MANAGERIAL APPROACHES ASSOCIATED WITH THE NATURAL GAS CRISIS IN THE AGRICULTURAL SECTOR FROM ROMANIA AND TÜRKIYE

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ABSTRACT

After the economic impact caused by the Covid-19 pandemic, with relevant effects on both supply and demand of natural gas and their derived products, there has been a high interest at both managerial and academic levels, directed towards decoding the relationships between key stakeholders involved. The agricultural economy has chain implications at the level of every industry, and the price of natural gas radically influences various fields. In the context of the Covid-19 pandemic and the war between Russia and Ukraine, Romania and Türkiye have faced unprecedented situations in the energy and agricultural sectors, especially due to high prices and low sales value of cereals due to imports from Ukraine. The present study brings to the light of the research information from secondary sources, both quantitative and qualitative, simultaneously with an interview-type approach arried out on five managers in the area of distributors and producers of chemical fertilizers in Romania and Turkey and moreover completed with an analysis of the effectiveness of managerial implementation nationlwide. The innovative element comes primarily from the informational value of the data provided by them, intrinsic and far-reaching aspects at the managerial level in companies with hundreds of employees. The paper outlines the element of necessity attributed to the use of natural gas in the world's economic fields, reflecting the national-level managerial directions approached by the governing bodies of the two countries in order to manage the situation. An analysis of the financial implications of recent years in the field and the management policies used to adapt to the atypical market context is outlined. To contribute to a deeper understanding of price relationships, this paper analyzes the dynamics between the prices of energy, natural gas and reference chemical fertilizers on the market in Romania and Turkey, especially over the years 2019 – 2023. The research emphasizes the managerial approaches that have impacted the mentioned sector and highlights the reactions of the governing bodies at the level of the two states, reflected in strategic directions oriented towards the population to support the citizens. In order to analyze the effectiveness of the implementation, a Google Forms type form addressed to the farmers of the two states was created, with coded questions, precisely defined based on the national managerial policies that will have been presented previously.

KEYWORDS:*, chemical fertilizers, , management, natural gas electricity, natural gas, strategy*

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1. INTRODUCTION

At the beginning of the COVID-19 pandemic, sectors dependent on natural gas production faced an instant economic standstill, concurrent with health restrictions imposed to limit the spread of the virus around the world. One of the implications of this event was a sudden and significant reduction in energy consumption as a result of the cessation of gainful activities in the vast majority of manufacturing and processing environments. The reduction in energy demand caused a drop in prices and implicitly forced

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a drop in its production (Bradley, 2022). With prices falling, Saudi Arabia has proposed that oil-producing countries cut production to help control prices. However, Russia disagreed, causing friction between the two countries and further impacting the sector's economy (Quintino et al., 2023). In this context, it is worth mentioning that Europe imports about 90% of its total gas consumption and about 45% of this comes from Russia (Pastore et al., 2022). To highlight te idea, in order to prevent price reductions due to low demand, members and partners of the Organization of the Petroleum Exporting Countries proposed a reduction in oil production (Quintino et al., 2023), supporting the approach encouraged by Saudi Arabia, but as it was previously specified, Russia refused. These issues have led to geopolitical instability and a trade war. Saudi Arabia, against its original proposal, increased production to gain a competitive position. Such events caused a sharp drop in energy prices, with WTI crude oil futures in Texas, USA, for example, even reaching negative values in April 2020 (Quintino et al., 2023).

With the resumption of activities in major industries at the end of 2021, energy supply could not keep up with demand, leading to higher prices and instability in the market as a whole. In addition to this natural cause of rising prices, as an economic result of demand exceeding supply, the current situation of the field has been worsened by the conflict between Russia and Ukraine that began in February 2022. In this context, it is necessary to deepen the understanding of the degree of relationship between the prices of natural gas, electricity and chemical fertilizers, especially after the significant economic shocks such as the pandemic crisis and the aforementioned war. To improve market understanding in times of price volatility, this study analyzed the correlations between these indicators.

2. THE NATURAL GAS CRISIS IN THE AGRICULTURAL SECTOR AND ITS MANAGERIAL IMPLICATIONS

2.1. Managerial approaches associated with the natural gas crisis in Romania in the agricultural sector

It is worth mentioning that Romania is located on the border with Ukraine, a country in a real war at the time of writing the paper, so the implications of this event were exponentially felt in the mentioned country. Ukraine serves as a major transit route for Russian gas exports to Europe, and any disruption in the region could affect natural gas supplies and prices. Romania was not directly affected by the changes to the grain supply chain in Russia and Ukraine as it has the capacity to independently cover its grain needs. Romania has a significantly developed agricultural sector and holds considerable potential for future development. The region is known worldwide for its diverse agricultural production, fertile soil and favourable climate for various crops. However, despite its agricultural potential, Romania faces challenges in fully exploiting its agricultural power. These challenges include outdated practices generated by limited access to modern agricultural technologies and infrastructure and fragmentation of land ownership.

Although with a developed agricultural sector, Romania is undoubtedly dependent on the use of chemical fertilizers. With a total agricultural area of 14,741 million hectares, an area that represents 61.8% (European Commission, 2022) of the total area of the country, considerable amounts of fertilizers are estimated to be necessary for the production to be healthy and rich. The largest producer of such chemical fertilizers in Romania is represented by Azomureș, a company with Swiss capital since 2011, located in Târgu Mureș, Romania, being a member of the large global group Ameropa Holding AG. The organization specializes in the production of fertilizers and chemicals, being known for the production of ammonia, urea and ammonium nitrate, which are essential components in agricultural fertilizers. Since its establishment in 1961, it has become one of the largest producers of fertilizers in Romania and the European Union, constituting a significant role in supporting the agricultural sector by providing essential nutrients for crops at the European level because their production is not only used in Romania, but also exported to various countries (Azomureș, 2023).

With the volatility of prices on the natural gas market, Azomureș was forced to close the factory on June 22, 2022, justifying the fact that the production price has reached a historical value, unsustainable in the economy. It is worth mentioning that the organization annually supplies Romanian farmers with various types of chemical fertilizers, specific to various plant needs, through their authorized distributors. So, on June 22, 2022, both the thousands of employees working on the ammonium platform and the national fertilizer distributors, along with farmers who still needed the products, were affected.

The managerial approaches at the national level in the agricultural sector had close ties with the policies implemented by the Romanian Government. Amid rising prices of chemical fertilizers, farmers have been faced with the inability to sustain high yields with such fertilizers, with most taking the decision not to apply plant food. In order for the agricultural year not to be compromised, they received a series of aids through the Payments and Intervention Agency for Agriculture (APIA). Subsidies were granted per hectare, to each farmer who proves the work is legal and according to the land tax control bodies. With the help of these aids, but also against the background of the appearance in the market of imports of chemical fertilizers, from Bulgaria, Serbia, Israel, Egypt, Turkey, Uruguay at prices lower than those of domestic production, Romanian farmers managed to fertilize the soils.

However, the market was suffocated by grain imports that entered Romania, reducing the value of local goods. The Romanian agricultural organizations that invested considerable sums in their crops, taking the decision to purchase fertilizers at increased prices in the hope of rich harvests, saw themselves in the situation of devaluation of the cultivated goods due to the excess in the market. Farmers have expressed concern about the effects of increased Ukrainian grain and oilseed imports on local markets. It is particularly difficult for both Romania and Ukraine's neighbouring countries to compete with the proliferation of cheap grain in the war-torn state. As a result, Romania imported 13.9% of Ukrainian grain worth 1.24 billion dollars, far ahead of any other country globally (Zamfir, 2023). A multitude of farmers left their produce languishing in warehouses for over a year, unable to cover their expenses by selling at the low market price of Ukrainian grain. In addition, transport for the foreign market was blocked, as all the logistics capacity of the Port of Constanța was assigned to Ukrainian goods and ships.

In the light of these measures, farmers in Romania were helped with various financings in order to overcome the crisis situation. However, the distributors of chemical fertilizers in Romania, a sector with a turnover of 1 billion euros annually, was not taken into account in order to draw up some strategic directions for recovery.

2.2. Managerial approaches associated with the natural gas crisis in Türkiye in the agricultural sector

Top-level decision makers in Türkiye are placing particular emphasis on quantifying the potential effect on the global wheat market, including imports, grain prices and welfare, indicators related to food purchasing power. The country has been preparing its "National Food Systems Pathway" since 2021, within the framework of the UN Food Systems Summit. This effort includes 10 priorities and 117 actions linked to the Summit's five action tracks to transform food systems and achieve the Sustainable Development Goals by 2030. Farmers have received subsidies on their exports, financing that applies to 14 commodity groups out of the 19 eligible groups under Turkey's commitments. These include processed fruits and vegetables, poultry and eggs. However, according to the Massachusetts Institute of Technology Observatory of Economic Complexity (cited in Foote, 2022), Turkey is the third largest importer of wheat in the world, importing mainly from Russia ($1.66 billion), Ukraine ($208 million), Canada ($104 million) and Germany. ($100 million).

Moreover, relevant to the research direction, it is worth mentioning the state-supported agricultural insurance (TARSİM) that arises as part of a public-private partnership in which private insurance companies offer uniform policies to farmers. The amount of grain transiting Türkiye is enough to

feed most of the world's hungry people for more than two weeks, and their efficient management presents a real competitive advantage that can be formed. Thus, some of the wheat delivered to Türkiye is bought and processed there, then re-exported to countries such as Iraq and Sudan, or sold to World Food Program (WFP) and distributed as food aid (Savage et al., 2023).

2. RESEARCH METHODOLOGY

The research methodology is rigorous, appropriate and carefully crafted to address the research questions. In accordance with the chosen methodology, data were collected from secondary sources, semi-structured interviews and Google Forms surveys ethically, from reliable sources and following the necessary protocols. In order to obtain meaningful insights and coherent conclusions, the collected data were analyzed through various techniques depending on their nature and research hypotheses. Both statistical analysis, qualitative coding and thematic analysis were carried out. Findings passed through the knowledge filter provided patterns, trends, relationships, and themes that emerged from the data and could be related to existing knowledge and theories in the field. The review considers any limitations or constraints of the study and discusses their implications for the findings.
In order to carry out the work, were consulted a number of books and research papers hat analyze the subject of natural gas. The study of secondary sources also considers the whole process of examining and analyzing previously collected, documented or published data. A complete analysis requires extensive domain knowledge and a holistic approach.
From the perspective of quantitative research, statistical data from various websites belonging to worldwide Statistical Institutions were consulted. A relevant example in this regard is Eurostat, or Statistia, online search engines in which numerical data related to both countries under the research microscope were found and which were able to provide a clear and objective picture of the situation under discussion. The emphasis in the research process was attributed to the sector predominantly affected, the agricultural one, an area of high importance for investors, producers and consumers around the world.
The first stage of the study of primary sources is based on conducting five interviews with managers in the chemical fertilizer production and distribution sector. As the research will later demonstrate, their price is largely influenced by the price of natural gas, the basic raw material for production. In order to simplify the research process, the people who took part in the investigation will be suggestively named MD1, MD2, MD3, MP1 and MP2 throughout the paper. They fall into the age category of 45-60 years. Those labelled MD are managers of chemical fertilizer distribution companies, one from Türkiye and two from Romania. At the same time, MP highlights the managers of two production organizations, also from the two countries.
In tandem with the analysis of the interviews, the research focused on the creation of a Google Forms questionnaire, addressed to workers in the agricultural sector. In order to understand the quality of the drafting and implementation of the policies to be presented, performing a comparative analysis on both countries, the survey based on a questionnaire was addressed both to farmers in Türkiye and to those in Romania. The questionnaire was distributed in online social networking groups, noting that the target group is made up of people who work or have worked in the agricultural sector. Only they were invited to take part in the investigation.
Once distributed on social networks, a number of 139 responses were collected, of which 87 from Romania and 52 from Turkey. It is worth considering the large share of answers in which there are students of the Faculty of Natural Sciences and Agricultural Sciences of Ovidius University, Constanța, as well as their acquaintances or relatives of Turkish nationality who are also active in agriculture. The collected data were centralized and mathematically coded, and entered into the SPSS computer program for analysis. In order to streamline the comparative approach, the related questionnaire results from the two countries were compared using the Mann-Whitney U statistical test, also analyzing the effect size estimate with data variability or other effect sizes reported in similar studies to assess practical significance of the observed difference.

4. RESEARCH ON THE EFFECTS OF THE NATURAL GAS CRISIS IN THE ECONOMIC ENVIRONMENT

4.1. Analysis of the effects of the natural gas crisis on the management in the agricultural sector – interview-based approach

It is worth noting that the national strategies envisaged for the economic recovery caused by the context of the natural gas crisis in the agricultural sector have been focused on farmers, with the direction of keeping food prices on a constant line. However, organizations in the chemical fertilizer production and distribution sector have not received any type of regulation, direction, or support of any kind within national policies. These were among the most affected by the current crisis, and the present research brings to light the way in which private companies in this sector have managed the situation in the absence of national policies that favor them. The secondary sources studied laid the foundations of the current research and opened the way for one's own contribution to the already existing literature. In order to carry out our own data collection approach, interviews were conducted with five senior level managers in the chemical fertilizer production and distribution sector, both in Romania, Türkiye and Europe. The people who participated in the interview, described in the Research Methodology chapter, represent senior managers in the chemical fertilizer production and distribution industry. They will be referred to throughout the paper as MD1, MD2 AND MD3, representing the three managers of the distribution companies and MP1, MP2, the two managers of the production companies, one from Romania and one from Turkey.
Table number 1 outlines the prices at which the Azomureș factory, previously mentioned, sells its products to their authorized sellers, namely independent organizations, with Azomureș exclusivity contracts. The data provided in the table are collected from MD1 and MD2, which are distributors throughout the country, and from the point of view of cost analysis, the mentioned values constitute the purchase price of the companies on the mentioned calendar dates. It is important to mention that the prices are expressed in lei and highlight the cost of one ton of product. To simplify the research, only two basic products from the Azomureș offer list were taken as reference, namely ammonium nitrate and NPK complexes 20.20.0. Respondents provided a range of product nomenclature prices, but noted that these are the main ones purchased and used by farmers. Moreover, according to the information provided by MD3, a representative of a chemical fertilizer distribution company in Turkey, the price variations of Turkish products in the domestic market were slightly different from the data in the following table.

Table 1. Prices of chemical fertilizers supplied by Azomureș to its authorized distributors in the period 2021-2023

Period of time		Ammonium nitrate price	NPK 20.20.0 Price
Month	Year		
July	2021	1540	2060
August	2021	1700	2220
September	2021	1790	2200
October	2021	1800	1990
November	2021	2310	2200
December	2021	3360	3030
January	2022	3520	3030
February	2022	3520	3030
March	2022	3510	3010
April	2022	3700	3300
May	2022	3760	3400

Period of time		Ammonium nitrate price	NPK 20.20.0 Price
Month	**Year**		
June	2022	3900	4000
July	2022	4360	4500
August	2022	4200	4100
September	2022	4300	4230
October	2022	4650	4520
November	2022	4500	4520
December	2022	4510	4400
January	2023	4000	4000
February	2023	3170	3000
March	2023	3170	3050

Source: data provided in interviews by MD1 and MD2

Important to observe in this data is the upward trend of prices, which brings to light increases of up to 100% for some products and renders management bodies at the level of distribution companies incapable of foresight. Precisely because of the novelty of the situation, the managerial ways of managing market volatilities constitute a relevant management theme. Each distributor's strategy is independent and varies from individual management policies. According to the generalization of the collected information, the market trend is normally considered steady in the chemical fertilizer market. The periods of high demand are in the months of February-April, respectively September-October. These are, moreover, the moments when the rates on the market are high, as a result of the change in the supply/demand relationship. The increases and decreases in price according to the mentioned calendar date can be found both for distributors in view of purchases from factories and for farmers in the final price of the product by sellers.

Taking into account this aspect, including the huge differences that are registered within just one month, most of the Azomureș partners decided to stock up and purchase significant quantities at the end of 2021. The managerial approach was based on the forecast of a continuous growth trend of prices until the spring of 2022, when farmers will buy products for the spring sowing campaign. The price increases in the winter of 2021 were attributed to the shortage of natural gas in the market, simultaneously with the lack of security in the Russian area that threatened Ukraine. Considering the time of winter, marked by price drops normally, the distributors in Romania and Türkiye increased their stocks, making purchases.

However, with the month of February 2022, Romanian and Turkish farmers, due to much higher prices, decided to avoid fertilization and cultivate without this important stage. It should be taken into account that chemical experts recommend that for a wheat crop approximately 650 kg/hectare of chemical fertilizers in order to achieve a rich crop (Aonofriesei, 2023). Taking into account the mean price of the period February-April 2022, namely 3656 lei per ton/hectare, by choosing not to fertilize the crop, farmers saved 2376 lei/hectare. Looking at the economic implications, although production costs were lower for farmers, crop yields were at risk. In the context of a holistic managerial approach, it should be mentioned that the farmers' decision to abandon the use of chemical fertilizers also comes against the background of the continuous drop in the price of cereals on the international market.

The decision to abandon chemical fertilizers led to a nutrient deficiency in the soil, with grains needing certain specific minerals to grow and develop properly. Without the addition of chemical fertilizers, the natural nutrient content of the soil may not be sufficient to meet the needs of the crop, thus affecting plant growth, crop yield per hectare. There are thus major implications for the Romanian and Turkish food industry for the value chain that will be turned upside down by the low grain supply. According to the information held by the Azomureș manager, namely MP1, approximately 60% of the agricultural area in Romania and Türkiye was fertilized in 2022. Moreover, the farmers decided to purchase imported fertilizers from Bulgaria, Serbia, Israel, Egypt, Uruguay

and many more at lower prices than domestic production. Imports came from countries with favorable tax policies and low production prices, so domestic products from Romania and Türkiye could not compete on the market.
Price differences of up to 1000 lei/ton attracted buyers, but created an unprecedented situation in the business environment. Distributors who had thousands of tons of fertilizers in stock had to sell them at prices far below the purchase price in order to reduce their expenses as much as possible, or to maintain the stock and anticipate a future price increase. In such a context of uncertainty, most organizations had to make ad hoc decisions, without a concrete, complete and coherent information base. Precisely because of the doubt, they decided to share the risk and sell half of the stock at a loss, keeping the other pole for later price changes. Spreading the risk seemed the best option.
Chemical fertilizers are a perishable product within a year. Taking into account the price fluctuations presented in Table no. 1, and the value of the goods purchased, the course of the stocks of the companies was a very large one, impossible to store in warehouses in the hope of price changes. In this context, the top managers of the distribution firms looked for ways to sell the products with as much loss margin as possible. Taking into account a simple hypothesis deduced from the respondents' statements, 2000 tons of ammonium nitrate purchased in December 2022 for the amount of 4510 lei/ton and sold in February 2023 for the minimum market price of 3170 lei/ton represents a loss of 1340 lei/ ton, respectively 2,680,000 lei for the entire quantity. According to reports, the purchases of fertilizers with such price differences only in the three organizations under the research microscope were in total approximately 30,000 tons of fertilizers, constituting a loss of at least 95,100,000 lei at the level of the companies. Moreover, the losses may be increased by the current tendency of consumers to continue to prefer imported products, which are constantly cheaper. Thus, in addition to the market price difference between the date of purchase and the date of sale, as well as the cost of storage, organizations had to adapt their work strategies to gain a competitive position and manage to sell the products, even in major losses.
The management approaches considered were carried out without a sound strategy, in a hasty manner due to the market situation. Managers believe that they have been overtaken, and the only ways to gain market share has come from working with large farmer financing companies, which purchase large quantities of fertilizer from distributors, but at rock bottom prices. These funds were the only safe option for organizations to liquidate stocks and reduce their losses.
The three managers in the distribution area concluded the period of the last calendar year as a chaotic one that highlighted their lack of managerial training. As I highlighted in the Research Methodology chapter, they do not have theoretical managerial knowledge and apply strategic elements in a rudimentary way. Careful and centralized planning, as well as a thorough analysis of the situation in order to make a forecast, would have significantly reduced the losses according to them.
Regarding MP1 and MP2, the managers of the production companies, the financial losses were not so large, but the respective organizations lost their credibility in the market and risk losing important partners. The entry of imports into the market and the lack of regulations favoring domestic production constitute a threat to the described sector, so that a large part of fertilizer distributors, under the light of the last year, will be forced by the financial situation to declare bankruptcy.

4.2. The effectiveness of the implementation of strategic directions at the national level from the perspective of farmers – questionnaire-based approach

The managerial approaches presented in Chapter III highlight the reactions of the governing bodies at the level of the two states, reflected in strategic directions oriented towards the population to support the citizens. Precisely because the field has been directly affected, both by domestic increases in the prices of chemical fertilizers, and by the limitations or directions imposed by the regulations in force, simultaneously with the decrease in the sale price of cereals, agricultural workers are considered able to reflect the efficiency from their perspective of these approaches. In order to survey the population, the quantitative research method based on a questionnaire was used. In order to

achieve this, the Google Forms program was chosen, through which the analysis could be facilitated. Forms of this type provide a structured and standardized approach to collecting data from a large number of participants and are particularly useful in obtaining specific information, opinions, attitudes or behaviors of individuals or groups. The completed questionnaire facilitated data collection in an efficient and systematic manner.

Therefore, as to simplify the method of data collection, the respondents were divided into two categories according to the extent of completing the questionnaire. The described sections include respondents from the two countries, the approach facilitating comparative analysis. The 138 respondents, of which 87 Romanians and 52 farmers from Türkiye provided valuable data regarding their perspective on the sector in which they operate. The main direction of analysis brings to light the non-parametric Mann-Whitney U test through which the potential differences between the opinions of Romanian and Turkish farmers are put under the magnifying glass of the research. The chosen probability for the test is 95%. The research hypotheses that have been discussed are:

H0: The shape of the distributions of the values in the two populations is homogeneous.

H1: There are differences between the shape of the distributions of the two samples.

To test the variance of the two populations, the respondents received a series of tems specific to the SWOT analysis that they were invited to evaluate.

Analysis of the farmer's opinion on the high points

Internal strengths are used to take advantage of external opportunities. Moreover, strategies exploit internal strengths to mitigate or minimize external threats. They constitute ways of capitalizing on the qualities at the organization level, implicitly generating a competitive advantage. Respondents rated a series of five such points using a scale of 1 to 5, where 1 is "strongly agree" and 5 is "strongly disagree" on the extent to which those strengths are found in the agricultural sector of which belong These can be found in table no. 2, long with the results of the Mann-Whitney U statistical test.

Table 2. Results of the Mann-Whitney statistical test related to strengths in agriculture

Strengths in agriculture		Mean ranks	Sum	Mann-Whitney U	Z	Sig.
Domestic products are readily available in the market	Romania	66.26	5765.00	1937.000	-1.457	0.145
	Türkiye	76.25	3965.00			
Low entry barriers in the agricultural sector	Romania	66.50	5785.50	1957.500	-1.374	0.169
	Türkiye	75.86	3944.50			
Agricultural institutes provide easy consultation on request	Romania	61.56	5294.00	1553.000	-3.117	0.002
	Türkiye	82.63	4297.00			
Low production costs	Romania	65.85	5729.00	1901.000	-1.644	0.100
	Türkiye	76.94	4001.00			
National regulations favor the farmer	Romania	65.06	5660.50	1832.500	-1.933	0.053
	Türkiye	78.26	4069.50			

Source: authors based on survey data

Agricultural institutes provide easy consultation on request. The option of calling on the opinion of agricultural engineers with studies in the field is a strength for any organization because it draws a clear and informed direction that can help increase production or save it. Thus, an economic environment in which specialized institutes offer organizations consulting programs applied to their problems is not only a section for creating competitive advantage for the farm, but also reflects the success of the implementation of national strategies aimed at prosperity. However, regarding the current study, the H0 hypothesis is rejected ($U = 1957.500$; $p < 0.01$)), showing statistically significant differences between the two groups of respondents. The lack of similarities is given by the considerable differences between the mean ranks in Romania (61.56) and in Türkiye (82.63), also

supported by the effect of the Mann-Whitney U value ($\eta^2 = 0.07$), which claims that 7% of the variability is attributable to the reference country. Therefore, the results suggest that that farmers in Türkiye have easier access to such consultancy compared to their counterparts in Romania.

National regulations favour the farmer. Although the level of asymptotic significance approaches the chosen probability value of 95%, the p-value (0.053) is greater than 0.05, outlining the validity of the null hypothesis and implicitly the similarity of the reference groups. Not significant from a statistical point of view, the mean ranks bring to the light of the research the more prominent existence of some regulations favoring the farmer in Türkiye (mean ranks = 78.26), compared to the legislation in Romania (mean ranks = 65.06). According to the Mann-Whitney U level ($\eta^2 = 0.02$), the country represents a quality that changes the variability of the answers by 2%. This aspect contradicts the multitudes of financial support that Romania receives due to its membership in the European Union. A relevant example in this regard is pointed by the fact that The Commission proposes to allocate 10.05 million euros to Romanian farmers as support (European Commission, 2023).

Analysis of the farmer's opinion on the presence of weak points

The analysis of weaknesses is the basis for evaluating the current state of the organization, the way in which it must evolve in order to capitalize on opportunities and diminish future dangers from the external environment, by increasing internal potential and change trends.

Table 3. Results of the Mann-Whitney statistical test related to agricultural weaknesses

Agricultural weaknesses		Mean ranks	Sum	Mann-Whitney U	Z	Sig.
Lack of trained engineers	Romania	75.12	6535.50	1816.500	-2.001	0.045
	Türkiye	61.43	3194.50			
Low use of research results in the field	Romania	75.49	6567.50	1784.500	-2.137	0.033
	Türkiye	60.82	3162.50			
Farms use outdated technologies	Romania	73.65	6407.50	1944.500	-1.420	0.156
	Türkiye	63.89	3322.50			
Farmers do not have superior knowledge in the field	Romania	76.43	6649.00	1703.000	-2.515	0.012
	Türkiye	59.25	3081.00			
The risk management system is poorly applied	Romania	72.36	6295.50	2056.500	-0.923	0.356
	Türkiye	66.05	3434.50			

Source: authors based on survey data

Lack of trained engineers. Regarding the lack of trained engineers in the agricultural sector in Romania and Turkey, the hypothesis H0 is rejected ($U = 1816.500$; $p < 0.05$) which suggests that there are significant differences between the two groups of respondents. Moreover, the value of the variation that appears between the two countries, dictated by the Mann-Whitney U coefficient ($\eta^2 = 0.029$) is 2.9%, outlining with the help of the mean ranks the fact that there are many more trained engineers in Türkiye in farms (mean ranks = 61.43) compared to the situation in Romania (75.12).

Low use of research results in the field. Interest in scientific evolution and research development is much more developed in the Anatolian region than in Romania. This statement is supported by the asymptotic value equal to 0.033 ($U = 1784.500$), lower than the chosen error level of 0.05, an aspect that confirms hypothesis H1 and highlights the differences between the two groups of respondents. According to the Mann-Whitney U effect ($\eta^2 = 0.033$), the variation related to the low use of research results in the field is 3.3% influenced by the reference country.

Farms use outdated technologies. Regarding the situation of technologies in farms, the asymptotic significance equal to 0.156>0.05 (p-value) ($U = 1944.500$), confirms the hypothesis H0 and prints the similarity of the two groups of respondents. Thus, due to the mean values of the ranks in similar and low values (73.65, respectively 63.89) it can be stated that in the view of workers in the agricultural

sector, both in Romania and in Turkey, farms use technologies that have not passed the test of time and which need to be renewed. The Mann-Whitney U effect ($\eta^2 = 0.014$) is applied with a variety of 1.4% as a differentiator by country of reference.

Farmers do not have superior knowledge in the field. Contrary to the previous result of the research, a significant difference is highlighted between the studies of farmers from Romania and Turkey, differences arising from the asymptotic significance 0.012 < 0.05 (U = 1703,000), which refutes the similarity of the variable of the continuous result of the two population. With a predominantly higher mean ranks (76.43) compared to the one in Türkiye (59.25), agricultural workers bring to light the fact that the Anatolia area is dominated by workers with higher education in the field, and per a contrario the Romanian sector is made up of less prepared people. The variation provided by the country as a differentiator against this weak point, dictated by Mann-Whitney U ($\eta^2 = 0.045$) is 4.5%. Thus, the last two weaknesses bring to light the fact that although farmers in Türkiye are much more academically prepared, the sectors in both countries still use used machinery, with little investment in new technologies. This aspect is also supported by the high costs in the industry, defined by the respondents in the section reserved for strengths, in which they unanimously highlighted the difficulties encountered in investments.

Analysis of the farmer's opinion on the implementation of opportunities

Capitalizing on market opportunities allows every organization to grow to its full potential. By identifying and capitalizing on favourable industry elements such as emerging markets, new customer segments or innovative technologies, market share, revenue and profitability can increase significantly.

Table 4. Results of the Mann-Whitney statistical test related to the implementation of opportunities in agriculture

Opportunities		Mean ranks	Sum	Mann-Whitney U	Z	Sig.
Use of online promotion campaigns	Romania	72.1437	6276.5	2075.500	-0.890	0.374
	Türkiye	66.4135	3453.5			
Cultivation of new, innovative varieties	Romania	66.0805	5749	1921.000	-1.576	0.115
	Türkiye	76.5577	3981			
Use of specialized chemical fertilizers	Romania	69.1724	6018	2190.000	-0.327	0.744
	Türkiye	71.3846	3712			
Development of online marketing	Romania	62.9655	5478	1650.000	-2.784	0.005
	Türkiye	81.7692	4252			
National collaboration with other producers	Romania	65.7069	5716.5	1888.500	-1.734	0.083
	Türkiye	77.1827	4013.5			

Source: authors based on survey data

Use of online promotion campaigns. Online advertising allows agricultural businesses to reach a much wider audience beyond their local region. By establishing a consistent presence through websites, social media platforms and virtual marketplaces, farmers and agribusinesses can connect with potential customers, suppliers and partners in different geographic locations, facilitating the sales process. Although online marketing can provide numerous benefits to the agricultural industry, it is important to note that effective implementation requires understanding your specific target audience, selecting appropriate online channels, and developing a well-thought-out digital marketing strategy that aligns with your organization's goals and resources. These steps require people trained in the field to realize the strategies directed and implemented correctly, implicitly substantial investments. As previously analyzed, the agricultural sector presents a multitude of gaps in terms of openness to innovation, and this aspect is also highlighted in the result of the current research. According to the

study, the null hypothesis is confirmed, validating the homogeneity of the variances of the two samples of respondents through the asymptotic significance of 0.374 > 0.05 (Mann-Whitney U = 2075.500). The mean ranks, in small values, highlights that online promotion is not a priority for any of the countries, the Mann-Whitney U variability ($\eta^2 = 0.005$) printing a difference of only 0.5% attributed to the reference country.

Use of specialized chemical fertilizers. As was revealed during the work, chemical fertilizers are an important element in the process of feeding plants and increasing crops. However, most of the fertilizers used are not targeted to the actual needs of the soil or of the reference plant. Specialized fertilizers are a new formula that factories can make after analyzing the needs of plants on farms. However, although with a high yield, their production and application involve additional costs that increase the already high investments. Thus, the research shows that although their use is encouraged by national development programs in both countries, farmers are not open to their use. With an asymptotic significance of 0.744 > 0.05 (Mann-Whitney U = 2190.000) it can be unequivocally stated that the two samples are homogeneous, confirming the hypothesis H0. The mean value of the ranks highlights the share in which none of the countries is a frequent user of chemical fertilizers, the differences between the answers being correlated with the country only in proportion of 0.07% ($\eta^2 = 0.007$).

Cultivation of new, innovative varieties. Differentiating cultures and bringing product varieties to the market, both in terms of total novelty and through different new characteristics attributed to a product, is undoubtedly a competitive advantage of differentiation. However, the mean ranks bring to light the fact that agricultural workers in the two countries do not use innovative varieties. The statement is supported by the asymptotic significance 0.115 < 0.05 (Mann-Whitney U = 1921.000) which confirms the hypothesis H0 and the similarities between the two samples. Moreover, according to the effect of the Mann-Whitney U value ($\eta^2 = 0.017$) the country differentiates the responses by only 1.7%.

Development of online marketing. With an asymptotic significance of 0.005<0.05, (Mann-Whitney U = 1650,000) the null hypothesis is rejected, outlining the discrepancies between the two samples. It is clear that in Türkiye (mean ranks = 81.7692) the online marketing of agricultural products is much more common compared to the situation in Romania (mean ranks = 62.9655). The coefficient of differentiation, given by the value of the Mann-Whitney U effect ($\eta^2 = 0.05$) is 5%. Thus, Turkish farmers capitalize on the digitized sales market, a common aspect also in the research based on secondary sources (Foote, 2022), as shown in the 2.2. part of this work, where it was highlighted that Türkiye exports a substantial amount of fruits and vegetables. A good part of these orders and contracts can be obtained through the Internet.

Analysis of farmer's opinion on vulnerability to threats

Threat-based strategies improve internal weaknesses by using external opportunities and diminish internal weaknesses to reduce external threats. They represent an imminent process whose occurrence cannot be controlled, but whose impact is dictated by the ways of action at the managerial level, both in the short and long term.

The challenges of international development. In general, farmers, like any other representative of an economic organization in a country, have the potential to evolve and expand their operations internationally. Advances in technology, transportation, and global trade have provided opportunities for companies to explore markets beyond their local regions through product exports, direct international sales, and partnerships. The same category includes agricultural organizations, enterprises that produce goods of global interest. International collaborations and expansions give farmers access to technical expertise, inputs and guaranteed markets. These development options can be a way to establish long-term relationships with international buyers and ensure a steady stream of income. Moreover, farmers can participate in international exchange programs, attend conferences or respond to training opportunities to learn about innovative agricultural practices, new technologies and market trends in different countries. However, expanding internationally as a farmer requires careful planning, understanding international markets, complying with trade regulations and adapting

to cultural and business practices in different countries. The extension is not only about availability, but is closely related to applicable legislation that may or may not favor exports. The present research brings under the magnifying glass the fact that farmers from Türkiye (mean ranks = 81.86) consider themselves much less vulnerable to these challenges compared to those from Romania (mean ranks = 62.91). An example that supports this statement is represented by the asymptotic significance 0.005 < 0.05 (Mann-Whitney U = 1645.500) which validates the differences between the two populations, rejecting the null hypothesis. According to the value of the Mann-Whitney U effect ($\eta^2 = 0.057$), the country influences the variability of the answers by a percentage of 5.7% (table 5).

Table 5. Results of the Mann-Whitney statistical test reported on the level of vulnerability to agricultural threats

Threats		Mean ranks	Sum	Mann-Whitney U	Z	Sig.
The challenges of international development	Romania	62.91	5473.50	1645.500	-2.805	0.005
	Türkiye	81.86	4256.50			
Fierce competition from substitutable products	Romania	62.63	5449.00	1621.000	-2.950	0.003
	Türkiye	82.33	4281.00			
Global or regional economic crisis	Romania	65.97	5739.50	1911.500	-1.574	0.116
	Türkiye	76.74	3990.50			
International companies with attractive products	Romania	64.70	5628.50	1800.500	-2.071	0.038
	Türkiye	78.88	4101.50			
Cereal imports	Romania	68.46	5956.00	2128.000	-0.602	0.547
	Türkiye	72.58	3774.00			

Source: authors based on survey data

Fierce competition of substitutable products. With a variety of producers and a lack of discernible differentiation between the quality of agricultural products, the competitive battle can become fierce in finding buyers. According to the data resulting from the application of the Mann-Whitney U test (U = 1621,000), the asymptotic significance of 0.003<0.05 confirms the hypothesis H1 and implicitly the fact that there are statistically significant differences between the two populations. In the view of Romanian farmers, competition is a threat to which they are much more vulnerable, compared to the opinion of Turkish farmers. The variability of responses between the two populations is 6.3% ($\eta^2 = 0.063$).

Global or regional economic crisis. Vulnerability to the economic crisis mainly depends on the degree of risk of each organization, but also on the confidence in the ability of the governing bodies to draft policies that favour overcoming critical moments. Especially regarding the agricultural sector, an area in which global production supports life on Earth and in which deficits are still found, farmers can only be concerned about its impact in the context of poor management by the authorities. According to the collected and analyzed data, with an asymptotic significance of 0.116>0.05 (Mann-Whitney U = 1911.500) the null hypothesis that prints the similarity of the populations is confirmed. Thus, farmers from the two countries consider themselves equally vulnerable to a possible crisis, and the mean values of the ranks highlight a low confidence in the degree of safety that the organizations they belong to can have in this context, both in Romania (rank mean = 65.97), as well as in Türkiye (rank mean = 76.74). The variability given by the country of the respondents is only 1.7%, ($\eta^2 = 0.017$).

International companies with attractive products. The large companies operating in each region are generally organizations with a strong brand behind them and which rely on attractive marketing campaigns. As the research demonstrated in the section on implementing opportunities, the majority of farmers in either country do not use online advertising as a means of development. In this context, local producers can be overshadowed in the absence of stable regulations by large corporations in the

competitive struggle. According to the asymptotic significance of 0.038 < 0.05 (Mann-Whitney U = 1800,500), it can be unequivocally stated that the two populations are statistically different. The Mann-Whitney U value effect ($\eta^2 = 0.031$) prints a difference of 3.1% per response by country of reference. Although in both countries, especially in the context of the natural gas crisis and the economic difficulties that have arisen, national strategies have been implemented to encourage the population to consume local products, at the same time as offering tax facilities and reducing market entry barriers for farmers, from Türkiye (mean of ranks = 78.88) consider themselves much less vulnerable to large corporations compared to those from Romania (mean of ranks = 64.70). This aspect outlines the effectiveness of the implementation of strategic directions in Türkiye and puts in a negative light the success of the approaches in Romania.

Cereal imports. As the research highlighted, grain imports that entered Türkiye and Romania from Ukraine significantly reduced the prices of domestic goods on the grain exchange. The increase in the supply of these low-value commodities has crucially threatened the profitability of agricultural organizations. Regarding the vulnerability that farmers feel, in the light of the measures taken by the authorities to reduce the impact of the repetition of such an incident, the fear is unanimously high. This statement is supported by the asymptotic significance of 0.547 > 0.05 (Mann-Whitney U = 2128,000) which confirms the null hypothesis and the similarity between the two populations. The fear described stems from the recent actions that took place on the market and that generated considerable losses on each part of the procurement chain.

5. CONCLUSIONS

Regarding agriculture, despite the strong motivational drive for the development of modern farms with specialized workers, due to the challenges in agriculture and the weak institutional context, the implementation of the strategies could not be properly achieved. This statement is supported by the results of the Mann Whitney U statistical test, which revealed the homogeneity of the two samples of respondents and their opinion regarding certain elements specific to the SWOT analysis in the organizations they belong to. Socio-economic conditions, especially frequent price fluctuations and irregular support policy, discourage farmers from investing, with high production costs, and commitment to permanent or semi-permanent payment commitments is an uncertainty. Therefore, designing systems of managerial options at the national level that are flexible enough to be adapted to local conditions and allow users to change cultures and adapt to new markets is fundamental.

In addition to the contributions of the present study, the identification of its limits lead to the broadening of the horizon of access and implicitly to the favoring of future research that succeeds in filling the existing gap in the literature. Although limiting this analysis to the logic of sustainable growth, the arguments recognize critical perspectives that have high potential for success in the perspectives of Romanian and Turkish policies for sustainable regional development.

At the microeconomic level, the structured interviews that took place with the participation of five managers in the chemical fertilizer sector provided data on the importance of providing much more specialized information to farmers regarding the technical and agronomic details regarding the compatibility of each type of crop with modern technologies, both in terms of productivity gains as well as operational costs. The presence of information constitutes an important direction of evolution. Given the increasing vulnerability to drought and extreme weather events, the potential benefits of agriculture are expected to increase.

As a research agenda to address future perspectives, new studies are suggested that address the current dynamics of these markets in light of the global geopolitical crisis as a result of the post-pandemic economic recovery, regarding the behavior of major oil and natural gas producers, especially the issue between Russia and Ukraine and its effects, as well as the potential reflection on the global chemical fertilizer market.

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