RESEARCH ON LOGISTICS COST MANAGEMENT STRATEGY FOR WOOD PROCESSING INDUSTRY BASED ON ENVIRONMENTALLY CONSCIOUS SUPPLY CHAIN

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ABSTRACT

Introduction: The wood processing industry is an important component of the forestry industry; It is a green and low-carbon industry with low energy consumption and low environmental pollution. With the acceleration of global economic integration, logistics costs have become a key factor in improving the development level of wood processing enterprises and an important component of the competitiveness of the forestry industry. In response to the current problem of high logistics costs in Chinese wood processing enterprises, starting from the innovative concept of logistics cost management, a strategic management system for logistics costs is constructed using Environmentally Conscious Supply Chain, management theory; Strengthening the logistics cost management of wood processing enterprises in the forestry industry plays an important role in promoting China’s transition from traditional quantity forestry to modern efficiency forestry.

Objective: To improve the overall level of logistics cost management of the whole country’s wood processing industry.

Results and Discussion: Forestry is an integrated industry combining the economic value, ecological value and social value of forests. Due to the importance of green coordinated and sustainable development of overall benefits in the forestry green supply chain, it is not only necessary to achieve economic benefits, but also to continuously increase resources and improve the ecological environment.

Research Implications: This research can implemented in order to bring environmental sustainability

Keywords: Environmentally Conscious Supply Chain, Wood Processing Enterprises, Logistics Costs, Strategic Management.

PESQUISA SOBRE ESTRATÉGIA DE GESTÃO DE CUSTOS LOGÍSTICOS PARA A INDÚSTRIA DE PROCESSAMENTO DE MADEIRA BASEADA EM CADEIA DE FORNECIMENTO AMBIENTALMENTE CONSCIENTE

RESUMO

Introdução: A indústria de processamento de madeira é um componente importante da indústria florestal; É uma indústria verde e de baixo carbono, com baixo consumo de energia e baixa poluição ambiental. Com a aceleração da integração econômica global, os custos logísticos tornaram-se um factor chave para melhorar o nível de desenvolvimento das empresas de processamento de madeira e uma componente importante da competitividade da indústria florestal. Em resposta ao problema atual de altos custos logísticos nas empresas chinesas de processamento de madeira, a partir do conceito inovador de gestão de custos logísticos, um sistema de gestão estratégica para custos logísticos é construído usando a teoria de gestão da Cadeia de Abastecimento Ambientalmente Consciente; O fortalecimento da gestão dos custos logísticos das empresas de processamento de madeira na indústria florestal desempenha um papel importante na promoção da transição da China da silvicultura tradicional em quantidade para a silvicultura moderna e eficiente.

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Research on Logistics Cost Management Strategy for Wood Processing Industry Based on Environmentally Conscious Supply Chain

**Objectivo:** Melhorar o nível global de gestão dos custos logísticos de toda a indústria de processamento de madeira do país.

**Resultados e Discussão:** A silvicultura é uma indústria integrada que combina o valor econômico, o valor ecológico e o valor social das florestas. Devido à importância do desenvolvimento coordenado e sustentável dos benefícios globais na cadeia de abastecimento verde da silvicultura, não é apenas necessário obter benefícios econômicos, mas também aumentar continuamente os recursos e melhorar o ambiente ecológico.

**Implicações de pesquisa:** Esta pesquisa pode ser implementada a fim de trazer sustentabilidade ambiental.

Palavras-chave: Cadeia de Suprimentos Ambientalmente Consciente, Empresas de Processamento de Madeira, Custos Logísticos, Gestão Estratégica.

INVESTIGACIÓN SOBRE ESTRATEGIA DE GESTIÓN DE COSTOS LOGÍSTICOS PARA LA INDUSTRIA DE PROCESAMIENTO DE MADERA BASADA EN UNA CADENA DE SUMINISTRO AMBIENTALMENTE CONSCIENTE

RESUMEN

**Introducción:** La industria procesadora de madera es un componente importante de la industria forestal; Es una industria verde y baja en carbono, con bajo consumo de energía y baja contaminación ambiental. Con la aceleración de la integración económica global, los costos logísticos se han convertido en un factor clave para mejorar el nivel de desarrollo de las empresas procesadoras de madera y un componente importante de la competitividad de la industria forestal. En respuesta al problema actual de los altos costos logísticos en las empresas procesadoras de madera chinas, a partir del concepto innovador de gestión de costos logísticos, se construye un sistema de gestión estratégica para los costos logísticos utilizando la teoría de la gestión de la cadena de suministro consciente del medio ambiente; El fortalecimiento de la gestión de costos logísticos de las empresas procesadoras de madera en la industria forestal desempeña un papel importante en la promoción de la transición de China de una silvicultura tradicional en cantidad a una silvicultura moderna y eficiente.

**Objetivo:** Mejorar el nivel general de gestión de costos logísticos de la industria procesadora de madera de todo el país.

**Resultados y Discusión:** La silvicultura es una industria integrada que combina el valor económico, el valor ecológico y el valor social de los bosques. Debido a la importancia del desarrollo verde coordinado y sostenible de los beneficios generales en la cadena de suministro forestal verde, no sólo es necesario lograr beneficios económicos, sino también aumentar continuamente los recursos y mejorar el entorno ecológico.

**Implicaciones de la investigación:** esta investigación se puede implementar para lograr la sostenibilidad ambiental.

Palabras clave: Cadena de Suministro Ambientalmente Consciente, Empresas Procesadoras de Madera, Costos Logísticos, Gestión Estratégica.

1 INTRODUCTION

"Dual carbon", namely carbon peaking and carbon neutrality, has become a global consensus to address climate change[1]. In the process of national economic development, the wood processing industry, as a pillar industry of the forestry industry, has the unique dual
characteristics and effects of natural low-carbon and carbon storage. Meanwhile, with the acceleration of global economic integration, logistics costs have become a key factor in improving the development level of wood processing enterprises and an important component of the competitiveness of the forestry industry. Therefore, based on the background of green supply chain, it is particularly important to strengthen the strategic management of logistics costs in the wood processing industry.

1.1 RESEARCH BACKGROUND AND SIGNIFICANCE

In 2021, the sales revenue of China's wood processing and wood, bamboo, rattan and grass products industries was 965.55 billion yuan, an increase of 12.51% percent year-on-year. In the wood processing industry, the important component of product cost is logistics cost; Logistics cost control is the key to enhance the core competitiveness of wood processing enterprises. Therefore, strengthening the logistics cost management of wood and related products can effectively reduce the price of wood products; It helps wood processing enterprises to better protect the environment and save resources in production and circulation, thus greatly improving the competitiveness and innovation of wood processing enterprises in the market economy; It is helpful to improve the competitiveness of the wood processing industry in the international market.

China's wood processing industry is in a stage of rapid development, from wide to strong is the way to choose. Combining the theory of green supply chain and the concept of sustainable development, the problems existing in the logistics cost management of traditional wood processing enterprises are analyzed. The modern wood processing logistics industry should be developed as soon as possible to reduce the logistics costs in the process of wood production and circulation. Thus improve the overall level of logistics cost management of the whole country's wood processing industry. The transformation of Chinese forestry from traditional quantity forestry to modern benefit forestry; It has important economic significance and practical significance, and is conducive to the sustainable development of China's forestry industry in the new era.
2 LITERATURE REVIEW

2.1 CONCEPT OF GREEN SUPPLY CHAIN

The Green Supply Chain theory is produced on the basis of the Supply Chain theory, and it is obtained by integrating the green factor into the Supply Chain. As in the case of supply chain management, the concept of green supply chains is not yet uniformly understood by academics. In 1996, the concept of Green Supply Chain was first formally introduced when a study on “Environmentally Responsible Manufacturing (ERM)” was conducted at the Manufacturing Research Institute at Michigan State University in the United States. Among domestic scholars, Dan Bin (2000) believes that Green Supply Chain is “a modern management model that takes environmental impact and resource efficiency into account in the whole supply chain, which is based on green manufacturing theory and supply chain management technology and involves suppliers, production factories, sellers and users, and its purpose is to make the products have the least impact on the environment and the highest resource efficiency in the whole process of acquiring materials, processing, packaging, warehousing, transporting, using and disposing of products at the end of life.”

2.2 SUPPLY CHAIN MODELS FOR WOOD PROCESSING ENTERPRISES

The supply chain model of China’s wood processing enterprises mainly consists of forest product processing enterprises represented by state-owned forest farms organizing and guiding forest farmers in the vicinity of forest product processing enterprises to engage in forest product production and operation activities through contract, shareholding cooperation and other relevant cooperation mechanisms. According to the experience of the United States, Canada and other developed countries, China’s value-added amount will be as high as 1-10 times through the circulation, processing, packaging and change of the properties of forest products such as forest fruits. Therefore, the supply chain model also forms a value-added chain along with the flow of forest products, as shown in Figure 1 below.
2.3 COMPOSITION OF LOGISTICS COSTS FOR WOOD PROCESSING ENTERPRISES

According to the national standard *Composition and Calculation of Enterprise Logistics Costs* (GB/T20523-2006), logistics costs refer to the monetary performance of physical labor and living labor consumed in logistics activities of an enterprise, including the sum of manpower, material and financial resources expended in the process of transportation, storage, packaging, loading and unloading, circulation processing, logistics information, logistics management, etc., as well as the costs of working capital occupation related to inventory, inventory risk costs and inventory insurance costs.

The logistics costs of wood processing enterprises are mostly reflected in the cost of processed wood and other forest products, which are inseparable from the cost of products. The composition of logistics costs for wood processing enterprises is shown in Table 1.
Table 1

**Composition of Logistics Costs for Wood Processing Enterprises**

<table>
<thead>
<tr>
<th>Cost Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour costs</td>
<td>Including wages, funds, allowances, and welfare costs for employees</td>
</tr>
<tr>
<td></td>
<td>in the supply, storage, handling, and marketing of wood and other</td>
</tr>
<tr>
<td></td>
<td>forest products</td>
</tr>
<tr>
<td>Procurement costs for materials such as</td>
<td>Including costs of transportation, insurance, and</td>
</tr>
<tr>
<td>wood</td>
<td>reasonable wear and tear</td>
</tr>
<tr>
<td>Sales costs of wood and other forest</td>
<td>Including costs of advertising, transportation,</td>
</tr>
<tr>
<td>products</td>
<td>exhibition promotion and information</td>
</tr>
<tr>
<td>Warehousing and storage costs</td>
<td>Including costs of warehouse maintenance and handling</td>
</tr>
<tr>
<td>Equipment costs</td>
<td>Including depreciation, repair, and maintenance costs of equipment</td>
</tr>
<tr>
<td></td>
<td>and warehouses related to wood processing</td>
</tr>
<tr>
<td>Operating costs</td>
<td>Including costs of energy consumption, material</td>
</tr>
<tr>
<td></td>
<td>consumption, depreciation, office expenses, travel, insurance, labour</td>
</tr>
<tr>
<td></td>
<td>protection</td>
</tr>
<tr>
<td>Financial costs</td>
<td>Including the interest on the funds occupied by</td>
</tr>
<tr>
<td></td>
<td>storage materials such as wood</td>
</tr>
<tr>
<td>Recycling costs</td>
<td>Including logistics costs for recycling waste</td>
</tr>
<tr>
<td></td>
<td>products such as wood</td>
</tr>
</tbody>
</table>


3 DEVELOPMENT

3.1 LACK OF INNOVATION IN COST MANAGEMENT CONCEPT AND SHORTAGE OF LOGISTICS PROFESSIONALS

On the one hand, China’s research on forest product logistics is still in the early stage of exploration, resulting in a low level of understanding of logistics in wood processing enterprises (mainly reflected in the low awareness of logistics costs), and a lack of innovation in cost management concepts, resulting in the absence of a clear goal of logistics cost management in relevant enterprises.

On the other hand, there is a serious shortage of financial management talents in China who are familiar with the wood processing process, proficient in logistics management technology, mastering the entire supply chain management extending outwards from the logistics within the forestry industry[1].
3.2 LACK OF INDEPENDENCE IN LOGISTICS MANAGEMENT DEPARTMENT AND LACK OF SYSTEM ON COST ACCOUNTING

At present, wood processing enterprises still adopt traditional accounting methods and do not set up a separate logistics management department, which makes the accounting system of logistics costs has not been constructed, the information of logistics cost reports is incomplete, and the basic data of involved costs in the logistics system are less, so that they cannot calculate the logistics costs of the relevant forest products, and even less can accurately and timely reflect the logistics costs. As a result, it is impossible to make vertical and horizontal comparisons of relevant logistics costs in the entire forestry industry, which leads to the fact that processing enterprises in the forestry industry cannot effectively control the costs incurred in the process of wood logistics operations. At the same time, the strategic decision-making of relevant enterprises is affected[12].

3.3 LONG WOOD INVENTORY TIME AND HIGH STORAGE COSTS

Wood inventory run through the entire line in the supply chain while the structure of China’s wood market is not yet perfect (mainly because in most regions, the wood market is just a trading venue established by local organizers). In addition, due to the weak management concept of enterprises on supply chain, the low degree of information network sharing in the forestry industry and other factors, the processing enterprises of forest products with wood as raw materials have been in stock after purchase and before sales, so that the storage costs of wood processing enterprises are too high.

3.4 OUTDATED LOGISTICS INFRASTRUCTURE AND LOW DISTRIBUTION EFFICIENCY

The means of transport in wood processing enterprises, especially the collection and transportation of wood, are still dominated by simple means of transport, such as root-digging machinery, branch collection and baling machines, mobile winch machines, scraper transporters and other forestry-specific tools, which are not utilized at a high rate, affecting the efficiency of the collection and transportation of wood. Information technology in logistics of wood processing enterprises is relatively backward, so that the information transmission of the
wood market is not accurate and timely, the speed and accuracy of logistics are affected, the efficiency of logistics services is not high, so that the efficiency of logistics distribution in wood processing enterprises is low.

3.5 EMPHASIS ON THE ECONOMIC BENEFITS OF THE INDUSTRY AND NEGLECT OF THE ECOLOGICAL BENEFITS OF FORESTRY

China’s wood-processing industry is still in a state of small-scale, decentralized and disorderly competition. And some enterprises in the forestry industry have frequently overloaded their transport vehicles in pursuit of short-term economic benefits. These not only cause serious damage to the road network, but also contribute to air pollution (mainly caused by increased emissions). This one-sided emphasis on the economic benefits of the wood processing industry, and the neglect of environmental pollution caused by the logistics circulation links of wood such as mining, collection, transportation, storage, etc., is not conducive to the coordination and sustainable development of wood processing enterprises in terms of ecological, economic and social benefits.

4 CONCLUSION AND OUTLOOKING

The existing literature indicates that enterprise innovation, including culture and green innovation, as well as tax reductions, and ESG programs are all positive factors that contribute to high-quality development, however subsidies can not help high-quality development so the influence of government incentive policy is not clear. The ESG performance of a company depends on its industry and is vital for high-quality growth. Intangibles like managers' histories, processes, and cultures dominate corporate social responsibility studies. Nonetheless, the relationship between complex factors like subsidies and corporate social responsibility remains unclear. Therefore, researchers need to conduct further studies to gain a comprehensive understanding of this relationship. What is more, China is just starting to adopt corporate ESG practices and scoring. Most state-owned company growth research is based on theory, the link between ESG performance and green innovation is far from clear. And the link between green technology and social information impacts a company's worth. Future studies can explore technology innovation and corporate social responsibility, so as to help firms understand how their ESG performance affects their value and lead sustainable practices and innovation decisions. However, there exist four gaps in the current study on high-quality enterprise
development: (1) Current study largely focus on the theoretical importance and influencing factors qualitatively, attaching little attention to empirical studies, practical assistance, and corporate implementation ideas are necessary. (2) Assessing the high-quality development index using dynamic panel methodologies and temporal periods may not generate desirable outcome. (3) It is necessary to study the impact of ESG recognition on high-quality development in order to determine its sustainability. Further study attempts to provide helpful supplements by examining the relationship between ESG performance and green technological innovation in listed firms to promote sustainable green development.

4.1 CONCLUSION

In the context of increasingly severe environmental pollution, it is necessary to include environmental factors in the logistics cost assessment of the wood processing industry under the background of green supply chain; Meanwhile, logistics cost control for wood processing enterprises is the key to improving their core competitiveness.

4.2 A NEW THINKING OF LOGISTICS COST MANAGEMENT IN THE WOOD PROCESSING INDUSTRY

In the face of the ever-changing, fiercely competitive market environment and the continuous improvement of customer demand diversification, personalization and consumption level, in order to formulate long-term development strategies and operate stable, enterprises must focus on changing concepts, improving cost awareness, improving logistics awareness, and establishing logistics management ideas to cultivate core competitiveness, so that the wood processing industry can build a high-efficiency and low-cost forest products logistics supply chain system as soon as possible. It is conducive to improving the economic benefits of timber and promoting the sustainable development of the forestry industry. Therefore, the new concept of wood logistics cost management is innovated, and the comprehensive level of logistics cost management of China’s wood processing industry has been further improved.
4.3 ESTABLISHING A GREEN SUPPLY CHAIN TO PROMOTE THE UPGRADING OF THE WOOD PROCESSING INDUSTRY WITH SCIENTIFIC AND TECHNOLOGICAL PROGRESS

With the deterioration of human living environment, governments, enterprises, and the public are paying more and more attention to environmental protection. In the supply chain, the consideration of the overall environmental impact of all products and supply chain processes is becoming increasingly important, and the concept of green supply chain has emerged [15]. Green supply chain, as an innovative environmental management approach, integrates concepts such as full lifecycle and extended producer responsibility into traditional supply chain management. It regards the ecological and environmental system as an internal subsystem, relies on the supply relationship between upstream and downstream enterprises, and takes core enterprises as the fulcrum to carry out green supplier management, green procurement, and other work, focusing on the forestry industry economy. Building a green supply chain not only helps to reduce industrial chain risks, adapt to the trend of green development, but also promotes industrial chain collaboration, win-win and high-quality development, and enhances enterprise competitiveness [16].

Due to the weak characteristics of wood production, such as long cycles, slow turnover of forestry funds, and the impact of climate disasters, forestry investment faces dual risks of nature and the market. Therefore, it is necessary to transform the forestry development model and rely more on innovative elements such as technology, talent, knowledge, and information to drive development. Firstly, it is vital to strengthen forestry scientific research and the transformation of scientific and technological achievements, and enhance the supporting role of scientific and technological innovation. Secondly, it is also important to accelerate the construction of forestry talent echelon, so as to comprehensively enhance the innovation ability and level of forestry talents. From the perspective of green supply chain, green technology innovation is necessary throughout the entire supply chain, namely from resource cultivation to distribution services [17]. However, due to the high cost of innovation, the supply chain requires strong support from policies such as fiscal policies. In the context of accelerating the green economy, the green supply chain can affect directly or indirectly the improvement of enterprise value. Relying on technology, policies and funds to continuously improve the development of the green supply chain, and then promote the transformation and upgrading of the entire industrial chain.
4.4 STRENGTHEN THE COLLABORATIVE MANAGEMENT CAPABILITIES OF CORE ENTERPRISES IN CROSS INDUSTRY, CROSS PROCESS AND CROSS CHAIN

The collaboration of forestry green supply chain with highly complex characteristics covers the entire process from seedling cultivation to forest product sales, crossing three industries of forestry. In order to effectively coordinate green supply chain cooperative enterprises, the core enterprises engaging in wood processing should have high-level collaborative management capabilities. Firstly, training all the employees of the green supply chain on supply chain collaborative management. Enterprises at each section of the supply chain must establish the "win-win" concept and conduct extensive and thorough cooperation based on confidence, commitment, and sharing and strengthen the internal and external connections between enterprises and departments at each section and consider the enterprises on the entire chain as an organic whole. The most important thing is to improve the collaborative management capabilities of core enterprises, develop supply chain collaborative management plans for the entire industry, chain and process and attach importance to collaborative communication, trust, and decision-making in problems solving, gradually improve high-level green forestry supply chain management capabilities. In addition, cultural collaboration should also be incorporated into the supply chain to help the parties concerned to achieve better communication, establish an overall awareness and ultimately improve the flexibility of the entire supply chain and optimize its value.

4.5 THE GOVERNMENT SHALL INCORPORATE ECOLOGICAL PERFORMANCE, RESOURCE PERFORMANCE AND SOCIAL PERFORMANCE INTO THE SUPPLY CHAIN PERFORMANCE EVALUATION SYSTEM

Forestry is an integrated industry combining the economic value, ecological value and social value of forests. Due to the importance of green coordinated and sustainable development of overall benefits in the forestry green supply chain, it is not only necessary to achieve economic benefits, but also to continuously increase resources and improve the ecological environment. Therefore, the logistics activities of timber should also be consistent with this goal. While completing the timber logistics activities, it is necessary to take the social, ecological benefits and sustainable development of forestry into consideration. The goal of wood processing enterprises is to maximize profits, while from the perspective of the entire industry, process and chain of the forestry green supply chain, a forestry green supply chain
without any benefits is unsustainable. Therefore, in the supply chain performance evaluation system, resource, ecological and social performance should be introduced as measurement indicators. Therefore, in the supply chain performance evaluation system, resource, ecological, and social performance should be introduced as measurement indicators. When managing the wood processing supply chain, attach importance to the preparation and reserve of forest resources and use them scientifically and efficiently as reliable sources of competitive advantage. In the process of utilizing forest resources, it is conducive to recycle wood waste transform if we transform from traditional “end control” to full process quality and source prevention, treat the green wood supply chain as a whole and build a green wood supply network and promote the improvement of forestry ecological and economic benefits. At present, the green supply chain has infiltrated into the economy and society which cultivates people’s green consumption concept, optimize the human being’s living environment, promote employment and drive the development of local social economy.

In summary, it is imperative to strengthen the cost management strategy. By optimizing the strategy and relevant measures, we can ensure the steady improvement of the economic and social benefits of wood processing enterprises, consolidate their advantages, demonstrate their unique advantages in the same industry and promote the sustainable and healthy development. Therefore, the concept of “green efficiency, intelligent standards and systematic collaboration” in logistics cost management of the wood processing industry under the background of green supply chain is an innovative application of "accelerating the environmentally friendly development mode transformation" proposed in the 14th Five Year Plan; It is significant to promote environmentally friendly, low-carbon and sustainable development of logistics and build a beautiful China.

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