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Conceptual and Structural Analysis of the Supply Chain in the Aromatic and Medicinal Plants (AMP) Sector in Northern Morocco

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Abstract

The aromatic and medicinal plant (AMP) sector in northern Morocco is characterised by a wide variety of products and complex logistical challenges related to seasonality, climatic conditions and regulatory requirements. This article provides an in-depth analysis of the conceptual foundations and organisational structures of the supply chain in this strategic sector. Drawing on classical and contemporary theories of supply chain management, the study highlights the interactions between physical, informational and financial flows, as well as their influence on the overall performance of companies. It also presents the different types of logistics structures — linear, dyadic, divergent, convergent and networked — and discusses their practical implications in the Moroccan context. The aim is to propose an analytical framework for optimising coordination between stakeholders, strengthening competitiveness and promoting sustainable and integrated management of local logistics chains.

Keywords : Supply chain – Supply chain management – Aromatic and medicinal plants – Logistics structure – Sustainability – Morocco – Integrated management.

Introduction

The aromatic and medicinal plant sector in northern Morocco is both strategic and complex, with supply chain management playing a decisive role in the competitiveness and sustainability of the companies involved(*Global logistics and supply chain management - Philippe-Pierre... - Librairie Eyrolles*, n.d.). This first chapter is devoted to analysing the theoretical and practical foundations that support this management in a local environment marked by unique logistical challenges . Optimising the supply chain in this sector is essential to ensure not only operational efficiency, but also adaptation to fluctuations in local and international markets(*Chapter 6. Innovation and CSR: the other competitive advantage | Cairn.info*, n.d.) .

The diversity of products in the MAP sector, ranging from medicinal herbs to extracts used in cosmetics and pharmaceuticals, requires careful and tailored logistics management. Producers face supply constraints related to crop variability, growing seasons and strict regulatory requirements governing their production. In addition, often unpredictable weather conditions further complicate the management of flows, both upstream (production, harvesting, processing) and downstream (distribution, sales, export). This

chapter explores the theoretical dimensions of these logistical challenges, drawing on classic and contemporary supply chain management models, while incorporating solutions tailored to the specificities of this *sector*(*Theses online*, n.d.) .

The first part of the chapter examines the conceptual foundations of the supply chain. Through a detailed analysis of the concepts of "supply chain" and "logistics flows"(*Supply Chain Management. Global Logistics - 2nd edition Global Logistics 2nd edition - paperback - André Marchal, la avec - Buy Book | fnac*, n.d.) , and "organisational structure", this section establishes a framework for understanding the practical issues faced by MAP stakeholders. The supply chain in this sector is not simply a sequence of physical processes; it also includes strategic dimensions such as managing relationships between producers, processors, distributors and end consumers.

The issue of supply chain optimisation is then addressed, with a focus on specific processes that can be improved to enhance the overall performance of the *chain*(*Global - Cdiscount Librairie*, n.d.). In such a dynamic sector, companies must adopt agile strategies to manage inventory, optimise transport routes and reduce storage costs. Inter-company collaboration, through strategic partnerships and long-term alliances, is also highlighted as a potential response to the challenges encountered. These strategies must be analysed in the context of local particularities, where infrastructure may be uneven and transport costs can quickly erode producers' profit margins.

The chapter concludes with an exploration of the fundamental theories that underpin supply chain management, including the theory of constraints, lean management and inventory management. These theories are then tested against the realities of the FMCG sector. For example, the theory of constraints, which aims to identify and eliminate bottlenecks in a supply chain, can offer practical solutions for overcoming inefficiencies in the harvesting and processing process. Lean management, for its part, offers tools for reducing waste and maximising added value at each stage of the chain. Interorganisational theories, such as systems theory and transaction costs, make it possible to analyse the complex relationships between actors in the sector and identify levers for cooperation that can improve overall *performance*(*ScienceDirect*, n.d.) .

With this in mind, the aim of this chapter is to establish a solid theoretical foundation that will serve as a reference for the following chapters. A thorough understanding of the fundamental principles of supply chain management, as well as theoretical approaches tailored to this specific sector, enables us to approach logistics dynamics with a clear and strategic vision(*Supply chain management. Purchasing, production, logistics, transport, sales - Le Moigne*, n.d.). This paves the way for a more detailed reflection on management practices, process optimisation and the innovation needed to meet the contemporary challenges facing aromatic and medicinal plants in northern Morocco.

1 The supply chain

The supply chain (SC) refers to all the processes and activities necessary to move a product or service from raw material to end *customer*(*Supply Chain Management*, n.d.) . Initially, the concept of the supply chain emerged in a military context, to manage resources and *supplies*(*Supply ChainBaglin, Olivier Bruel, Alain Garreau, Michel Greif*, n.d.) . It was only after the Second World War that logistics management became widespread in the industrial sector. Initially, logistics was seen as a secondary operational function, focused on tasks such as transport, handling and storage. However, from the 1970s onwards, the logistics function gradually evolved to become an essential strategic lever in business *management*(n.d.) .

As it developed, the supply chain came to be recognised as a network of interconnected entities, ranging from suppliers to distributors and processors. Supply chain management has therefore evolved from local and fragmented task management to integrated, coordinated and systemic management, aimed at optimising all flows of products, information and capital across the network of companies. The aim of this evolution has been to ensure greater operational efficiency, minimise costs and respond more quickly to market *needs*(*chain logistics management*, n.d.).

One of the major revolutions in supply chain management has been the introduction of the concept of "supply chain management," which emphasises collaboration between the various players in the network. Supply chain integration enables smoother management of relationships between companies, better resource planning and optimised flow control. Supply chain optimisation thus becomes a strategic lever, not only reducing costs but also improving service quality and customer satisfaction ((*LOGISTICS 4.0: A REALITY | Journal of Control, Accounting and Auditing*, n.d.).

The term "supply chain" has acquired a more precise meaning over time. According to Christopher (1992), a supply chain is "a network of companies that participate, upstream and downstream, in the various processes and activities that create value in the form of products and services delivered to the end consumer". This definition emphasises the importance of

inter-company relationships and how they create value together throughout the chain. Information flows and financial exchanges between actors therefore become as important as physical flows of *products*(n.d.) .

Supply chain management also relies on the coordination of different flows. Physical flows concern raw materials, semi-finished products and finished products, which move from one point to another within the network. Information flows enable actors in the chain to exchange data on demand forecasts, stock levels and orders. Finally, financial flows correspond to transactions related to payments between the various players. This complex interaction between physical, information and financial flows is what distinguishes an efficient supply chain from a less efficient *one*(*chain management - 2nd ed. - Purchasing, production, logistics, transport, sales - paperback - Rémy Le Moigne - Buy Book | fnac*, n.d.) .

In summary, the supply chain represents a complex system of interconnected relationships and activities. It goes far beyond simple inventory and transport management; it involves the comprehensive and strategic management of all processes, with the ultimate goal of maximising added value while minimising costs. The supply chain must therefore be viewed as an integrated whole, requiring smooth coordination between the various players in the network(*Collaborative practices between players in the supply chain | Revue Française d'Economie et de Gestion*, n.d.).

2 Physical structure of the supply chain

The physical structure of the supply chain refers to the geographical and functional organisation of the various actors and entities involved in managing the flow of goods, information and capital within the chain. This structure determines how resources are transported, processed, stored and distributed throughout the supply process. The efficiency of the supply chain depends largely on the configuration of this structure, which must be adapted to the specific needs of each sector and the requirements of customers.

There are several types of physical supply chain structures, which vary according to the products, industries and strategies adopted by companies. Understanding these different structures is essential for optimising logistics flows and reducing costs while maximising added value at each stage of the process. The main structures identified in the literature are linear, dyadic, divergent, convergent and network *structures*(n.d.).

2.1 Linear structure

The linear, or serial, structure represents a configuration in which the entities in the supply chain are linked sequentially, forming a continuous production or distribution process. Each link in the chain depends on the previous one, and physical, information and financial flows move in a linear direction, from upstream to downstream. This type of structure is often used in simple manufacturing processes and production chains where resources are transported along a single, orderly route. This model is particularly relevant for studying the effects of information propagation and resource optimisation in small supply chains.

2.2 Dyadic structure

The dyadic structure is a special case of the linear chain, where the relationship is limited to two main entities, often a supplier and a client. This type of structure is common in simpler supply chains, where a major player works directly with a single supplier or subcontractor. Customer/supplier or client/subcontractor relationships are at the heart of this model, which allows for more flexible and rapid flow management, but may lack robustness in the face of market fluctuations or chain disruptions.

2.4 Divergent structure

The divergent structure, also known as a distribution network, is characterised by a single point of origin (often a central supplier or manufacturer) from which products are distributed to different points of consumption or processing. This model is often found in industries where a standard product is manufactured from a base material and then distributed through different channels to reach the end consumer. The electronics industry is one example, where a basic component is supplied to manufacturers of chips, integrated circuits and other sub-components, before ending up in finished products such as mobile phones.

2.5 Convergent structure

Unlike the divergent structure, the convergent structure is used in supply chains where multiple suppliers or components converge at a single point of assembly or production. This model is particularly suited to industries where parts from different suppliers are assembled at a single final production site. The automotive industry is a classic example of this structure. For example, a car manufacturer receives spare parts from different suppliers (bodywork, engines, seats, etc.) before assembling the final vehicle in a factory. This structure

facilitates centralised resource management, but it can be vulnerable to supply or coordination issues between different *suppliers*(*Supply Chain Management et stratégie orientée*s. d., p. 1) .

2.6 Network structure

The network structure combines the characteristics of convergent and divergent structures, integrating flows that can simultaneously head to multiple destinations while maintaining multiple points of origin. This model is typically seen in complex supply chains where products require coordination between multiple suppliers and distributors. For example, in the fashion industry, where clothing manufacturers purchase fabrics and other materials from multiple suppliers, the products are then sent to different retailers and distributors, creating a network of interconnected relationships. This type of structure promotes flexibility, but requires rigorous flow management to avoid overloading or depleting resources at certain points in the network (*Information sharing in the supply chain: assessing the impact on supply chain performance of the modes of collaboration implemented between partners and the information exchanged | Theses.fr*, n.d.).

The structure of the supply chain is also influenced by the type of product, market needs and the distribution strategies chosen by companies. Effective management of this structure requires continuous evaluation of the performance of each link in the chain, as well as the adoption of appropriate logistics solutions that optimise the flow of materials and information at each stage.

3. Types and their practical implications

A detailed understanding of these structures enables companies to better adapt their logistics strategy to the specific characteristics of their products and market needs. For example, a linear structure may be preferred for products with a simple manufacturing process, while a network structure will be more suitable for complex products requiring multiple suppliers and rigorous monitoring of flows at each stage.

The structure of the supply chain must also take into account geographical aspects, such as the proximity of suppliers and customers, as well as the available infrastructure. For example, in regions with limited infrastructure, a simpler structure, such as a dyadic structure, may be more effective. On the other hand, in areas with well-developed transport networks and warehouses, a network structure may offer greater flexibility and efficiency (Waters, 2003).

To sum up, the physical structure of the supply chain is a key factor influencing a company's operational efficiency. Choosing the structure best suited to market needs and product specifications not only reduces costs but also improves responsiveness and service quality. An in-depth analysis of this structure is therefore essential to optimise the management of logistics flows, guarantee better performance and ensure greater customer *satisfaction*(n.d.) .

Conclusion

Analysis of the logistics chain in the aromatic and medicinal plants (AMP) sector reveals the strategic importance of integrated and systemic management of physical, informational and financial flows. Logistical performance is closely dependent on the chosen structure—whether linear, dyadic, divergent, convergent or networked—and its ability to adapt to local geographical and institutional realities. Theoretical models such as the theory of constraints or Lean Management offer avenues for optimisation to improve process fluidity and reduce costs. However, in the specific context of northern Morocco, characterised by product diversity and climate variability, the efficiency of the logistics chain relies above all on inter-company cooperation, resource pooling and the gradual digitisation of flows. This integrated approach opens up promising prospects for strengthening competitiveness, supporting territorial development and consolidating the sustainability of the PAM sector.

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