

SUMMARY

Keywords: innovation, competitiveness, economic growth, NTG, hybrids

The relationship between innovation, competitiveness, and economic growth forms the foundation of sustainable progress and the achievement of superior performance across a wide range of fields. Continuous innovation creates the premises for strengthening competitive advantage, which, in turn, becomes the engine of economic expansion by stimulating productivity and technological development, thus generating a positive feedback loop characterized by successive reinvestments in innovative activities.

Innovation in agriculture primarily aims to enhance and improve the economic and financial results of farms by reducing production costs and increasing technical yields. Most innovations can lead to reduced resource usage and greater resilience regarding the environmental impact of agriculture (precision farming, biotechnology innovations, or the bioeconomy). The results of applying innovations in agriculture can be quantified by the degree of production cost reduction and the increase in agricultural yields.

The focus of this doctoral thesis revolves around the innovation–competitiveness–economic growth triangle, approaching these three fundamental pillars globally through the lens of agricultural activity in general, and corn hybrid performance in particular. The testing of these hybrids was conducted under the auspices of the Romanian Farmers and Professional Processors Forum Association (RFPFPA), an organization led by the author of the thesis.

The aim of the doctoral thesis is to analyze how the interaction between innovation, competitiveness, and economic growth is reflected in agricultural practice by evaluating the technical and economic impact of genetic engineering products (corn hybrids), with implications for improving the efficiency of agricultural activities and supporting the development of the agribusiness sector in general.

The objectives set to achieve the proposed aim were:

- Investigating the specialized literature in order to identify the global importance of the topic through an extensive quantitative analysis of the WOS database over the past 20 years, with results reflected through a specific bibliometric analysis;
- Synthesizing the results of the most important studies conducted in recent years that incorporated the innovation–competitiveness–economic growth relationship, especially in the agri-food sector;
- Theoretical conceptual foundation of the terms that form the basis of the thesis (innovation, competitiveness, economic growth);
- Characterizing the agricultural sector at the global and European levels by presenting defining aspects through comparative analyses and forecasts based on trends, with a focus on innovation in agricultural biotechnology (GMOs and

new plant breeding techniques through genome editing);

- Characterizing the organizational and institutional framework in which the research was conducted (RFPPFA through the Independent Field Testing and Analysis Network - RITAC); Studying the performance of corn hybrids from different maturity groups marketed by major seed companies, highlighting their main characteristics and results in tabular form, and performing comparative and evolutionary analyses to determine the performance level of hybrids across different FAO groups to scientifically establish their behavior under different pedoclimatic conditions. The data was made available to stakeholders interested in implementing innovations and developing the agricultural sector as a whole.

The research methodology was oriented along several dimensions corresponding to the established objectives and reflected in:

- *Bibliometric analysis* conducted to explore and quantify aspects of scientific production, such as volume, impact, collaboration, and thematic evolution of academic literature. This systematic approach, based on bibliographic data extracted from the Web of Science database, examined relationships between publications (articles, books, conferences), authors, institutions, and countries using bibliometric indicators such as number of publications, number of citations, co-citation analysis, keyword analysis, and co-authorship analysis, providing an objective perspective on the structure and dynamics of the research fields. Two segments were analysed: the theoretical part with 2,091 scientific articles and the practical part with 2,904 articles, mapping relationships and organization of research in the thesis field. Data was visually processed using VOSviewer software;
- *Literature review and knowledge exploration* regarding the relationship between innovation, competitiveness, and economic growth in agriculture, summarizing conceptual elements, principles, and characteristics that underpinned subsequent working directions, based on scientific papers, books, reports, and key academic documents;
- *Comparative analysis* of national and international studies on the topic, focusing on methods and results, highlighting similarities and/or differences in approaches and outcomes;
- *Statistical data analysis* and the creation of tabular or graphical representations scientifically interpreted according to academic standards. The main statistical databases used were Eurostat and the Romanian National Institute of Statistics (INS), along with reports such as the "EU Agricultural Outlook: 2024–2035," "European Innovation Scoreboard 2024" by the European Commission, and the "OECD-FAO Agricultural Outlook 2024–2033";
- *Case study, experimentation, and analysis of hybrid testing* results conducted through RFPPFA and RITAC under two approaches: Version A (all corn hybrids divided into six maturity groups and analyzed based on the maturity group average for each location) and Version B (all corn hybrids analyzed based on location average, regardless of maturity group).

By providing comparative, classified, and filtered data based on relevance, productivity, and stability criteria, the thesis offers farmers and other stakeholders a

science-based decision-making tool for selecting corn hybrids best suited to their specific pedoclimatic conditions and production objectives, thereby optimizing agricultural results and enhancing resilience to environmental fluctuations. The thesis is structured into seven chapters, following a logical progression from general to specific:

Chapter 1 presents two bibliometric studies using the Web of Science database to frame the research in the context of the existing global situation. Data were processed using VOSviewer, highlighting research intensity and focus areas. The first study used the terms "innovation," "competitiveness," and "growth/development," while the second used "genetically modified organism," "new genomic techniques," and "biotech crops," with tabular and graphical representations reflecting key findings.

Chapter 2 provides the theoretical foundation for the thesis by identifying, correlating, and comparing prior studies in the field. Major research findings were synthesized, and a research gap was identified, ensuring the originality and practical utility of the thesis.

Chapter 3 discusses the innovation process cycle and analyzes innovation at global, European, and national levels, particularly through the "European Innovation Scoreboard 2024" and Romania's country-specific profile. It also compares research and development sector investments across countries.

Chapter 4 characterizes the agricultural sector, integrating current data from key reports ("OECD-FAO Agricultural Outlook 2024–2033" and "Agricultural Outlook: 2024–2035" by the European Commission), providing forecasts and a comprehensive overview of global, European, and national agriculture.

Chapter 5 shifts the focus to the integration of innovation in agriculture, especially in agricultural biotechnology (GMOs and new genomic techniques), with a particular focus on corn. The global economic impact of GMOs is analyzed through key study findings.

Chapter 6 outlines the purpose, objectives, research methodology, organizational framework, and key applied directions. It details the activities of RFPPFA and RITAC, describing how specific hybrid testing was conducted to ensure compliance and result representativeness.

Chapter 7 presents the results of the applied study and specific interpretations, offering an analysis of hybrid productivity by FAO group and by location. It ranks the most productive hybrids and complements the analysis without FAO group considerations, providing essential information for farmers.

The thesis ends with general conclusions and a representative bibliography.

The importance of the studied topic stems from the ongoing global transformations across all sectors driven by the interaction of technological progress — innovation — with competitiveness and economic growth factors. Understanding the mechanisms for managing these performance drivers, especially in agriculture,

can represent one of the pillars of success. This doctoral thesis supports stakeholders by facilitating the understanding of this interaction through problematization, in-depth study, and, most importantly, by providing conclusive results that bridge theoretical elements with the practical outcomes of conducted studies.

The degree of originality and novelty of the thesis is reflected and presented across different levels and stages, starting with the specialized bibliometric analysis divided into two dimensions for an exhaustive approach, followed by the customized comparative analysis of existing studies, new data regarding the national agricultural sector, and especially through the case study conducted via RFPPFA, which involved testing a significant number of hybrids under different pedoclimatic conditions and technologies applied.