LOGISTIC PARTNERSHIP IN THE FOOD SUPPLY CHAINS MANAGEMENT IN THE CONTEXT OF INTERNATIONAL EXPANSION

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ABSTRACT

The purpose of this paper is the literature review about food supply chain management and research analyze of a logistic partnership choice within food industry enterprises in the aspect international markets expansion. Based on the reviewed literature, the most important aspects of cooperation between the various links of the food supply chain and the factors determining the level of this cooperation were identified. An important issue was also discussed, which is measuring and assessing the integration of the food supply chain. Based on our own survey analysis, using the correlation of r-Pearson and linear regression analysis, the relationship between the choices of individual logistic partnership in the aspect international expansion was indicated. The food industry is one of the largest and most complex production sectors in the world economy. By the same this sector also contributes to the phenomenon of food waste. Previous studies show that two-thirds of the wasted food is occurred in supply chain and connected mainly with harvesting, shipping and storage. Therefore, taking into account the trend of sustainable development, the subject of food supply chain management and the effective cooperation to reduce waste in this chain is very important. The research is important not only from the economic, but also from the social point of view, because it gives the attention to the issue of cooperation that is important in

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the context of food waste reduction. The conducted research is a starting point for further analyses regarding the optimization of the dependents identified in the practical part the selection of logistic partners.

Keywords: food supply chain management, integrity of food supply chains, cooperation of food supply chains, measuring supply chain integration, international markets expansion.

1. INTRODUCTION

The most important role of food industry is providing all basic and necessary goods that support various human activities and behaviors. The food industry is one of the largest and most complex production sectors in the world economy (Badia-Melis, Mishra, & Ruiz-García, 2015). It covers the entirety of material production processes related directly and indirectly to the production and distribution of food (Antic & Bogetic, 2015). Once harvested or produced, the food should be stored, delivered, and retailed so that they could reach to the final customers by due date. It was reported that about one-third of the produced food has been abandoned or wasted yearly (Chadderton et al, 2017). Two-third of the wasted food is occurred in supply chain like harvesting, shipping and storage (La Scalia et al, 2017). Meat, bakery products or fruit and vegetables, such perishable food is wasted by millions tons worldwide every year due to the inefficient and ineffective food supply chain management (FSCM) (Balaji & Arshinder, 2016). Therefore, FSCM is significant to save the food (Kirezieva et al, 2013).

That is why the subject of food supply chains and its management are so important. Three major trends are identified in this area, such as globalization, consolidation across many food categories at all levels of the FSC, and commodization where food products are traded as undifferentiated commodities, traded in large quantities, and sourced from global locations, in order to achieve cost minimization (Friel & Barosh, Lawrence, 2014; Genovese et al, 2017). These factors are leading towards a FSC based on extensive global sourcing, thus complicating supply chain management (Kamalahmadi & Parast, 2016), due to an increasing numbers of subjects involved; this can increase the cooperation problem, as well as coordination as its effect, in supply chain (Pang et al, 2015).

Paper consists of two main parts. The first part concerns the review of literature and constitutes a theoretical study of the article. The considerations relate to the general idea of food supply chains. The second part of the article refers to practical research based on surveys in the field of cooperation of food supply chain links. In this part is presented the structure of the research sample and its characteristics. Based on the r-Pearson correlation and linear regression analysis, dependencies were identified in the selection of individual logistic partners while supporting expansion into foreign markets. The literature and practical research undertaken was concluded with a summary and conclusions..

2. FOOD SUPPLY CHAIN GENERAL IDEA

Food supply chains and their management differ from the traditional overview and approach to these elements of logistics science. The differences of FSCM from other supply chains and supply chain management are the importance reflected by factors like food quality, safety, and freshness within limited time (Zhou, Kai, & Liang, 2015), which make the underlying supply chain more complex and difficult to manage (La Scalia et al, 2016; Bansal & Gruère, 2012; Dabbene, Gay, & Tortia, 2016). The food supply chain represents a network of organizations that are involved, through links up and down the chain, into various processes and activities that create value in the form of food products for the final customer (Zhong, Yang, & Chen, 2015). The

Institute of Logistics broadly describes the food supply chain as a sequence of events made to meet the consumer's needs in the area of food products (Aramyan et al, 2013). FSC is the flow of food materials and goods and information about them (including cash flow) within and between organizations, bound by a number of tangible and intangible mediators, including relations, processes, activities and integrated information systems (Gunasekaran, Subramanian, & Rahman, 2015; Guo et al, 2015).

Depending on the configuration of the food chain, its cells may be various mining, processing and commercial companies (Genovese et al, 2017). Their place taken along the food supply chain results from the division of labor at subsequent stages of production and sale of food products (Louw, Troskie, & Geyser, 2013). The food supply chain can therefore be described by indicating its features such as: (1) subjective structure, (2) the object of flow, (3) objectives, functional scope and areas of cooperation of participating entities (Bezuidenhout, Bodhanya, & Brenchley, 2012). Thus, the food supply chain is made up of agricultural producers, intermediary (trade) companies, processing, production and service enterprises (Hu et al, 2013) and their clients (Lan et al, 2016), among whom flows streams of agri-food products, information and financial resources (Ahearn, Armbruster, & Young, 2016).

3. THE STRUCTURE OF FOOD SUPPLY CHAIN

The food supply chain connects three important sectors of the economy, i.e. agriculture, food processing and distribution, which have a significant impact on the level of economic well-being, the social and environmental situation of citizens (Banasik et al, 2017). Various activities are carried out in the supply chain that make up economic processes (Shukla, & Jharkharia, 2013). The food supply chain is characterized by a large diversity of entities included in its composition. It includes producers, suppliers, transport companies, warehouses, wholesalers and retailers, service organizations and consumers (MacCarthy et al, 2016; Meneghetti, & Monti, 2015). They constitute a network of organizations involved, through links with suppliers and recipients, in various processes and activities that create value in the form of food products and services provided to final consumers (Hou, Grazia, & Malorgio, 2015).

In the structure of the food chain, different types of entities can be distinguished, i.e.(Gómez, & Ricketts, 2013): agricultural units, food industry, wholesale and retail trade in food. Flows in the food supply chains include various intermediary links (Fig. 1).

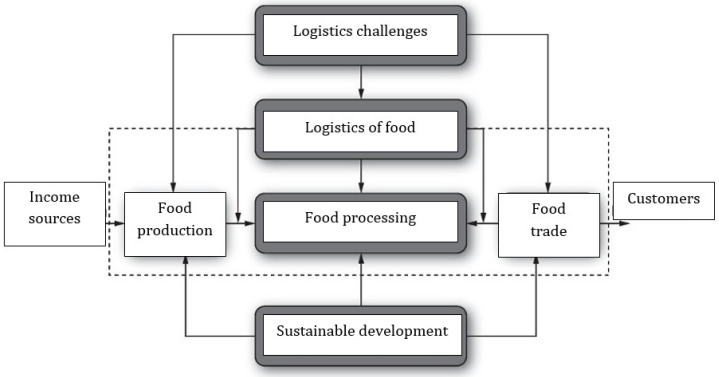

Figure 1. The structure of food supply chain – units and flows
Source: Own elaboration based on (Chopra, & Meindl, 2007; Suryaningrat, 2016)

The task of food supply chain management is to coordinate flows in designated links, assuming principles characteristic of traditionally understood supply chain management (Chen, Zhang, & Delaurentis, 2014). In the literature it is possible to find differentiated systematics. For example, agricultural producers, purchase of agricultural products, enterprises of the food industry, secondary wholesale, retail, final buyers and supporting institutions are included (Agustina, Lee, & Piplani, 2014). The general classification indicates different levels and degrees of organization sophistication, resulting in the isolation of four types of cases (Wu et al, 2016; Cai, & Ma, 2015):

- inactive entities - simple measures are used to assess the effectiveness of the system,
- reactive entities - they use productivity measures,
- proactive entities - they also use technical indicators,
- integrated measurement system - complete information pertains to production, storage, transport and distribution system, which allows full communication in the supply chain.

4. INTEGRITY OF FOOD SUPPLY CHAINS

A phenomenon that also significantly affects the processes of flows and configuration of infrastructure is the globalization of the food economy, which causes various consequences for the supply network (Akhtar et al, 2016; Dubey et al, 2017). Globalization accelerates the processes of integration of the food chain links because (Marucheck et al, 2011; Fountas et al, 2015; Faisal, Talib, 2016; Tsolakis et al, 2014):

- a declining number of entities in all links of the food chain speeds up the flow of information and good;
- certification and standardization of food products requires the identification of producers co-operators also from other parts of the food chain;
- increasing competition between food producers forces to minimize costs through effective organization of processes and relations between the company and suppliers in order to simplify and eliminate all types of activities affecting the increase of costs, without changing the value of the product.

An important issue is also measuring and assessing the integration of the food supply chain, which directly translate into the measures used in a given situation (Hasuike, Kashima, & Matsumoto, 2014). Depending on the degree of integration of the supply network, the degree of advancement and organizational connections is different, which makes it necessary to look for other types of indicators and measures to assess its functioning (Jraisat, & Sawalha, 2013). Analysis in the area of assessing the correctness of cooperation between partners in the network also requires the adoption of a perspective from which the indicators and indicators are evaluated (Kilger, Reuter, & Stadtler, 2015; Papathanasiou, & Kenward, 2014). Four types of perspectives can be indicated: financial perspective, customer perspective (market), process perspective and development perspective, i.e. resources (Manning et al, 2016). In each of them, other components of the supply chain operation will have a priority.

The simplest way is to notice that each indicator can be measured for: any process, subprocess, step or state in the process (Wang et al, 2015) It is impossible to indicate a simple solution, serving all components, because it is determined by the purpose of the research. It is also impossible to maximize all indicators, according to the classic trade-off that occurs in logistics management, which also translates into food supply chains management (Eriksson et al, 2016; Kannan et al, 2017). Generally, everything is based on five main measures that depend on each other. The increase of one always causes the decrease of the other, assuming that the others have not changed (Tzamalis, Panagiotakos, & Drosinos, 2016): (1) reliability, (2) responsiveness, (3)

flexibility, (4) cost, (5) asset utilization. It is impossible to achieve a state in which all the ingredients are maximized (Jacxsens et al, 2011) It is necessary to define processes, people responsible for various decisions taken in individual steps, determination of measures, groups of recipients (Savino, Manzini, & Mazza, 2015; Thomopoulos, Croitoru, & Tamani, 2015). Then it becomes possible to optimize processes within the supply chain management.

5. RESEARCH APPROACH

Every year, 1.3 billion tons of food is wasted in the world, or about 1/3 of the globally produced volume (European Commission, 2016). In Europe, there is an annual waste of 100 million tons of food products. In this respect, Poland ranks 5th in the European Union, wasting around 9 million tons of food annually (Bank of Food). Poland is one of the leading food producers in the European Union. The share of the Polish food industry in the European Union is 9%, which translates into the sixth place in the EU market (Food Portal).

Due to the exposure to competition from other Member States for Polish units of the food sector, cooperation in the supply chain may prove to be an important area of development. It is understood as a systematic coordination of the movement and storage of goods as well as related information (Akhtar, & Khan, 2015). It should also be noted that there are still competitive relations between the links down and up the supply chain in Poland rather than cooperative behavior (Aggarwal, & Srivastava, 2016).

5.1 Research methodology

The research was made within the realization of BS project framework (details in acknowledgements) in January of 2018 year in the form of questionnaire. This research questionnaire had 19 questions and was divided into 3 sections: main section, information about the strategy of entering food producers and sellers into foreign markets and information about the characteristics of the food supply chain in the units under study. The study concerned the assessment of the entry strategies of food producers and sellers on foreign markets and the characteristics of the supply chain. The aim of the study was to determine the relationship between the parameters of business operations in the food supply chain and the selection of entities with which the surveyed companies established cooperation to operate on the foreign market. The survey was addressed to Polish manufacturing and/or trading companies in sector of food industry. The wide range and complexity of the food industry was determined by the selection of a research sample, among which only those entities that were active in the area of the Polish Classification of Activities (PKD) 10, i.e. production and / or trading of foodstuffs, more precisely:

1. PKD 10.1 - processing and preserving of meat and production of meat products;
2. PKD 10.3 - processing and preserving of fruits and vegetables;
3. PKD 10.7 - production of bakery and farinaceous products.

According to CSO data, these areas constitute the largest share in the Polish food market, therefore it is assumed that enterprises from these areas of activity constitute a sample representative for the whole population of food products. At the same time, it was assumed that establishing cooperation with foreign partners can be credibly evaluated only if the share of foreign capital in the company does not exceed 51%.

The sample size was N = 250 entities. The structure of the research sample due to the area of activity according to the PKD and due to the level of persons employed and / or the annual turnover is presented in the Fig. 2.

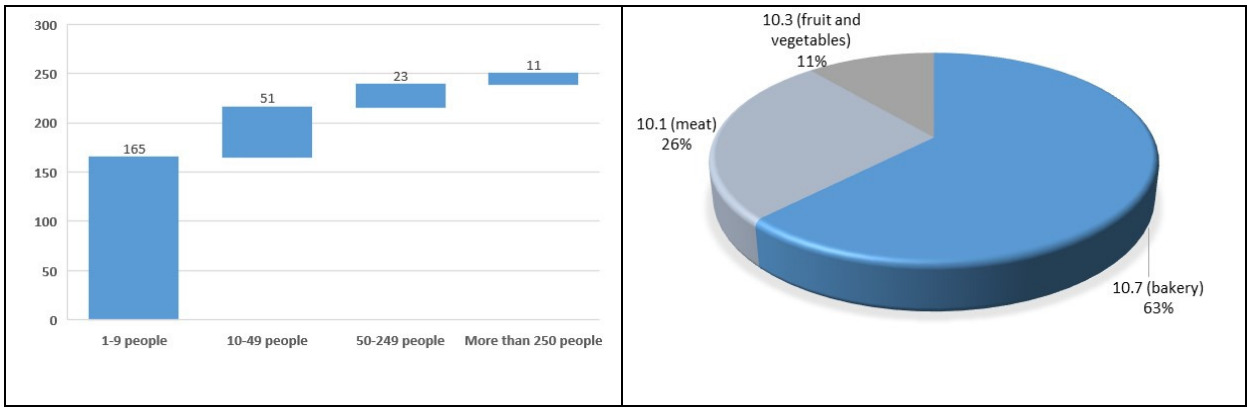

Figure 2. Structure of research sample due to the size and area of activity of the surveyed entities

Among the surveyed enterprises, a significant part of them (66%) are micro-enterprises employing up to 9 people. Every fifth enterprise surveyed employed between 10 and 49 people (20%). Other entities employing more than 50 people constituted the smallest share in the sample (13%). At the same time, the most frequently surveyed entities carry out activities with the number PKD 10.7, these are bakeries (63% of the sample). Every fourth company surveyed performs tasks in the processing and preservation and production of meat (26%). The rest of the research is occupied by companies from the area of fruit and vegetable production and processing.

Subsequently, the companies were asked about the type of business and the time it operated on the market. The structure of responses is shown in the contingency table (Tab. 1).

Table 1. Table of contingency for the type and time of operation on the market of the surveyed companies

		Time of operation on the market					Total
		Less than 4 years or equal	5-8 years	9-12 years	13-16 years	More than 16 years	
Activity kind	Production	2	5	1	7	12	27
	Trade	7	9	13	9	21	59
	Production and trade	8	8	10	5	25	56
	Services	28	23	12	13	32	108
Total		45	45	36	34	90	250

The majority of the surveyed sample were entities that performed service functions (43% of the total), and trade companies (24%) as well as trade and production (22%) had a significant share. Considering the length of activity on the market, the oldest companies with a market period of over 16 years dominated (36%). The share of other companies was almost evenly distributed (18% and 16%).

6. ACTIVITY OF FSC COMPANIES ON INTERNATIONAL MARKET - RESEARCH RESULTS

The key question regarding the implementation of research focused on the scale of operations of the surveyed enterprises that had a choice of local, regional, national and foreign

markets (Fig. 3). All surveyed enterprises carry out activities on a foreign scale. The countries of the European Union, mainly the Netherlands, Lithuania and Germany, were generally referred to as partner countries.

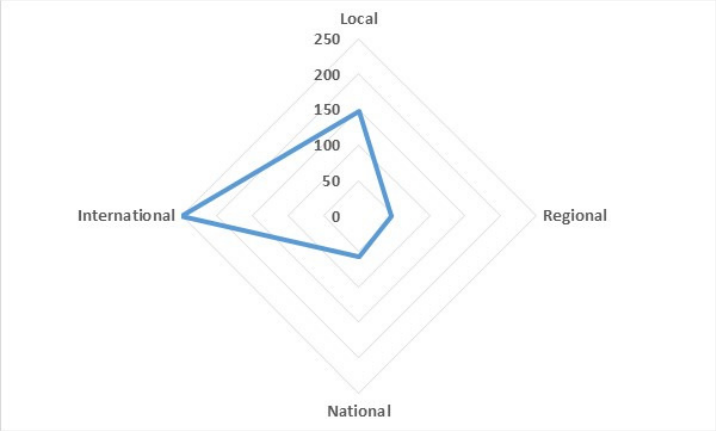

Figure 3. The scale of activity of the surveyed entities

Entities that conducted business activities abroad were to indicate the time of conducting business abroad and the country in which they operate. The results are presented in the table 2. The most frequently researched companies conduct foreign operations from 3 to 4 years (48%). A considerable share is also occupied by those that are on the market for 5 to 8 years (26%). Generally, it is observed that with the increase in the number of years, the number of companies that have been operating abroad for long is decreasing.

Table 2. Structure of the length of activity on the foreign market

Length of activity	Level of observation
1- 2 years	0
3-4 years	120
5-8 years	65
9-12 years	52
13-16 years	5
More than 16 years	8
Total	250

The implementation of the research objective required identification with which entities the company established cooperation to operate on the foreign market. The structure of responses is shown in the figure 4. Each of the surveyed entities established cooperation with government institutions to be able to carry out their activities abroad. Over half of them also use the services of suppliers (24% of all indications) or a foreign distributor (10% of all indications). Relations with other partners are at a minimum level of 3% on average.

Figure 4. The structure of partner selection for the purpose of functioning on the foreign market

6.1. Relationships between food supply chain partners

An analysis of the correlation between the choice of the type of foreign partners to cooperate abroad and the scale, showed few statistically significant correlations for $p < 0.05$. The value of $r < 0.2$ indicates a lack of connection between the size of the company, the type of industry, the way and time of doing business and the scale of the company's operation and the strategy of selecting partners for cooperation on the foreign market. During the analysis of the pair's correlation, numerous correlations were identified between particular indications of the question about the type of foreign partners.

In order to check whether the partners' choices are mutually determined, linear correlations between particular pairs of dependent variables were determined. Its results are presented in Table 3. Due to the fact that values for state institutions were identical and assumed a constant value of 1, they were excluded from the study of dependencies. Data for the study are qualitative. Therefore, the non-parametric chi-square test and the r-Pearson index for the strength of the relationship were used to study the relationship. Based on the obtained results, significant pairs of variables are identified at the level of $p < 0.001$ (8 pairs of variables) and at the level of $p < 0.05$ (5 pairs of variables). According to J. Cohen (Lawner, Weinberg, & Knapp, 2008) r-Pearson values from -0.3 to 0.3 indicate a lack or weak correlation between the variables studied. Therefore, only two pairs of variables can be considered significant.

The first one for $r = -0.469$ and $p < 0.001$ means a moderate correlation, which means that the supplier selection process usually accompanies the selection of a foreign distributor. The negative value of the ratio r - Persona indicates the proportional nature of the relationship: the entrepreneur deciding on the selection of the supplier at the same time most often resigns from the cooperation of a foreign distributor and vice versa. The second pair of variables for $r = -0.329$ and $p < 0.001$ means a moderate correlation, which means that the process of selecting foreign clients is usually accompanied by the selection of a foreign agent. Positive value of the r - Persona index indicates the direct proportional coexistence of both partners: an entrepreneur cooperating with a foreign client at the same time usually also works with a foreign agent and vice versa.

In order to deepen the analysis, linear regression analysis was used, which allowed to determine the level of explanation of the variance of two pairs of dependent variables. Table 4 specifies the analysis of variance between individual pairs of variables.

Table 3. Correlation table. Significance of two-sided for pairs of variables regarding the selection of a partner to carry out activities abroad

	Supplier	Foreign distributor	Logistics and/or distribution	Competitors	Industry organizations	Financial institutions	Foreign agent	Foreign customers	Intermediary	Exporters group
Supplier	1	-.469**	-.153*	-.265**	-.008	-.271**	-.085	-.194**	.126*	-.156*
Foreign distributor	**-.469****	1	-.067	-.054	-.037	-.094	.036	.171**	-.031	-.071
Logistics and/or distribution centres	-.153*	-.067	1	.100	-.092	-.037	-.064	-.042	.024	.129*
Competitors	-.265**	-.054	.100	1	-.023	-.107	.188**	.070	-.018	-.046
Industry organizations	-.008	-.037	-.092	-.023	1	-.066	.087	-.068	-.083	-.029
Financial institutions	-.271**	-.094	-.037	-.107	-.066	1	-.046	-.089	-.064	.197**
Foreign agent	-.085	.036	-.064	.188**	.087	-.046	1	.329**	.183**	-.020
Foreign customers	-.194**	.171**	-.042	.070	-.068	-.089	**.329****	1	.199**	-.039
Intermediary	.126*	-.031	.024	-.018	-.083	-.064	.183**	.199**	1	-.047
Exporters group	.013	.264	.041	.467	.652	.002	.753	.543	.459	1

**Statistically significant values on the level of 0.01
* Statistically significant values on the level of 0.05

Table 4. Analysis of variance for significant variable pairs

Models of variable pairs	Regression coefficients	Sum of squares	df	Average square	F	Significance
The model of customer and foreign agent selection	Regression Rest Total	.635 5.221 5.856	1 248 249	.635 .021	30.183	.000
The model of supplier and foreign distributor selection		13.208 46.792 60.000	1 248 249	13.208 .189	70.003	.000

In each case examined, the result of the analysis of variance is significant because F (1, 248) = 30.183 for p <0.01 and F (1.248) = 70.003 for p <0.01. This means that given regression models better than average allow predicting the results of given variables. For R = 0.469 and adjusted R-squared = 0.217, the variable "foreign distributor" explains 20% of the variance of the variable "supplier". In turn, for R = 0.329 and adjusted R-squared = 0.108, the variable "foreign clients" explains only in 10% the variable "foreign agent". Ultimately, only the first pair of variables can be considered as important when developing a strategy to look for a foreign partner in the supply chain. The value of the directional coefficient B = - 0.541 means that with the cooperation with a foreign distributor established, the opportunity to establish cooperation with the supplier decreases. While preparing the strategy of selecting partners for operations on the foreign

market, the surveyed enterprises usually choose foreign suppliers or distributors for cooperation. The conducted statistical testing proved that the choices of these partners are mutually exclusive in most cases.

7. DISCUSSION AND CONCLUSIONS

Food supply chains are an economic category with a complex structure and relationships. This is due to the fact that they are one of the largest subsystems of the economy, as indicated by the volume of the product being created, as well as the potential involved in the production and distribution of products derived from agricultural raw materials. The industry structure of the food industry is very complex and includes both production of means for production in agriculture and agro-food processing, as well as agriculture and industries dealing with primary and secondary processing.

The growing requirements in terms of food quality, traceability and proper organization of the distribution of agro-food products necessitate the use of comprehensive and modern logistics solutions in agribusiness enterprises. This is particularly true when companies with their operations go beyond local markets and also expand into foreign markets. The confrontation with other entities that constitute competition forces enterprises to look for market allies that form the links of a common supply chain.

Cooperation with entities participating in the supply chain requires building long-term, trust-based partner relationships, which is a prerequisite for the implementation of an appropriate strategy and, consequently, leads to the growth of the company and its competitive advantage. This is due to the fact that certain assumptions about the sources of obtaining a competitive advantage for specific sectors (i.e.: price, quality, variety of products offered) are similar. Therefore, one of the key factors shaping a competitive advantage is the ability to interact with entities operating on the market, focus on key competences (core competence) and develop all forms of relationships. Taking this into account, it should be stated that the basis for achieving competitive ability is to enter into numerous interactions with other entities and to shape logistic functions and processes in integrated supply chains.

Cooperating, partners try to establish good relationships voluntarily and refrain from opportunistic behavior at the expense of others. The basis of this concept is mutual trust and the implementation of the win-win strategy, which in turn leads to the creation of a logistics partnership. The interaction between the environment and the organization means that the organization's effectiveness is conditioned by the efficiency of its logistic chain, including, above all, the mutual, partner dependencies between all links in the chain. It should be understood that it consists in shaping significant and long-term cooperation between the participants of the food supply chain on the basis of trust, risk-sharing and benefits, leading to additional synergy effects and competitive advantage.

The presented research proofs the source of mutual cooperation. The conducted analyses indicated that enterprises from the food sector that chose to expand internationally usually choose foreign suppliers or distributors who will support the effective flow of their goods. What's more, they rarely decide to use the services of both partners at the same time, which suggests that the choice of supplier and foreign distributor may be mutually exclusive or such cooperation is simply not necessary in the food supply chain.

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