



Technical University of Moldova

OPTIMIZING COLD CHAIN MANAGEMENT FOR FRESH FRUITS THROUGH STRATEGIC INTEGRATION OF POST-HARVEST PRACTICES

The formable:

Rija Iurie

Coordinator:

**Zbanca Andrei
dr., conf. univ.,**

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Aurelia LITVIN

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ANNOTATION

to the MBA Management in Agribusiness Microqualification thesis prepared by master's student Rija Iurie

The master's thesis is structured and includes: annotation, introduction, three chapters and subchapters, conclusions and recommendations, bibliography, annexes.

Keywords used in the thesis: fruits, value chain, added value, unit cost, market, prices, competitiveness, post-harvest operations.

The field of study of this thesis is the optimization of cold chain management for fresh fruits through the strategic integration of post-harvest practices, focusing on their impact on fruit competitiveness, access to export markets and ensuring the sustainable development of the sector.

Thesis purpose and objectives:

The purpose of the paper is to assess the economic impact of optimizing the cold chain management for fresh fruits through the strategic integration of post-harvest practices in the Republic of Moldova through investments in post-harvest operations and by analyzing their influence on the competitiveness of domestic fruits on international export markets.

In order to achieve this goal, the **following tasks** are formulated:

1. analysis of the mechanisms through which the cold chain management for fresh fruits is developed and optimized;
2. assessment of the impact through investments in post-harvest operations for fruits for the creation of added value, comparative economic advantages and the integration of fruits into new distribution channels for the marketing of fruits at advantageous prices
3. identification of opportunities and recommendations for optimizing the cold chain management for fresh fruits through the strategic integration of post-harvest practices;

The novelty and scientific originality of the results obtained consists of: in-depth analysis of the optimization of cold chain management for fresh fruits through the strategic integration of post-harvest practices; assessment of the impact of investments in post-harvest operations on the development of value chains for fruits; as well as elucidation of recommendations adapted to the conditions of the Republic of Moldova.

Theoretical importance of the work. The conclusions and recommendations formulated in the thesis provide support for the systematization of theoretical information on the management of the cold chain for fresh fruits through the strategic integration of post-harvest practices.

The thesis includes substantiation provides a substantiation of the content of investments in post-harvest operations, the creation of added value and comparative advantages for domestic fruits.

Applicative value. The analysis of value chains for different fruit distribution channels in the work constitutes a case study for farmers, exporters, consultants and decision-makers in agriculture. The recommendations made aim both at improving the management of the cold chain for fresh fruit through the strategic integration of post-harvest practices, as well as measures to increase the competitiveness of fruit and the agricultural activity of companies.

ADNOTARE
la teza de microcalificare MBA Management în agrobusiness
elaborată de masterandul Rija Iurie

Teza de master este structurată și include: adnotare, introducere, trei capitole și subcapitole, concluzii și recomandări, bibliografie, anexe.

Cuvinte cheie utilizate în teză: fructe, lanț valoric, valoare adăugată, cost unitar, piață, prețuri, competitivitate, operații post-recoltare.

Domeniul de studiu al prezentei teze îl constituie optimizarea managementului lanțului de frig pentru fructele proaspete prin integrarea strategică a practicilor post-recoltare, concentrându-se pe impactul acestora asupra competitivității fructelor, accesului pe piețele de export și asigurarea dezvoltării sustenabile a sectorului.

Scopul și obiectivele tezei:

Scopul lucrării este de a evalua impactul economic al optimizării managementului lanțului de frig pentru fructele proaspete prin integrarea strategică a practicilor post-recoltare în Republica Moldova prin investiții în operații post-recoltare și prin analiza influenței acestora asupra competitivității fructelor autohtone pe piețele internaționale a exporturilor.

În vederea realizării acestui scop sunt formulate următoarele sarcini:

1. analiza mecanismelor prin care se dezvoltă și se optimizează managementul lanțului de frig pentru fructele proaspete;
2. evaluarea impactului prin investiții în operații post-recoltare la fructe pentru crearea de valoare adăugată, avantaje economice comparative și integrarea fructelor în noi canale de distribuție pentru comercializarea fructelor la prețuri avantajoase
3. identificarea oportunităților și recomandărilor pentru optimizarea managementului lanțului de frig pentru fructele proaspete prin integrarea strategică a practicilor post-recoltare;

Noutatea și originalitatea științifică a rezultatelor obținute constă în: analiza aprofundată a optimizării managementului lanțului de frig pentru fructele proaspete prin integrarea strategică a practicilor post-recoltare; evaluarea impactului investițiilor în operații post-recoltare la dezvoltarea lanțurilor valorice pentru fructe; precum și elucidarea recomandărilor adaptate la condițiile Republicii Moldova.

Importanța teoretică a lucrării. Concluziile și recomandările formulate în teza oferă suport la sistematizarea informațiilor teoretice privind managementului lanțului de frig pentru fructele proaspete prin integrarea strategică a practicilor post-recoltare.

Teza include fundamentare oferă o fundamentare a conținutului de investiții în operații post-recoltare, crearea de valoare adăugată și avantaje comparative la fructele autohtone.

Valoarea aplicativă. Analiza lanțurilor valorice pentru diferite canale de distribuție a fructelor în lucrare constituie un studiu de caz pentru fermieri, exportatori, consultanți și factori de decizie din agricultură.

Recomandările formulate vizează atât perfecționarea managementului lanțului de frig pentru fructele proaspete prin integrarea strategică a practicilor post-recoltare, cât și măsuri de sporire a competitivității fructelor și activității agricole ale companiilor.

INTRODUCTION

Topic relevance

The Republic of Moldova has significant potential in the production and export of fresh fruit, especially apples, plums, cherries, table grapes and apricots. However, the competitiveness of the horticultural sector depends not only on the quality of the production obtained in the orchard, but also on the efficiency of post-harvest management and the cold chain. In the context of the increasingly stringent requirements of international markets and the process of alignment with European Union standards, maintaining the quality and safety of products throughout the supply chain has become a determining factor for commercial success.

The cold chain is an integrated system of activities that ensures the continuous maintenance of the optimal temperature from harvest to the final consumer. Any interruption of this chain can accelerate the ripening and degradation processes, reduce the shelf life, favor the occurrence of post-harvest diseases and generate considerable economic losses. In the Republic of Moldova, post-harvest losses of fruits are influenced by delayed cooling, insufficiently modernized infrastructure, limited monitoring of storage parameters and incomplete integration of digital technologies in logistics management.

The analysis of cold chain management for fresh fruits is of strategic importance for the development of the horticultural sector in the Republic of Moldova, as it directly contributes to reducing post-harvest losses, maintaining product quality and increasing competitiveness on domestic and foreign markets. In the context of climate change, intensifying competition and increasingly stringent requirements for food safety and product quality, cold chain optimization is becoming an essential element of modern agri-food value chain management.

Cold chain management optimization requires a strategic approach, which starts from the moment of harvest and continues throughout the stages of pre-cooling, sorting, packaging, storage, transport and distribution. The integration of good post-harvest practices, modern refrigeration technologies, digital temperature and humidity monitoring systems, as well as traceability mechanisms contribute to reducing quantitative and qualitative losses, maintaining the freshness of fruits and increasing their commercial value.

At the same time, optimizing the cold chain plays an important role in reducing food waste, making energy consumption more efficient and reducing the impact on the environment, being in line with the principles of the circular economy and sustainable development. Investments in modern refrigeration infrastructure, digitalization of logistics processes and strengthening the skills of producers and operators in the value chain are essential directions for increasing the competitiveness of the Moldovan horticultural sector.

Therefore, the strategic integration of post-harvest practices in cold chain management is an essential condition for improving the economic performance of fruit producers, increasing access to export markets and consolidating the position of the Republic of Moldova as a supplier of high-quality fresh fruits on international markets. This approach contributes to the development of a more competitive, resilient and sustainable horticultural sector, capable of meeting the current and future demands of consumers and trading partners.

The field of study of this thesis is the cold chain management for fresh fruits through the strategic integration of post-harvest practices, focusing on their impact on fruit competitiveness, access to export markets and ensuring the sustainable development of the sector.

The purpose of the paper is to assess the economic impact of optimizing the cold chain management for fresh fruits through the strategic integration of post-harvest practices in the Republic of Moldova through investments in post-harvest operations and by analyzing their influence on the competitiveness of domestic fruits on international export markets.

In order to achieve this goal, the **following tasks** are formulated:

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3. identification of opportunities and recommendations for optimizing the cold chain management for fresh fruits through the strategic integration of post-harvest practices.

The novelty and scientific originality of the results obtained consists of: in-depth analysis of the optimization of cold chain management for fresh fruits through the strategic integration of post-harvest practices; assessment of the impact of investments in post-harvest operations on the development of value chains for fruits; as well as elucidation of recommendations adapted to the conditions of the Republic of Moldova.

Theoretical importance of the work. The conclusions and recommendations formulated in the thesis provide support for the systematization of theoretical information on the management of the cold chain for fresh fruits through the strategic integration of post-harvest practices. The thesis includes substantiation provides a substantiation of the content of investments in post-harvest operations, the creation of added value and comparative advantages for domestic fruits.

Applicative value. The analysis of value chains for different fruit distribution channels in the work constitutes a case study for farmers, exporters, consultants and decision-makers in agriculture. The recommendations made aim both at improving the management of the cold chain

for fresh fruit through the strategic integration of post-harvest practices, as well as measures to increase the competitiveness of fruit and the agricultural activity of companies.

In conclusion, research into cold chain management and the strategic integration of post-harvest practices represents a priority direction for increasing the competitiveness of Moldovan fruits, reducing economic losses, increasing added value and sustainable development of the agri-food sector in the Republic of Moldova.

- ✓ Traffic conditions: Traffic delays can cause temperature excursions and spoilage, and in many areas, wait times due to heavy volumes of traffic leads to added risk.
- ✓ Regulatory compliance and standardization: Standards vary, and adherence to guidelines is uneven in implementation.
- ✓ Sustainability: The environmental negative impacts of diesel-fueled and electrically heated pack of refrigerated all-terrain vehicles to remove perfectly healthy edible crops and food before harvest.

Best Practices for Strong Cold Chain Management:

- ✓ Pre-cool without delay.
- ✓ Control and maintain temperature and humidity specific to the specific requirements of the produce, at every stage.
- ✓ Proper air flow and ventilation in storage and transport.
- ✓ Use of IOT sensors or data loggers to record every stage of temperature change as a monitored item.
- ✓ Use a rigid package (or package the fruits) to limit the exposure to preventing cooling and heat up processes.
- ✓ Train staff on proper handling, storing, and shipping protocols.
- ✓ Purchase new or more energy-efficient refrigeration equipment and transport.
- ✓ Develop procedures and back up plans for when an equipment inevitably fails.
- ✓ Use technology and leverage what is available: AI for demand forecasting and supply chain route mapping, and flow for more accurate traceability through block chain.
- ✓ Engage stakeholders at every stage of the supply chain to promote collaborative food systems.

By overcoming these obstacles and following best practices, cold chain management can greatly help to minimize food waste, enhance food safety, and provide a consistent stream of high-quality fruits and vegetables to consumers.

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