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ANALYSIS OF THE FINANCIAL HEALTH OF SELECTED COMPANIES IN THE AGRI-FOOD SECTOR USING THE TOPSIS METHOD

Key words: financial health, agri-food sector, TOPSIS method, synthetic indicator, EMIS database

ABSTRACT. The aim of this article is to assess the financial health of selected enterprises in the agri-food sector. The study of the financial condition of enterprises, including the food industry is a complex issue. A thorough and comprehensive analysis requires the consideration of numerous aspects of a company's operation. Therefore, a wide range of financial indicators is used, which enables the measurement of selected components of financial condition. The research used data for enterprises operating in the agri-food sector (from various branches). The selection of enterprises for the research was purposeful and was based on the ranking of enterprises published in the EMIS database. The financial statements published in the EMIS database for the year 2021 were used for the study. The TOPSIS method was used to assess the development of the enterprises, which made it possible to determine the financial condition of the studied enterprises. It was shown that the best financial condition was characterised by enterprises that based their activities on the production of margarine and similar edible fats, meat processing, excluding poultry meat, and the processing of milk and cheese products.

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INTRODUCTION

In the Polish economy, the agri-food sector plays an important role [Gołaś 2016], as evidenced, among others, by the number of entities operating in the agri-food sector, which in 2020 amounted to 1,315, i.e. 14% of total industrial enterprises. Moreover, the sector employs around 300,000 people, i.e. around 16% of the total industrial workforce [GUS 2022]. When studying the agri-food sector, it is also necessary to analyse the economic indicators that characterise its functioning, so that we can assess its economic condition in the economy [Parzonko, Bórawski 2021].

The issue of assessing the financial condition of agri-food sector enterprises in Poland is frequently addressed in the national literature [Urban 2009, Wigier 2011, Bieniasz et al. 2012, Florek et al. 2013, Drożdż et al. 2014, Gołaś, Kurzawa 2014]. The study of the financial health of enterprises, including the agri-food sector, is a complex issue, which makes it impossible to determine it using a single characteristic and direct measurement [Wędzki 2009, Czyżewski, Kryszak 2017]. A thorough and comprehensive analysis requires the consideration of numerous aspects of the company›s operation. Consequently, a wide range of financial indicators are used, which enables the measurement of selected components of financial health. The complexity of the problem causes difficulties in unambiguous assessment of financial indicators. Some of the indicators may indicate that the financial condition of the studied enterprise at a given moment is stable, while others may indicate emerging problems [Szanduła 2011, Czerwińska-Kayzer et al. 2013]. The analysis of financial condition is a multifaceted phenomenon, which makes one of the key tools for analysing financial condition a synthetic measure of development, which is the resultant function of simple characteristics explaining the key components and linkage of the complex phenomenon [Czerwińska-Kayzer et al. 2013, Czyżewski, Kryszak 2017]. In order to determine the financial condition of economic entities operating in the agri-food sector, the TOPSIS method is applicable. It is a benchmark method, in which the Euclidean distances of the analysed object from both the benchmark and the anti-benchmark of development are calculated. This approach distinguishes the TOPSIS method from the Hellwig method, which only considers distances from the development pattern [Wysocki 2010, Czerwińska-Kayzer et al. 2013]. The TOPSIS method presented by Ching-Lai Hwang and Kwangsun Yoon [1981] belongs to methods of line ordering of objects (e.g. provinces, farms, enterprises) according to a specific measurement criterion. In the case of the research conducted and described by Feliks Wysocki [2008], this was the level of development of the dairy sector and its individual links. The idea behind the TOPSIS method is to determine the distance of the objects under consideration from the ideal and anti-ideal solution. The final result of the analysis is a synthetic index that creates a ranking of the objects under study. The best object is considered to be the one with the

smallest distance from the ideal solution and, at the same time, the largest distance from the anti-ideal solution [Wysocki 2008].

The objective of the research was to analyse the financial condition of enterprises operating in the agri-food sector in Poland in 2021, using a synthetic development measure constructed on the basis of the TOPSIS method, using financial statements from the EMIS database. In addition, research questions were identified:
– what is the importance of the agri-food sector in the national economy,
– what was the financial condition of enterprises operating in the Polish agri-food sector
– agri-food sector in 2021,
– what financial indicators shaped the position of the surveyed enterprises.

The following research hypothesis was also formulated: the stable position of the agri-food sector in the national economy in 2021 was determined by the financial results obtained by enterprises from the meat, dairy and oil industry.

RESEARCH MATERIAL AND METHODS

The research subjects in the empirical analysis were enterprises operating in the agri-food sector in Poland. The selection of the research sample for the empirical analyses was purposive, which was determined by criteria such as:
– availability of data to carry out empirical analyses for 2021 – data was collected based on the EMIS database, from which financial statements were downloaded, which enabled the construction of a proprietary database. In the empirical research, financial measures were used to identify the partial advantages of the analysed companies operating in Poland;
– the importance of the agri-food sector in Poland.

The financial statements for 2021 published in the Emerging Markets Information Service database [EMIS 2022] were used to carry out research on the financial health of selected companies operating in the agri-food sector. The sample selection for the study was purposive. Initially, 100 companies with the highest sales revenue and financial results achieved in 2021 were selected. Due to the lack of some key data for calculating financial indicators, 78 companies from the agri-food sector operating across Poland were eventually selected for research analyses. The empirical research was carried out for one financial year, due to the availability of comparable data for a separate research sample.

In the conducted research, the financial condition of selected companies from the agri-food sector was assessed by applying the TOPSIS method according to the following procedure [Stanisławska, Majchrzak 2009, Aryanezhad et al. 2011, Czerwińska-Kayzer et al. 2013]:

1. Selection of simple traits and determination of the direction of their preference with respect to the financial situation.

2. The unitisation of the values of simple traits was carried out based on the following criteria [Czerwińska-Kayzer et al. 2013, Czyżewski, Kryszak 2017]:

– $z_{ik} = \dfrac{x_{ij} - max_i\,(x_{ik})}{max_i\,(x_{ik}) - min_i\,(x_{ik})}$ for stimulants, the formula used was: $(i = 1, 2, \ldots, n;\ k = 1, 2, \ldots, k)$

– $z_{ik} = \dfrac{max_i\,(x_{ik}) - x_{ij}}{max_i\,(x_{ik}) - min_i\,(x_{ik})}$ for destimulants, the formula used was: $(i = 1, 2, \ldots, n;\ k = 1, 2, \ldots, m)$

whereby: $max_i\,(x_{ik})$ is the maximum value of the k-th characteristic, $nom\,(x_{ik})$ is the nominal value of the k-th characteristic, $min\,(x_{ik})$ is the minimum value of the k-th characteristic, i – is the object (in this case the company).

3. Calculation of the euclidean distance of individual aggregate units from the benchmark $z^+ = (1, 1, \ldots, 1)$ and the antithesis of development $z^- = (0, 0, \ldots, 0)$ – according to the following formulae:

$$\sqrt{\sum_{j=1}^{K} (z_j^* - z_j^+)^2}\ \text{ from the benchmark}$$

$$d_i^- = \sqrt{\sum_{j=1}^{K} (z_j^* - z_j^-)^2}\ \text{ from the anti-pattern}$$

whereby: $z_j^+ = (max\,(z_{i1}^*), (max\,(z_{i2}^*),\ldots, (max\,(z_{iK}^*)) = (z_1^{*+}, z_2^{*+}, \ldots, z_K^{*+})$

$= z_j^- = (min(z_{i1}^*), (min(z_{i2}^*),\ldots, (min(z_{iK}^*)) = (z_1^{*-}, z_2^{*-}, \ldots, z_K^{*-})$

4. Determination of the value of the synthetic trait by using the following formula:

$$q_i = \frac{d_i^-}{d_i^+ + d_i^-}$$

– together with a classification of the identified companies in terms of their level of financial standing based on a statistical criterion using the arithmetic mean and standard deviation of the synthetic measure value:

- class I: $q_i \geq q$ (average) + s_q,
- class II: q (average) + $s_q > q_i \geq q$ (average),
- class III: q (average) > $q_i \geq q$ (average) – s_q,
- class IV: $q_i < q$ (average) – s_q.

where: q is the arithmetic mean of the measure values, while s_q is the standard deviation.

RESULTS OF THE STUDY

The leading food producers in Poland include Animex Foods Sp. z o.o. and Cedrob S.A. (entities operating in the meat industry), as well as Spółdzielnia Mlekovita Mleczarska Mlekovita, Spółdzielnia Mlekpol Mleczarska in Grajewo, Polmlek Sp. z o.o. (entities operating in the dairy sector). In 2021, it was the meat and dairy industries that shaped the financial results of the entire Polish agri-food sector. In addition to the above-mentioned industries, the analysed enterprises included entities related to the fat, sugar, feed, fish, cereal and confectionery industries. The entities analysed were characterised by different sizes of employees, ranging from 50 employees to 9,000 people [EMIS 2022]. The volume of revenue generated in 2021 by the surveyed entities operating in the agri-food sector assumed values ranging from PLN 506 million to PLN 9 billion [EMIS 2022]. Approximately 38% of the research sample are companies generating annual revenue above PLN 1 billion [EMIS 2022]. In the case of 5 entities, i.e. Superdrob S.A., Suempol Sp. z o.o., Gobarto S.A., Zakłady Mięsne Silesia S.A., Koral S.A., Agrifirm Polska Sp. z o.o., a negative financial result was recorded. These companies were primarily engaged in meat and fish processing [EMIS 2022]. The rest of the surveyed entities showed positive net profit, which ranged from PLN 2 million to PLN 315 million [EMIS 2022].

The first stage concerns the selection of variables. On the basis of substantive criteria, with reference to research carried out to date, a selection of characteristics describing the financial situation of enterprises in the agri-food sector was carried out. Variables were selected to represent different groups of indicators, i.e. profitability, liquidity, operating efficiency and debt, which enabled a detailed assessment of the financial condition of the studied entities. Statistical analysis in the form of the classic coefficient of variation was used to eliminate simple characteristics (Table 1). Characteristics were eliminated that were excessively correlated with each other and those showing low variability in value[2].

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[2] If a trait is excessively correlated with the others, the diagonal elements of the inverse correlation matrix R significantly exceed the value of 10, which is a sign of poor numerical conditioning of the R matrix [Wysocki, Lira 2007, Wysocki 2010]. To assess the variability of feature values, the classical coefficient of variation was used.

Table 1. Indicators taken into account for the construction of a synthetic measure to assess the financial health of agri-food enterprises in Poland in 2021

Name of the measure	Calculation formula	Nature of the measure	Coefficient of variation [%]
Return on assets (ROA) [%]	*net profit / total assets* × 100%	stimulant	101
Return on equity (ROE) [%]	(*net profit/equity*) × 100%	stimulant	125
Net profitability [%]	*net profit / net sales revenues* × 100%	stimulant	104
Non-current asset turnover ratio	*net revenue from sales / tangible fixed assets*	stimulanta	342
Asset turnover ratio	*net revenue from sales / total assets*	stimulant	56
Liability turnover ratio	*short-term liabilities / net revenue from sales* × 365	destimulant	187
Overall debt ratio	*external capital / total assets* × 100%	destimulant	110
Debt to equity ratio	*third-party capital / shareholders' equity* × 100%	destimulant	161
Interest coverage ratio	(*gross profit + interest*) / *interest* × 100%	stimulant	872
Liability coverage ratio	*property, plant and equipment / non-current liabilities* × 100%	stimulant	861

Source: own calculations based on financial statements from EMIS database

It was found that the return on equity, i.e. ROE, in the system of the analysed business entities in 2021 was characterised by high variability, as evidenced by the value of the coefficient of variation at the level of 125% (Table 1). A low return on equity was recorded in about 44% of the surveyed entities. The value of the equity ratio for these enterprises ranged from 0.4% to 9.8%. Entities that had a low return on equity included Cargill Poland Sp. z o.o. (0.4%), Mlekpol Dairy Cooperative in Grajewo (2.9%), Krajowa Grupa Spożywcza S.A. (4,6%). There are entities involved in starch production, milk processing and sugar production [EMIS 2022]. On the other hand, the highest return on equity were Bunge Polska Sp. z o.o. (40.5%), Paula Fish Sławomir Gojdz Sp.j. (44.1%), Storck Sp. z o.o. (52.7%), Cereal Partners Poland Torun-Pacific Sp. z o.o. (70.4%). These enterprises are engaged in the production of margarine and fats, fish processing, production of cocoa, chocolate and confectionery, production of cereal milling [EMIS 2022]. ROA in 2021 for the surveyed

entities ranged from -7.6% (Suempol Sp. z o.o.) to 22.4% (Bunge Polska Sp. z o.o.) and was characterised by a high variability of 101% (Tables 1 and 2). The lowest value of the return on assets index was characterised by economic entities engaged in fish processing and preserving (Suempol Sp. z o.o., Koral S. A.), production of meat products, including poultry meat (Zakłady Mięsne Silesia S.A., Superdrob S.A.), production of ready-made animal feed (Agrifirm Polska Sp. z o.o., Agrocentrum Sp. z o.o. (Kolno)), starch production (Cargill Poland Sp. z o.o.), milk and cheese processing (Okręgowa Spółdzielnia Mleczarska w Piątnicy, Okręgowa Spółdzielnia Mleczarska w Łowiczu, Spółdzielnia Mleczarska Mlekpol w Grajewie, Okręgowa Spółdzielnia Mleczarska w Kole, Przedsiębiorstwo Produkcyjno-Handlowo-Usługowe Laktopol Sp. z o.o.), production of ready-made pet food (Nestle Purina Manufacturing Operations Poland Sp. z o.o.), production of sugar (Sudzucker Polska S.A.), production of oils (ADM Czernin S.A.), production of cocoa, chocolate and confectionery (Mondelez Polska Production Sp. z o.o.), and production of fruit and vegetable juices (Dohler Sp. z o.o.). On the other hand, the highest value of the return on assets index was characteristic of business entities involved in the processing and preservation of fish and crustaceans (Paula Fish Sławomir Gojdz Sp.j.) and the production of margarine and edible fats (Bunge Polska Sp. z o.o.) (Table 2).

The net profitability of sales indicator extends the analysis of the gross margin rate, indicating the burdening of net sales revenue with all operating costs, including costs resulting from tax burdens. Considering the data obtained for the studied economic entities, it was shown that the lowest net profitability was characteristic for enterprises operating in the meat industry, i.e. Zakłady Mięsne Silesia S.A. and Superdrob S.A., as well as from the fish processing and canning industry (Suempol Sp. z o.o., Koral S.A.) (Table 2). This indicates that the aforementioned companies operating in the agri-food sector in 2021 had to obtain a higher value of sales in order to achieve the desired level of net profit (because the greater part of revenues is absorbed by operating costs). On the other hand, the highest value of the net profitability ratio was held by entities involved in sugar production – Pfeifer & Langen Polska S.A. and coffee and tea processing – Mokate Sp. z o.o. (Table 2). This means that the entities in question had a competitive advantage over the rest of the surveyed entities in 2021.

Other important indicators for assessing the financial health of businesses include the fixed asset turnover ratio and asset turnover. The tangible fixed asset turnover ratio determines the efficiency of the management of these assets in the company. In the case of the companies surveyed, the fixed asset turnover ratio took on values ranging from 0.4 to 271.1 and was characterised by high variability, which amounted to 342% (Tables 1 and 2). The total turnover ratio, on the other hand, complements the assessment of the efficiency (effectiveness) of operations, from the point of view of the company's asset management. It informs about the ability of the company's assets to generate sales revenue.

Table 2. Indicators describing the financial condition of the surveyed companies of the agri-food sector in Poland in 2021

Company	ROA	ROE	Net profitability [%]	Non-current assets turnover ratio	Asset turnover ratio	Liability turnover ratio	Overall debt ratio [%]	Debt to equity ratio [%]	Interest coverage ratio	Liability coverage ratio
Animex Foods Sp. z o.o.	7.2	18.3	3.3	3.8	2.2	15.8	9.9	25.3	6.0	1.2
Cargill Poland Sp. z o.o.	0.3	0.4	0.1	7.9	2.8	0.2	1.7	2.9	-20.7	4.1
Cedrob S.A.	5.0	13.5	2.6	3.0	1.9	11.3	34.9	94.3	7.2	0.2
Spółdzielnia Mleczarska Mlekovita	4.5	8.2	1.5	9.2	3.1	0.1	7.8	14.0	56.5	0.1
Spółdzielnia Mleczarska Mlekpol w Grajewie	1.6	2.9	0.7	6.4	2.3	-0.1	10.9	20.5	17.2	0.7
Bunge Polska Sp. z o.o.	22.4	40.5	6.6	14.7	3.4	13.6	1.8	3.2	71.5	22.2
Wipasz S.A.	5.4	11.9	2.3	4.4	2.4	0.4	38.6	84.8	13.0	0.1
Mars Polska Sp. z o.o.	6.7	13.6	4.9	2.0	1.4	0.0	0.0	0.0	461.4	0.0
Polmlek Sp. z o.o.	11.4	25.6	6.4	3.4	1.8	8.4	15.6	34.8	25.1	0.7
Krajowa Grupa Spożywcza S.A.	3.7	4.6	5.0	1.3	0.7	10.9	1.7	2.1	150.4	7.8
Superdrob S.A.	-4.4	-9.7	-2.1	3.5	2.1	8.1	28.1	62.1	-6.6	-0.2
Gobarto S.A.	-3.7	-8.5	-1.7	3.1	2.2	-7.1	26.9	61.7	0.0	0.1
Komagra Sp. z o.o.	11.0	24.2	2.9	7.5	3.8	1.3	36.4	80.5	18.2	-0.1
Okręgowa Spółdzielnia Mleczarska w Piątnicy	1.0	1.4	0.4	4.1	2.1	9.7	0.0	0.0	43.1	0.0
Pfeifer & Langen Polska S.A.	8.8	11.6	12.9	1.9	0.7	5.6	0.3	0.4	5223.5	32.8
Milarex Sp. z o.o.	2.4	8.4	1.1	5.2	2.2	0.4	39.8	138.1	5.3	0.0

Table 2. Cont.

Company	ROA	ROE	Net profitability [%]	Non-current assets turnover ratio	Asset turnover ratio	Liability turnover ratio	Overall debt ratio [%]	Debt to equity ratio [%]	Interest coverage ratio	Liability coverage ratio
Okręgowa Spółdzielnia Mleczarska w Łowiczu	1.0	2.6	0.3	7.9	3.4	0.2	13.1	34.0	4.4	-0.2
Barry Callebaut Manufacturing Polska Sp. z o.o.	7.0	10.0	3.4	4.9	2.1	0.6	0.0	0.0	1194.8	0.0
Polmlek Raciąż Sp. z o.o.	9.6	34.7	3.4	6.1	2.8	-0.1	6.9	24.8	31.6	2.2
AgroRydzyna Sp. z o.o.	17.3	28.9	6.4	15.2	2.7	0.0	0.7	1.1	46.8	3.9
Zakład Przemysłu Mięsnego Biernacki Sp. z o.o.	1.7	5.2	0.9	4.0	1.8	0.1	30.6	93.1	8.0	0.0
Nutricia Zakłady Produkcyjne Sp. z o.o.	8.5	38.3	4.2	3.9	2.0	0.0	0.0	0.0	27.7	0.0
Zott Polska Sp. z o.o.	10.3	11.4	7.9	2.2	1.3	0.1	0.0	0.0	194,461.6	0.0
Drobimex Sp. z o.o.	5.3	11.0	2.4	3.9	2.2	0.0	17.6	36.5	17.6	0.7
Zakłady Mięsne Skiba S.A.	14.3	19.0	4.5	9.3	3.2	17.9	1.0	1.3	453.3	19.7
Suempol Sp. z o.o.	-7.6	-10.2	-2.5	20.3	3.1	16.4	1.1	1.5	-134.7	-4.6
Animex Kutno Sp. z o.o.	3.8	5.7	2.0	2.5	1.9	12.6	17.1	25.9	19.9	0.5
Polmlek Grudziądz Sp. z o.o.	5.3	22.5	1.4	7.8	3.8	0.2	28.8	123.8	12.8	0.3
Intersnack Poland Sp. z o.o.	5.6	14.3	3.1	3.0	1.8	8.9	36.9	93.5	15.4	0.3
ADM Czernin S.A.	1.3	2.0	0.4	12.2	3.6	0.0	0.0	0.0	0.0	0.0
Storteboom Hamrol Sp. z o.o.	7.2	9.8	3.1	7.6	2.3	-0.2	3.4	4.7	146.6	5.7
Lisner Poznań Sp. z o.o. sp. k.	3.5	7.6	2.7	3.8	1.3	0.3	0.0	0.0	44.1	0.0

Table 2. Cont.

Company	ROA	ROE	Net profitability [%]	Non-current assets turnover ratio	Asset turnover ratio	Liability turnover ratio	Overall debt ratio [%]	Debt to equity ratio [%]	Interest coverage ratio	Liability coverage ratio
Best Oil Sp. z o.o.	3.7	-29.9	0.4	21.0	8.6	0.0	8.7	-71.0	85.9	0.5
Zakłady Mięsne Silesia S.A.	-4.4	-15.9	-2.6	2.5	1.7	0.4	16.6	59.2	-10.2	-0.3
Sudzucker Polska S.A.	1.1	1.3	2.7	1.4	0.4	0.3	0.0	0.0	13.7	0.0
Okręgowa Spółdzielnia Mleczarska w Kole	1.9	3.4	0.7	6.3	2.6	0.2	3.5	6.5	34.1	0.1
Nestle Purina Manufacturing Operations Poland Sp. z o.o.	1.0	2.0	2.3	0.5	0.4	4.3	0.5	1.0	49.8	16.3
Royal Canin Polska Sp. z o.o.	3.3	6.1	1.8	3.9	1.8	0.1	0.0	0.0	29,647.4	0.0
Zakłady Mięsne Łuków S.A.	10.4	22.6	3.1	8.3	3.4	14.2	13.0	28.3	59.4	0.0
Cereal Partners Poland Torun-Pacific Sp. z o.o.	14.8	70.4	8.2	2.9	1.8	3.4	0.0	0.0	14.0	0.0
Ferrero Polska Sp. z o.o.	2.6	3.7	7.8	0.4	0.3	0.1	17.7	25.1	113.5	0.5
Okręgowa Spoldzielnia Mleczarska (Gizycko)	14.5	16.8	6.3	5.4	2.3	0.2	0.0	0.0	45,613,192.3	0.0
Okręgowa Spółdzielnia Mleczarska w Sierpcu	3.6	5.0	1.8	6.6	2.0	0.1	0.0	0.0	0.0	0.0
Dohler Sp. z o.o.	2.0	17.7	2.7	1.8	0.8	0.1	0.0	0.0	2.0	0.0
Przedsiębiorstwo Drobiarskie Drobex - Sp. z o.o.	3.0	8.7	1.1	4.6	2.6	6.9	19.0	55.3	7.0	0.5
Goodmills Polska Sp. z o.o.	6.8	14.8	5.2	2.2	1.3	0.5	36.7	80.0	9.2	0.0
Borowski Investments Sp. z o.o. S.K.A.	12.0	19.5	5.8	3.9	2.1	0.4	24.1	39.1	40.4	0.5

Table 2. Cont.

Company	ROA	ROE	Net profitability [%]	Non-current assets turnover ratio	Asset turnover ratio	Liability turnover ratio	Overall debt ratio [%]	Debt to equity ratio [%]	Interest coverage ratio	Liability coverage ratio
Drosed S.A.	3.4	6.6	0.9	10.6	3.7	0.1	0.1	0.1	39.0	70.4
Agrocentrum Sp. z o.o. (Kolno)	1.4	7.6	0.7	6.8	1.9	1.0	64.1	360.4	4.0	-0.1
Roldrob S.A.	3.9	6.9	1.7	4.5	2.3	-0.1	10.7	19.1	26.4	1.0
Frosta Sp. z o.o.	15.4	30.3	6.5	6.2	2.4	-0.1	2.8	5.5	288.1	11.4
Pamapol S.A.	2.7	10.7	1.6	3.5	1.7	-4.0	34.9	140.8	0.0	0.1
Hochland Polska Sp. z o.o.	2.2	7.5	1.4	2.7	1.6	0.1	1.7	5.8	0.0	1.8
Zakład Mięsny Wierzejki J.M. Zdanowscy Sp.j.	5.5	24.3	1.8	4.3	3.2	0.2	34.4	151.7	12.0	0.2
Mondelez Polska Production Sp. z o.o.	1.8	2.0	4.9	0.4	0.4	0.0	0.0	0.0	641.8	0.0
R. Twining And Company Sp. z o.o.	8.5	10.0	8.8	1.5	1.0	0.2	0.0	0.0	26,906.3	9,309.4
Froneri Polska Sp. z o.o.	12.4	22.9	6.8	2.6	1.8	6.0	5.3	9.8	15.8	1.5
Polindus Sp. z o.o.	2.4	7.3	1.3	3.1	1.9	0.2	29.8	89.2	4.5	0.1
Bg Production Sp. z o.o.	2.2	23.9	0.8	4.3	2.8	0.1	23.0	251.0	2.1	0.7
Mokate Sp. z o.o.	11.9	14.3	13.1	2.1	0.9	0.3	0.0	0.0	6,132.6	0.0
Spółdzielcza Mleczarnia Spomlek	2.9	6.4	1.3	4.1	2.2	10.3	13.9	30.5	4.4	0.6
Instanta Sp. z o.o.	9.1	12.8	7.7	3.7	1.2	2.5	2.3	3.2	200.5	4.1
Storck Sp. z o.o.	10.7	52.7	2.2	271.1	4.9	0.0	0.0	0.0	22,248.2	0.0

Table 2. Cont.

Company	ROA	ROE	Net profitability [%]	Non-current assets turnover ratio	Asset turnover ratio	Liability turnover ratio	Overall debt ratio [%]	Debt to equity ratio [%]	Interest coverage ratio	Liability coverage ratio
Agrifirm Polska Sp. z o.o.	-1.1	-2.3	-0.6	6.4	2.0	0.2	24.0	48.6	-3.0	0.1
Lumiko Sp. z o.o.	8.5	20.4	1.8	16.7	4.8	0.4	18.8	45.3	37.4	-0.3
Plukon Sieradz Sp. z o.o.	4.6	22.2	1.6	4.2	2.8	0.1	47.6	229.7	6.6	0.2
Inter Europol S.A.	3.7	6.5	4.4	1.1	0.8	0.2	15.1	26.9	22.3	0.8
Abp Poland Sp. z o.o.	4.4	17.4	1.4	9.5	3.2	-0.2	1.7	6.7	4.6	8.6
Polskie Zakłady Zbożowe ++++Sp. z o.o.	2.9	8.0	2.0	2.3	1.5	7.7	36.7	100.9	4.0	0.0
Foodcare Sp. z o.o.	16.3	23.9	11.2	3.9	1.5	3.1	1.6	2.4	95.1	7.2
Adros Sp. z o.o.	2.5	4.8	1.8	1.8	1.4	0.1	13.2	25.2	6.0	0.4
Przedsiębiorstwo Produkcyjno-Handlowo-Usługowe Laktopol Sp. z o.o.	1.6	3.9	0.6	4.6	2.5	0.4	15.6	37.8	8.4	0.4
Paula Fish Sławomir Gojdz Sp.j.	20.0	44.1	11.6	2.8	1.7	0.3	32.0	70.5	46.2	0.6
Koral S.A.	-4.0	-22.7	-1.7	4.7	2.3	6.1	40.9	230.0	0.0	-0.1
Dr.Oetker Polska Sp. z o.o.	6.1	7.6	6.0	1.6	1.0	0.1	0.0	0.0	11,780.9	0.0
Tasomix Sp. z o.o.	6.0	8.0	2.5	9.5	2.4	0.3	0.1	0.1	196.9	-45.3
FDW Pasze Sp. z o.o.	2.4	6.4	0.4	20.0	5.6	0.0	7.0	19.0	21.5	0.2
Nordzucker Polska S.A.	5.6	8.9	7.9	1.3	0.7	1.0	26.1	41.4	0.0	0.1

Source: own calculations based on financial statements from EMIS database

The asset turnover ratio for the analysed enterprises in the agri-food sector ranged from 0.3 to 8.6 and was characterised by an average variation of 56% (Tables 1 and 2). The best efficiency was characteristic of entities operating in the sector dealing with the production of margarine and edible fats (Bunge Polska Sp. z o.o.).

The level of indebtedness of the surveyed enterprises was characterised by high variability. In the case of enterprises operating in the agri-food sector in Poland in 2021, the values of the general debt ratio ranged from 0% to 64% (Table 2). In the case of about 53% of the surveyed entities, the indicator of the level of total indebtedness took on values below 10%, in 19% it was at the level from 10.7% to 19.0%, while in 28% this indicator took on values from 23% to 64% (Table 2). The level of indebtedness of the surveyed companies in 2021 was relatively low, which also had a significant impact on the degree of debt security and the possibility of timely repayment of the loan taken out, i.e. interest. For this purpose, the interest coverage ratio is used, which makes it possible to assess how many times the profit generated by an entity's business activities (before taxes and interest payments) covers the annual value of interest paid [Czerwińska-Kayzer et al. 2013]. This indicator is determined by the financial condition of the entity and the size of its loans. The agri-food sector is characterised by a large variation in the size of debt, which has resulted in a high variability of the interest coverage ratio. In 2021, the businesses surveyed took on interest coverage ratio values ranging from -133.7 to 45,613,192.3 (Table 2). For 50% of the businesses, less or 19.0 times profit covered the value of interest. This means that the surveyed businesses operating in the agri-food sector in 2021 had no difficulty covering interest on their loans.

From a set of substantively acceptable sub-indices, only those with a sufficient level of coefficient of variation and, at the same time, not excessively correlated with other indicators were selected for the construction of the synthetic measure. Correlation was assessed by constructing a correlation matrix between the variables and then an inverse matrix. The diagonal elements of the inverse matrix were further analysed. Values significantly exceeding the number 10 indicate inappropriate numerical conditioning of the matrix and thus excessive correlation of the trait with the other traits. Selected diagnostic variables after the correlation procedure, including the inverse correlation matrix, 10 diagnostic characteristics were included for further study. The current liquidity ratio, quick liquidity ratio, sales revenue dynamics and total revenue dynamics were excluded from further research.

The second stage in the estimation of the synthetic measure was to carry out a null unitarisation of simple characteristics while transforming the destimulants into stimulants. This made it possible to standardise the nature of the characteristics and to reduce the individual characteristics to a comparable form taking values in the range from 0 to 1. The stimulants included return on assets, return on equity, net profitability, fixed asset turnover ratio, asset turnover ratio, interest coverage ratio, liability coverage ratio.

The destimulants were the liability turnover ratio, the total debt ratio, the debt-to-capital ratio (Table 1). Taking into account the empirical material collected, it was shown that none of the characteristics considered were counted as a nominant (Table 1).

The third step in the construction of the synthetic measure involved calculating the Euclidean distances of the individual units from the development benchmark and anti-benchmark. The inclusion of distances from both the benchmark and the anti-benchmark distinguishes the TOPSIS method from other methods. The Euclidean distances were determined based on the formulas in the material and methods section of the study.

In the fourth step, the value of the synthetic trait was determined. The final stage was the determination of the value of the synthetic measure on the basis of the normalised values of the simple traits and the linear ordering and classification of agri-food enterprises based on the values of the synthetic measure of financial condition (Table 3).

It was shown that, in 2021, the synthetic measure for assessing the financial health of companies in the agri-food sector in Poland was characterised by high variability, which is influenced by the variability of the coefficient value for individual diagnostic characteristics (Table 1). The highest variability was characterised by the interest coverage ratio, the liability coverage ratio and the fixed asset turnover ratio (Table 1).

 Based on the normalised values of simple characteristics, the values of the synthetic measure of the financial condition of individual enterprises in the agri-food sector were determined and, on its basis, a linear ordering was carried out along with the classification of the studied entities with regard to their financial condition (Table 3).

Ten enterprises were classified in Class I (Table 3). These were the entities that were characterised by the most favourable financial situation. Enterprises included in Class I are engaged in the production of margarine and similar edible fats, processing of meat excluding poultry meat, production of grain mill products, processing of milk and cheese products, processing of fish, processing of tea and coffee, and production of cocoa, chocolate and confectionery (Table 3). This class was characterised by high profitability of total assets in the range from 8.5 to 20%, high profitability of equity in the range from 10 to 70%, a general debt ratio at the level of 0 to 2.8%, the exception being the entity Paula Fish Sławomir Gojdz Sp.j. for which in 2021 the value of this ratio was recorded at the level of 32% (Table 2). Enterprises included in Class I were characterised by the size of employment in the range of 170-966 persons, and the size of revenues ranging from PLN 631 million to PLN 4 billion. In addition, all entities had a positive profit in 2021. Entities belonging to Class I are characterised by high financial efficiency (profitability), which they achieve through a proper policy of financing activities and efficient management of assets.

Table 3. Classification of surveyed agri-food enterprises in 2021 based on the value of synthetic

Limiting values of the synthetic measure	Level	Typo-logical class	Synthetic measure values
> 0.463	high	I	Bunge Polska Sp. z o.o. (0.481), AgroRydzyna Sp. z o.o. (0.492), Cereal Partners Poland Toruń-Pacific Sp. z o.o. (0.503), Okręgowa Spółdzielnia Mleczarska (Giżycko) (0.539), Frosta Sp. z o.o. (0.481), R. Twining and Company Sp. z o.o. (0.518), Mokate Sp. z o.o. (0.482), Storck Sp. z o.o. (0.556), Foodcare Sp. z o.o. (0.485), Paula Fish Sławomir Gojdz Sp.j. (0.475)
0.401-0.463	medium-high	II	Cargill Poland Sp. z o.o. (0.404), Spółdzielnia Mleczarska Mlekovita (0.415), Mars Polska Sp. z o.o. (0.438), Polmlek Sp. z o.o. (0.415), Pfeifer & Langen Polska S.A. (0.458), Barry Callebaut Manufacturing Polska Sp. z o.o. (0.434), Polmlek Raciąż Sp. z o.o. (0.452), Nutricia Zakłady Produkcyjne Sp. z o.o. (0.462), Zott Polska Sp. z o.o. (0.458), Zakłady Mięsne Skiba S.A. (0.426), ADM Czernin S.A. (0.419), Storteboom Hamrol Sp. z o.o. (0.432), Lisner Poznań Sp. z o.o. sp. k. (0.417), Best Oil Sp. z o.o. (0.454), Sudzucker Polska S.A. (0.402), Okręgowa Spółdzielnia Mleczarska w Kole (0.406), Royal Canin Polska Sp. z o.o. (0.416), Okręgowa Spółdzielnia Mleczarska w Sierpcu (0.418), Dohler Sp. z o.o. (0.417), Borowski Investments Sp. z o.o. S.K.A. (0.425), Drosed S.A. (0.429), Hochland Polska Sp. z o.o. (0.408), Mondelez Polska Production Sp. z o.o. (0.414), Froneri Polska Sp. z o.o. (0.444), Instanta Sp. z o.o. (0.444), Lumiko Sp. z o.o. (0.429), Abp Poland Sp. z o.o. (0.433), Dr.Oetker Polska Sp. z o.o. (0.435), Tasomix Sp. z o.o. (0.430), FDW Pasze Sp. z o.o. (0.430)

Table 3. Cont.

Limiting values of the synthetic measure	Level	Typological class	Synthetic measure values
0.340-0.401	medium-low	III	Animex Foods Sp. z o.o. (0.378), Spółdzielnia Mleczarska Mlekpol w Grajewie (0.389), Wipasz S.A. (0.355), Krajowa Grupa Spożywcza S.A. (0.388), Gobarto S.A. (0.360), Komagra Sp. z o.o. (0.398), Okręgowa Spółdzielnia Mleczarska w Piątnicy (0.376), Okręgowa Spółdzielnia Mleczarska w Łowiczu (0.388), Drobimex Sp. z o.o. (0.396), Animex Kutno Sp. z o.o. (0.345), Polmlek Grudziądz Sp. z o.o. (0.378), Nestle Purina Manufacturing Operations Poland Sp. z o.o. (0.387), Zakłady Mięsne Łuków S.A. (0.397), Ferrero Polska Sp. z o.o. (0.400), Przedsiębiorstwo Drobiarskie Drobex Sp. z o.o. (0.353), Goodmills Polska Sp. z o.o. (0.371), Roldrob S.A. (0.400), Pamapol S.A. (0.350), Zakład Mięsny Wierzejki J.M. Zdanowscy sp.j. (0.361), Polindus Sp. z o.o. (0.346), Bg Production Sp. z o.o. (0.344), Spółdzielcza Mleczarnia Spomlek (0.354), Agrifirm Polska Sp. z o.o. (0.344), Inter Europol S.A. (0.393), Adros Sp. z o.o. (0.385), Przedsiębiorstwo Produkcyjno-Handlowo-Usługowe Laktopol Sp. z o.o. (0.378), Nordzucker Polska S.A. (0.395)
< 0.340	low	IV	Koral S.A. (0.212), Agrocentrum Sp. z o.o. (Kolno) (0.246), Superdrob S.A. (0.284), Polskie Zakłady Zbożowe Sp. z o.o. (0.300), Cedrob S.A. (0.311), Milarex Sp. z o.o. (0.320), Plukon Sieradz Sp. z o.o. (0.320), Intersnack Poland Sp. z o.o. (0.321), Zakłady Mięsne Silesia S.A. (0.331), Zakład Przemysłu Mięsnego Biernacki Sp. z o.o. (0.339), Suempol Sp. z o.o. (0.340)

Source: own calculations based on financial statements from EMIS database

The second typological class consists of 30 enterprises operating in the agri-food sector (Table 3). The value of the synthetic measure was in the range of 0.402-0.462 (Table 3). Entities included in this typological class are mainly engaged in processing of milk and cheese products, processing of meat, including poultry meat, production of sugar, production of edible oils and fats, production of fruit and vegetable juices and processing of coffee and tea, as well as production of cocoa, chocolate and confectionery (Tables 3). The enterprises included in the second class were characterised by a return on assets ratio ranging from 0.3% to 14.3%, a value of the return on equity ratio ranging from -29 to 38%, moreover, the surveyed entities did not have a debt problem, generating a profit from operations of between PLN 2 million and PLN 301 million (Table 2). The surveyed companies generated revenues between PLN 617 million and PLN 6 billion in 2021 [EMIS 2022].

Class III was formed by 27 enterprises in the agri-food sector (Table 3). The enterprises included in Class III are engaged in the production of meat products, including poultry meat products, processing of milk and cheese products, production of feed, production of sugar, processing and preserving of poultry meat. This class was characterised by a medium-lower level of financial situation. The profitability of equity was determined in this class by net profitability and return on total assets. However, the structure of external capital was dominated by long-term liabilities. Furthermore, in this class, the entities surveyed were characterised by high values of the total debt ratio. This means that the management of committed assets is a weakness in these companies (Table 2). In addition, two enterprises included in class III were characterised by a negative financial result, i.e. (Gobarto S.A. and Agrifirm Polska Sp. z o.o.).

Class IV, i.e. with the weakest financial condition, included 11 enterprises (Table 3). This class was characterised by low profitability, low involvement of external capital in financing operations. Entities included in this typological class are mainly engaged in processing and preserving fish and potatoes, as well as production of ready-made animal feed. Entities included in class 4 were characterised by an employment size of less than 4,000 persons each, mainly entities employing between 158 and 1,500 persons [EMIS 2022]. In addition, 4 entities were characterised by a negative financial result in 2021 (i.e. Superdrob S.A., Suempol Sp. z o.o., Zakłady Mięsne Silesia S.A. and Koral S.A.).

CONCLUSIONS

On the basis of the obtained values of the synthetic measure used to assess the financial condition of enterprises, 4 typological classes of entities operating in the agri-food sector were specified. The results obtained make it possible to analyse the financial situation of the studied business entities in 2021, and to formulate some important conclusions:

1. The best financial condition was characterised by enterprises in Class I, which based their activities on the production of margarine and similar edible fats, processing of meat excluding poultry meat, production of grain mill products, processing of milk and cheese products, processing of fish, processing of tea and coffee, and production of cocoa, chocolate and confectionery.
2. The enterprises included in class I had high profitability of total assets, high profitability of equity, low value of the total debt ratio.
3. The least favourable financial position in 2021 was held by enterprises mainly engaged in the processing and preservation of fish and potatoes, and the production of prepared animal feed.
4. Class 4 was characterised by low profitability and low involvement of external capital in financing activities, and the surveyed entities showed a lack of effective asset management, as evidenced by the financial result obtained in 2021.

In summary, the importance of the Polish agri-food sector in 2021 was determined primarily by the financial results obtained by entities engaged in the production of meat products, including poultry meat products (Animec Foods Sp. z o.o., Cedrob S.A, Superdrob S.A.), processing of milk and cheese products (Mlekovita Dairy Cooperative, Mlekpol Dairy Cooperative in Grajewo, Polmlek Sp. z o.o.), as well as entities producing margarine and similar edible fats (Bunge Polska Sp. z o.o.). Relating the obtained results to studies by other authors [Bieniasz et al. 2012, Czerwińska-Kayzer et al. 2013, Florek et al. 2013, Drożdż et al. 2014, Gołaś, Kurzawa 2014], it can be concluded that the meat industry, the dairy industry and the oil industry are characterised by a stable financial condition, which determines the development of the agri-food sector in Poland and its strong position in the whole national economy, as well as on the European arena. Due to the COVID-19 pandemic, the war in Ukraine, as well as progressing inflation, which contributes to an increase in the price of feed, as well as the price of energy and materials used in food production, the Polish agri-food sector faces the challenge of maintaining its current competitive advantage against other sectors of the national economy.

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ANALIZA KONDYCJI FINANSOWEJ WYBRANYCH
PRZEDSIĘBIORSTW SEKTORA ROLNO-SPOŻYWCZEGO
Z WYKORZYSTANIEM METODY TOPSIS

Słowa kluczowe: kondycja finansowa, sektor rolno-spożywczy, metoda TOPSIS,
miernik syntetyczny, baza EMIS

ABSTRAKT. Celem artykułu jest ocena kondycji finansowej wybranych przedsiębiorstw sektora rolno-spożywczego. Badanie kondycji finansowej przedsiębiorstw, w tym przemysłu spożywczego, jest złożonym zagadnieniem. Dokładna oraz kompleksowa analiza wymaga rozpatrywania licznych aspektów funkcjonowania przedsiębiorstwa. W związku z tym, wykorzystuje się szeroki zakres wskaźników finansowych, co umożliwia pomiar wybranych składowych kondycji finansowej. Do badań wykorzystano dane dla przedsiębiorstw funkcjonujących w sektorze rolno-spożywczym (z różnych gałęzi). Dobór przedsiębiorstw do badań był celowy i oparto go na rankingu przedsiębiorstw zamieszczonym w bazie EMIS. Do badań wykorzystano sprawozdania finansowe publikowane w bazie EMIS za rok 2021. Do oceny rozwoju przedsiębiorstw wykorzystano metodę TOPSIS, która umożliwiła określenie kondycji finansowej badanych przedsiębiorstw. Wykazano, że najlepszą kondycją finansową cechowały się przedsiębiorstwa, które opierały swoją działalność na produkcji margaryny i podobnych tłuszczów jadalnych, przetwarzaniu mięsa, z wyłączeniem mięsa drobiowego, oraz na przetwórstwie mleka i wyrobie serów.

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