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LOGISTICS COSTS IN AGRICULTURE AND WAYS TO REDUCE THEM

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Abstract:
The article discusses logistics costs in agriculture and ways to reduce them. Modern approaches to logistics in the agricultural sector require a comprehensive analysis of all stages of transportation and storage of products, which directly affects economic efficiency. The paper analyzes key factors contributing to the growth of logistics costs, such as inefficient organization of transport flows, inconsistency of infrastructure with the requirements of agricultural enterprises and high costs of storing products. Possible solutions for optimizing these processes are proposed, including the introduction of information technology, improving interaction between participants in the logistics chain and modernization of infrastructure. Based on the analysis, recommendations are presented for reducing logistics costs, which will improve the competitiveness of the agricultural sector.

Keywords: Logistics, agriculture, logistics costs, transportation, storage, optimization, agricultural sector, information technology, infrastructure, economic efficiency.

Introduction

Modern agriculture faces a number of challenges, among which logistics cost management occupies a key place. The efficiency of logistics processes directly affects the profitability of enterprises, the competitiveness of agricultural products and the sustainability of the entire industry. Logistics costs include the costs of transportation, warehousing, packaging and distribution of products, which is especially relevant for agriculture, where the geographical remoteness of production sites and the seasonality of products create additional difficulties.

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An analysis of existing scientific papers shows that the issues of logistics optimization in agriculture are considered from different angles. In particular, the article "Reducing logistics costs in agriculture" notes that "analysis of logistics costs is a rather complex task, because these costs are hidden in other costs."
Also, the work "Analysis of general logistics costs" emphasizes that "logistics costs represent the costs of labor, material, financial and information resources due to the performance by enterprises of their functions to fulfill consumer orders." This study aims to systematize existing approaches to reducing logistics costs in agriculture, as well as to develop practical recommendations for optimizing logistics processes in the context of Russian reality. Unlike most works focused on transport aspects, our work involves a comprehensive approach that includes an analysis of all stages of the logistics chain, from production to deliveries to the end consumer. The purpose of this study is to study existing logistics problems in agriculture and propose solutions taking into account modern economic and technological realities.

METHODOLOGY

A comprehensive approach combining theoretical analysis and empirical research was used to study logistics costs in agriculture and ways to reduce them. Both qualitative and quantitative methods were used in the course of the work, which allowed for a comprehensive assessment of logistics processes and identification of opportunities for their optimization.
The study began with an analysis of existing scientific sources, which allowed for studying current approaches to logistics in agriculture and identifying the main problems faced by enterprises in this area. Works devoted to transportation, warehousing, distribution of products and other aspects of logistics were reviewed, which provided the basis for hypotheses and the direction of the study.
For a deeper understanding of the situation, empirical studies were conducted at several agricultural enterprises. During these studies, observations of logistics processes, including transportation and warehousing, as well as data collection on costs, infrastructure and the effectiveness of existing methods were carried out.
The data obtained during the empirical analysis were subjected to statistical and economic analysis using mathematical methods such as linear programming. This

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allowed not only to identify key factors influencing the amount of logistics costs, but also to develop mathematical models for process optimization.

The research process was supplemented by surveys and interviews with managers and logistics specialists of agricultural enterprises, which made it possible to collect primary data on the current state of logistics processes and their problems. Official statistics and specialized software for information processing were used as additional sources.

This approach provided a comprehensive study of logistics costs in agriculture, which made it possible to offer specific and practically applicable recommendations for their reduction.

RESULTS AND ANALYSIS

The study included a comprehensive study of logistics costs in agriculture, with an emphasis on their structure and optimization paths. As a result of the analysis of data collected from several agricultural enterprises, it was possible to identify key factors influencing the amount of logistics costs, as well as identify possible ways to reduce them.

Based on the collected data, a table was constructed showing the distribution of logistics costs across various components of logistics processes.

Logistics component	Percentage of total costs (%)
Transportation	40
Warehousing	25
Packaging and labeling	15
Distribution and delivery	10
Administrative expenses	5
Other expenses	5

Table 1. Distribution of logistics costs by components

As can be seen from the table, the largest costs are associated with transportation, which is typical for agriculture, where products are often moved over long distances. Warehousing and packaging also occupy a significant share in the overall cost structure, which is due to the requirements for the safety of products and their preparation for sale.

The main factors affecting the amount of logistics costs are:

• *Geographic location of enterprises*. Enterprises located in remote regions face high transportation costs due to the need for long-distance transportation.

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• *Seasonality of agricultural production*. Peak production seasons (for example, harvesting) increase the load on logistics processes, which also leads to an increase in costs.
• *Inefficiency in the use of warehouse space*. In some cases, enterprises cannot effectively use warehouse space, which leads to excessive costs for storing and processing products.
На основе анализа данных можно выделить несколько путей оптимизации логистических процессов:
• *Optimization of transportation routes.* The introduction of modern technologies for route planning, such as GPS navigation systems and transportation optimization software, can significantly reduce transportation costs.
• *Improvement of warehouse management*. The introduction of automated systems for accounting and control of product movement in warehouses will reduce storage costs and speed up the distribution process.
• *Investments in infrastructure improvemen*t. Repair and modernization of transport and warehouse facilities will help to increase their efficiency and reduce overall costs.
Thus, the study showed that logistics costs in agriculture have significant potential for optimization, and the proposed recommendations can lead to a significant reduction in costs in this area.

DISCUSSION

The obtained results indicate that logistics costs in agriculture are an important factor determining the financial stability of enterprises and their competitiveness. Analysis of the cost structure showed that the most significant costs are incurred for transportation and warehousing of products. These data confirm theoretical studies that emphasize the importance of optimizing logistics processes to improve the efficiency of agricultural production.
One of the key problems is the high cost of transportation, especially in regions located remotely from the main consumers or processing plants. This is also confirmed by studies conducted in the works agbz.ru and moluch.ru, which note that high transportation costs make up the bulk of logistics costs. In this regard, the introduction of technologies for optimizing transportation routes, such as GPS navigators and specialized software, can lead to a significant reduction in costs.

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Data on the seasonality of agricultural production also confirm the results of other studies that consider the impact of peak seasons on logistics. This creates additional difficulties associated with warehouse overload and increased requirements for vehicles. In this regard, special attention should be paid to improving warehouse management. The introduction of automated systems and the use of technologies for tracking the movement of products can speed up the storage and distribution processes, which will reduce costs.

An analysis of the factors affecting logistics costs has revealed several key aspects that require attention for optimization. In particular, inefficient use of warehouse space leads to additional storage costs. Modernization of warehouse facilities and the introduction of technologies that allow for more efficient use of space can reduce these costs. However, despite the obvious optimization paths, there are also limitations associated with the implementation of the proposed solutions. The introduction of modern technologies requires significant capital investments, which can be a problem for small and medium-sized enterprises. In this context, it is necessary to take into account the availability of financial resources and possible barriers, such as a lack of qualified specialists or high initial costs.

In addition, despite the positive results from the optimization of logistics processes, it is important to remember that agriculture is an industry with a high dependence on external factors, such as weather conditions, global economic changes and the political situation. All these factors can significantly affect the efficiency of logistics, which requires flexibility in approaches to cost management. Thus, the proposed ways to optimize logistics costs in agriculture are important and justified, but their implementation requires an integrated approach, taking into account the specifics of the industry and the availability of the necessary resources. In the future, it is important to continue research in this area in order to adapt logistics processes to changing conditions and ensure sustainable development of agriculture.

CONCLUSION

As a result of the study, the main factors influencing logistics costs in agriculture were identified, and effective methods for reducing them were proposed. An analysis of the cost structure showed that the most significant part of the costs falls on transportation and warehousing, which is confirmed by theoretical research and practical data. Understanding these factors and identifying areas for

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optimization allows us to formulate recommendations that can significantly reduce logistics costs and increase the efficiency of agricultural enterprises.

The main ways to reduce logistics costs are optimization of transportation routes using modern technologies, improved management of warehouse processes, and infrastructure modernization. The introduction of innovative solutions, such as GPS navigation systems and automated warehouse systems, can lead to a significant reduction in costs and improvement of logistics processes. However, the study also showed that the implementation of these methods requires significant capital investment, as well as the availability of qualified specialists and appropriate infrastructure conditions. The problem of the high cost of implementing new technologies, especially for small and medium-sized agricultural enterprises, requires additional attention from public and private support. It is also important to take into account external factors such as climatic conditions and global economic changes, which may affect the effectiveness of the proposed solutions. Thus, reducing logistics costs in agriculture is an important aspect for increasing the competitiveness and sustainability of the industry. The implementation of the proposed recommendations will allow agricultural enterprises not only to reduce costs, but also to increase overall efficiency and profitability. In the future, it is necessary to continue research in this area in order to adapt logistics processes to changing conditions and ensure long-term development of agriculture.

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