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EVOLUTION OF GREEN FINANCE IN ALBANIA

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ABSTRACT

Aim: Green finance is a concept that is only partially known in Albania. However, Albania is committed to supporting green agreements for a planet that respects the environment and sustainability. For this reason, this paper aims to analyze the level of knowledge and awareness of Albanian people regarding green finance, the financial products that are part of green finance, the activities developed to promote green finance, as well as the expected results regarding the commitment towards a sustainable green world. **Methods:** In order to study the latest developments, a questionnaire was built, which was distributed at institutions that are related to sustainability activities or are responsible for sustainability reporting and also where the financial institutions that produce financial products that promote green finance operate. **Results:** The results of the study show an increasing trend of activities in support of sustainable development, but still relatively little recognition of the problems related to the emission of greenhouse gasses and climate change. Reporting about sustainability activities is in the process of being included in financial reporting standards. **Conclusions:** In conclusion, green finance in Albania is in its first steps and needs general awareness and involvement of all actors to make possible a quick transition to a sustainable economy and living. Reporting about sustainability activities is still voluntary and not mandatory; standards about sustainability reporting are still in progress and, when finalized, will help to boost all individuals and enterprises toward performing and reporting sustainability activities.

Key words: Green finance, Sustainable Development Goals, financial product, climate change, Green Deal

JEL codes: F65, Q01, Q51

INTRODUCTION

Green finance is still a relatively new concept in Albania. Albania is strongly engaged in all European initiatives to support the Sustainable Development Goals (SDGs) and climate change mitigation, as well as to preserve and protect the environment as part of green agreements. The issue of setting up green finance starts with an initial assessment of climate change and its negative effects on the planet. Green finance consists of the creation of financial products that activate public and private investments in support of maintaining sustainability, protecting the environment, and mitigating climate change [Höhne et al. 2011]. There is no standard definition regarding green finance, and we often find terms such as climate finance, environmental finance, and sustainable finance, which are similar and overlap, but are not the same thing. Basically, green finance is part of sustainable finance [Mohd and Kaushal 2018]. Green finance focuses on environmental issues that aim to preserve the environment by activating investments and the flow of capital towards sectors that produce products and services that protect the environment

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and help preserve it. For example, investments in the production of renewable energy, the reduction of environmental pollution, the preservation of forests and waters of the seas, rivers, lakes, and oceans, as well as the development of electric transport that reduces the level of environmental pollution, etc. [Krastev and Krasteva-Hristova 2024]. The concept of green finance is explained by first understanding the concept of sustainable finance and the concept of sustainability itself. The concept of sustainability is related to meeting the needs of today's world while respecting and preserving the demands and needs of tomorrow's world [Baudry et al. 2017]. The concept of sustainability is closely related to the concept of the continuation of the existence of human beings and all other beings that are part of this planet; it relates to the continuation of life and the survival of the world that we know [Arcagök 2023]. The concept of sustainable finance refers to the activation of the movement of capital towards sectors that develop environmental protection activities, social activities, and governance activities [Schäfer 2012]. All mechanisms created or activated by sustainable finance aim to support the 17 SDGs and environmental, governance, and social strategies [Schumacher et al. 2019]. Green finance is realized through financial instruments specifically created to activate the financing of projects for the benefit of environmental protection, mitigating the effects of climate change, and the transition towards the elimination of greenhouse gas emissions [Knez et al. 2022]. The most popular financial products created in the framework of green finance are green bonds, environmental bonds, and sustainable bonds, which are all debt instruments that aim to finance the public and private sector that implements projects, programs, and activities that promote environmental protection, mitigating the effects of climate change, as well as moving towards an economy that maximally reduces emissions of carbon dioxide and greenhouse gasses [Cerqueti 2023]. The development of green finance requires the public and private sectors to work together to implement projects aimed at supporting the SDGs. To achieve this, the government, international institutions, private companies, public agencies, universities, second-level banks, the central bank, and any other crediting financial institution must be included [Martin 2022]. Green finance is intended to assess and reduce climate risks, mitigate the negative effects of climate change, and gradually move towards the production of renewable energy that is sustainable, long-term, and that protects the environment and life on the planet [Brühl 2021]. Global warming, or global combustion, as it is called in recent years, is now a problem for our entire planet. It is a problem that must be addressed by all countries of the world, especially those that cause the biggest part of the problem. Unfortunately, the countries with the smallest emissions suffer the most [Soundarrajan and Vivek 2016]. The primary countries responsible for high carbon dioxide emissions are China, Russia, Canada, the USA, Japan, Iran, India, Germany, South Korea, Indonesia, Brazil, South Africa, Turkey, and the United Kingdom, mainly due to industrial activities [Singh 2017]. Understandably, it is these same countries that should be on the front line of the attack to compensate, setting up mechanisms to reduce the damage created by global warming as well as to promote the reduction of the cause of this global damage [Koval et al. 2022]. The main countries that have produced financial products in the framework of green finance, otherwise known as green bonds, are China, Germany, the USA, the United Kingdom, Italy, France, Spain, Holland, and Hong Kong [Statista 2024]. In the last decade, the USA has led in the generation of funds through green bonds totaling USD 454 billion. It is impossible for Albania to be the main actor in the development of green finance, but it can become part of all the initiatives of the Western Balkans for the creation of green bonds, to absorb green investments, and through the development of well-coordinated fiscal policies to reduce the emission of carbon dioxide and greenhouse gasses [Dashi 2023]. Currently, there is a green finance platform where all the specifics of a green financial system are explained, which is based on two main components: first, the prioritization of all green investments with a focus on the environment and mitigating climate change, and the second is the support of all investments that increase sustainability and prioritize all SDGs (CPI 2021). Since the industrial acceleration of the 1980s, the world is constantly experiencing negative effects regarding sustainability. Rapid industrial development was accompanied by

the deterioration of sustainability [Sachs 2014]. In the following years, many phenomena have been related to this development, and in relation to COVID-19, the connection with the deterioration of sustainability has been widely discussed [Ranjbari 2021]. The effects of COVID-19 make the actions of all the countries of the world much more important in increasing sustainability and responding in support of the 17 SDGs [Barbier and Burgess 2020]. After the COVID-19 pandemic, the perception regarding sustainability has completely changed, identifying determinants of sustainability through a new perspective, that of a post-COVID-19 world [Abbas et al. 2021]. In their recent studies, Gjoni and Muça [2023] studied the financial reporting problems of rural households and also took into consideration their reporting on green finance issues. There is always a need for environmental support in regard to preserving nature and its equilibrium [Šarić et al. 2023].

AIM AND METHODS

In Albania, there are very few studies about green finance and the perception of green investments in relation to sustainability and the SDGs. For this reason, it is necessary to analyze the level of knowledge of the concept of green finance, the instruments available to countries like Albania, how much these funds have been used by financial intermediaries, the government and market actors, and how much these funds have been translated into investments in projects, programs, and activities that support sustainability by focusing on mitigating the negative effects of climate change as well as the transition towards a green economy with a significant reduction in the emission of carbon dioxide and greenhouse gases.

The study's methodology is based on quantitative and qualitative data analysis and interpretation. For this purpose, a questionnaire was built and distributed to about 500 individuals who work in companies that are related to sectors that must support sustainability, such as energy, transport, tourism, agriculture, etc. From this sample, only 220 questionnaires were valid and were analyzed and processed statistically. Questions were focused on recent research on this topic and selected to reach the main objective of the study, which is to evaluate the level of evolution of green finance in the perception of Albanian stakeholders. About 20 interviews were also conducted with representatives of agencies that report on sustainability in Albania, such as agencies of the Ministry of Agriculture and Rural Development, the Ministry of Tourism and Environment, and agencies under the municipalities, etc. A descriptive method of analysis was used to analyze the results and draw some important conclusions. The research questions we raised to carry out this study were:

Q1: What is the awareness level of the concept of green finance in Albania and the scope of its coverage?
Q2: Do Albanian institutions periodically report on sustainability and investments in the framework of green finance?
Q3: Does the Albanian financial market offer financial products that support green investments, protect the environment, and increase sustainability?
Q4: Have the Albanian institutions applied for the absorption of funds for projects in the framework of green finance?
Q5: What is Albania's contribution regarding activities that increase sustainability and support the SDGs?

RESULTS

Regarding the first question, the respondents answered that they partially know the concept of green finance, and that there are only a few initiatives to convey information about green financing and the sectors that can benefit. Most of them fail to differentiate between the terms sustainable finance, green finance, climate finance, and environmental finance; they think they are the same term formulated in different ways (Fig. 1).

Regarding the question of whether the institutions where they work, or are related to, report on activities that support sustainability, they answered that there are short reports on financing related to green energy sources, such as renewable energy produced through solar panels, hydropower plants, and mini-hydropower plants, as well as urban transport services utilizing electric cars, and increasing the use of recyclable packaging, etc. (Fig. 2).

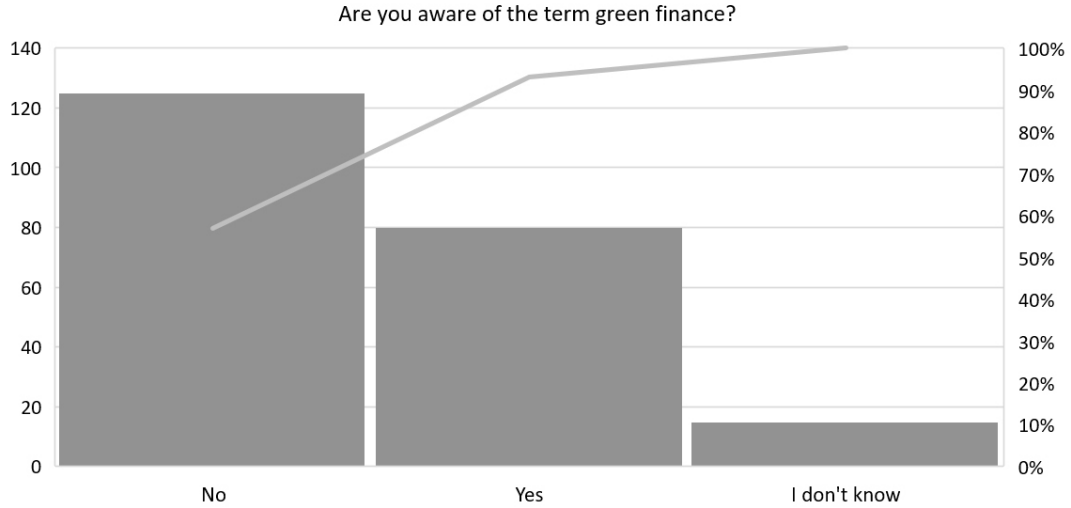

Fig. 1. The awareness level of the green finance concept

Source: the authors.

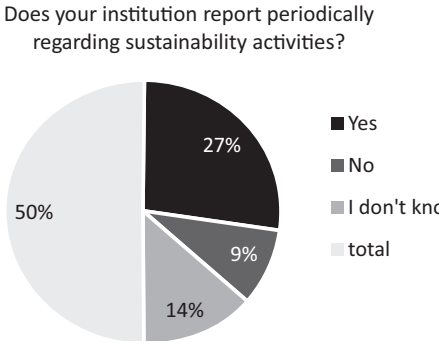

Fig. 2. Reporting of sustainability activities

Source: the authors.

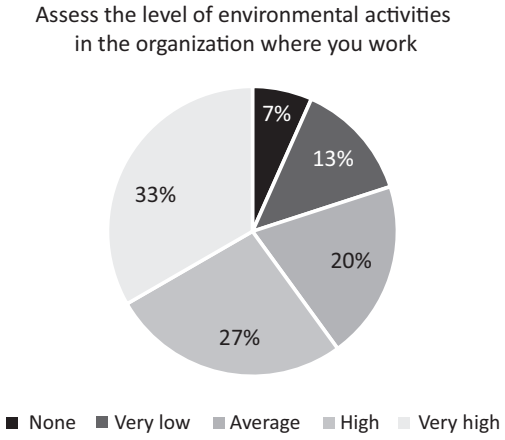

Fig. 3. The level of environmental activities

Source: the authors.

The level of environmental activities in Albania, according to the respondents (Fig. 3), is mainly represented by a general initiative of municipalities to plant 1,000,000 green trees throughout the country, initiatives to clean the banks of rivers and lakes, and the establishment of a national moratorium for the protection of Albanian forests by law since 2016 [LIGJ 5/2016].

Regarding the question of whether the Albanian financial market offers specialized financial products for green investments, the respondents answered that there are such products in the form of green loans offered for transport utilizing electric cars as well as the installation of solar panels widely in hotel businesses and in the production sector.

Regarding the fourth question regarding applications for European Union funds for financing green projects, the respondents answered that they accessed funds through cross-border projects, projects within the framework of consortia between private organizations, universities, and foreign partners, as well as agencies of ministries and municipalities in the country. However, the level of applications for these funds and the level of their profit from the Albanian partners still remains low (Fig. 4).

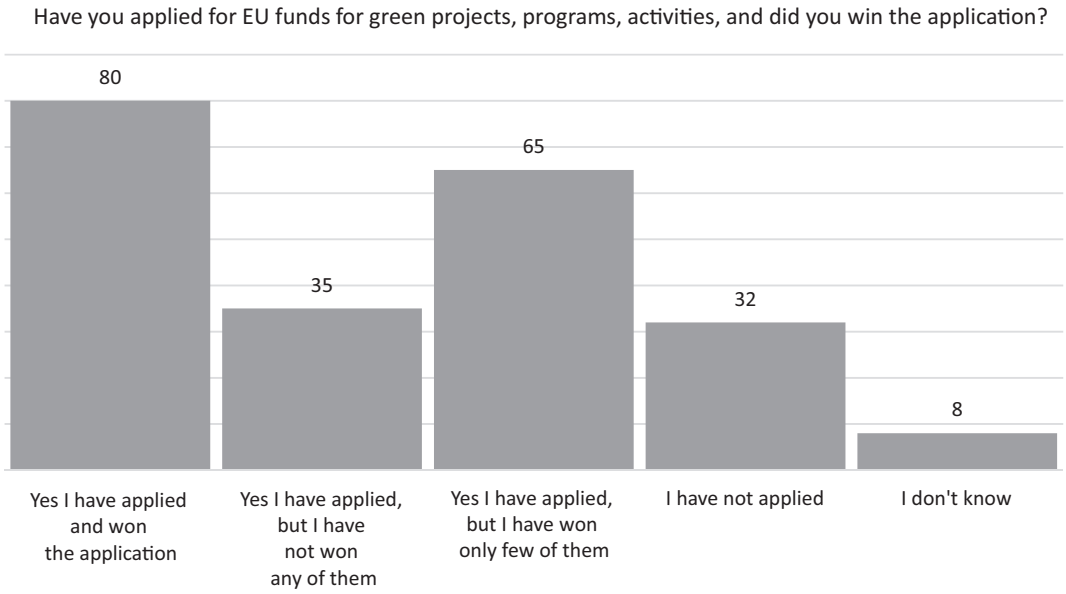

Fig. 4. Level of application for green investments

Source: the authors.

Regarding the fifth question, the respondents answered through an open question whether Albania has embraced all the initiatives of the transition towards a renewable energy industry through the hydropower plants built throughout its territory, as well as through the wind energy that will be produced through three new projects that have just started. There has also been great support for transportation using electric buses and electric taxis. This will significantly help reduce the country's carbon dioxide emissions. However, Albania remains a country with a high level of transport based on diesel and gasoline vehicles, which needs to be reduced through government policies encouraging renewable energy.

Through interviews with actors who have access to reports related to activities that support sustainability, it turns out that the reports have very little information, within the amount of one or two paragraphs, and without explaining the ongoing impact in relation to the benefits derived from the activities related with stability. The interviewees in 93% of them emphasize that the role of the government, municipalities, and local administration units should be much higher to sensitize communities regarding sustainability and the opportunities created through green finance.

CONCLUSIONS

As a conclusion from the study conducted with 500 respondents regarding the concept and effectiveness of green finance in Albania, as well as 20 interviews with actors participating in agencies that report on sustainability, it turns out that an accurate portion of Albanians still do not have a accurate understanding of green finance, sustainability, sustainable finance, and issues related to climate change. For this, more awareness is needed on the part of the government, international institutions, financial intermediaries, non-governmental organizations, and other actors who have full knowledge about the concept of sustainability and the SDGs in order to expand as much as possible the scale of participants in activities, projects, programs, and investments that improve sustainability. Also, the study showed that there are specialized financial products to support green investments, but that there is still a relatively low recognition of them, with unfavorable conditions for profit and difficulty in obtaining financing. Also, the study showed that there is still a lack of a reporting culture in Albania regarding the financing of green investments and engagement in activities that support sustainability and their periodic report-

ing. We recommend that this type of reporting for all companies that engage in projects with an impact on the environment should become part of the mandatory and standard annual financial reporting of these companies. The study showed that, to a large extent, local and local government institutions do not regularly report on activities that support sustainability, and this is due to a lack of ongoing funds and a lack of culture regarding the importance of sustainability and mitigating the effects of climate change. In conclusion, there is a need for more studies in this field, with the aim of encouraging the commitment of the entire population regarding sustainability, access to green finance, and reporting on sustainability.

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EWOLUCJA ZIELONYCH FINANSÓW W ALBANII

STRESZCZENIE

Cel: Zielone finanse to koncepcja wciąż częściowo znana w Albanii. Jednak Albania zobowiązała się do wspierania zielonego porozumienia na rzecz planety, która szanuje środowisko i zrównoważony rozwój. Z tego powodu artykuł ma na celu przeanalizowanie poziomu wiedzy i świadomości Albańczyków na temat zielonych finansów, produktów finansowych, które są częścią zielonych finansów, działań opracowanych w celu promowania zielonych finansów, a także oczekiwanych rezultatów dotyczących zaangażowania na rzecz zrównoważonego zielonego świata. **Metody:** Aby zbadać najnowsze osiągnięcia, opracowano kwestionariusz, który został rozesłany do instytucji związanych z działaniami na rzecz zrównoważonego rozwoju lub odpowiedzialnych za raportowanie zrównoważonego rozwoju, a także tam, gdzie działają instytucje finansowe, które wytwarzają produkty finansowe promujące zielone finanse. **Wyniki:** Wyniki badania pokazują rosnący trend działań na rzecz zrównoważonego rozwoju, ale nadal stosunkowo niewielką rozpoznawalność problemów związanych z emisją gazów cieplarnianych i zmianą klimatu. Sprawozdawczość na temat działań na rzecz zrównoważonego rozwoju jest w trakcie uwzględnienia w standardach sprawozdawczości finansowej. **Wnioski:** Podsumowując, zielone finanse w Albanii są na początku swojej drogi i potrzebują ogólnej świadomości i zaangażowania wszystkich podmiotów, aby umożliwić szybką transformację w kierunku zrównoważonej gospodarki i życia. Sprawozdawczość dotycząca działań na rzecz zrównoważonego rozwoju jest nadal dobrowolna i nieobowiązkowa, standardy dotyczące sprawozdawczości w zakresie zrównoważonego rozwoju są nadal w toku i po ich sfinalizowaniu pomogą zachęcić wszystkie osoby i przedsiębiorstwa do wykonywania i raportowania działań na rzecz zrównoważonego rozwoju.

Słowa kluczowe: zielone finanse, cele zrównoważonego rozwoju, produkt finansowy, zmiana klimatu, Zielony Ład

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THE EFFECTS OF THE EURO'S DECLINE ON THE ALBANIAN ECONOMY

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ABSTRACT

Aim: This study aims to analyze in detail the sectors that have suffered from the euro's fall and evaluate their situation in the Albanian economy. This article investigates the impact of the euro's devaluation on the primary economic sectors, including imports and exports. Since the clothing sector was among the most impacted by this drop, particular attention has been paid to the export of leather and its products, as well as the textile and footwear sectors. **Methods:** The data used in the analysis were sourced from the primary institute that published the data. These institutions, which are in charge of collecting and releasing accurate and reliable economic data, include the Institute of Statistics and the Bank of Albania. Data analysis was done using descriptive analysis. This analytical technique was used to draw attention to the shifts and effects that the exchange rate transactions had over the time under study. As a result, now we have the chance to comprehend how and why these developments have affected the Albanian economy. **Results:** The results in this study allow us to see how changes in exchange rates have affected the main sectors of the economy. Since import, export, and tourism are the industries with the highest income in euros rather than the native currency, they have seen the largest impact. **Conclusions:** Despite the measures taken by the main institutions, these measures didn't have the expected impact. What these businesses should do to protect themselves from the fall of the euro is to either make contracts in the national currency or use forward contracts for the sale and purchase of euros at the euro rate when the initial contract was concluded.

Key words: exchange rate, import, export, tourism
JEL codes: E20, E31, F31

INTRODUCTION

Since the transition from a centralized socialist economy to a free market economy in the early 1990s, Albania has experienced major changes in its exchange rate system. The implications of exchange rates are crucial to understanding the economic dynamics of nations like Albania, which are continuously developing their internal markets and integrating economically with the rest of the world.

Between 2020 and 2024, there were notable fluctuations in the exchange rate between the Euro (EUR) and the Albanian Lek (ALL) due to worldwide events, including the COVID-19 pandemic and the conflict in Ukraine, as well as tensions between Russia and EU member states. The EUR, as an important currency in the Eurozone, experienced a difficult decline in relation to most other currencies, including the ALL. In order to preserve domestic financial stability and minimize the effects of international uncertainty, the Bank of Albania has implemented appropriate monetary policies, which have been a crucial part of its response to these difficulties.

The COVID-19 pandemic and then the war in Europe brought about an increase in inflation in Europe as a result of the breakdown of market mechanisms, as

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Ukraine and Russia were two of the biggest exporters. The consequences have been noticeable in the export and import of goods, but less so in other sectors that are not significantly impacted by this phenomenon, according to reports from INSTAT and the Bank of Albania.

The year 2020 marks the beginning of the pandemic, and this is when the troubles with Albania's EUR to ALL exchange rate began and was the cause of exchange rate differences in 2020. Gongkhonkwa [2021] discovered that other exchange rates were significantly impacted by COVID-19 as well. The depreciation of CNY, MYR, SGD, VND, AUD, and TWD was caused by confirmed incidents of COVID-19. The study's findings indicate that the COVID-19 pandemic has impacted the foreign exchange market's efficiency. The COVID-19 pandemic has affected exchange rates, as well as the containment and stabilization measures introduced. Thus, the pure spread of the pandemic was also able to influence the exchange rate if the cases were about to increase more strongly in one country than in another [Klose 2023]. There were differences in the effectiveness of major currency exchange rates before and during the COVID-19 pandemic. Prior to the pandemic, AUD and JPY had the highest efficiency; only CAD, CHF, and GBP exhibited improvements in efficiency. This shows that investor strategies and risk management have been impacted by the pandemic's major effects on the foreign exchange markets [Aslam et al. 2020].

Ilzetzki and Jain [2023] assert that the start of the conflict between Russia and Ukraine resulted in significant distortions in international trade flows because, on the one hand, military actions on the territory of Ukraine, one of the world's largest grain exporters, disrupted global supply chains, and, on the other hand, sanctions placed on the Russian Federation fueled a sharp rise in the futures prices for trading oil and its derivatives. Many nations, particularly those in Europe, especially the Eurozone, which has been viewed as a suitable monetary area, experienced three major challenges as a result of the new reality of global economic flows:

- rapid inflation,
- an increase in budget deficits,
- an increase in public debt.

Many economists believe that the start of the conflict indirectly contributed to the EUR devaluation versus the US dollar. However, a recent CFM-CEPR survey found that 56% of respondents thought monetary policy changes were the cause of the EUR devaluation, while only 30% thought it was related to the overall macroeconomic environment, that is, the Russo-Ukrainian conflict [Ilzetzki and Jain 2023].

However, the most significant analyses carried out by the major economic institutions have concluded that the conflict between Russia and Ukraine was primarily responsible for the EUR's indirect depreciation against the dollar. This was due to two factors: 1) the EU's, including the Eurozone's, reliance on Russian gas and other energy sources; and 2) the gap between interest rates and monetary policy [Taskovski and Paceskoski 2023].

Pandemic-induced demand shifts and supply chain disruptions were one of the main drivers of the deterioration in EUR area export performance according to Fidora and Gunella [2024]. For the EUR area, there is evidence that firms progressively seek to diversify their supply of strategic goods to source these from producers in geopolitically aligned countries [Fidora and Gunella 2024].

The traditional finance literature has pointed out that the magnitude of exchange rate volatility has a major impact on the stability of foreign trade and a country's external environment. Higher exchange rate volatility intensifies financial market risks, increases the uncertainty of foreign investments, and leads to a decrease in social welfare. The result of Genc and Artar's [2014] study shows that there is a co-integration between the real effective exchange rate and the export-import of emerging economies in the long run. Brahimllari [2016], in her paper, concludes that exports are a very important factor in reaching sustainable economic development. The importance of increasing exports is not related only to the reduction of trade balance but also to the improvement of the quality of products and the increase of production capacity, new jobs, and well-being.

Gaberli et al. [2021] in their paper find that the decline of a local currency has an impact on the number of tourists visiting the country. Under a regime with a relatively weak Turkish lira (TRY), the number of tourists visiting Turkey from Germany declines as the local German currency (EUR) appreciates.

The exchange rate has both positive and negative effects on the performance of the manufacturing sector as a whole [Adeoye 2024]. This implies that

each industry in the manufacturing sector should take advantage of the increase (currency depreciation) in exchange rate by exporting more final products, and making use of local materials so as to reduce the rate at which they import manufacturing inputs. In their paper Musaluke and Hapompwe [2024] find that significant exchange rate volatility between 2019 and 2023 has had a marked impact on the manufacturing sector in Lusaka. Firms with robust hedging strategies and diversified sourcing were better able to mitigate negative effects, whereas those without measures experienced decreased profitability and increased financial strain.

According to Alba et al. [2010], when industries are favorable to foreign direct investment (FDI), the level of the exchange rate has a positive and very significant impact on the rate of FDI inflows. This implies that a stronger host country currency can make the investment more profitable for foreign investors who enjoy an increase in their home currency income. Volatility is disadvantageous in the long run because broad money, inflation rates, and external debts are a balance of payment instruments that usually increase FDI [Mustafa et al. 2024]. The currency fluctuations create uncertainty for foreign investors, impacting loan availability for businesses that affects the economic performance of banks [Onchwari and Miroga 2024].

In their paper, Crescenzi and Ganau [2024] find that a low degree of FDI diversification helped regions gain productivity after the shock. The effect is stronger in regions with an industrial profile concentrated in a limited number of sectors, particularly in services.

AIM AND METHODS

The aim of this paper is to analyze how the change in the exchange rate of the EUR has affected the main sectors of the Albanian economy. The main focuses are import-export, tourism, and textile and footwear, since these are the most affected from the changes in the EUR exchange rate.

A descriptive method was used to analyze the data. This analytical method was applied to highlight the changes and impacts of exchange rate transactions throughout the period under examination. The data used in the analysis were obtained from the most important institutions responsible for data distribution.

RESULTS

The change in the EUR exchange rate during the period 2020–2024

The official EUR to ALL exchange rate had several major changes in 2020, reflecting the effects of the COVID-19 pandemic as well as both internal and foreign economic issues (Fig 1).

The Albanian government implemented strict and complete measures during the COVID-19 pandemic. The Bank of Albania implemented a number of mon-

Fig. 1. The EUR – ALL exchange rate during 2020

Source: [Bank of Albania].

etary measures in an effort to help the economy and minimize the pandemic's negative impacts. These measures included lowering interest rates and providing the necessary liquidity to the banking sector and to enterprises. The primary goals of these actions were to safeguard the nation's financial stability and promote economic growth.

At the beginning of 2021, the EUR exchange rate was 123.8 ALL, which is the highest value that the EUR reached during this period. From this moment, the EUR depreciated throughout the year, reaching the exchange value of 120.36 ALL (Fig. 2).

Based on the analysis of the data, it can be noticed that the EUR declined versus the ALL in 2021. This could be the outcome of various macroeconomic variables, as well as improved economic conditions in Albania and higher revenue from remittances and tourists. These adjustments reflect Albania's financial and economic progress over the past few years. Arce et al. [2023] state that the conflict severely disrupted the world economy, particularly the food and energy markets, causing supplies to be severely limited and prices to rise. The Eurozone has been especially vulnerable to the economic effects of Russia's occupation

Fig. 2. The EUR – ALL exchange rate during 2021

Source: [Bank of Albania].

of Ukraine in comparison to other economic zones. This is mostly due to the Eurozone's heavy reliance on energy imports, which in 2020 accounted for over half of the region's energy consumption.

As a result of the Russo-Ukrainian war and the increase in the price of imported goods, the exchange rate of the EUR was affected throughout 2022 (Fig. 3).

Even during the year 2023, the exchange rate of the EUR against the Albanian ALL showed significant fluctuations. Throughout the year, the exchange rate declined with small recoveries for some very short periods (Fig. 4).

In 2024, the currency rate has been highly unstable, showing a declining pattern from January to April, followed by an uptick in April from ALL 102.93 to 104.64 before dropping once again to ALL 102.87. The minimum value reached so far is ALL 99.3 in September (Fig. 5).

The primary goals of the Bank of Albania's cautious monetary policy throughout 2022 were to maintain price stability and promote economic growth. The policy has been adjusted to the nation's monetary and economic developments. By adjusting interest rates to meet its monetary goals, the Supervisory Council of the Bank of Albania has demonstrated throughout the year that it can react quickly and systematically to changes in the economic environment. In general, the transactions carried out by the Bank of Albania for the purpose of regulating the exchange rate in 2022 have not produced the expected effects.

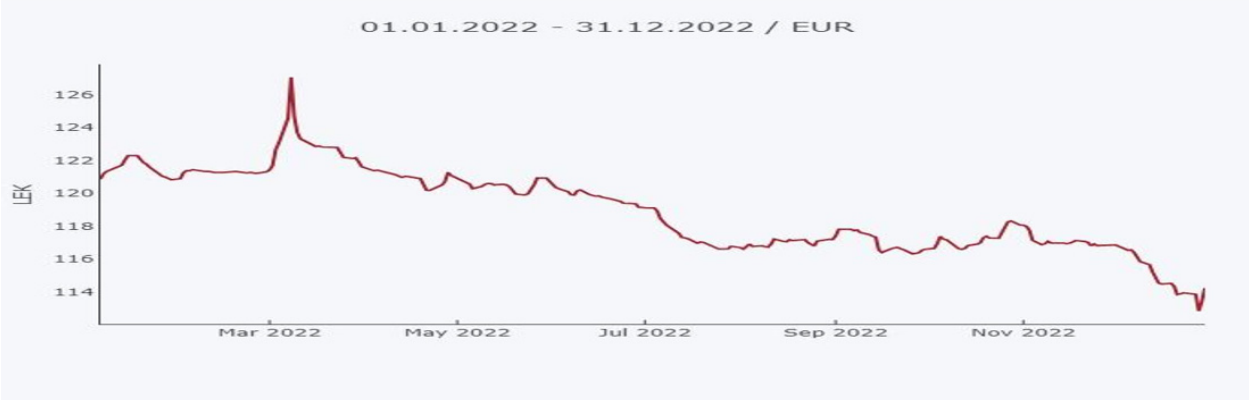

Fig. 3. The EUR – ALL exchange rate during 2022

Source: [Bank of Albania].

Fig. 4. The EUR – ALL exchange rate during 2023

Source: [Bank of Albania].

Fig. 5. The EUR – ALL exchange rate during 2024

Source: [Bank of Albania].

During the year 2023, the Bank of Albania has followed a cautious and measured approach in its monetary policies, making changes that reflect a balance between maintaining macroeconomic stability and promoting economic growth. These decisions have been based on detailed analyses of economic and monetary developments, taking into consideration the challenges and potential risks for the country's economy. The transactions of the Bank of Albania did not bring the expected results, helping only a few times to improve the exchange rate, with the highest value of the period captured after the purchases made at ALL 114.94.

The 2024 purchases have also had negative effects on the exchange rate. The three purchases have not contributed to an improvement in the EUR exchange rate for this period.

The effects of the EUR dropping in terms of exports-imports, tourism, and foreign direct investments

Albania experienced effects from the depreciation of the EUR in terms of tourism, foreign direct investment, and exports and imports. These indicators have dropped in recent years as a result of the EUR depreciation, especially in 2023, the year that saw the worst decline in the value of the EUR. The decline in remittances is a result of the collapse of the EUR. The Bank of Albania's data indicates that foreign incomes were not as high as they had been in prior years.

Albania's economy heavily depends on the export of goods, which promotes job creation and economic growth. Albania exports a broad variety of goods, such as construction supplies, minerals and metals, textiles, and agricultural items. The main exports are to the countries of the European Union, with Italy, Germany, and Greece as the main trading partners.

Albanian exports are significantly impacted by the decline in the value of the EUR, which results in fewer export revenues when converted to ALL. There isn't much of a difference between one period and the next when comparing export revenue in EUR, but because of the EUR depreciation, ALL revenue has fallen over time.

The data indicates that there has been a 9.7% decline in overall exports in 2023, where the ALL exchange rate with other currencies has affected matters in addition to geopolitical and economic ones. Based on INSTAT data, Albania exports most goods to countries whose main currency is the EUR.

Regarding the export of textiles and shoes, it can be said that this sector has also experienced a decrease in income and problems due to the devaluation of the EUR. Based on the analysis, this sector has experienced a decrease in exports from 2022 to 2023 by about 14.3%.

A study of the import data between 2021 and 2023 reveals a shift in the Albanian economy. From ALL 800.718 million in 2021 to ALL 950.381 million in 2022, the total amount of imports increased significantly before declining to ALL 872.676 million in 2023, indicating an 8.18% decline. This pattern points to an expansionary phase of the economy followed by

Table 1. Export of goods between 2020–2023 [million ALL]

Export	2020	2021	2022	2023
Total	**271.955**	**368.769**	**486.784**	**440.308**
Food, Drinks, Tobacco	39.050	44.469	51.715	55.667
Minerals, Fuels, Electricity	39.915	69.327	107.490	94.034
Chemical and Plastic Products	7.409	10.681	17.618	16.347
Leather and Leather Products	1.811	2.177	2.888	2.614
Wood Products and Paper Goods	8.643	10.148	14.283	11.179
Textiles and Footwear	102.344	112.455	135.222	126.308
Construction Materials and Metals	41.809	80.072	105.360	83.243
Machinery, Equipment, and Spare Parts	22.396	28.887	39.689	39.071
Other	8.577	10.554	12.521	11.845

Source: [Eurostat, INSTAT, MECI].

Table 2. Import of goods between 2020–2023 [million ALL]

	2020	2021	2022	2023
Import	**605.262**	**800.718**	**950.381**	**872.676**
Food, Drinks, Tobacco	110.927	130.017	149.225	145.778
Minerals, Fuels, Electricity	54.552	105.103	171.645	101.961
Chemical and Plastic Products	91.016	114.702	117.054	114.053
Leather and Leather Products	12.631	14.921	17.021	13.656
Wood Products and Paper Goods	24.006	28.894	35.219	30.045
Textiles and Footwear	75.457	90.831	101.788	94.191
Construction Materials and Metals	78.259	111.818	137.116	122.815
Machinery, Equipment, and Spare Parts	133.820	170.093	187.019	212.947
Other	24.595	34.341	34.294	37.229

Source: [Eurostat, INSTAT, MECI].

a stabilization or decline in the demand for imports as a whole.

Tourism is an important and rapidly growing sector within the national and international economy, driven by the development of new tourism markets. While international competition is intensifying, the sector requires a more accurate assessment of customer expectations to identify any gaps that may arise between them and the quality of services provided [Burlea-Schiopoiu and Ozuni 2021].

During the tourist season, the currency is normally devalued due to the increase in money inflows from tourists. This situation affects businesses in the tourism sector, especially those in the hospitality industry, which sell their services mainly in EUR. The Albanian tourism sector has enjoyed a competitive advantage in attracting foreign tourists due to relatively lower prices compared to competing destinations in Europe. However, the increase in prices, caused by the strengthening of the ALL and high labor costs, may reduce this advantage.

It should be pointed out that because tourist contracts are signed a year in advance and the EUR continues to decline, the revenue generated by exchanging EUR for ALL is lower than it was a year prior. As a result, tourism businesses experience a decline in revenue. The number of foreigners entering the country is increasing significantly year on year, but because

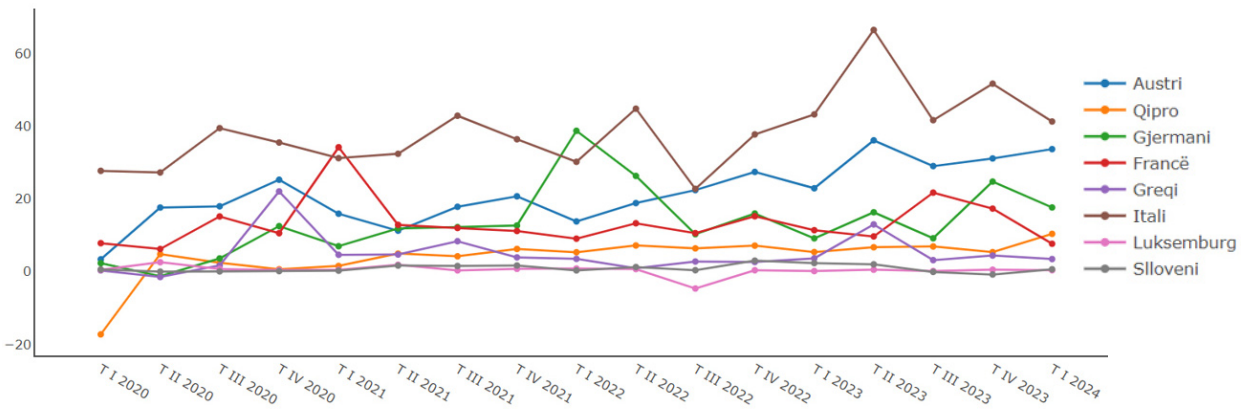

Fig. 6. FDI 2020–2024

Source: [Bank of Albania].

of exchange rates, revenues have not increased at the same rate.

In theory, foreign direct investments from the Eurozone should experience lower expenses as a result of the EUR decline against the ALL. Due to decreased investment costs, Albanian assets, projects, and businesses become more appealing to international investors from these nations. A scenario like this encourages investors to look into new ventures and strengthen their ties to the Albanian market in the hopes of profiting from the favorable exchange rate (Fig. 6).

In general, the period from 2022 to the beginning of 2024 shows continuous and increased interest from foreign investors, although with pronounced variations during different quarters.

CONCLUSIONS

With the start of the COVID-19 pandemic in 2020, the EUR started a decline that persisted through 2021 with sporadic declines. The beginning of the Russo-Ukrainian War in Europe in 2022 led the EUR to face its largest decrease. According to several authors, the cause for the devaluation of the EUR is related to Europe's dependence on Russian energy imports, especially gas, which is one of the primary raw resources in the Eurozone, as well as the disruption of global supply networks. Due to the significant influx of foreign currency, the EUR is predicted to continue its downward trend and even decline during the peak travel season.

In order to defend itself from the economic shocks brought about by the pandemic and, subsequently, the war in Europe, the Bank of Albania changed its monetary policy multiple times over the period. The Bank of Albania's efforts to reduce the negative effects of the EUR depreciation have not been successful. The exchange rate not only did not rise in response to the vast majority of the Bank of Albania's interventions in 2022, 2023, and 2024, but it actually had the opposite impact, causing the EUR to decline more sharply in the days that followed.

Exports of goods, including leather and its products, textiles, and footwear, decreased, according to the analysis that was done. The clothing sector was among the businesses that suffered the most from the decrease in the exchange rate. These exporting companies earn money in EUR and pay costs in ALL. Given this, the decline in the exchange rate caused these businesses' revenue to decrease and their expenses to rise.

Meanwhile, although theoretically, tourism should suffer a decrease as a result of the strengthening of the ALL against the EUR, based on the descriptive analysis, an increase in arrivals to Albania was observed during 2023 and the first part of 2024. The data indicates a rising trend in arrivals to Albania; nevertheless, the growth percentage for the first half of the year has declined.

Furthermore, since the contracts had been linked a year ago with a higher, more valuable EUR, hotel-tourism businesses – including agribusinesses – saw a decline in income as a result of the EUR decline. The quantity of foreign revenue and entry into Albania is insufficient to support such a significant devaluation of the EUR, according to the data.

What these businesses should do to protect themselves from the fall of the EUR is to either make contracts in national currency or use forward contracts for the sale and purchase of EUR at the EUR rate when the initial contract was concluded.

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WPŁYW SPADKU EURO NA GOSPODARKĘ ALBANII

STRESZCZENIE

Cel: Badanie ma na celu szczegółową analizę sektorów, które ucierpiały na skutek spadku EUR i ocenę ich sytuacji w gospodarce Albanii. W artykule zbadano wpływ dewaluacji EUR na główne sektory gospodarki, w tym import i eksport. Ponieważ sektor odzieżowy był jednym z najbardziej dotkniętych tym spadkiem, szczególną uwagę zwrócono na eksport skóry i jej produktów, a także na sektory tekstylny i obuwniczy. **Metody:** Dane wykorzystane w analizie pochodziły z głównego instytutu publikującego dane. Instytucje te, które odpowiadają za gromadzenie i udostępnianie dokładnych i wiarygodnych danych ekonomicznych, obejmują Instytut Statystyki i Bank Albanii. Analizę danych przeprowadzono przy użyciu analizy

opisowej, co umożliwiło charakterystykę zmian i skutków transakcji kursowych w badanym okresie. Dzięki temu wskazano, w jaki sposób te wydarzenia wpłynęły na gospodarkę Albanii. **Wyniki:** Badanie pokazało, jak zmiany kursów walutowych wpłynęły na główne sektory gospodarki. Ponieważ import, eksport i turystyka to branże o najwyższych dochodach w EUR, a nie w walucie rodzimej, odnotowały one największy wpływ. **Wnioski:** Pomimo działań podjętych przez główne instytucje, środki te nie przyniosły oczekiwanego wpływu. Przedsiębiorstwa, aby zabezpieczyć się przed spadkiem wartości EUR, powinny albo zawierać kontrakty w walucie krajowej, albo korzystać z kontraktów terminowych na sprzedaż i zakup EUR po kursie EUR w momencie zawarcia pierwotnej umowy.

Słowa kluczowe: kurs walutowy, import, eksport, turystyka

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ORIGINAL PAPER

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PIG LIVESTOCK PRICE FLUCTUATIONS COMPARED TO CHICKEN, TURKEY, AND CATTLE PRICES FROM 2006–2022 IN POLAND

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ABSTRACT

Aim: To present the type and level of fluctuations of pig livestock prices against chicken, turkey, and cattle price fluctuations from 2006 to 2022. **Methods:** The data consisted of a monthly time series of pig, broiler chicken, turkey, and cattle livestock prices from the Integrated Agricultural Market Information System (ZSRIR). Price fluctuations were analyzed by a time series decomposition using the Census X11 method. **Results:** Nominal prices of pig livestock have increased by 82% over the last seventeen years (2006–2022), while real prices have remained at the same level. Pig prices in 2006 were similar to those of turkeys, 50% higher than chickens and 45% lower than cattle. In 2022, pig prices were 20% lower than turkeys and 42% lower than cattle, while they were only 16% higher than chickens. The cyclical fluctuations accounted for 44%, seasonal for 42%, and random for 14% of the total annual fluctuations of pig prices. **Conclusions:** Pig prices fluctuated similarly to chicken prices. These two types of livestock are distinguished by a high seasonality of prices. Also, irregular changes affect pig and chicken prices more than cattle or turkey prices. From the point of view of price risk, the nature of the fluctuations is important. Regular seasonal fluctuations or long-term trends allow them to be considered in the decision-making process. On the other hand, short-term random fluctuations and medium-term changes with a large deviation from the expected price level represent a risk.

Key words: pigs, livestock price, time series, seasonality, cyclical fluctuations

JEL codes: C22, Q11

INTRODUCTION

The price fluctuations of agricultural products are of great importance to agricultural producers in the context of optimizing the production objective function and consumers making purchasing choices for specific products. At the same time, the analysis of price levels provides an indirect means of assessing market efficiency. The price level of agricultural commodities is mainly influenced by the biological-technical nature of agricultural production, the low short-term elasticity of supply, inter-market linkages, and linkages to world prices [Assefa et al. 2017, Boroumand et al. 2017, Öhlund et al. 2017, Bergevoet et al. 2020]. The occurrence of price fluctuations in agricultural markets is inevitable. Still, it is important to understand the causes of these fluctuations to anticipate and prevent sudden changes in price levels.

In recent years, there has been a significant increase in the prices of agricultural raw materials and inputs in Poland and worldwide. At the same time, there has been an increase in their fluctuations, which is a manifestation of price risk. Negative consequences of the increase in price fluctuations concern all market par-

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ticipants – agricultural producers, processors, traders, and consumers [Hamulczuk 2014].

Characteristic components of price fluctuations in agriculture are annual seasonal fluctuations and longer, periodically recurring cyclical fluctuations. The best known are the so-called pig cycles in pig production. Despite many studies and a relatively well-described mechanism for the formation of 'pig cycles', it has not been possible to eliminate them. The level of prices in livestock production is also significantly influenced by the existence of complementarities and linkages between pig, poultry, or cattle prices [Goodwin et al. 2000, Miller et al. 2001, Serra et al. 2006]. The fluctuations in prices of particular types of livestock or meat were analyzed by: Idzik [2009], Olszańska [2012], Szymańska [2012], and Utnik-Banaś [2012, 2017a, b, 2018].

Price dynamics and price transmission in the pig market were studied by: Abdulai [2002], Hamulczuk [2006, 2020], Bakucs and Fertö [2009], Xu et al. [2012], Carsten and Stephan [2013], Holst and Cramon-Taubadel [2013], and Babula and Miljkovic [2016]. An outbreak of African Swine Fever (ASF) strongly influenced the pig market and would lead to an economic disaster, not only for those farms hit, or where a transport ban came into force, but also for the rest of the country due to market disruptions [Bergevoet et al. 2020, Hoste 2020]. Price fluctuations are a key aspect of price risk for all market members: producers, processors, as well as consumers [Assa and Wang 2021]. Agricultural prices in European food markets have become more volatile over the past decade, exposing agribusinesses to risk and uncertainty [Assefa et al. 2017]. Havlícek et al. [2020] analyzed the efficiency of pig production on an international scale. They stated that half of the monitored EU countries were ranked as full-efficiency producers.

This study aims to present the type and level of fluctuations of pig livestock prices compared to chicken, turkey, and cattle price fluctuations from 2006 to 2022.

MATERIAL AND METHODS

The research material consisted of a monthly time series of pig, broiler chicken, turkey, and cattle livestock prices for the years 2006–2022 from the Integrated Agricultural Market Information System [ZSRIR 2023]; (Fig. 1). To eliminate the impact of inflation, which varied widely during the study period, all price series were adjusted to real prices [Idzik 2009] using an inflation index given by Statistics Poland [GUS 2023].

The data presented in Fig. 1 indicates the potential structural break in time series; therefore, the Zivot and Andrews [1992] (Z-A) non-stationarity test with the presence of one endogenous structural break was used. This test indicated a point in the time series of a potential structural break but did not state if such a break is significant. To confirm or reject the significance of the breakpoint occurrence indicated by the Z-A test, we applied the Chow test [1960].

The analysis of the fluctuations in pig livestock prices was carried out using a time series decomposition. The following components can be distinguished in the time series [Gujarati 2003, Dittmann 2008]:

- Trend (T) shows the long-term tendency for one-way price changes (increase or decrease). It is understood as the effect of the influence of a constant set of factors,
- Cyclic fluctuations (C) – they are formed as long-term, rhythmically repetitive price fluctuations around the developmental tendency in time intervals longer than one year,
- Seasonal fluctuations (S) – are price fluctuations of the observed variable (price) around the developmental tendency and repeat in a time interval of no longer than one year.
- Random fluctuations – random element – (I).

Given the mutual relation between the long-term trend (T) and cyclic fluctuations (C) formed by similar factors, the elements of the time series are treated in the paper as a whole trend-cycle element (T_tC_t). To describe the time series for turkey livestock prices, a multiplicative model was used in the form of the following formula [Ramanathan 2002, Čechura and Šobrová 2008, Dittmann 2008, Stańko 2013]:

$$Y_t = T_t C_t S_t I_t \quad (1)$$

where:
Y_t – livestock price in time t,
T_t –trend,

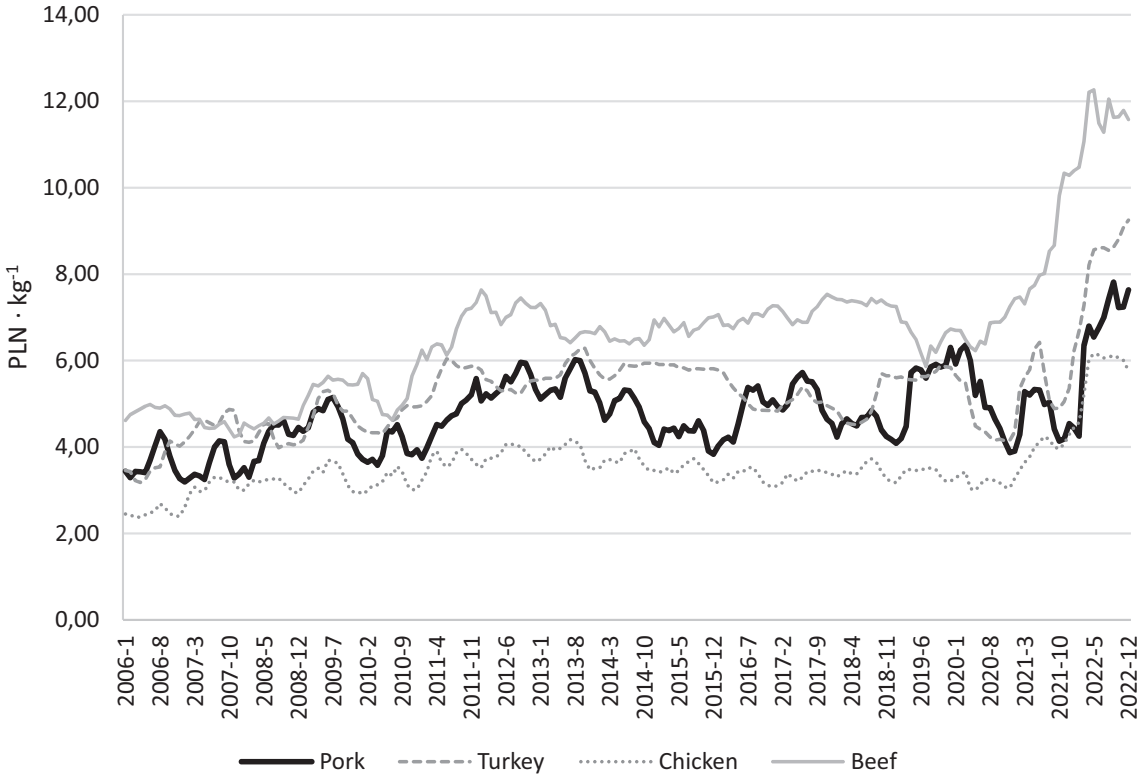

Fig. 1. Nominal prices of the selected types of livestock from 2006 to 2022
Source: own calculations based on ZSRIR [2023].

C_t – cyclic fluctuations,
S_t – seasonal fluctuations,
I_t – random fluctuations.

The Census II/X11 [Shiskin et al. 1967, Idzik 2009] method was used to determine the seasonality of indicators. The advantage of Census II/X11 is, among others, the ability to calculate seasonal fluctuations for each year separately, allowing for an analysis of possible changes in seasonality models in longer periods. Seasonality was eliminated from the original series, dividing the empirical price values by the corresponding seasonality coefficients. The significance of seasonal fluctuations (p <0.01) was evaluated using the F test. Trend-cycle (T-C) was extracted from the time series as a Henderson mean. In turn, (I) was obtained by dividing the seasonally adjusted time series by the trend-cycle (TC).

The separation of the cyclical component from the trend was done using the Hodrick–Prescott filter to isolate a stochastic, smoothly varying trend [Hodrick and Prescot 1997; Ravn and Uhlig 2002]. In the Hodrick–Prescott method, the value of the time series is represented as a sum of a long-term trend and a cyclical component:

$$X_t = T_t + C_t \quad (2)$$

where: X_t – value of the time series,
T_t – value of the long-term trend,
C_t – value of the cyclical component.

The smoothing parameter was set to a level of λ = 14,400 as monthly data were used. In order

to determine the effects of the studied types of fluctuations on overall price variability, the share of their variances in the overall variance was determined for different time horizons of change. The calculations were carried out with a forecasting and time series analysis package using Statistica 13.1 software.

RESULTS

The nominal price of pig livestock in the last seventeen years has increased from PLN 3.65 kg^{-1} in 2006 to PLN 6.62·kg^{-1} in 2022 (Table 1). On the other hand, real prices (taking average prices in 2006 as a reference point = 100%) in the same period even decreased slightly to the level of PLN 3.32·kg^{-1} in 2022. Between 2006 and 2010, real prices were close to nominal prices, but as inflation increased, the differences widened. By the end of 2022, real prices were around 120% lower than nominal prices.

Comparing the different types of livestock, in 2006, pig prices were similar to those of turkeys, 50% higher than those of chickens and 45% lower than cattle (Table 1). In subsequent years, the price relationships changed in favor of other types of livestock. In 2022, pig prices were 20% lower than turkeys and 42% lower than cattle, while they were only 16% higher than chickens. Pig prices were the most volatile. Coefficients of variation of prices for 2022, for example, were highest for pigs at 17.3%, followed by turkeys at 11.6%, chickens at 10.9%, and the lowest for cattle at 5.3%.

The prices of the analyzed livestock were significantly correlated with each other, with the price of pigs being the most strongly correlated with the price of chickens (r = 0.739) and turkeys (0.738) and less with the price of cattle (0.660).

Results of the Zivot-Andrews test revealed that time series are non-stationary and, at the same time, indicated the occurrence of potential structural changes between February 2020 and May 2020 (Table 2). The results of the Chow test confirm that the detected structural breaks are statistically significant (p <0,001). The structural breaks coincide with the outbreak of the COVID-19 pandemic.

Table 1. Price characteristics of selected types of livestock in 2006 and 2022

Prices	Year	Pigs	Turkeys	Chickens	Cattle
Nominal average [PLN·kg^{-1}]	2006	3.65	3.60	2.47	4.84
	2022	6.62	8.21	5.72	11.49
Real average [PLN·kg^{-1}]	2022	3.32	4.13	2.89	5.82
Coefficient of variation [%]	2006	10.0	9.6	3.8	2.3
	2022	17.3	11.6	10.9	5.3
Price relationship: pigs to other livestock	2006	1	1.01	1.48	0.75
	2022	1	0.81	1.16	0.58
Correlation coefficient (2006–2022)		1	0.738	0.739	0.660

Source: own calculations based on ZSRIR [2023].

Table 2. Zivot-Andrews test for non-stationarity with one potential structural break and the Chow test for a structural break for price series from 2006 to 2022

Price time series	Zivot-Andrews test	Structural break	Chow test F
Pigs	–4.042	2020-03	21.340***
Cattle	–3.356	2020-02	22.691***
Chickens	–4.145	2020-04	28.806***
Turkeys	–3.454	2020-05	38.092***

In the Z-A test, the critical value, including intercept and trend, is – 5.57 and – 5.08 at a 1% and 5% significance level, respectively; *** denotes rejection of the null hypothesis (H_0: no structural change) in the Chow test at a p <0.001 significance level.

The decomposition of the time series of pig prices indicates the presence of regular fluctuations: seasonal, cyclical, and irregular random fluctuations. The results of the stable seasonality test confirmed that the seasonal fluctuation of pig prices is statistically significant (p <0.0001, F-statistic value = 22.98).

During the analyzed period, there was a clear change in the pattern of seasonality and a reduction in the amplitude of seasonal fluctuations. In 2006, pig livestock was the cheapest (92%) in the winter months (December–February), and the most expensive (112%) in the summer months (July–September). The amplitude of seasonal changes was 20% (Fig. 2 and Fig. 3).

In subsequent years, there was a gradual reduction in the amplitude of fluctuations to 15% in 2014. In the most recent period, a shift of the seasonal peak of prices to the spring and early summer periods (April––June) is observed. The share of seasonal fluctuations amounted to 47% of the total price fluctuations at a horizon of 1 month, while the highest impact of seasonal fluctuations of 63% was observed at a changing horizon of 4 months, which was associated with a significant reduction in the impact of irregular fluctuations (Table 2).

Analyzing the pig price fluctuations against the background of other livestock prices, we found that

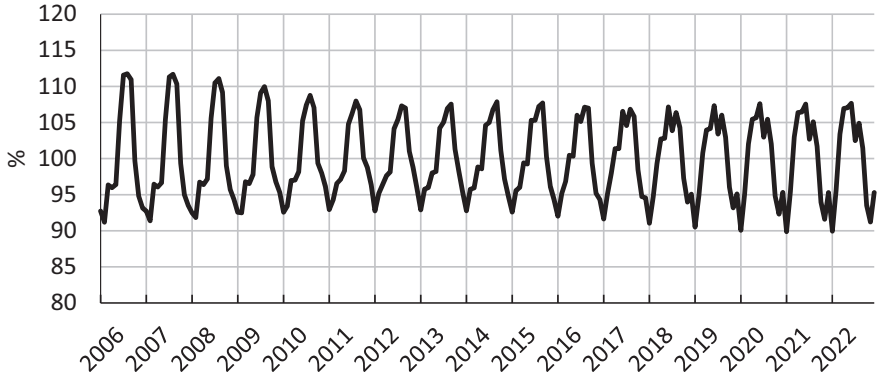

Fig. 2. Seasonal fluctuations in pig livestock prices from 2006 to 2022
Source: own calculation based on ZSRIR [2023].

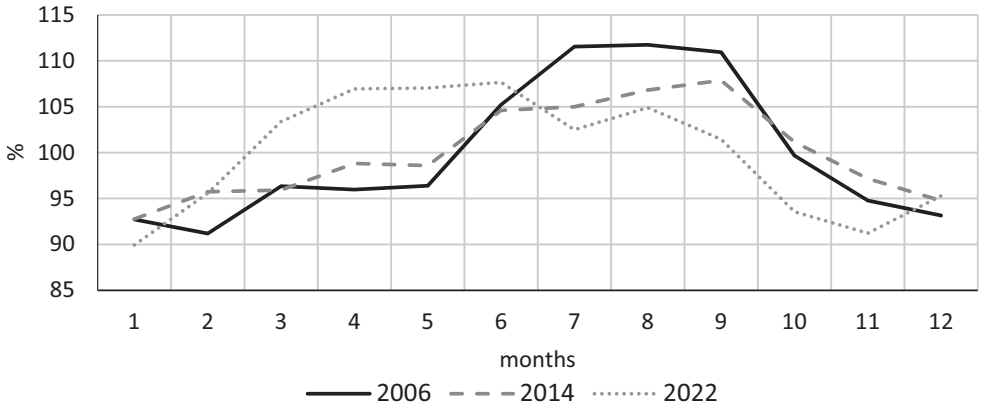

Fig. 3. Changes in the seasonality pattern of pig livestock prices between 2006 and 2022
Source: own calculation based on ZSRIR [2023].

Table 2. Contribution of seasonal cyclical and irregular changes to the total variability of livestock prices from 2006–2022

Livestock	The horizon of change (months)	Changes [%]		
		irregular	cyclical	seasonal
Pigs	1	41.1	11.5	47.4
	4	9.6	27.0	63.3
	6	7.0	36.9	56.1
	Annual average	13.7	43.8	42.4
Cattle	1	32.3	25.7	41.9
	4	6.1	58.3	35.6
	6	4.1	69.9	26.0
	Annual average	8.8	66.1	25.2
Turkeys	1	22.3	55.7	22.0
	4	4.0	83.0	13.0
	6	2.6	87.8	9.6
	Annual average	5.7	83.9	10.4
Chickens	1	30.4	7.5	62.2
	4	8.5	17.9	73.5
	6	6.2	29.7	64.1
	Annual average	11.1	36.1	52.8

Source: own calculation based on ZSRIR [2023].

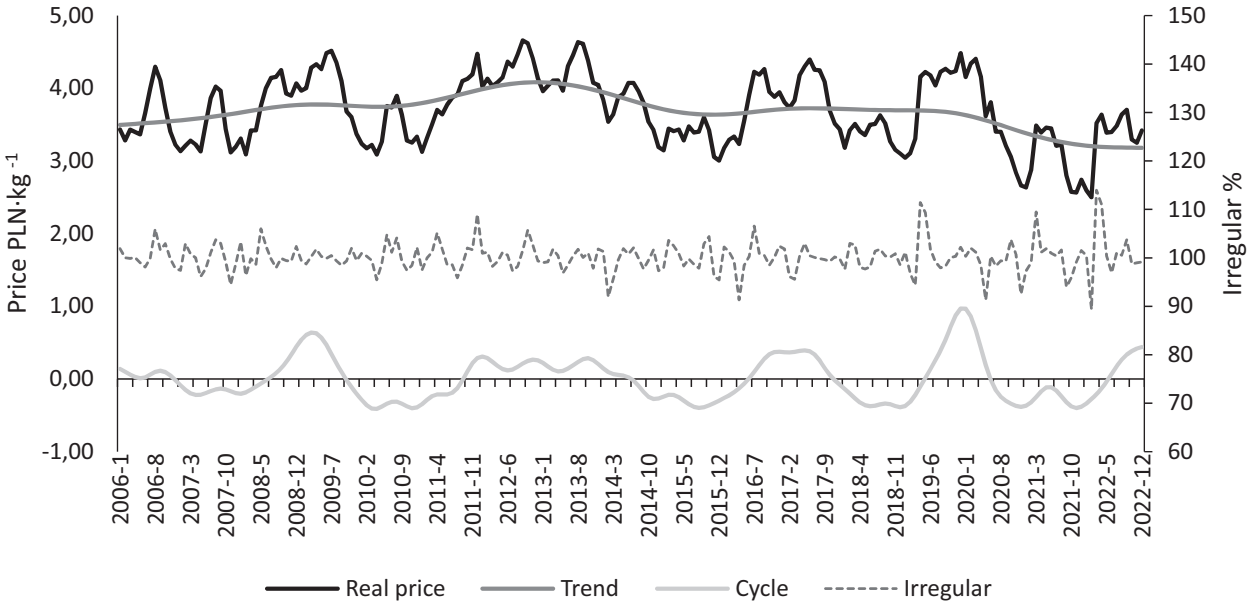

Fig. 4. Results of the decomposition of the time series of real pig livestock prices
Source: own calculation based on ZSRIR [2023].

pig prices fluctuated similarly to chicken prices. A high seasonality of prices distinguishes these two types of livestock: 52.8 and 42.4% for chickens and pigs, respectively (Table 2). Also, irregular changes affect pig and chicken price fluctuations more (13.7% and 11.1%, respectively) than cattle or turkey prices (8.8 and 5.7%, respectively). This type of fluctuation causes sudden changes that are difficult to predict, interacting adversely with the process of price risk management. Changes in pig livestock prices between 2006 and 2022 were characterized by pronounced cyclical fluctuation with cycle lengths of three to five years (Fig. 4).

The upper turning points (tops) were: June 2009, December 2012, July 2017, and January 2020. The value of MCD = 3.79 indicates that it is possible to speak of a new cycle after four months of unidirectional changes. Cyclical fluctuations in the 1-month change horizon accounted for 11.5%, while in the 9 months, their share was 66% of the total variability (Table 2). Irregular fluctuations at the monthly change horizon accounted for 41% of total price variability, while at the 4-month horizon, their share was less than 10%. On an annual average, cyclical fluctuations accounted for 44%, seasonal fluctuations for 42%, and random fluctuations for 14% of the total variability of pig livestock prices.

DISCUSSION

Price fluctuations are a characteristic of a free market, operating based on the law of equilibrium between demand and supply. Price variability represents an important risk factor for supply, especially in agricultural products. Agricultural prices tend to be more volatile due to seasonality, inelastic demand, and production uncertainty [Holt and Moschini 1992]. Rezitis and Stavropoulos [2009] highlight that price fluctuations translate into a significant price risk. Thus, an increase in price volatility implies higher uncertainty about future prices, a fact that can affect producers' welfare, especially in the absence of a hedging mechanism. Szymańska and Tatarczak [2010] analyzed changes in pig livestock prices from 1995 to 2008 and found that monthly purchase prices of pig livestock are characterized by reasonably high levels of cyclical fluctuation with an average cycle length of about 3.5 years. The results obtained in this article confirm pronounced cyclical fluctuation with cycle lengths of three to five years. Stańko [2008] studied trends in pig production, foreign trade, and consumption in Poland between 1990-2008 and found that cyclical, trend, and seasonal fluctuations are of primary importance in explaining price volatility in the pig market, explaining about 92.0% of price volatility, while the remaining 8.0% of volatility is caused by random fluctuations. Our results show a higher share of random fluctuations (14%), which indicates this type of fluctuation in recent years. The increase in the irregular fluctuation of pig prices in Czechia in 2019 due to African swine fever is also pointed out by Sirohi et al. [2023].

This research indicates a clear seasonality of pig livestock prices, with the lowest prices occurring during the winter months (92%) and the highest during the summer months (112%). A similar pattern of seasonality in pig livestock prices for the Iowa/Minnesota market (USA) was indicated by Schulz [2020], reporting that lower-than-average annual prices occur during the months of January to March (90%) and September to December (90%), while higher-than-average prices occur from May to August with the peak in July (114%). The tendency for prices to show seasonal weakness during the fall and winter results from larger pig production during these periods than during the summer months, and pig slaughter remains highest in the fourth quarter. Similarly, Bergevoet et al. [2020] reported a significant increase in pig slaughtering in the month of December. Rezitis and Stavropoulos (2009) analyzed price fluctuation in the Greek pig market and stated that the seasonal components are statistically significant, indicating the presence of a strong seasonal effect during December.

Using the Zivot-Andrews test for non-stationarity and occurrence of the potential structural break, we found the price series integrated in the first order and confirmed the breakpoint in the pig price time series in the period of the COVID-19 pandemic outbreak (March 2020). Similarly, Wan and Li [2022] used the Zivot-Andrews test to analyze price volatility in the Chinese pig market, found price series integrated into

the first level, and confirmed breakpoints coincide with the food price crisis of 2007. Sirohi et al. [2023] also reported a price shock in the pig price series caused by the COVID-19 pandemic outbreak.

CONCLUSIONS

In this paper, the fluctuations of pig livestock prices in comparison to other kinds of livestock were analyzed. The decomposition of time series prices revealed the presence of seasonal, cyclical, and irregular random fluctuations. Pig prices fluctuated similarly to chicken prices. These two types of livestock are distinguished by a high seasonality of prices: 52.8 and 42.4% for chickens and pigs, respectively. Also, irregular changes affect pig and chicken price fluctuations more (13.7% and 11.1, respectively) than cattle or turkey prices (8.8 and 5.7%, respectively). The research findings are significant from the price risk point of view. Regular seasonal fluctuations or long-term trends allow them to be considered in the decision-making process. On the other hand, short-term random fluctuations and medium-term changes with a large deviation from the expected price level represent a risk.

Further research on the more detailed connection between different types of livestock is needed, especially in the short term, by performing causality tests, and in the long term, using cointegration methodology.

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FLUKTUACJE CEN ŻYWCA WIEPRZOWEGO W PORÓWNANIU Z CENAMI KURCZĄT, INDYKÓW ORAZ WOŁOWINY W LATACH 2006–2022 W POLSCE

STRESZCZENIE

Cel: Przedstawienie rodzaju wahań cen żywca wieprzowego w porównaniu z cenami kurcząt, indyków i wołowiny w latach 2006–2022. **Metody:** Materiał badawczy stanowiły miesięczne szeregi czasowe cen żywca wieprzowego, kurcząt brojlerów, indyków i żywca wołowego pobrane ze Zintegrowanego Systemu Rolniczej Informacji Rynkowej (ZSRIR). Analiza fluktuacji cen została przeprowadzona za pomocą dekompozycji szeregów czasowych przy użyciu metody Census X11. **Wyniki:** Nominalne ceny żywca wieprzowego wzrosły o 82% w ciągu ostatnich siedemnastu lat (2006–2022), podczas gdy ceny realne pozostały na tym samym poziomie. Ceny wieprzowiny w 2006 roku były zbliżone do cen indyków, 50% wyższe niż kurcząt i 45% niższe niż wołowiny. W 2022 roku ceny wieprzowiny były o 20% niższe od cen indyków i 42% niższe od cen wołowiny, oraz tylko o 16% wyższe od cen kurcząt. Wahania cykliczne stanowiły 44%, sezonowe 42%, a przypadkowe 14% całkowitej rocznej zmienności cen wieprzowiny. **Wnioski:** Pomiędzy fluktuacjami cen wieprzowiny i kurcząt występuje wyraźne podobieństwo. Te dwa rodzaje żywca wyróżniają się wysoką sezonowością cen, a ponadto wahania nieregularne wpływają na ceny wieprzowiny i kurcząt w znacznie większym stopniu niż na ceny wołowiny czy indyków. Z punktu widzenia ryzyka cenowego istotny jest charakter wahań. Regularne wahania sezonowe lub długoterminowe trendy pozwalają na ich uwzględnienie w procesie decyzyjnym. Nieregularne wahania krótkookresowe i zmiany średniookresowe z dużym odchyleniem od oczekiwanego poziomu stanowią ryzyko cenowe.

Słowa kluczowe: wieprzowina, ceny żywca, szeregi czasowe, sezonowość, wahania cykliczne, fluktuacje cen

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THE CRITICAL IMPORTANCE OF ASSESSING STAKEHOLDER AWARENESS OF FOOD SAFETY AND SECURITY ACROSS THE FOOD VALUE CHAIN

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ABSTRACT

Aim: This study aims to assess the critical importance of stakeholder awareness of food safety and security across the food value chain. A lack of awareness can hinder the development of sustainable agriculture; therefore, this research explores why awareness of food safety and security is essential for different stakeholders in the food value chain. **Methods:** A comprehensive literature review was conducted using content analysis to investigate the level of awareness among various stakeholders, from farmers to consumers, regarding food safety and security. The review focused on identifying key factors that influence stakeholder engagement and awareness throughout the food value chain. **Results:** The analysis revealed that stakeholder awareness of food safety and security significantly enhances food safety measures, promotes sustainability, ensures regulatory compliance, and improves overall efficiency. It also reduces waste, strengthens consumer trust, builds brand loyalty, and addresses global food challenges. Additionally, the study found that the awareness of farmers at the early stages of the food value chain is as important as that of end-stage players, such as food service workers and consumers. **Conclusions:** Understanding the level of awareness of food safety and security among stakeholders is crucial for promoting sustainability, improving food safety, and ensuring regulatory adherence across the food value chain. Enhancing awareness, particularly at the farming stage, is vital for improving the overall effectiveness of food safety and security initiatives.

Key words: food safety, food security, sustainability, influencer, awareness, value chain

JEL codes: Q18, Q01, D83

INTRODUCTION

Food safety and food security, together with nutrition, are vital to sustaining human life and human health. Food safety and food security are inextricably linked concepts that significantly impact human well-being, and numerous external factors influence both areas. To clearly understand the difference between food safety and food security, Oyarzabal and VanRenterghem [2020] underline the quality and quantity of food separately. International organizations such as the World Health Organization (WHO) and the Food and Agriculture Organization (FAO) play very important roles in defining and promoting food safety and food security. WHO highlights public health, issuing guidelines to combat foodborne diseases and ensuring that food is safe for consumption. FAO ensures that international standards, guidelines, and practices for food safety are adhered to, particularly in the areas of food production and trade [Hanning et al. 2012]. There

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is no consistent definition of food safety. For example, food safety can be summarized as safe (wholesome) foods because of production, manufacturing, processing, packing, or holding practices [Oyarzabal and VanRenterghem 2020]. Unsafe food containing harmful bacteria, viruses, parasites, or chemical substances is responsible for over 200 different diseases, ranging from diarrhea to cancer. This contributes to a detrimental cycle of disease and malnutrition, particularly affecting vulnerable groups such as infants, young children, the elderly, and those who are ill [WHO 2022]. Foods can be contaminated at any stage of the production process. Therefore, industries use control programs like Hazard Analysis and Critical Control Points (HACCP) to minimize food safety risks. Since the majority of foodborne illnesses are caused by microorganisms rather than foreign objects or allergens, HACCP plans often prioritize the reduction and prevention of pathogens. This targeted approach helps to effectively address the most common and harmful risks associated with food safety [Elbehiry et al. 2023].

Food security is primarily defined and prompted by the FAO, which is widely accepted by international organizations and commonly serves as a standard for developing policies and programs focused on eradicating hunger and enhancing food and nutrition security globally. The concept of food security has experienced several evolutions since the middle of the 1970s, and finally, the widely accepted definition was decided in 1996 at the World Food Summit and reinforced the multidimensional nature of food security [FAO 2006]: "Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life". The definitions are:

- "**Food availability:** The availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports (including food aid).
- **Food access:** Access by individuals to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet. Entitlements are defined as the set of all commodity bundles over which a person can establish command given the legal, political, economic, and social arrangements of the community in which they live (including traditional rights such as access to common resources).
- **Utilization:** Utilization of food through adequate diet, clean water, sanitation and health care to reach a state of nutritional well-being where all physiological needs are met. This brings out the importance of non-food inputs in food security.
- **Stability:** To be food secure, a population, household, or individual must have access to adequate food at all times. They should not risk losing access to food as a consequence of sudden shocks (e.g., an economic or climatic crisis) or cyclical events (e.g., seasonal food insecurity). The concept of stability can, therefore, refer to both the availability and access dimensions of food security".

Despite the critical role of all main actors in ensuring effective food safety and security, there is a lack of comprehensive analysis of how varying levels of awareness among these stakeholders impact overall outcomes. Studies such as this one regarding food safety awareness among pre-retail (production, processing, logistics, and storage) food supply chain actors are relatively few, as most studies focus on retailers and consumption levels [Nordhagen et al. 2023]. This research addresses the problem of insufficient understanding regarding the significance of different players' awareness of food safety and security throughout the food value chain. It aims to thoroughly examine the importance of awareness across all key food value chain participants. This review is structured by the importance of food safety and food security awareness, as well as the awareness, knowledge, and practices of food safety and food security among different players along the food value chain. In the end, we will provide possible solutions to raise awareness of food safety and food security.

LITERATURE REVIEW

The global food system has been encountering serious challenges due to the cascading effects of COVID-19, the Russo-Ukrainian war, and global warming [Deák 2023, Wu et al. 2023]. Especially Russia and Ukraine are playing increasingly important roles in the world's food supply in terms of main crops (wheat, maize, barley, and sunflower seed), according to our

time series analysis [Deák 2023, Wu et al. 2024], and the war between them is still ongoing from 2022 till April 2024 [Murray 2024]. Food security issues can be the cause or the effects of conflict [Ahmad et al. 2021] as the Russo-Ukrainian war brings. As our previous research found, the risks and threats in agriculture are closely linked to global security changes and trends, such as globalization, demographics and security, natural risks, health security, the international system of governments, environmental security and biodiversity, and energy and infrastructure security [Wu et al. 2023]. As the prior research has proved, knowledge and information play important roles in strengthening food security, as it impacts the entire food system from production to consumption, and raising awareness is also one of the solutions to food insecurity problems [Ahmad et al. 2021]. However, a lack of awareness can also hinder the development of sustainable agriculture and continues to pose challenges, particularly in developing countries where educational campaigns on food safety remain underfunded and inadequately implemented [Grace 2015]. For example, organic farming is regarded as sustainable farming; however, the biggest obstacle to its development is a lack of awareness in India, where a large segment of the population remains unfamiliar with its advantages [Dev and Pandey 2022].

Similarly, Bangladeshi bakery enterprises are facing a lack of knowledge and practices related to food safety. Jubayer et al. [2020] examined the food safety knowledge, attitudes, and practices (KAP) among workers in the baking industry in Dhaka, Bangladesh. They found that while training improves knowledge and attitudes towards food safety, consistent application of this training in daily practices remains a challenge. They also advocate for continuous and comprehensive training programs to bridge this gap and enhance food safety in the bakery industry.

The importance of awareness regarding food safety and food security is evident across various sectors, both globally and nationally. According to the World Health Organization (WHO), one of their key responses to enhance national food control systems is by "promoting safe food handling through systematic disease prevention and awareness," which helps member states improve global capabilities for preventing, detecting, and responding to public health risks linked to unsafe food [WHO 2022]. Similarly, in India, a strategic focus has been placed on "food safety awareness and nutrition education" as one of the approaches to ensure safe and nutritious diets, thereby securing nutritional safety [Dev and Pandey 2022].

In some countries, raising the population's awareness of food security is highlighted at a national level. For example, the 5-year plan of Afghanistan's "Food Security and Nutrition Public Awareness and Advocacy Framework and Plan" [FAO 2018] was crafted through a comprehensive, collaborative process involving various stakeholders who utilized the social and behavior change communication (SBCC) approach and indicated that lack of public awareness of food security and nutrition is one of the current problems. This method (SBCC) involves a deliberate, organized approach to identify key obstacles and incentives for change. Following this, it focuses on crafting and executing a broad array of strategies and actions aimed at promoting positive behaviors and securing essential support from social and political spheres. It drives and facilitates significant enhancements in food security and nutrition across all levels and ensures that the development of the plan is both consultative and participatory, integrating insights and feedback from multiple perspectives to address the issues at hand effectively. The national plan highlights the crucial role of public awareness in tackling food security and nutrition challenges in Afghanistan. It stresses the need for a coordinated and well-informed public awareness campaign to address food insecurity and malnutrition throughout the country. By promoting a thorough understanding among all stakeholders and the broader public, the strategy seeks to achieve lasting enhancements in food security and nutritional health nationwide.

Overall, the literature consistently highlights that enhancing public awareness is a critical factor for both food safety and food security. Without targeted and sustained educational efforts, efforts to improve food systems and ensure public health remain inadequate. This gap in awareness presents a challenge to global food security goals, particularly in low- and middle-income countries where public health infrastructures are often underdeveloped [Grace 2015]. Therefore, fu-

ture efforts must focus on integrating awareness campaigns with broader policy and infrastructure developments to achieve lasting improvements in food safety and security.

AIM AND METHODS

This study aims to explore the critical importance of stakeholder awareness of food safety and security across the food value chain, highlighting how a lack of awareness can hinder sustainable agriculture development. In order to investigate the awareness of different players on food safety and food security along the food value chain, we first conducted this review to see the necessity of conducting future primary research on the topic. We analyzed extensive research to provide a comprehensive review via content analysis as a research method. The content analysis method is a systematic research approach used to evaluate and synthesize data from diverse sources. In this study, we applied this method to comprehensively review the existing literature, identify key themes, and extract meaningful insights to offer a well-rounded understanding of the subject. Based on secondary data and literature, the extensive secondary research offers different perspectives, contributing to this inclusive review of how important different players' awareness of the food value chain is and the potential solutions to raise awareness on food safety and food security.

RESULTS

The awareness, knowledge, and practices of different players on food safety and food security along the food value chain

In order to explore the necessity of surveying different players' awareness of food safety and food security, we first researched previous researchers' work (survey and review) on the topic and made a summary. According to Porter's value chain concept [Porter 1985], we define the food value chain (Fig. 1) as five steps in this review, and the main players in the food value chain are farmers, transporters, processors, food service staff, and consumers as Figure 2 shows.

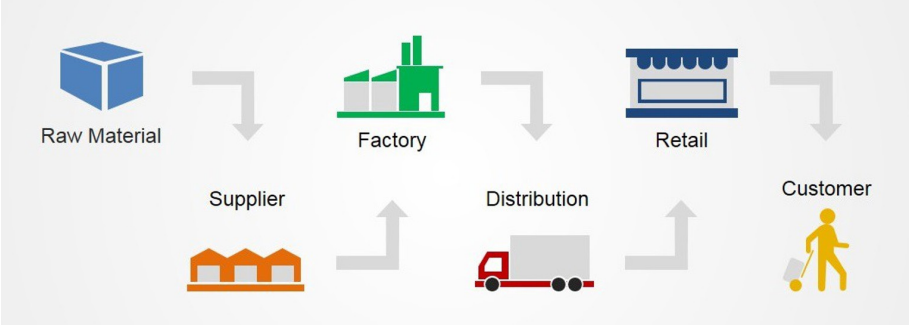

Fig. 1. Food value chain

Source: [Naina 2019].

Fig. 2. Main players in the food value chain

Source: [Nosratabadi et al. 2020].

Farmers

As the first step in the food value chain, farmers' awareness and knowledge about food safety and security are vital for effectively managing risks related to food production and enhancing the safety and reliability of the overall food supply chain. This awareness enables farmers to implement practices that minimize contamination and improve the quality of the food they produce, contributing significantly to public health and food security. The key points regarding farmers' awareness, knowledge, and practices of food safety and food security are summarized into four categories. **Climate change perception** [Harvey et al. 2018]: climate change severely impacts smallholder farmers, but their perceptions vary from different types of farmers, threatening poverty reduction, food security, and sustainable development globally. Comprehending how farmers adapt to climate change and what influences their adaptation choices is essential for crafting effective agricultural development strategies and policies to ensure food security. **Sustainable biological and chemical control** [Constantine et al. 2023]: farmers' awareness and knowledge significantly influence decision-making in pest management and food safety. The research also underscores the importance of cooperative research in improving farmers' adoption and understanding of biological control methods. Besides, the proper use of fertilizer and other nutrition supplements for crops is also of significance in food safety and food security. **Knowledge and innovation in agriculture** [Hassen and Bilali 2020]: knowledge and innovation practices can make agriculture more productive and sustainable, such as precision agriculture and smart agriculture. **Importance of biosecurity** [Li et al. 2023]: awareness of biosecurity is important for sustainable development, such as the biosecurity measures to prevent African swine fever. Currently, Chinese biosecurity policies are effective. It has also been proved that farmers' behavior regarding the adoption of biosecurity measures can be prompted by government regulations.

Besides the main points of farmers' awareness, knowledge, and practices in food safety and security, complying with regulations, participation in certifications, collaboration with other communities, and farmers' awareness of market demand also can impact their decision-making, such as the increasing demand for organic products [Wu and Takács-György 2022].

Transporters

Transporters in the food value chain play a distinct and more passive role, as they have limited roles in food safety and quality, instead focusing mainly on delivering goods on time. This topic is also understudied and is given less policy attention. They generally lack involvement in food safety aspects and face significant logistical challenges such as high fuel costs and poor road conditions. Transporters are portrayed as external service providers with minimal interaction with other supply chain actors, which isolates them from broader food safety discussions and responsibilities. Clients generally do not impose penalties on transporters regarding food safety as long as there are no visible signs of spoilage or damage to the products during transit. However, this lack of direct accountability and engagement in food safety reflects a broader systemic issue within the supply chain [Nordhagen et al. 2023].

Processors

According to our research, there is an obvious lack of research on food safety and food security awareness among food processors. However, education for food processors has been paid attention to in the US. The Processors' Food Safety Toolkit, developed by the Northeast Center to Advance Food Safety (NECAFS), helps food processors in the Northeast US comply with the FSMA's Preventive Controls for Human Food Rule. NECAFS, an FDA/USDA-funded center, coordinates training and resources aimed at small to medium-sized food producers and processors to enhance food safety standards nationally [About Us… n.d.].

Food service staff

A survey about the levels of knowledge, attitudes, and practices (KAP) of food handlers in food services and restaurants conducted in Malé, Maldives, shows they generally possess adequate food safety knowledge and attitudes, with good safety practices noted except in "time and temperature control" and "foodborne pathogens". Knowledge was specifically affect-

ed by work experience, attitudes by education level, and practices by age, education, and work experience [Halim-Lim et al. 2023]. Another survey conducted in Espírito Santo, Brazil, shows similar results that food safety knowledge is regarded as sufficient, while the attitudes and practices need more education and training to be transformed from knowledge [Vitória et al. 2021], which was also proved by the survey in A1 Madinah Hospitals, Saudi Arabia [Alqurashi et al. 2019].

Consumers

Consumers' knowledge of food security and behavior of waste reduction is enhanced due to the COVID-19 pandemic, but the concerns about food safety remain the same before and after the pandemic [Erol et al. 2023]. A survey among students showed that knowledge and hygiene practices of food safety significantly impact awareness of food safety [Mohamed and Patwary 2021]. A survey about consumers' perception of food safety shows that highly educated female consumers were especially concerned about personal health risks and the safety of food content. Gender, education level, and income significantly influence food safety perceptions. Women and educated consumers show higher food safety awareness. It also grouped the concerned food safety consumers by prioritizing hygiene and information on food content, particularly vitamins, minerals, and additives. Non-concerned food safety consumers care more about the price and bargains instead of the safety risks, and moderately concerned food safety consumers showed moderate attitudes toward food safety and health risks [Miftari et al. 2024].

Solutions to raise awareness of food safety and food security

As mentioned above about the necessity of surveying different players' awareness of food safety and food security, we accordingly provide some solutions from the different stages of the food value chain from the perspective of main stakeholders, such as education staff, governors, non-governmental organizations, media staff, scientific staff, and individuals (Fig. 3).

Fig. 3. Main stakeholders as solutions to raise awareness of food safety and food security

Source: authors' own construction.

Education

As the above proved, education has a significant role in raising awareness of food safety and food security for different players in the food value chain. The existing literature emphasizes education as a solution more extensively than other approaches. Online courses such as MOOCs [Stevens et al. 2020] can help to understand food security, promote sustainability brands, and take preventive actions against terrorist threats in the food and agriculture sector. Non-formal education and cross-sector collaboration among the youth can boost global citizenship and awareness of food security and sustainability through case study competitions and initiatives like the Young Earth Solutions competition and the Sustainable Development Solutions Network Youth division [Allievi et al. 2019]. A digital game such as the browser-based game Food Safety Quest in Canada is also an interesting format targeting the 12–18 age group [Lee and Fisher 2015] and allows players to experience food security challenges through role-playing characters in various scenarios. Food Safety Quest can also be played on mobile (Torontomu). The UN's International Day of Awareness of Food Loss and Waste effectively and inclusively advocates different sectors contributing to food loss and waste reduction [FAO 2022].

Government

The Food Security Cluster (FSC), led by the FAO and WFP, coordinates global food security responses during crises. It supports over 1000 partners to ensure effective interventions and collaborates with other clusters for comprehensive solutions. Governments lead national FSCs, implement anticipatory actions, and engage in policy advocacy. They enhance local capacity, integrate humanitarian and development approaches, and support resource mobilization and monitoring efforts (Food Security Cluster). The government's contribution to raising awareness of food safety and food security can also be indirect, such as the collaborative development of digital games [Lee and Fisher 2015], promoting food loss and waste reduction values through education [FAO 2022], and promoting sustainability through regulations, standards, and incentives for sustainable food production and marketing. A co-organized workshop between international organizations and the government can highlight the workshop's role in raising awareness and sharing insights among policymakers. For example, a workshop in Tajikistan, organized by the FAO and local ministries, aimed to enhance government officials' skills in food security and nutrition, which includes training on international standards and improving policy decisions [FAO 2019a].

Civil society

Sustainable food production is key to food security (such as organic food), and demand for such products is growing. Brands use logos and labels (or food marketing) to highlight ethical and environmental attributes, influencing consumer willingness to buy, satisfaction, and loyalty [Franco and Cicatiello 2019]. The FAO Liaison Office in Geneva participated in the Festi Terroir festival in Geneva to raise awareness about food security, which aims to engage the community and youth with activities like sticker surveys on food waste and climate change and a quiz on food facts and the FAO's history. The event aimed to strengthen local ties and highlight the FAO's efforts in combating hunger and promoting sustainable agriculture [FAO 2023].

Media (journalists)

On February 17, 2019, the FAO conducted a two-day training course in Tsaghkadzor, Armenia, to raise journalists' awareness about food security and nutrition and aimed to improve the accuracy of their reporting. Fifteen journalists from national TV, radio, newspapers, and social media attended, learning about food security, safety, and micronutrient deficiencies. The event is part of an FAO project funded by Russia to enhance food security and nutrition in the region. Journalists found the training valuable and showed interest in further education [FAO 2019b].

Influencers

Influencers can significantly raise public awareness about food safety and food security due to their profound impact on people's daily lives. The solutions can be:

- create educational content explaining safe food practices and food security concepts; 2) collaborate with NGOs and government agencies to amplify

credible information;
- share personal stories to make the issues relatable;

initiate challenges and calls to action to engage their followers;
- highlight innovations and solutions to inspire adoption and support for these initiatives.

While there isn't specific scholarly research focusing solely on the impact of influencers on raising awareness about food safety and food security, this concept can be understood as an extension of social media. Social networks, including influencers, play an important role in disseminating health information and providing support. It offers insights into applying social networking dynamics to health communication, potentially enhancing food safety and food security through increased awareness and education [Chung 2014].

Scientific staff

Research usually contributes to providing suggestions to policymakers. FAO suggests that research and academia engage in interdisciplinary research to understand the causes and drivers of food loss and waste, conduct applied research to address the complexities of reducing food loss and waste sustainably, help build the business case for reducing food loss and waste by quantifying potential benefits for food security, nutrition, and the planet, as well as identify potential trade-offs [FAO 2022].

Individual

Individually, we can reduce food waste at home, buy what we need, speak up to make wasting food unacceptable [FAO 2022], choose sustainable food (e.g., local food or organic food), learn basic food safety practices (e.g., food handling, cooking, and storage), keep informed about the latest food safety outbreaks via paying attention to trusted organizations (FAO, WHO, CDC [CDC 2022] or local authorities), join a food-related workshop as well as other social activities that we have mentioned above.

DISCUSSION

Awareness undoubtedly plays a crucial role in food safety and food security and in promoting sustainable agriculture as it impacts the entire food system from production to consumption [FAO 2018, Jubayer et al. 2020, Dev and Pandey 2022, WHO 2022]. The findings of this study regarding the awareness of different players across the main food value chain stages were compared to the literature, and an importance assessment was also given according to three points, ranging from less important, important, and very important (Table 1).

Compared to the research contribution on the awareness of the food service and consumption stage, there is less focus on the beginning stages, such as production, transportation, and processing [Nordhagen et al. 2023]. In our discussion, we have extensively emphasized the significance of farmers, including their importance on climate change perception, sustainable biological and chemical controls [Constantine et al. 2023], knowledge and innovation in agriculture [Hassen and Bilali 2020], and the importance of biosecurity [Li et al. 2023]. Because of their limited roles and participation in the food value chain, transporters' and processors' awareness of food safety and food security is not well-researched [Nordhagen et al. 2023]. The awareness, knowledge, and practices of food service staff in food safety and security are often discussed, and it shows that even though the awareness is quite acceptable, the necessity of education and training in the transformation from knowledge to attitudes and practices should be addressed [Alqurashi et al. 2019, Vitória et al. 2021, Halim-Lim et al. 2023]. Consumers' awareness of food safety and security is also significantly influenced by knowledge [Mohamed and Patwary 2021] and demographic characteristics such as gender, education level, and income, as well as food prices [Miftari et al. 2024].

The solutions to raise different players' awareness of food safety and food security are proved broad and effective via different and innovative types of education [Lee and Fisher 2015, Allievi et al. 2019, Stevens et al. 2020, FAO 2022, Torontomu, n.d.], direct and indirect governmental interventions [Lee and Fisher 2015, FAO 2019a, FAO 2022, Food Security Cluster n.d.], civil society activities targeting local food markets and communities [Franco and Cicatiello 2019, FAO 2023], and training for media (journalists); [FAO 2019b], influencers [Chung 2014], scientific staff [FAO 2022], and individuals [FAO 2022].

Table 1. Comparison of findings and literature

Players and Stage	Findings	Literature	Importance level
Farmers (Production)	Farmers play a crucial role, with emphasis on climate change perception, sustainable biological and chemical controls, and innovation in agriculture.	Awareness of sustainable agricultural practices, including biosecurity, is vital but is under-researched, especially in the context of food security [Ben Hassen and El Bilali 2020, Constantine et al. 2023, Li et al. 2023].	Very important
Processors (Food Processing)	Limited focus on processors' awareness and roles in food safety/security.	Similar findings, with little research addressing the role of processors in maintaining food safety/security [Nordhagen et al. 2023].	Important
Transporters (Logistics)	Limited awareness and participation in the food value chain; under-researched compared to other players.	Research on transporters' and processors' awareness of food safety/security is scarce. Greater attention is needed on their roles [Nordhagen et al. 2023].	Less important
Food Service Staff (Retail)	Awareness is high, but there is a gap in transforming knowledge into attitudes and practices.	Staff knowledge is generally high, but consistent training is needed to convert awareness into consistent practices [Alqurashi et al. 2019, Da Vitória et al. 2021, Halim-Lim et al. 2023].	Very important
Consumers (Consumption)	Awareness of food safety/security is significantly influenced by knowledge, gender, education, income, and food prices.	Consumer awareness is strongly linked to demographic factors. Education campaigns targeting these aspects can improve awareness [Mohamed and Patwary 2021, Miftari et al. 2024].	Very important

Source: authors' own construction.

CONCLUSIONS

This study highlights the necessity of investigating the awareness of various actors in the food value chain regarding food safety and food security. Our findings underscore that understanding and improving awareness at each stage of the food system – from production to consumption – is critical for maintaining a sustainable food system, complying with regulatory standards, and enhancing consumer trust. While previous research predominantly focuses on food service staff and consumers [Alqurashi et al. 2019, Mohamed and Patwary 2021], our research uniquely advances the field by identifying the critical, yet often overlooked role of farmers at the production stage. The awareness of farmers directly impacts food safety and quality, as well as the ability to manage risks in agricultural practices, making their contribution essential for ensuring public health and food security.

Furthermore, we highlight gaps in the existing literature concerning transporters' and processors' awareness. While these actors are less emphasized in discussions of food safety, their role is not insignificant, especially in reducing food waste and ensuring the safe transportation of products across the supply chain. Our research adds value by drawing attention to the need for increased awareness and training among these groups.

This paper contributes to the existing body of knowledge in three key ways:

1. Emphasis on Farmers' Awareness: Unlike much of the existing research, which tends to focus on end-stage actors (e.g., food service staff and consumers), we underscore the importance of raising awareness at the beginning of the food value chain – particularly among farmers. By prioritizing awareness at the production level, we argue that public health outcomes and food security can be significantly enhanced.
2. Addressing Underexplored Players: We identify and advocate for more research and training focused on transporters and processors, whose roles in food safety and security, though critical, are often underestimated. This paper calls for interventions that include these actors to ensure a holistic approach to food safety across the entire food value chain.

3. Innovative Solutions for Awareness-Raising: Our research proposes novel strategies for increasing awareness besides traditional strategies. Beyond traditional education, government interventions, civil society activities, scientific work, and daily individual practices, we suggest leveraging the influence of digital media and internet influencers to communicate essential food safety messages. This "integrated communication" approach between value chain players and other stakeholders can serve as an effective model for raising awareness, particularly in a digital era.

Finally, the broader implications of this research extend to global food security and sustainability. As global citizens, we all share a responsibility to ensure a sustainable food system that supports public health and food security. The integrated communication strategies proposed in this paper emphasize the role of cross-sector collaboration and public participation in addressing global challenges related to food safety. By fostering awareness at every level of the food value chain and supporting coordinated efforts between stakeholders, we can collectively contribute to the sustainable development of our food systems and the planet.

According to our research, the research about awareness of different players in food safety and food security is not distributed evenly at different stages, and most research focuses on the retailer and consumption stages, which indicates a research gap [Nordhagen et al. 2023]. Food safety and food security are closely linked, but our research found that surveys about awareness of food security and food safety are usually two separate topics, and food security gets less attention in comparison. Therefore, we recommend that future researchers pay more attention to the survey study on food security awareness among different players in the food value chain, especially the beginning step – production.

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KRYTYCZNE ZNACZENIE OCENY ŚWIADOMOŚCI INTERESARIUSZY W ZAKRESIE BEZPIECZEŃSTWA ŻYWNOŚCI I OCHRONY ŻYWNOŚCI W CAŁYM ŁAŃCUCHU WARTOŚCI ŻYWNOŚCI

STRESZCZENIE

Cel: Badanie ma na celu ocenę krytycznego znaczenia świadomości interesariuszy w zakresie bezpieczeństwa żywności i ochrony żywności w całym łańcuchu wartości żywności. Brak świadomości może utrudniać rozwój zrównoważonego rolnictwa. Dlatego poddano ocenie, dlaczego świadomość bezpieczeństwa żywności i ochrony żywności jest niezbędna dla różnych interesariuszy w łańcuchu wartości żywności. **Metody:** Przeprowadzono kompleksowy przegląd literatury, w celu zbadania poziomu świadomości wśród różnych interesariuszy, od rolników po konsumentów, w zakresie bezpieczeństwa żywności. Przegląd skupił się na identyfikacji kluczowych czynników, które wpływają na zaangażowanie i świadomość interesariuszy w całym łańcuchu wartości żywności. **Wyniki:** Analiza wykazała, że świadomość interesariuszy w zakresie bezpieczeństwa żywności i ochrony żywności znacznie zwiększa środki bezpieczeństwa żywności, promuje zrównoważony rozwój, zapewnia zgodność z przepisami i poprawia ogólną wydajność. Jednocześnie ogranicza ilość odpadów, wzmacnia zaufanie konsumentów, buduje lojalność wobec marki i rozwiązuje globalne wyzwania żywnościowe. Ponadto badanie wykazało, że świadomość rolników na wczesnych etapach łańcucha wartości żywności jest równie ważna, jak świadomość uczestników końcowych etapów, takich jak pracownicy gastronomii i konsumenci. **Wnioski:** Zrozumienie poziomu świadomości bezpieczeństwa żywności i ochrony żywności wśród interesariuszy jest kluczowe dla promowania zrównoważonego rozwoju, poprawy bezpieczeństwa żywności i zapewnienia przestrzegania przepisów w całym łańcuchu wartości żywności. Zwiększanie świadomości, szczególnie na etapie rolnictwa, jest kluczowe dla poprawy ogólnej skuteczności inicjatyw w zakresie bezpieczeństwa żywności i ochrony żywności.

Słowa kluczowe: bezpieczeństwo żywności, bezpieczeństwo żywnościowe, zrównoważony rozwój, influencer, świadomość, łańcuch wartości

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