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Scientific basis of supply chain management of material flows

Mukhamedjanova Kamola Akramovna¹

¹*TSUE, PhD research, e-mail: k.mukhamedjanova@tsue.uz*

In recent years, logistics and supply chain management has been a key feature in business processes. Many scientists from the CIS countries, who have been researching for many years in this direction, Sergeev and V.S. Lukinski [2:448] noted that logistics developed in the early 50's and 60's of the 20th century, but was carried out economically by logistic processes.

In the 1950s and 1960s, the term logistics meant the physical distribution of material flows, inventory management, and also logistics was considered as a functional marketing component.

Next, in the 1960s and 1970s, the concept of total cost reduction, changing inventory-stockpiling strategies, and matching supply and demand was the basis for the development of logistics. From that moment, the concept of supply chain management began to develop separately from logistics.

Then in 1980 and 1985, logistics developed on the basis of computerized management systems, the so-called procurement-production-distribution chain with the lowest level of costs.

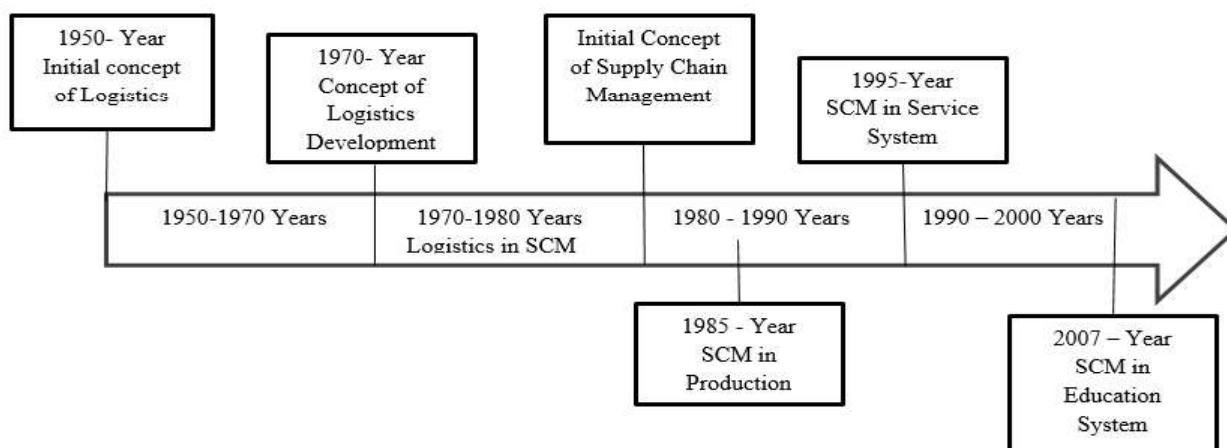


Figure 1. Evolution of Concept of Supply Chain Management

Since the 1985s, the focus has been on supply chain management as the main paradigm of business process management. Many scientists believe that UCP has become not only a catalyst for fundamental changes in a number of areas, but also changed the concept of competition. As it was noted that supply chain management is a relatively new area, this term has been described differently by many scientists.

Table 1.

Definitions of Supply Chain Management

Author	Definition
K. Oliver and M. Webber	Supply chain management (SCM) is the process of planning, implementing, and controlling the operations of the supply chain with the purpose to satisfy customer requirements as efficiently as possible.
D. Grant, D. Lambert, J. Stock, and L. Ellram	Supply Chain management refers to corporate business processes integration from end users through suppliers that provides information, goods, and services that add value for customers.
D. Bowersox, D. Closs and M. Cooper	Supply chain (sometimes called the value chain or demand chain) management consists of firms collaborating to leverage strategic positioning and to improve operating efficiency.
V.I. Sergeev	The supply chain is a set of interrelated subjects based on contracts with a supplier of raw materials from the end user.
A.N. Rodnikov	Supply Chain Management This is the rules for the regulation and enforcement of various logistics processes
D.A. Ivanov	Supply chain management - a systematic approach to planning and managing material and information flows and services from the end user to the supplier

In the CIS and far abroad countries, the spheres of management conducted research on how different supply chain management and logistics differ, whether they are complementary to each other or one component of the other. In particular, Mangan et al. [5; 45] summarized the key definitions of this issue from different sources and highlighted four main approaches relating to supply chain management and logistics:

- logistics as an integral part of supply chain management;
- supply chain management is an integral part of logistics;
- Supply chain management and logistics are independent, separate directions;
- supply chain management and logistics have some common points of view.

Summing up all ideas about supply chain management and logistics, the following conclusion can be drawn: logistics mainly includes production, distribution, processing, delivery of material flows, while supply chain management is focused on managing and optimizing both internal and external material, financial and value added information flows.

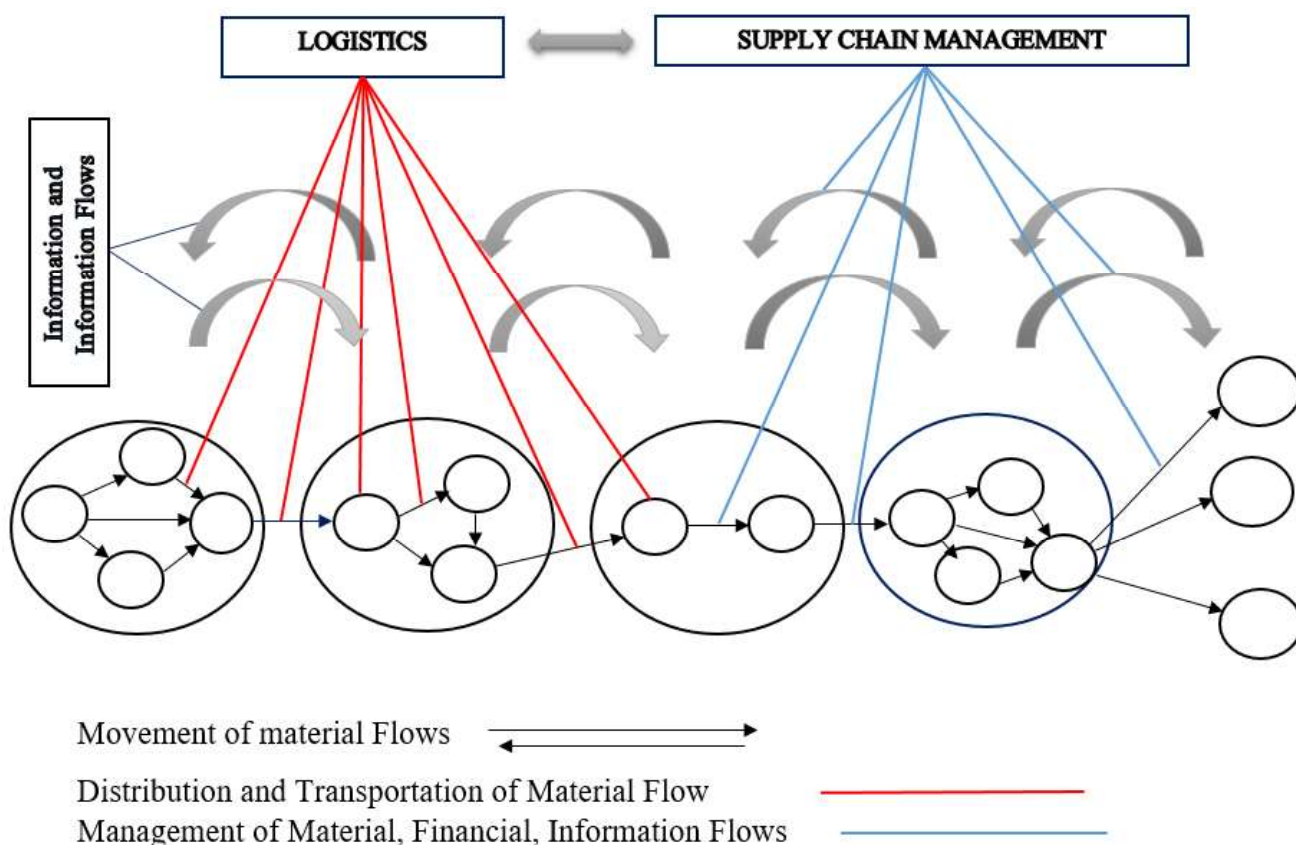


Figure 2. Supply Chain Management and Logistics functions

Despite the fact that the concept of supply chain management is used in business processes in different areas, it is of particular importance in the agro-industrial complex. In particular, one of the important factors characterizing the supply of agricultural products is the variability of the mechanical properties of the product during storage, temperature, humidity. That is, the quality of perishable goods is one of the urgent problems determining food security.

The scheme of the micro-logistics system of an agricultural enterprise is shown, which shows the main functional areas of logistics, the types of flows within the logistics system, as well as the main logistics functions that are performed in each of the areas.

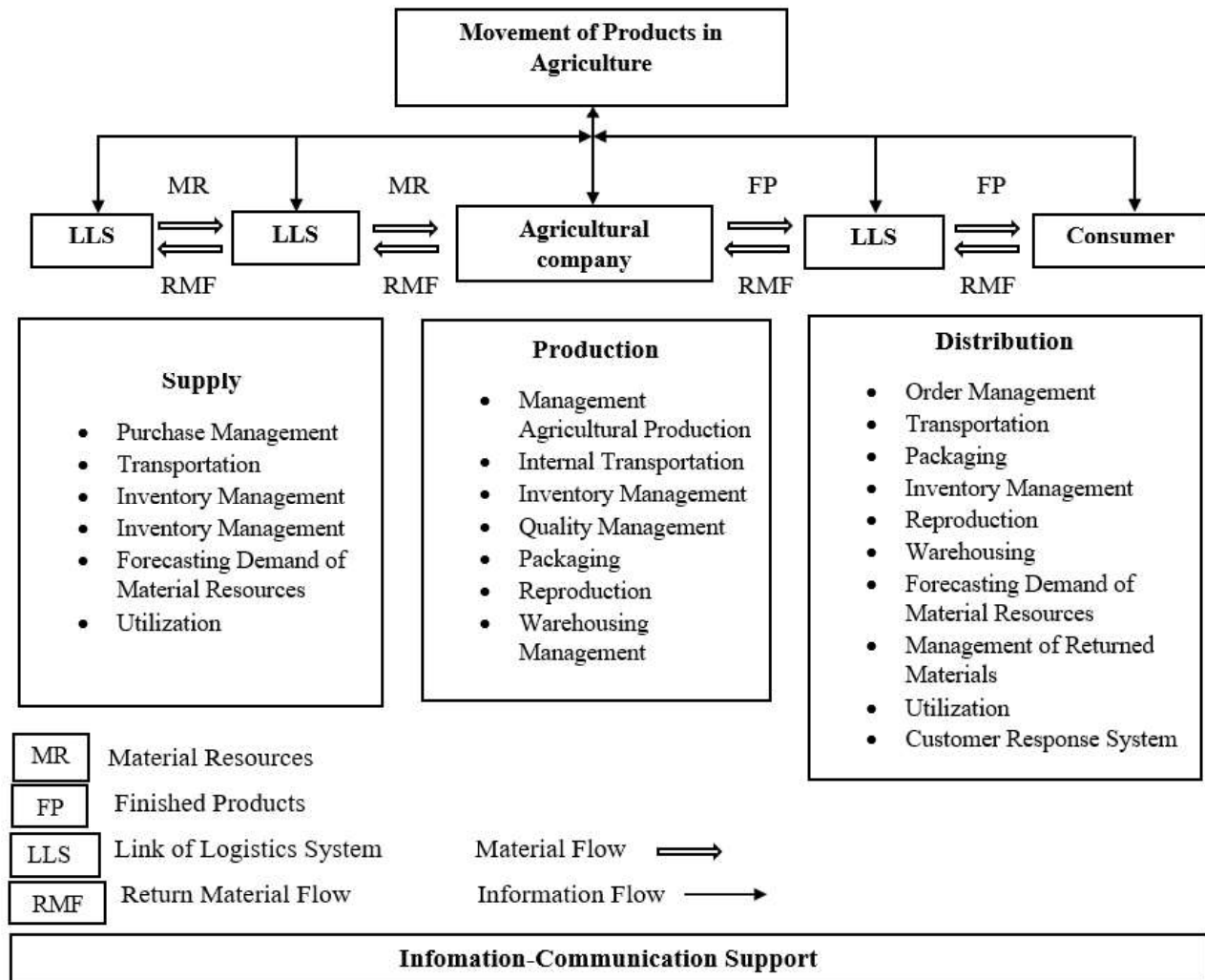


Figure 3. Movement of goods in agriculture

The territorial length of enterprises in the agrarian sphere, their remoteness from the places of storage, processing and consumption of agricultural products objectively require the formation of a transport support system for the functioning of rural producers. In this system, we can distinguish two subsystems: the subsystem of on-farm transportation and the subsystem of external transportation.

One of the important factors characterizing agricultural goods is the variability of their mechanical properties under the influence of humidity, pressure, temperature, storage time.

When organizing urgent shipments of fruits and vegetables to be stocked, they are sometimes transported without packaging. In such cases, mechanical damage to the fruit, the natural loss, and the idle time of the rolling stock under loading and unloading operations increase significantly.

Fruits and vegetables grown in Uzbekistan are high-quality, environmentally friendly and have perfect organoleptic properties. The volume of exports of fruit and vegetables has a steady upward trend, this is primarily due to the excellent taste quality of agricultural products grown in the regions of the country due to the large number of sunny days and natural and climatic conditions. Currently Uzbekistan

produces 70 types of fruits and vegetables and exports them to more than 80 countries.

The diagram below illustrates the major countries where fruits and vegetables are exported. The largest share of exports of fruits and vegetables is in Kazakhstan (46%, 584.7 thousand tons), but this is not only for consumption, but also for re-export. Russia is second with about 18% or \$ 164.8 million.

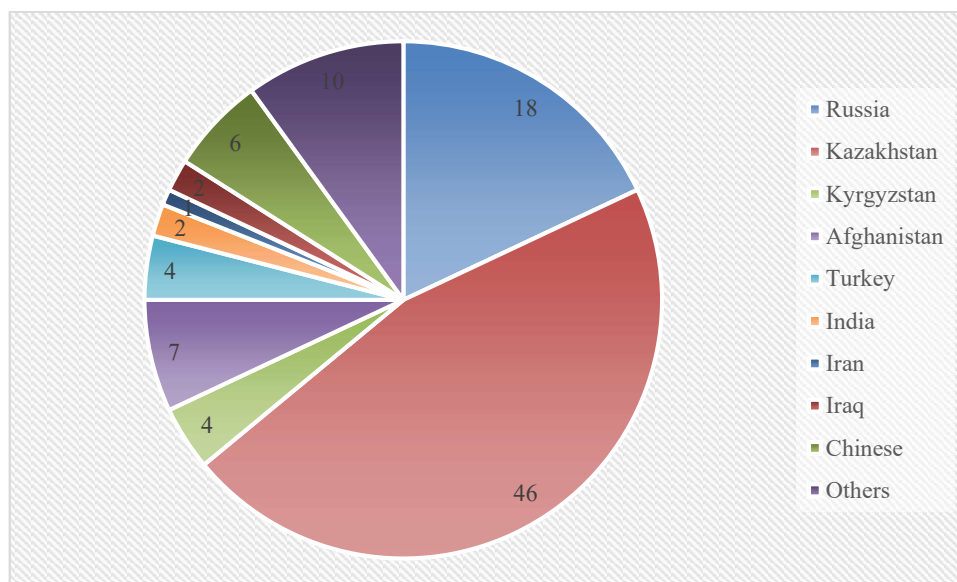


Figure 4. Export of Fruits and Vegetables in 2017 (in %)

The most common way to store fruits and vegetables is cold storage. The duration of storage is determined by a number of factors, ranging from the influence of soil and climatic conditions of cultivation of crops, varietal characteristics, rational use of fertilizers, agricultural technology, irrigation, protection against pests, diseases and weeds, timing and methods of harvesting, commodity processing and, of course, methods and storage conditions. All biochemical processes in fruits and vegetables depend on temperature. At high temperatures, there is an accelerated metabolism, loss of moisture, vitamins, organic substances.

In the transport of fruits and vegetables in local and international traffic in recent years, road transport has been actively involved. During the period of mass harvesting, the shipper uses the services of refrigerated vehicles for the export of fresh fruits and vegetables for export.

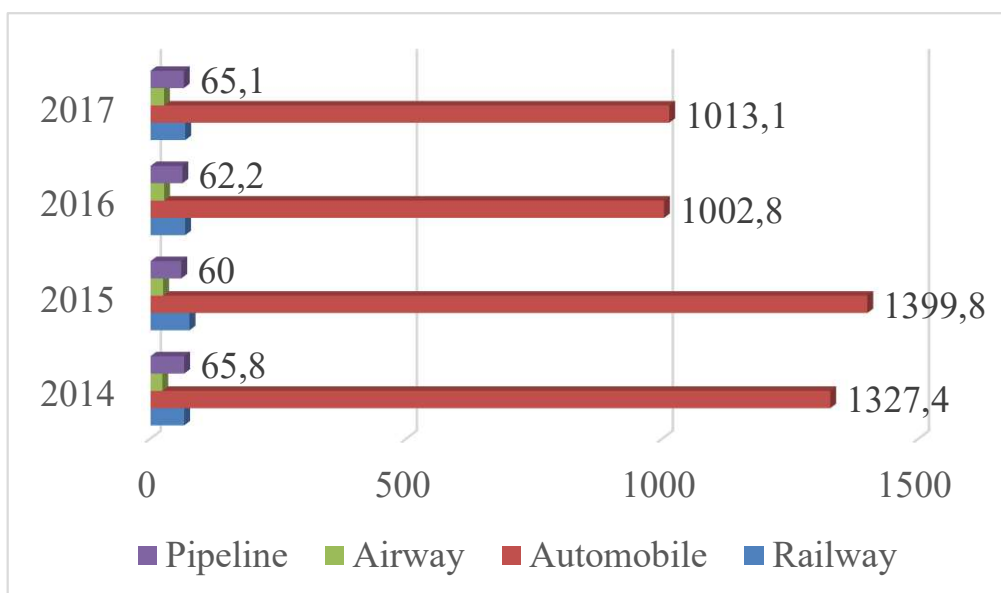


Figure 4. Dynamics of transported goods in 2017 (mln. tons.)

This is primarily due to the over-standard damage of goods during the transportation of fresh fruits and vegetables by road, a limited number of refrigerated fleets and the lack of special temporary storage facilities at the places where fruits and vegetables are prepared. All of these products by property belong to perishable goods, which must be kept in a special temperature regime not only during transportation, but also before and after it. The contravention in one of the links in the whole chain adversely affects the quality of the products delivered.

To solve the above problems, connecting farmers to a logistics refrigeration terminal will help reduce transportation costs and improve the quality of delivery of perishable goods. When choosing different options for bringing farmers closer to cooling terminals under the same conditions, it is necessary to pay attention to options that speed up the delivery of goods and ensure minimal transport costs.

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