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SELECTION OF THE SUPPLIER OF PRODUCTION MEANS AS A RISK ELEMENT IN FARM LOGISTICS

Krzysztof Pakuła^{1*}, Krystyna Pieniak-Lendzion², Marcin Becher³, Beata Kuziemska⁴

^{1,3,4} Siedlce University of Natural Sciences and Humanities, Faculty of Agrobioengineering and Animal Sciences,
14 Prusa Str., 08-110 Siedlce, Poland

² Siedlce University of Natural Sciences and Humanities, Faculty of Social Sciences,
39 Żytnia Str., 08-110 Siedlce, Poland

E-mail:^{1*} krzysztof.pakuła@uph.edu.pl (Corresponding author)

Abstract. The aim of the study was to analyze the structure of criteria for selection of suppliers (price of the product, product quality, availability of products, flexibility of deliveries, timeliness of deliveries, payment terms, distance from the farm, transport of the supplier, experience and position of the supplier, evaluation of the existing cooperation) of selected products for plant and animal production (mineral fertilizers, plant protection products, seed material and industrial fodder for farm animals) and their importance in the logistics of agricultural holdings in the central-eastern part of Poland. The source material for the study were the results of a survey carried out among farmers having and managing their own farms of various sizes with mixed production profile - cereal cultivation and animal husbandry (dairy and meat cattle, swine). The choice of supplier in the surveyed farms was determined mainly by the quality and price of the offered product, its availability and timeliness of deliveries, and their dynamics changed as the farm area increased. Based on the conducted research, it can be concluded that the proper selection criteria for the suppliers of production means are an important element of limiting production risk in management of a farm.

Keywords: agriculture; farm logistics system; production means; supply logistics; supplier selection criteria

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1. Introduction

The market of suppliers of agricultural mean of production is an important element of agribusiness, which aims at creating conditions for harmonious flow of goods and information with the use of efficient logistics (Gebresenbet, Bosona, 2012; Wajszczuk et al., 2012). Effective logistics systems allow the rationalization of logistics processes in the company, becoming the main factor determining the company's success. The mission of supply logistics is

to provide maximum security for all material needs of the company at minimum costs of delivery. The primary objective is to obtain a competitive advantage on the market and a certain level of profitability of the conducted business activity (Ghorabae et al., 2017; Anca, 2019; Wątróbski, 2019). The needs and requirements of customers are considered to be one of the basic driving forces in the supply chain. An efficient production supply system increases the usefulness of time and space in meeting the needs of buyers. The need is the reason why the customer takes action aimed at purchasing a product or service (Staniewska, 2012; Kara, Firat, 2018; Zhang et al., 2020). Risk management is a system of activities aimed at rational maximization of broadly understood benefits or rational minimization of losses. One of the important processes reducing this risk is therefore the proper selection of suppliers of production means, ensuring an appropriate level of production quality assurance (Baran, Żak, 2013; Urbaniak, 2014; Galińska et al., 2015; Kara, Firat, 2018; Ghorabae et al., 2017).

2. The role of the supplier of production means in the farm supply chain - literature review

For a production company, such as farm, selecting a supplier is a strategic decision. It constitutes the basis for the achievement of production targets by securing the continuity of the production process at a given production volume and profitability. The quantity, quality and price of products offered on the consumer market depends on this decision (Pruska et al., 2011; Wajszczuk et al., 2012; Zieliński, 2013). Taking into account the specific operating conditions of farms (seasonality of production, variable production cycles), it is important to adopt criteria for the selection of suppliers appropriate to the production profile, ensuring an appropriate delivery time of the necessary production means, resulting from the current demand. The most frequent criteria in this respect are: price, quality of delivered products, supplier's location, timeliness of deliveries, order completion time, discounts, payment terms, packaging method, evaluation of previous cooperation, location, communication with the supplier, complaint handling method, delivery terms, customer service quality, innovation, supplier's flexibility, resources and product range, position and reputation in the industry, comparison with the competition (Chen, 2011; Baran, Żak, 2013; Zieliński, 2013; Molamohamadi et al., 2013; Galińska et al., 2015; Ghorabae et al., 2017). However, many authors emphasize that the criterion of price offer is in many cases more important than the quality of the product and decides about its purchase due to the reduction of production costs and the need to be competitive on the market (Morylewski, Kuboń, 2010; Thiruchelvam, Tookey, 2011; Nowakowski, Werbińska-Wojciechowska, 2012; Wajszczuk et al. 2012; Molamohamadi et al., 2013; Banaeian et al., 2015; Owsiak et al., 2015; Szymańska et al., 2018). Szymańska et al. (2018) stated that the position of suppliers on the supply market or the well-known product brand and the attractiveness of its packaging are not criteria of little importance. Nowakowski and Werbińska-Wojciechowska (2012) report that the reason for leaving and approaching competition is poor customer service (68%), unsatisfactory product quality (14%) and high price (9%) of agricultural means products.

Transport in agriculture, both inside and outside the farm, is a key element in determining the agricultural production process, its efficient functioning and profitability. The proper flow of raw material and commodity streams in farms depends mainly on the proper farm equipment with technical means of production in the form of machines and transport devices, which are part of the logistic infrastructure in farms [Gebresenbet, Bosona, 2012; Liu, 2017; Sheng et al., 2018].

According to Rut and Kulińska (2011), monitoring the flow of production resources should be increased to quickly respond to crises in the supply chain related to the lack of continuity of supplying farms, especially during periods of increased demand resulting from animal breeding technology or agricultural plant technology. Szymańska et al. (2018) stated that the optimal time for providing means for field production should not exceed 7 days.

Malak-Rawlikowska and Milczarek-Andrzejewska (2016) state that price, and in particular the possibility to negotiate it, is the main criterion for selecting a supplier of means of production on the feed supply market for

animal production. According to their research, 59% of farmers negotiate feed prices, with more such events occurring in the case of their purchase directly from producers (71.7%) than from intermediaries (47.3%), and obtaining a discount results from the size of the purchase and being a loyal customer to the supplier. In the case of animal production based on feed from external sources, the temporary absence of feed may lead to irreversible consequences and to longer production cycles (Wasilewski, 2010).

Supply chain management is subject to some risk, as random events and phenomena may occur - lack of proper quantity and quality of production means due to problems with timeliness and flexibility of supplies, disrupting communication with contact, financial reasons (Hardaker et al., 2004; Theuvsen L., 2013; Gebresenbet, Bosona, 2012; Serafin, 2013; Janisz, Mikulec, 2017; Anca, 2019; Zhang et al., 2020). Because of that, farmers must have risk management skills to better anticipate problems and limit their negative consequences (Kahan, 2008). Appropriate identification and estimation of the risk level enables a proper decision-making reaction in crisis situations (Kulińska, 2012; Gaschi-Uciecha, 2014; Nyamah et al., 2017; Komarek et al. 2020).

3. Materials and methods

The selection of the supplier of the means of production is an important element in farm management in the realities of a free and competitive food production market. Efficient production management eliminates the emergence of crisis situations as a result of the lack of appropriate means of production. The specificity of agricultural production requires the implementation of 7 R's rule (right product, right place, right price, right customer, right condition, right time, right quantity), in the management of farm which may guarantee the achievement of the production goals of agricultural holdings.

The aim of the study was to analyze the structure of criteria for selection of suppliers of selected products for plant and animal production and their importance in the logistics of agricultural holdings in the central-eastern part of Poland.

The lack of this type of research relating to the research area has made an attempt to describe this problem in the aspect of sustainable agricultural production on the soils of different quality and different farms area.

The source material was the results of a survey conducted in the group of 40 individual farm owners from the Łuków and Siedlce counties, with mixed production profile - cereal cultivation and animal husbandry (dairy and meat cattle, swine). Farms were divided into 4 groups depending on the area of used land: I - below 10 ha, II - 10.1-30 ha, III - 30.1-50 ha and IV - above 50 ha. The research was anonymous and based on a questionnaire containing 20 closed, single-choice questions. The questionnaire included metric questions (concerning socio-demographic characteristics of respondents) and questions concerning the study problem – criteria for selecting suppliers of production means (fertilizers, plant protection products, animal feed, seed) in the logistic process of production supply in a farm. The decision making process related to the selection of sources of farm supply with direct means of production was based on the assessment of 10 factors: unit price of the product, product quality, availability of products, flexibility of deliveries, timeliness of deliveries, payment terms (possible loans), distance from the farm, transport of the supplier, experience and position of the supplier, evaluation of the existing cooperation. The weight of the examined criteria was determined on a five-point scale: 1 – definitely not, 2 – rather not, 3 – neither yes nor no, 4 – rather yes, 5 – definitely yes. In addition, respondents were asked to prioritize all analyzed criteria on a 1 to 10 scale. The obtained results were processed in the Statistica 12 software.

The size of the studied farms was diversified and ranged from 5.0 to 109 ha of agricultural land. Most farms were included in the 10.1 - 30 ha area group (37.5%), and the least – with an area over 50 ha (15.0%). Farms with an area below 10 ha accounted for 27.5%, and from the area group 30.1-50 ha - 20% of the surveyed farms. All

farmers were male. Nearly half of them (48.6%) were between 36 and 55 years old with vocational (41%) and secondary (39%) education.

4. Results and discussion

In the surveyed farms, the differences in the structure of factors determining the supplier selection for mineral fertilizers, plant protection products, seed material and industrial fodder for farm animals were found, depending on the size of the farm (tab. 1).

As the farm area increased, the share of product quality, punctuality of deliveries, supplier's experience and position, flexibility of deliveries, payment terms, supplier's transport and evaluation of cooperation to date increased, whereas product prices, availability and distance from the farm decreased. The greatest dynamics of change was observed for distance from the farm (decrease by 1072%), flexibility of deliveries (increase by 483%), transport (increase by 71.7%), payment terms (increase by 66.7%), evaluation of the existing cooperation (increase by 55.6%). The choice of supplier was determined mainly by the quality and price of the offered product, its availability and punctuality of deliveries (mean 15.1% of responses). It should be emphasized that in farms with an area of < 30 ha, the price was put first (16.7-17.3% of responses), and in larger farms (> 30 ha) – the first place was taken by the quality criterion (16.5-16.9% of responses). Distance from the supplier (14% of responses) and availability of products are an important decision factor for farmers with less than 10 ha of farmland. Based on the analysis of the results obtained from all farms, it was found that agricultural producers, when choosing their suppliers for production means, put the price (4.8) and product quality (4.8), punctuality of deliveries (4.8) and their availability (4.7) on an equal footing. The price criterion is in many cases decisive for the purchase of production means, and not their quality, due to the reduction of production costs and the need to be competitive. It should be noted that in the surveyed farms with an area of up to 30 ha, the price criterion prevailed over quality (Fig. 1 and 2).

Table 1. Structure of the criteria for selecting a supplier of selected means for plant and animal production in the investigated farms

Criteria for selecting a supplier	Farm area				Mean
	< 10 ha	10-30 ha	30-50 ha	> 50 ha	
	%				
experience of the supplier	6.4	7.8	8.0	8.4	7.6
availability of products	16.9	14.2	12.7	10.9	13.7
timeliness of deliveries	14.2	15.6	16.0	16.2	15.5
price of the product	17.3	16.7	13.1	12.7	15.0
product quality	14.5	16.0	16.5	16.9	16.0
flexibility of deliveries	1.8	3.3	7.5	8.7	5.3
payment terms	6.0	6.4	7.6	10.0	7.5
transport of the supplier	5.3	8.2	8.9	9.1	7.9
distance from the farm	14.0	7.3	4.2	1.5	6.7
evaluation of the existing cooperation	3.6	4.5	5.5	5.6	4.8

Source: own study

Wajszczuk et al. (2012) report that this is often due to limited financial resources allocated to production, which is caused by its small scale. The larger the farm, the more important the quality of the production means and the timeliness of deliveries (Fig. 3 and 4), because of the need to respect the technological deadlines for their use, which affect the quantity and quality of the final product going to the consumer market. In agricultural production, the time of order completion is important - punctuality of deliveries, because farmers have only a strictly defined period of time for their application (e.g. agrotechnical terms) (Szymańska et al., 2018).

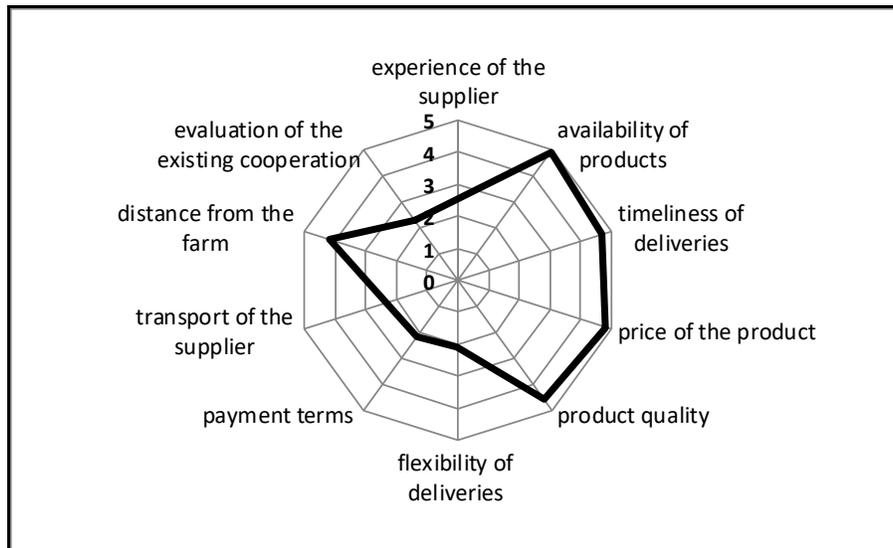


Fig. 1. Factors deciding about selection of suppliers on the investigated farms with an area below 10 ha (scale 1-5 points)
 Source: own study

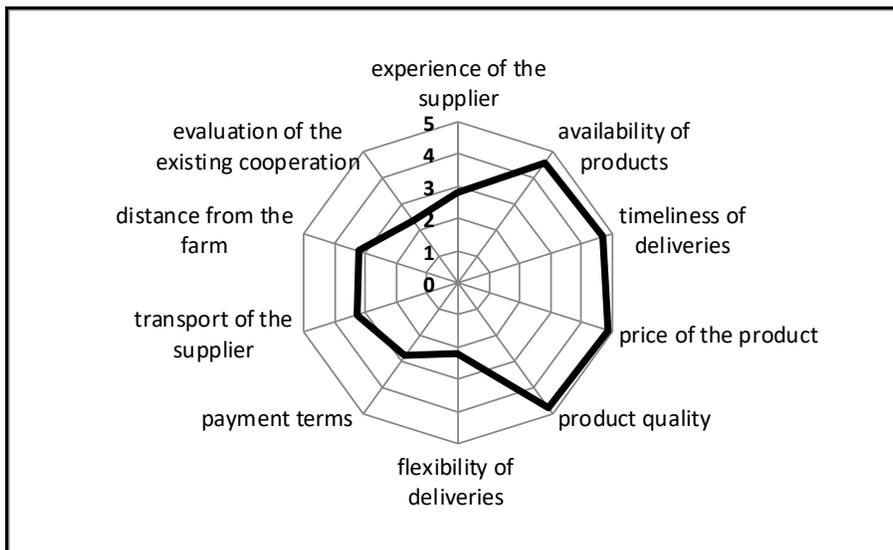


Fig. 2. Factors deciding about selection of suppliers on the investigated farms with an area in the range of 10-30 ha (scale 1-5 points)
 Source: own study

The least significant factor was the evaluation of the prior cooperation (2.5), which may mean that farmers have the possibility to obtain supplies from several suppliers who are at the moment in a position to present the best

commercial offer. It should be emphasized that over 70% of respondents look for suppliers based on recommendations of other agricultural producers, including 35% - who use the Internet to search for information, 15% - who trust advertising, 15% - who leave it to chance. 80% of the surveyed farms, especially those with an area of more than 10 ha, establish cooperation with more than two suppliers of production means, taking into account their position and experience on the market (2.8 - 2.9) (Fig. 2, 3, 4). In addition, it was found that 20% of farms, especially those with an area of over 30 ha, cooperate with suppliers specializing in the marketing of a particular product.

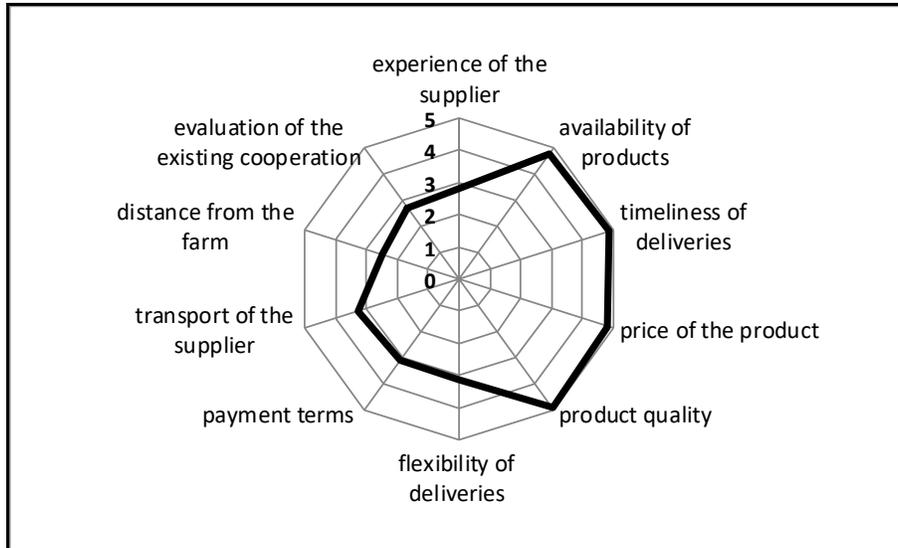


Fig. 3. Factors deciding about selection of suppliers on the investigated farms with an area in the range of 30-50 ha (scale 1-5 points)
Source: own study

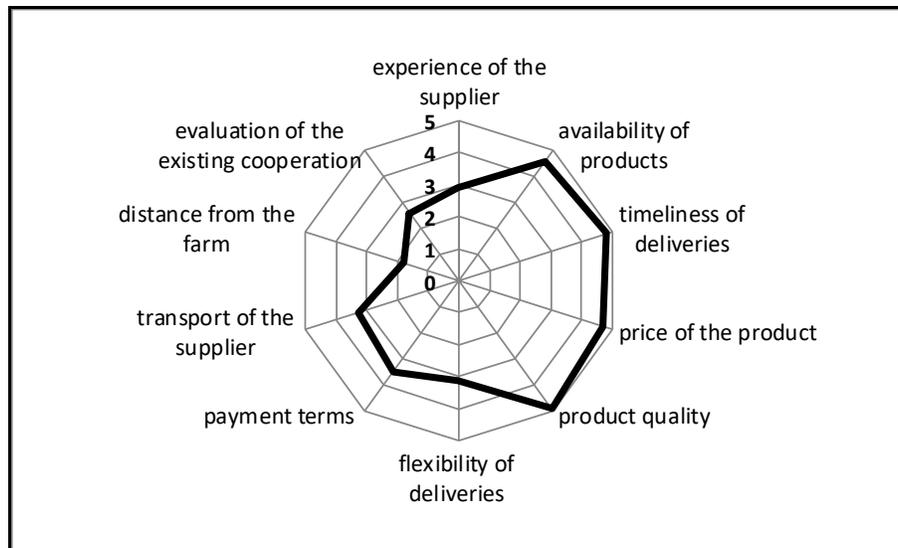


Fig. 4. Factors deciding about selection of suppliers on the investigated farms with an area above 50 ha (scale 1-5 points)
Source: own study

Diversification of the sources of supply for production with appropriate measures is an element limiting the risk to the continuity and viability of agricultural holdings. Flexibility of supplies (2.6) proved to be a minor factor in the scale of all the farms studied, especially in farms with an area of up to 30 ha (Fig. 1 and 2), where means of production are most often stored temporarily. This is also due to the widespread availability of basic fertilizers, plant protection products and seeds, as well as well-planned purchases in terms of the expected volume of production.

In small farms (< 10 ha) the distance from the supplier (4.2) turned out to be an important criterion due to the use of own means of transport to transport the purchased means of production (75% of farms), the number of which did not entitle to use the supplier's transport offer (2.3) and to negotiate payment terms (2.2) (Fig. 1). As the farm area and production volume increase, the importance of these factors increases – supplier's transport (3.3) and payment conditions (3.5), which is related to a larger amount of purchased means of production, which is best delivered in a large batch from the production logistics point of view, using means of transport of appropriate capacity offered by the supplier (85.7% of farms with an area of over 30 ha), thus reducing the weight of the distance between the supplier and the recipient (1.8), because the transport process does not require physical involvement of the farmer (Fig. 2, 3, 4) and affects the reduction of his costs (Gebresenbet, Bosona, 2012; Banaeian et al., 2015).

Conclusions

Farms purchase certain mean of production within the time limits and quantities resulting from their business profile. Efficient logistics is an important element of their functioning in the realities of the market economy. Customers expect efficient logistics services from suppliers in terms of order cycle length, delivery volume and frequency, product availability and order fulfillment performance. The choice of supplier in the surveyed farms was determined mainly by the quality and price of the offered product, its availability and timeliness of deliveries, and their dynamics changed as the farm area increased. The evaluation of the existing cooperation, flexibility of deliveries and the experience and position of the supplier on the market of agricultural co-production means turned out to be a minor factor. An important factor for the surveyed agricultural producers, not exceeded by their farms, was the distance from the supplier (farms with area < 10 ha) and the possibility to negotiate payment terms (farms with area > 30 ha), which results mainly from the scale of production and the degree of commitment of the possessed resources. Disruptions in the supply of production means can negatively affect the volume and quality of farm production. Based on the conducted research, it can be concluded that the proper selection criteria for the suppliers of production means are an important element of limiting production risk in logistic management of a farm.

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Krzysztof PAKUŁA (dr hab. inż), Assoc. Professor at Siedlce University of Natural Sciences and Humanities, Faculty of Agrobioengineering and Animal Sciences, Research interests: soil science; production of food; quality of the environment; sustainability; supply chain management.

ORCID ID: orcid.org/0000-0002-6568-0639

Krystyna PIENIAK-LENDZION (prof. dr hab.), Full Professor at Siedlce University of Natural Sciences and Humanities, Faculty of Social Science, Research interests: regional development; sustainability; supply chain management, waste management.

ORCID ID: orcid.org/0000-0002-7309-4074

Marcin BECHER (dr hab. inż), Assoc. Professor at Siedlce University of Natural Sciences and Humanities, Faculty of Agrobioengineering and Animal Sciences, Research interests: soil science; management of organic matter; production of food; sustainability; supply chain management.

ORCID ID: orcid.org/0000-0003-4996-1200

Beata KUZIEMSKA (dr hab.), Assoc. Professor at Siedlce University of Natural Sciences and Humanities, Faculty of Agrobioengineering and Animal Sciences. Research interests: waste management; environment pollution; sustainability; supply chain management; production of food, **ORCID ID:** orcid.org/0000-0002-1619-0799

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