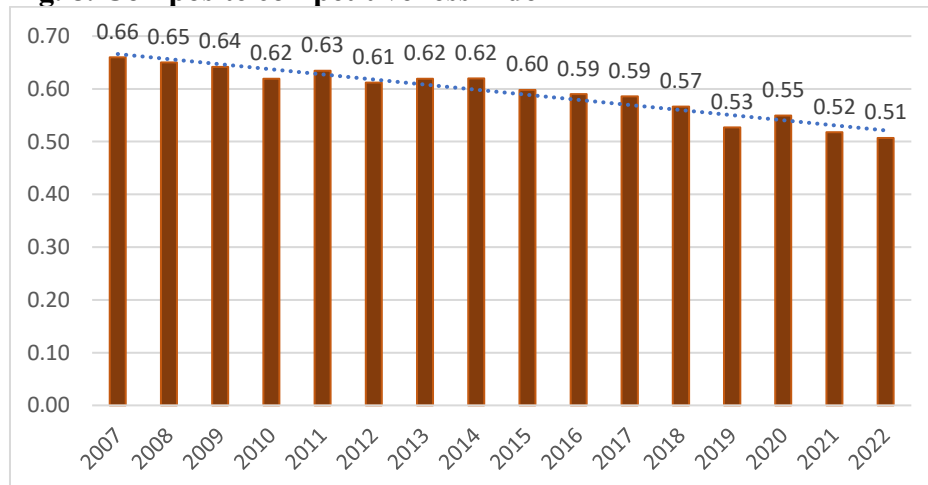
Fig. 7. Value-added component for Bulgaria



Sources: ITC Trade Map, UN Population division, EUROSTAT, NSI, own calculations

For Bulgaria, a decline is also observed in the value-added component, decreasing from 0.70 to 0.58 (–17.1%). The reasons for the significant fluctuations in the component’s value can be sought both in internal factors—where a reduction in the supply of milk on the domestic market leads to price increases—and in developments on external markets related to the availability of raw milk for import into the country and changes in dairy commodity prices on the EU market. It is important to note that the calculations are based on current producer prices, with procurement prices increasing over the analyzed period from BGN 590.0 to BGN 843.3 per thousand liters (+42.9%).

Fig. 8. Composite competitiveness index



Sources: ITC Trade Map, UN Population division, EUROSTAT, NSI, own calculations

The composite competitiveness index of Bulgarian milk production shows a sustained decline over the analyzed period, decreasing from 0.66 to 0.51 (–22.7%). Accordingly, the level of competitiveness shifts from *very good* to *satisfactory*.

Analysis of Competitiveness Indicators by Groups

Group 1 – Production Factors

Following EU accession, the number of dairy cows in Bulgaria declines substantially, while beef cattle numbers increase. Farmers unwilling or unable to invest increasingly shift

toward beef production in order to avoid stricter hygiene requirements while maintaining access to subsidies. Production becomes increasingly concentrated in larger farms: the share of cows kept in holdings with more than 20, and especially more than 50 cows, rises steadily, improving economies of scale, while small farms exit the sector. At the same time, the productivity of Bulgarian dairy cows continues to lag behind the EU average, reaching only about half of the European mean. This indicates limited progress in genetics and feeding practices, incentives to retain low-productivity animals (particularly under decoupled support), and a significant “grey” share of milk outside official statistics. In parallel, labor input per cow decreases by more than threefold, while capital per cow and per farm increases markedly—the sector becomes more capital-intensive, but the entry threshold for young farmers rises substantially.

Group 2 – Economic Factors

Revenues per cow in specialized dairy farms increase over time mainly due to higher procurement prices rather than improvements in productivity. The revenue-to-cost ratio indicates good profitability in the years immediately following 2007, but subsequently declines to around 1.0–1.1, implying that in some years farms barely cover their costs and are highly vulnerable to adverse market conditions. Partial recovery after 2016 improves efficiency, yet average margins over the period remain low and strongly dependent on subsidies and macroeconomic conditions. Labor costs increase significantly due to labor shortages and competition with other sectors, while labor per cow declines as a result of production concentration and mechanization. High asset specificity (housing, machinery, livestock) and frequent reliance on personal credit make exit from the sector difficult even under low profitability, which also explains the relatively low sensitivity of certain economic indicators to short-term price shocks.

Group 3 – Structural Factors

Structurally, dairy cattle farming moves away from the traditional “dualistic” model characterized by many small and few large farms. The average number of cows per specialized holding nearly doubles compared to the beginning of the period, and census data show that herds with more than 50 cows now account for the majority of the dairy herd. This facilitates better asset utilization, adoption of modern feeding systems and mechanization, and lower costs per liter of milk, but simultaneously accelerates the exit of small extensive farms, particularly in mountainous regions. The average age of farm managers increases, indicating declining attractiveness of the sector for young farmers due to high labor intensity, lower returns relative to alternative activities, price volatility, and heavy regulation. The COVID-19 crisis temporarily slows herd reduction and even leads to short-term increases in some livestock categories; however, rising feed and energy prices after 2021 restore the trend toward production concentration and exit of smaller farms.

Group 4 – Market Factors

The procurement price of raw cow’s milk in Bulgaria is shaped by a combination of internal and external factors. Domestically, strong inflation in production costs (feed, energy, labor), investments required to meet EU quality standards, and shortages of skilled labor exert upward pressure on prices. External shocks—the global financial crisis (post-2009), the Russian embargo (2016), the pandemic, and subsequent supply chain disruptions—lead to sharp price declines followed by later increases, as the EU is a net exporter and external demand strongly influences internal prices. Milk shortages after 2017, resulting from declining herd size and weak productivity growth, combined with sharp increases in input prices in 2021–2022, stimulate procurement price growth. At the same time, the average quantity of milk purchased

per processor declines, indicating underutilization of some processing capacities, seasonal operation of smaller processors, and incentives for importing dairy raw materials from other EU Member States. The Balassa index (RCA1) for dairy products deteriorates persistently and remains negative, indicating the absence of revealed comparative advantage and increasing pressure from competitive imports.

Group 5 – Regulatory Factors

Support per livestock unit and per specialized dairy farm increases significantly throughout the period, with targeted schemes for dairy herds expanding multiple times relative to the initial baseline. This reflects both the focus of agrarian policy on “sensitive” sectors and efforts to support rural economies. However, total subsidies per farm grow faster than subsidies per cow, indicating a concentration of resources in larger, better-capitalized farms—fewer in number but with more animals and land. Targeted support mitigates part of the price shocks and supports investment, but simultaneously risks preserving low-productivity farms if conditions do not sufficiently incentivize efficiency improvements and genuine market orientation (e.g., requirements for proven production and minimum quantities). Ultimately, policy plays a dual role: on the one hand, it reduces risk and improves farm liquidity; on the other, it facilitates restructuring in favor of larger producers.

Group 6 – Macroeconomic Factors

At the macroeconomic level, income and GDP per capita more than double over the period, but inflation—particularly after 2021—partially erodes real purchasing power, including for dairy products. Economic hardships following both the global financial crisis and the COVID-19 pandemic shift some consumers toward cheaper dairy substitutes. Alongside economic growth, agriculture’s share in Bulgaria’s GDP declines, which is typical for economies undergoing structural transformation toward industry and services, but also implies a relative weakening of the agrarian sector’s weight. The consumer price index exhibits periods of relative stability interspersed with sharp increases, as the combination of post-pandemic recovery, the energy crisis, and the war in Ukraine generates strong price pressure on food and production inputs toward the end of the period. Demographic decline—resulting from negative natural growth and substantial migration to urban areas and emigration of young people abroad—contracts the domestic market while simultaneously constraining labor supply in rural areas, increasing labor costs and making it more difficult for farms to recruit workers. Thus, the macroeconomic environment simultaneously creates demand for more efficient, capital-intensive production and intensifies external pressure on the competitiveness of Bulgarian dairy cattle farming.

Breeding Control

In Bulgarian dairy cattle farming, the share of cows under breeding control reaches approximately 41–42% of the herd, with breeding associations playing a strong role, particularly for the Black-and-White breed, where productivity in some controlled herds already approaches EU average levels. Breeding programs, artificial insemination using pedigree bull semen, and (in earlier years) imports of high-yielding heifers support genetic progress; however, challenges remain, including fragmentation of breeding activities (multiple organizations for the same breed) and limited overall coverage of selection efforts.

Impact of Agrarian Policy

With regard to agrarian policy, milk quotas have never constituted a binding constraint for Bulgaria, as production has consistently remained below the allocated quota levels.

Moreover, the substantial share of milk that does not reach processing indicates weak integration between farms and dairies, an insufficiently developed collection system, and the existence of a strong “parallel” market during the first years following the country’s accession to the EU.

Support through coupled payments and state aid for livestock farming increases markedly after 2007, particularly for the dairy sector, with new schemes gradually replacing earlier “targeted subsidies.” Some instruments (specialized support per cow, de minimis aid, and breeding-related support) exert a stabilizing effect and encourage participation in breeding programs; however, the policy logic of “supporting income rather than produced quantities” entails a risk of weakening the link between herd size and effective production. At the same time, steps are taken toward a fairer allocation of pastures—shifting from auction-based mechanisms to administrative allocation exclusively to active livestock farmers. Nevertheless, the overall shortage of permanent grassland and competition with crop production increase land prices and constrain pasture-based systems.

In milk processing, the introduction of EU hygiene standards leads to a sharp decline in the number of dairies after 2007, with survival limited to enterprises able to modernize buildings, equipment, and quality control systems. In contrast, raw milk producers lag behind in investment, restricting the availability of high-quality raw material for processors.

Milk Processing

The milk processing industry undergoes significant structural transformation—from hundreds of small enterprises toward a more consolidated, yet still weakly concentrated sector, in which the top 25 firms account for up to 80% of total volume, while the Herfindahl–Hirschman Index remains well below the threshold for high concentration. Key players include companies with foreign ownership, integrated into regional and global value chains, which provides access to external markets but also renders the domestic sector dependent on strategic decisions of multinational groups (restructuring, plant closures, and relocation of production to other countries).

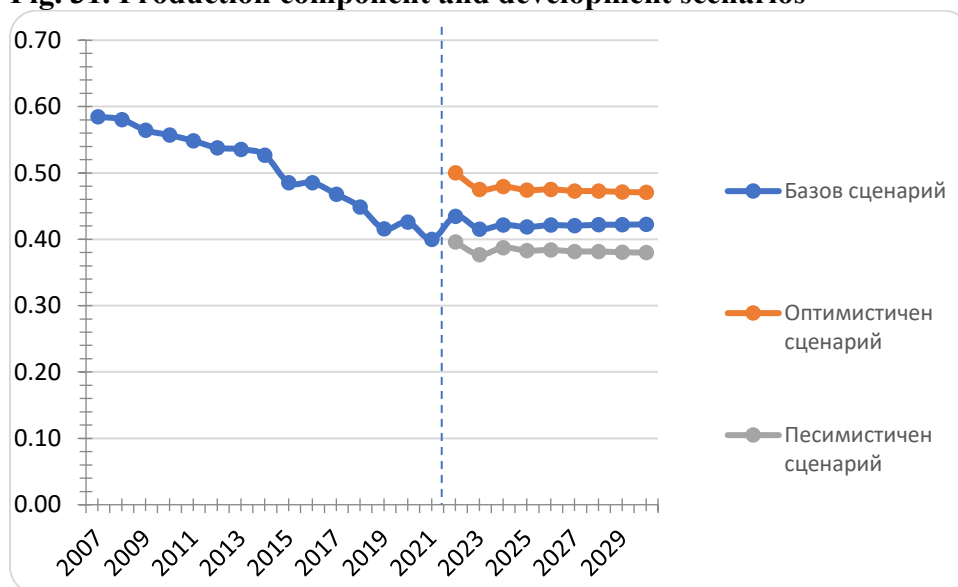
Vertical integration between farms and processors in Bulgaria is less developed than in other countries in the region. Examples of closed production cycles—from feed production to final dairy products—remain relatively limited, while horizontal integration through strong producer organizations is insufficient. As a result, farmers retain weak market power and remain dependent on the pricing and contractual policies of processors and retail chains. At the same time, integration into the EU single market—including the ease of importing milk powder and other dairy raw materials—intensifies competitive pressure on Bulgarian dairy cattle farming.

Horizontal integration in Bulgarian dairy cattle farming remains underdeveloped, despite the availability of Measure 9 under the Rural Development Programme, which supports the establishment of producer groups and organizations. As of 2025, only one producer organization and a limited number of producer groups are registered in the sector, while interbranch organizations for milk and dairy products are absent due to legal constraints at the national level. The main reasons for low participation include historical legacies associated with negative experiences of collectivization, lack of trust among farmers and other value-chain actors, differences in scale and technological development across farms, insufficient managerial skills for governing collective structures, and a shortage of successful local examples. The combination of social, psychological, and institutional factors constrains incentives for cooperation, despite the potential of producer organizations to strengthen farms’ market power and reduce costs.

CHAPTER FOUR SCENARIOS FOR COMPETITIVENESS AND FOR THE DEVELOPMENT OF KEY INFLUENCING FACTORS

Figure 31 presents scenarios for the development of product competitiveness after 2021. Under the baseline scenario, following 2023 the level of competitiveness is expected to be maintained until 2030, after a certain decline during the period 2022–2023. This development is expected to result both from a slowdown in the reduction of dairy herds in the country and from a moderate increase in productivity, attributable to the gradual expansion of the number of animals included in breeding programs. From a longer-term perspective, however, this scenario does not imply an improvement in the competitive position of producers, as the index declines from a good level of competitiveness (0.58) in 2007 to a low level (0.42) by 2030 under the baseline scenario.

Fig. 31. Production component and development scenarios

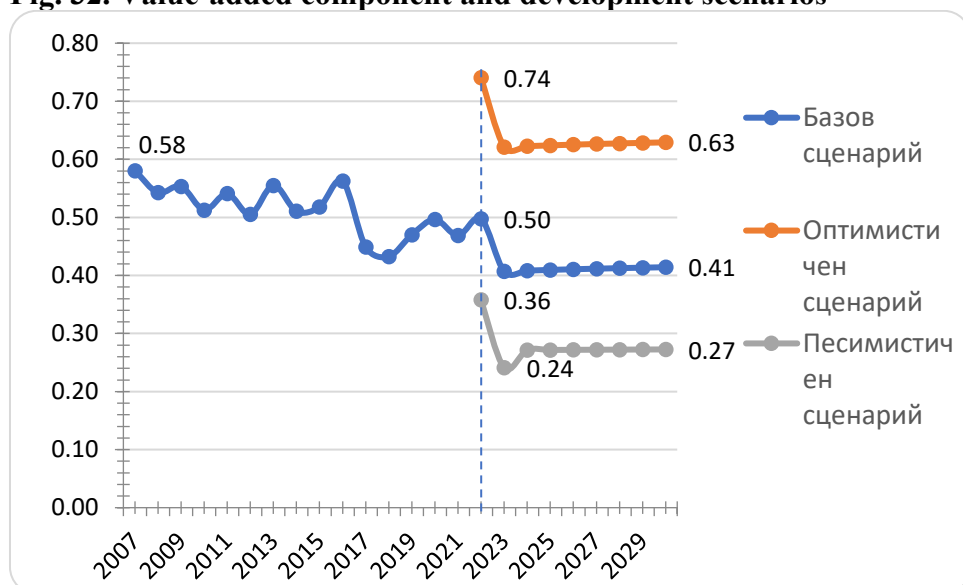


Source: MAF, NSI, ITC, UN, own calculations

Under the optimistic scenario, an improvement is observed, with the index value reaching 0.47 by the end of the period, corresponding to a medium level of competitive performance. The drivers of such a development may include increased investment at farm level in terms of breed composition and mechanization, improvements in staff training and the recruitment of workers from other countries, as well as enhanced feeding practices (including the use of software for ration formulation tailored to the different stages of the animals' life cycle).

Under the pessimistic scenario, a decline in the index value is observed to 0.38, indicating competitive performance in the lower range. The driving forces behind such a development may include a reduction in farm-level investments due to anticipated decreases in support and/or stricter requirements imposed on producers; retirement or exit of a significant share of owners of smaller farms; and a worsening shortage of labor.

Fig. 32. Value-added component and development scenarios



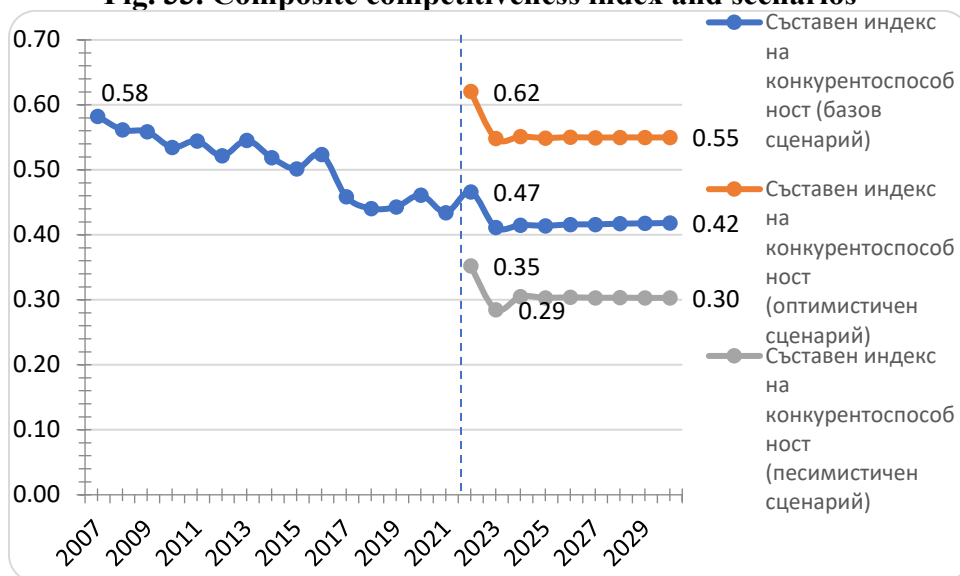
Source: MAF, NSI, ITC, UN, own calculations

Under the baseline scenario for the development of the value-added component, stabilization and a slight improvement toward 2030 are envisaged, albeit remaining at a low level (Fig. 32). The minimum value of the index is reached in 2023 (0.41) and remains close to this level thereafter. This scenario assumes relative economic stability and the preservation of procurement price levels for different types of milk, with only a modest increase driven by overall inflation in the economy.

Under the optimistic scenario, a significant improvement in performance is observed, with the index reaching 0.61 and an improving competitive position that falls within the “good” range according to the evaluation scale. Factors stimulating such a development would include increased production of raw milk, higher procurement prices, and regulatory requirements mandating the use of a certain share of Bulgarian raw materials in domestically produced dairy products. Additional influence could stem from the introduction of new market labels (e.g., “mountain product”) promoting local production across all market channels.

Under the pessimistic scenario, a pronounced decline is observed, with a minimum index value of 0.24, approaching the non-competitive threshold. Factors that could drive such a development—associated with a sharp reduction in demand and procurement prices—include severe reputational or quality-related compromise of the production of one or more Bulgarian processors, leading to reduced demand for Bulgarian products; another possibility is the restriction or interruption of EU exports to one of the Union’s major dairy product importers (e.g., China in the event of a trade war), resulting in increased inventories, declining dairy prices on the common market, and imports of dairy products into Bulgaria at prices below the production costs of domestically produced dairy products. This outcome would also be facilitated by the scale of production in plants operated by leading European dairy processors, which are an order of magnitude larger than those of Bulgarian processors, enabling lower unit costs due to economies of scale.

Fig. 33. Composite competitiveness index and scenarios



Source: MAF, NSI, ITC, UN, own calculations

Under the baseline competitiveness scenario, based on the model equation, the index is assumed to remain around 0.41, corresponding to a low level of competitive performance. Under the optimistic scenario, an increase to approximately 0.55 is observed, indicating good competitive performance, close to the levels recorded in the first years following EU accession, albeit within the context of the common market. Under the pessimistic scenario, a persistent deterioration is observed, with the index declining to 0.30 (low competitive performance), exerting a negative impact on farms.

The results of the study indicate relative stability of performance over the coming years up to 2030 under all three scenarios considered. Therefore, achieving a positive development would require the implementation (to the extent feasible) of a more proactive policy aimed at improving production efficiency in dairy farms and supporting producer organizations in the development of short supply chains.

Scenarios of the main indicators affecting competitiveness

The leading factors influencing competitive performance, identified in Chapter Three, are presented in the table. The selected indicators have a rating above 0.7.

Table 12. Factors with the Greatest Impact on Competitiveness

No.	Indicator	Unit of measure	Rating (CPR)
1.	Yield per cow	ton/cow	0.80
2.	Labor per cow	AWU/cow	0.81
3	Production efficiency (revenue / total costs)		0.75
4.	Total income per capita	K levs	0.71

5.	GDR per capita	K levs	0.71
6.	CPI based on previous year	%	0.74
7.	Population of Bulgaria	million	0.74

Productivity is identified as one of the key factors for the competitiveness of dairy cattle farming, with high significance according to the CPR score (0.80) and a clearly positive relationship with the competitiveness index. Nevertheless, the historical growth in milk yield in Bulgaria over the period 2007–2022 has been very weak (approximately 34 kg per cow annually, i.e. less than 1% per year), which is identified as a major reason for the loss of competitiveness. The scenarios up to 2030 suggest a continued but moderate increase in productivity: the baseline scenario projects limited growth, the optimistic scenario allows for higher levels but still at rates insufficient to substantially close the gap with the EU average, while the pessimistic scenario implies a return of milk yields to levels characteristic of the mid-2010s. The scenario assessments indicate a stronger skewness toward lower values, meaning that the risk of realizing less favorable outcomes is relatively higher.

Labour input per livestock unit is the strongest factor among the production indicators (CPR 0.81) and is also positively related to competitiveness. This relationship is interpreted as reflecting a structural shortage of labour: reductions in labour constrain production in ways that cannot be compensated quickly enough through increased capital intensity, mechanisation, or improved management practices. Bulgaria is among the countries with the fastest decline in labour input in dairy farming during 2007–2022, with a substantial contraction relative to initial levels. The scenarios to 2030 point to a predominantly downward trajectory under the baseline scenario and a wide range of possible deviations under the optimistic and pessimistic variants. The overall conclusion is that the most likely outcome is for labour input to remain below historical average levels.

Production efficiency (revenues/total costs) is the only economic indicator in its group that meets the criteria for statistical significance and ranks among the most important determinants of competitiveness (CPR 0.75). Improvements in efficiency support competitiveness through lower unit costs and better price positioning. Historically, efficiency has fluctuated, but since 2015 a weak yet persistent upward trend has been observed. The scenarios to 2030 suggest the maintenance of efficiency levels above the historical average, with a limited risk of severe deterioration. This implies that production efficiency acts as a relatively stabilising factor for the competitiveness index, including under the baseline scenario.

Among macroeconomic factors, income per capita exerts a positive influence on competitiveness (CPR approximately 0.71), as it stimulates demand; however, historically, rising consumption has not translated into an increased market share for domestic production. The income elasticity of demand for dairy products is low, indicating that prices and production costs play a more decisive role. The scenarios to 2030 foresee continued income growth, which, through the demand channel, could moderately support competitiveness.

In contrast, GDP per capita is found to have an inverse relationship with competitiveness, interpreted as the result of resource reallocation toward higher-return sectors and relatively lower profitability in dairy farming during periods of overall economic growth. Forecasts indicate sustained GDP growth up to 2030, which, *ceteris paribus*, may exert downward pressure on competitiveness, although the weight of this factor is not among the highest.

Inflation (CPI) is among the stronger macroeconomic indicators (CPR around 0.74) and shows a positive relationship with competitiveness, insofar as higher prices may support supply conditions. At the same time, its predictability is limited, and the reliability of extrapolation is among the lowest. The scenarios assume inflation remaining relatively higher than historical averages, but with substantial uncertainty. Finally, population size (CPR around 0.74) is positively related to competitiveness, yet all scenarios project a continued decline up to 2030 with high reliability. This implies additional downward pressure through contraction of the domestic market and constraints on labour availability. Overall, the forecasting framework indicates that while productivity and efficiency provide limited support to the competitiveness index, the most significant risks up to 2030 stem from labour shortages and adverse demographic trends, which push the sector toward baseline or less favorable development trajectories.

Evaluation of the proposed hypotheses

Hypothesis 1 assumes that Bulgaria's accession to the EU single market has a positive effect on the competitiveness of dairy cattle farming, with an expected increase in the value component. Empirical results, however, indicate the opposite overall dynamic: over the period 2007–2022, the composite competitiveness index declined by approximately 25%, while the value component also decreased by around 17% (albeit with fluctuations and at a slower pace), which leads to the rejection of the hypothesis. Although integration into the single market creates conditions for more transparent price formation, greater comparability of standards, and potential value creation through processing and niche products, these positive effects are offset by intensified competitive pressure and structural weaknesses in production. These include a persistent decline in the number of specialised farms and dairy cow herds, limited growth in productivity, substitution of domestic raw milk with imports, and technological practices allowing a lower share of raw milk in final products. As a result, accession has tended to intensify competition and production pressure on the sector rather than generate a sustained improvement in competitiveness, including in value terms.

Hypothesis 2, which posits that competitiveness in dairy cattle farming is primarily driven by internal production factors and external market factors, is not supported by the research findings and is therefore rejected. The analysis shows that decisive importance lies with internal production factors in combination with external macroeconomic conditions, while market factors do not emerge as leading determinants, despite rising farm-gate prices. In the context of an open and highly competitive EU single market, better-adapted producers are able to realise advantages, whereas structural weaknesses constrain the impact of favourable market signals. Although Bulgarian dairy farms have achieved compliance with EU quality standards, limited domestic supply of raw milk, increased imports of dairy inputs, weak integration between producers and processors, and the absence of Bulgarian participation in major European dairy exchanges restrict market realisation and long-term growth. In this context, macroeconomic and structural constraints prove more influential than market factors in shaping sectoral competitiveness.

Hypothesis 3 is confirmed, as the scenario analysis indicates that the weaknesses and crisis processes accumulated in Bulgarian dairy cattle farming after EU accession are highly likely to persist in the medium term. Under the baseline scenario, competitiveness remains below the historical levels observed up to 2022, without substantial further deterioration but also without recovery. Positive expectations for improvement arise only under the optimistic scenario, which assumes simultaneous stabilisation of the market environment, greater policy predictability, increased investment activity, improvements in productivity, and the entry of new farmers. Structural constraints—labour shortages, demographic ageing, high requirements and capital barriers for new entrants, regulatory instability, and weak integration between

production and processing—continue to exert systemic pressure on the sector, limiting the scope for a sustainable increase in competitiveness and steering its development toward the baseline or pessimistic scenario.

Hypothesis 4 is also confirmed, as the results demonstrate that support under the CAP and national policy instruments, including direct payments, plays a significant role in the restructuring and adaptation of dairy cattle farming but is insufficient to reverse the sector's persistent negative trend. Support contributes to the survival and concentration of more capitalised farms and partially mitigates price and market shocks, yet it does not compensate for structural constraints such as high indebtedness, limited investment capacity, low productivity, and strong price pressure from the EU single market. In conditions of increasing supply of milk and dairy products within the single market, substantial imports, and limited national regulatory leverage, policy support remains primarily stabilising and restructuring in nature, without creating the prerequisites for a sustainable recovery in competitiveness, which would require additional targeted investments, modernisation, and deeper integration along the value chain.

STATEMENT OF THE MAIN SCIENTIFIC AND APPLIED SCIENTIFIC CONTRIBUTIONS OF THE DISSERTATION

A. Theoretical and Methodological Contributions

1. On the basis of a substantial body of authors and sources, a comprehensive theoretical review of approaches to competitiveness analysis is conducted, examining different schools of thought and their perspectives—classical and modern theories on the impact of international trade on competitiveness, the strategic management school, and methods for measuring the determinants of competitiveness.
2. An approach is developed for quantifying the competitive performance of the dairy sector at the national level through a competitiveness index based on macro-level market performance.
3. Based on an original approach, a theoretical framework is proposed for grouping the indicators influencing specialized dairy farms into six categories, according to whether they are internal or external to the farm and according to their mode of influence—production, economic, structural, market, regulatory, and macroeconomic factors.
4. A historical–economic analysis is carried out of the economic policy applied and its impact on the development of the dairy subsector before and after Bulgaria's accession to the EU single market for the period 2007–2020.
5. A structured methodology is developed that is applicable to macro-level analysis and can be extended to other agricultural sectors.

B. Applied Scientific Contributions

6. An assessment is conducted of the effects of the quota system and the “Milk Package” on specialized Bulgarian dairy farms.
7. The factors exerting the greatest influence on farm competitiveness are identified on the basis of multiple regression analysis and the CPR method.
8. An assessment of concentration in the milk processing industry in Bulgaria is carried out using the Herfindahl–Hirschman Index.

9. Scenarios are developed for the evolution of the factors with the greatest impact on competitiveness up to 2030, which can be used by experts, businesses, and NGOs for strategic planning.
10. Horizontal integration among producers and the possible reasons for the failure of cooperation and collective organization are examined.
11. Policy and measure proposals are formulated to enhance competitiveness, including investment programs and initiatives to improve awareness of the use of local raw materials in dairy products produced in Bulgaria.

IV. LIST OF PUBLICATIONS RELATED TO THE DISSERTATION TOPIC

1. **Stoychev, V.** (2018) Effect of cow's milk price volatility on dairy farms income in Bulgaria. *Bulgarian Journal of Agricultural Economics and Management*, Agricultural Academy, Vol. 63, No.3, pp. 22-31, ISSN (Print): 0205-3845, CABI Record Number: 20193045150
2. **Toteva, D., Dimitrova, D., Stoychev, V.,** (2022) Factor Productivity of Chosen Bulgarian Agricultural Productions. *Journal "Agriculture and Forestry"*, University of Montenegro, Vol. 68, Is. 3, pp. 147 - 159, ISSN 0554-5579 (Printed)
3. **Stoychev, V., Ivanov, B.** (2022) Comparison of competitiveness between Bulgaria, EU, USA, and New Zealand dairy sectors. Proceedings of the 2021 International Scientific Conference 'Economic Sciences for Agribusiness and Rural Economy', Warsaw, No. 5, pp. 147 - 159, ISBN 978-83-8237-073-7

V. DECLARATION OF ORIGINALITY

I hereby declare that the present dissertation is entirely the result of my own research and that no publications or materials authored by others have been used in its preparation in violation of their copyright.