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THE LEVEL AND STRUCTURE OF LOGISTICS COSTS IN GREAT AREA AGRICULTURAL ENTERPRISES

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ABSTRACT. An attempt of evaluation of level and structure of logistics costs in chosen great area agricultural enterprises was shown in the paper. The results of the research have shown, that great area agricultural enterprises have got high share costs of logistics both in total costs of production – 42.2%, and in selling value of products and services – 27.5%. Costs of physical flow of materials predominate in the structure of total logistics costs of great area agricultural enterprises – 86.5%.

Key words: logistics, agricultural enterprises, logistics costs

Introduction

Rural enterprises acting on free market, just as enterprises of other sectors, should search sources of competitive advantages on several fronts. To be distinguished in clients eyes on the background of competitors by diversification of their own offer can be one way of these advantages. Taking into account the a fact of food's overproduction, another way, which seems for rural enterprises more advisable, is permanent searching of capabilities of cost reduction of own activity, achieving higher profits at the same time. Input to sphere of enterprise management a concept of logistics is one of a manner of introducing to life another way of achieving competitive advantages. The main principles of the concept can be defined as follows: "Logistics is a process of strategic management of supply, relocation and storage of raw material, not finished production and final products, also information flows both in the enterprise and within its marketing channels, in order to, maximize both present and future profitability by cost effective realization of orders".

Taking into account the above-mentioned, the question of cost of logistics becomes the main key. The issue of logistics costs has a complex character both with reference to the process surface and to objective one in their forming aspect. Complexity in a pro-

cess surface means costs of whole flows of materials and information within the enterprise. In an objective surface, costs present a decrease of enterprise property in connection with preparation and realization of logistic process (Nowicka-Skowron 2000, Twaróg 2003). In spite of high importance of complex treatment of logistics costs, this problem does not find appropriate place both in economic literature and practical activity of enterprises. How important, the issue is can be observed in the fact, that in highly developed countries, average level of logistics costs is about 20-30% of whole enterprise's costs (Rzymyszkiewicz 1995). In Poland some attempts of identification of level and structure of logistics costs are undertaken, but they still do not have a systematic and complex research character (Blaik 2001). Application of traditional methods of book-keeping in enterprises is an important limitation of development of complex account of logistics costs. A present book-keeping does not get efficient information, because of lack of adjustment for explanation of modern logistics problems. Therefore, creation of a proper system of cost analysis, oriented on logistics, is one of the most important requirements of enterprise today.

Taking into account the above-mentioned considerations, an attempt of estimation of level and structure of logistics costs in chosen great area enterprises was undertaken in the research. This research should be treated as initial research, informing about a scale of the phenomenon, and giving methodical base of logistics cost estimation in such a kind of enterprises.

Material and methods

The initial research was conducted in four great area rural enterprises located in the Wielkopolska region in 2003. Taking into account organizational structure aspect, these enterprises consist of from 3 to 5 separate but strongly connected units-farms. The area of the analyzed enterprises fluctuated from 1067 ha of agricultural land to 3628 ha of agricultural land. These enterprises led typical agricultural production with a similar structure.

In scientific literature of logistics, taking into account complexity of the presented problems, can be found many definitions of logistics cost. Taking into account comprehensiveness of the problems above mentioned cost and specificity of analyzed enterprises, a definition of logistics costs suggested by Skowronek and Sarjusz-Wolski (1999) was used in the research. The authors define logistics costs as labour inputs, means and objects of work, financial expenses and also other negative results of extraordinary events caused by flow of material goods (raw material, materials, products, commodities) within the enterprise and between enterprises and inventory costs as well.

Logistics costs can be presented in different profiles. Basic structure profiles of logistics costs and connections between them were shown on Figure 1. Taking into account the aim of this analysis (estimation of level and structure of logistics costs also their connections with basic kinds of logistical processes in the enterprise), the calculation was made based on the profile of costs according to basic elements of logistics processes – physical flow of material, inventory and information processes. Calculation according to the above-mentioned profile of costs and taking specificity of rural great area enterprise into consideration was made as follow:

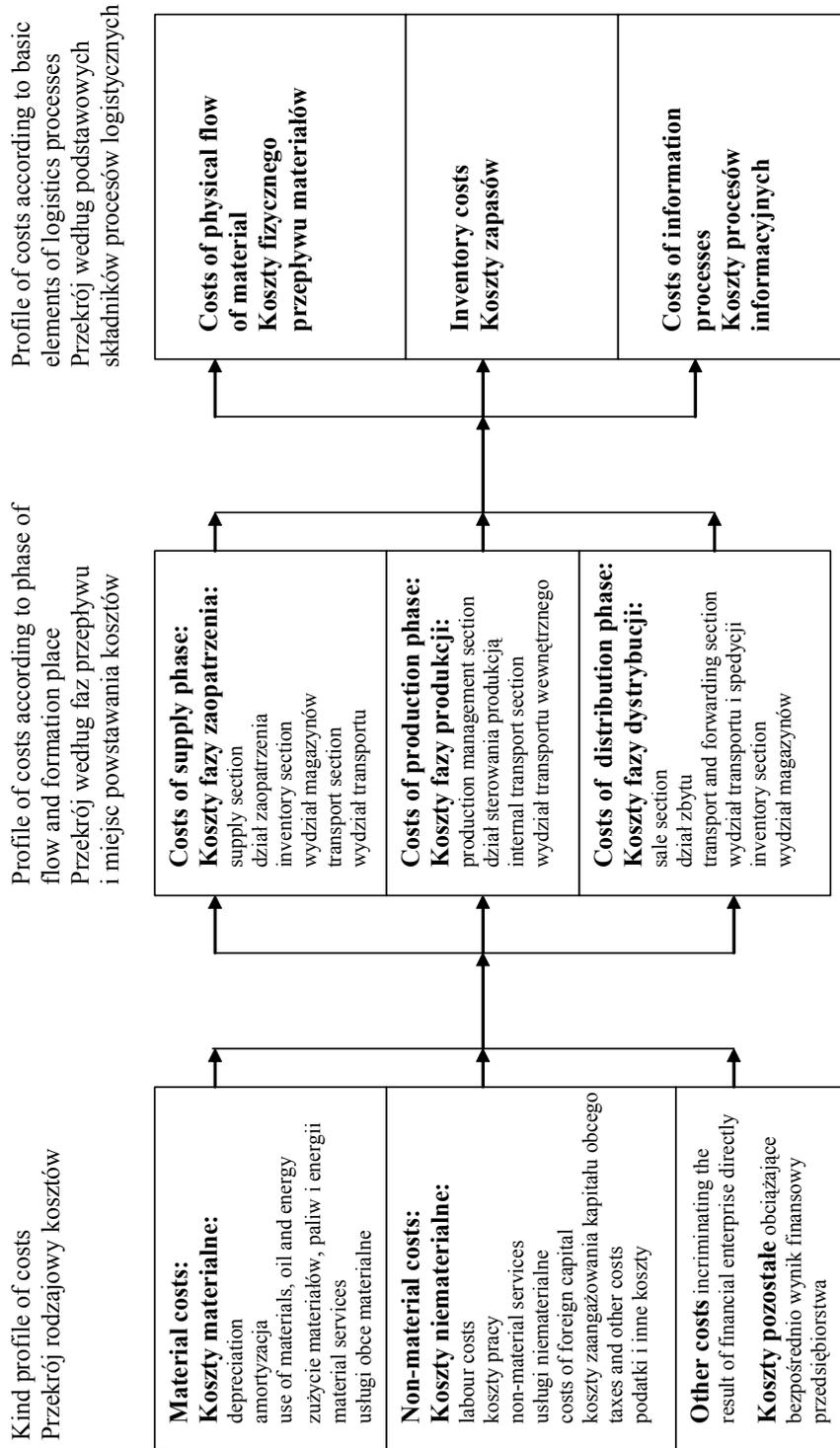


Fig. 1. Basic structure profiles of logistics costs and connections between them (Skowronek and Sarjusz-Wolski 1999)
Ryc. 1. Podstawowe przekroje strukturalne kosztów logistyki i ich powiązania (Skowronek i Sarjusz-Wolski 1999)

$$C_l = C_{pfm} + C_{inv} + C_{inf}$$

Particular groups of costs:

- a) costs of physical flow of material (C_{pfm}):
 - depreciation costs of property which is involved in logistical processes (C_d),
 - leasing costs (lease for square, garages, internal ways) (C_l),
 - labour costs (C_{lb}),
 - use costs of oil, materials and energy (C_{ome}),
 - costs of transport external services (C_{tes}),
 - other costs of flow (taxes and insurance of transport means, repairs and preservation of equipment) (C_{oth}),
- b) inventory costs (C_{inv}):
 - costs of inventory leasing (C_{invl}),
 - labour costs (C_l),
 - costs of stock losses (losses during evaporation, going stale of stock, diseases, pests) (C_{sl}),
 - other costs (insurance, energy, cost of inventory capital) (C_o),
- c) costs of information processes (C_{inf}):
 - labour costs (also material and energy costs) (C_l),
 - depreciation of information equipment (C_d),
 - costs of telecommunication services (C_{ts}).

Results

The level of logistics costs can be characterized by some economic categories describing activity of enterprise, for example in relation to total costs of activity or to selling and services value. The results of the research, conducted in chosen rural great area enterprises, showed high share of logistics costs in total costs in comparison to non-agricultural enterprises. The index of share was 42.2% whereas in non-agricultural enterprises fluctuates from 20% for 30% (Table 1). Similar relation is observed in comparison analysis of index showing share of logistics costs in relation to selling and services value. In the researched enterprises, the average level of this index amounted to 27.5%, whereas in some other kind of enterprises, as show research carried in high developing countries, this index amount to merely, from 5.8% for 12.1% – (**Blaik** 2001, **Christopher** 2000, **Skowronek** and **Sarjusz-Wolski** 1999). However, we must consider this comparison very carefully, in view of two aspects at least. Firstly, existing differences in specificity of particular sectors and kind of enterprises – the research in western countries was led in non-agricultural enterprises. And secondly, we should take into consideration the fact that in western countries accustoming of logistics principles and making of logistics cost analysis already started in 60's of the century. These research showed, that level of the index amounted to 21.8% (**Pfohl** 1998) – and it led to successive fall in the participation of this cost.

The carried out analysis allowed to indicate logistics cost indexes (PLN/ha of agricultural land) of particular logistics activities in rural great area enterprises. From the data presented in Table 1 follows, that general level of logistics cost index for this kind of enterprise amounted to 1470.4 PLN per 1 ha of agricultural land. But over 86% of this

Table 1

Level and structure of logistics costs in great area agricultural enterprises according to basic elements of logistics processes
Poziom i struktura kosztów logistyki w wielkoobszarowych przedsiębiorstwach rolnych według podstawowych składników tych kosztów

Specification Wyszczególnienie	Level of logistics costs (PLN/ha AL) Wysokość kosztów logistycznych (PLN/ha UR)	Structure of logistics costs Struktura kosztów logistycznych (%)	Share of logistics costs in total costs Udział kosztów logistycznych w kosztach całkowitych (%)
1	2	3	4
Costs of physical flow of materials Koszty fizycznego przepływu materiałów	1 272.3	86.5	36.5
Depreciation Amortyzacja majątku trwałego	112.2	7.6	3.2
Leasing Czynsz dzierżawny	20.4	1.4	0.6
Labour costs Koszty pracy	366.3	24.9	10.5
Use costs of oil, materials and energy Koszty zużycia paliw, materiałów i energii	640.6	43.6	18.4
Costs of transport services Koszty usług zewnętrznych transportowych	34.4	2.3	1.0
Other costs of flow Inne koszty przepływu	98.4	6.7	2.8
Inventory costs Koszty zapasów	178.7	12.2	5.1
Costs of inventory leasing Dzierżawa magazynów	67.5	4.6	1.9
Costs of inventory workers Koszty pracy magazynierów	28.4	1.9	0.8
Costs of stock losses Koszty ubytków zapasów	31.9	2.2	0.9
Other costs (insurance) Inne koszty (ubezpieczenie magazynów)	50.9	3.5	1.5

Table 1 – cont.

1	2	3	4
Costs of information processes Koszty procesów informacyjnych	19.4	1.3	0.6
Depreciation Amortyzacja sprzętu	2.5	0.2	0.1
Labour costs Koszty pracy	13.8	0.9	0.4
Costs of telecommunication services Usługi telekomunikacyjne	3.1	0.2	0.1
Total logistics costs Koszty logistyczne razem	1 470.4	100.0	42.2
Other costs in enterprise Pozostałe koszty w przedsiębiorstwie	2 005.4		57.8
Total costs Koszty całkowite ogółem	3 475.8		100.0
Selling value of products and services Wartość sprzedaży wyrobów i usług	5 348.7		100.0
Share of logistics costs in selling value of products and services Udział kosztów logistyki w wartości sprzedaży wyrobów i usług	1 470.4		27.5

level is connected with cost of physical flow of materials – 1272.3 PLN per 1 ha of agricultural land. If we analyze this complex of logistic operation in detail we notice, that highest costs are related with expenditure of fuel, materials and energy – 43% and cost of labour – near 25%.

Whereas the inventory cost index has been formed at the level of 178.7 PLN per 1 ha of agricultural land. In this group of logistic costs, the highest participation is related with leasing of storehouses – nearly 38%. Research showed, that information flow in analyzed enterprises, generated merely 1.3% of general logistics costs. It gave 19.4 PLN per 1 ha of agricultural land index. Cost of labour turned out a predominating cost in this group – 13.8 PLN per 1 ha of agricultural land.

Based on the carried comparative analysis concerning participation of basic elements of logistics costs (Table 2), important differences within the elements mentioned above between the researched agricultural enterprises and non-agricultural enterprises are ascertained.

Table 2
Share of basic elements of logistics costs in total logistics costs of the investigated enterprises in comparison with enterprises of other sectors (Skowronek and Sarjusz-Wolski 1999, completed)

Udział podstawowych składników kosztów logistyki w całkowitych kosztach logistyki w badanych przedsiębiorstwach na tle przedsiębiorstw innych branż (Skowronek i Sarjusz-Wolski 1999, uzupełnione)

Element of logistics costs Składnik kosztów logistyki	Investigated enterprises Badane przedsiębiorstwa	Enterprises of other sectors Przedsiębiorstwa innych branż
Costs of physical flow of materials Koszty fizycznego przepływu materiałów	86.5	40-50
Inventory costs Koszty zapasów	12.2	30-40
Costs of information processes Koszty procesów informacyjnych	1.3	15-20

Cost of physical flow of materials in the researched rural great area enterprises is the highest cost in total logistics costs – 86.5%. This index is near about 50% higher than in non-agricultural enterprises. This could be explained by two facts. First, there is the specificity of agricultural production and the second one is organizational structure of the investigated enterprises (each of them consists of 3 to 5 units and distance between them is sometimes around several kilometers). Taking into account the facts mentioned above, almost 90% of these costs are connected with internal transport and transport between particular units. There are some specific features of transport in agricultural production:

- expansive character of agricultural production,
- seasonal character of agricultural production,
- diversity of transported loads,
- requirement to have many miscellaneous transport means,
- global transported mass (from the point of view both of transported tones and multiple of move) is very large,
- one-way of agricultural transport,
- short distance transportation on bad quality roads (mostly dirt roads).

From the results of the earliest research follows that, taking into account direction of production and level of intensity, from 20 for 80 t on each hectare of agricultural land are transported (Wajszyk 1994, Wielicki 1983). Therefore, already in 1913 Albrecht Thaer formulated a known affirmation, that "...agricultural enterprise is a transport enterprise in spite of will" (Wolszczan 1988).

However, in external transport of the analyzed enterprises, in last years are observed changes gradually making way in structure of inputs. Recently, more of these inputs, cooperating firms take over from agricultural enterprises (both suppliers of means and receivers of products) – phenomenon outsourcing.

From the analysis of the second element – inventory cost – it was noticed, that its participation in logistics costs of agricultural enterprises is around 3.5 times smaller in comparison with non-agricultural enterprises. It can be a result of several circumstances. Firstly, in the researched enterprises, majority of fabricated agricultural products can be

characterized as raw materials for farthest processing and short period of freshness. Secondly, the enterprises want to get back their engaged capital very quickly in order to start the next productive cycle again, so most of agricultural enterprises sell their products immediately. Based on this fact, it is possible to put hypothesis saying about it, that enterprise which is located in the supply chain “near the final receiver”, has higher inventory costs because it must keep certain level of stock for assurance of liquid service of clients. The analyzed enterprises are placed at the beginning of such a supply chain. Thirdly, currently, contrary to the past years, the agricultural enterprises do purchasing of production means just before their use for production. In this way the enterprise is limiting costs of the engaged capital to minimum. This fact has caused, that in analyzed enterprises some store surface was not used fully. Such a situation is also a result of rules of past economic system. Before 1990, the agricultural enterprises because of general lack of production means, had to buy very early and consequently store them for a long time. So, it considerably increased the storage cost.

In agricultural enterprises costs of information processes present the lowest participation in total costs of logistics – 1.3%, whereas in non-agricultural enterprises this index is higher on the average 13-times. As the research shared, such a big disparity between the compared enterprises is practically a result of lack of information investment (both software and hardware type). Still today, the basic means of information transfer is phone and fax. Like in case of non-agricultural enterprises, it can be assumed, that during developing contacts with market and increase of competition, the level of this cost will grow.

Conclusions

1. There is a high share of logistics costs in total costs of production in agricultural enterprises in comparison with non-agricultural enterprises. The index was about 42% in case of relation to total costs and around 28% in relation to selling and services value.

2. Carried analysis has allowed estimating levels of logistics costs indexes both in total aspect and for particular elements of logistics costs. General level of logistics cost index for agricultural great area enterprises has amounted to 1470.4 PLN/ha of AL. The structure of this index as follows: 1272.3 PLN/ha of AL was related with physical flows of materials, 178.7 PLN/ha of AL was related with inventory costs, and finally 19.4 PLN/ha of AL has been generated by information processes.

3. Specificity of agricultural production causes, that in rural enterprises costs of physical flows of materials predominate in total logistics costs – 86.5%. Costs of inventory but especially costs of information processes present insignificant participation in total logistics costs.

4. High participation of labour costs it must be noted – around 28% in total logistics costs. First of all, these costs are related to onerous transport work like loading and unloading.

5. Carried analysis shows, that logistical processes exert a wide-ranging and important influence on business of agricultural enterprises. Based on experiences of high developing countries in putting into practice principles of logistics and visible effects from these operations, we see the necessity of complex approach to the issue and based on this, way of looking for manners of reduction of logistics cost.

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**WYSOKOŚĆ I STRUKTURA KOSZTÓW LOGISTYKI
W WIELKOBSZAROWYCH PRZEDSIĘBIORSTWACH ROLNYCH****S t r e s z c z e n i e**

W pracy podjęto próbę oszacowania wysokości i struktury kosztów logistycznych w wybranych wielkoobszarowych przedsiębiorstwach rolnych. Wyniki badań wykazały, iż przedsiębiorstwa rolne cechuje duży udział kosztów logistyki zarówno w stosunku do całkowitych kosztów produkcji – 42,2%, jak i w stosunku do wartości sprzedaży wyrobów i usług – 27,5%. W strukturze kosztów logistyki przedsiębiorstw rolnych zdecydowanie dominują koszty fizycznego przepływu materiałów – 86,5%.