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THE INFLUENCE OF COVID-19 PANDEMIC ON FOOD SAFETY AND QUALITY ASSURANCE STANDARDS IN SELECTED COMPANIES IN POLAND

Abstract: Food safety is the basic characteristic of food and the most important one because food has the direct impact on our health. The COVID-19 pandemic influenced the whole food chain and consumer behavior by the restrictions, shutdowns and fear of being infected. This paper presents the results of the survey conducted among 71 enterprises operating in the food industry in Poland in 2022. The representatives were asked to assess the influence of the pandemic on food safety standards and their usefulness during the pandemic. They were also asked about the positive and negative aspects of the pandemic from the perspective of the food industry. It was shown that the pandemic strengthened the need and understanding of the hygienic standards, collaborations with suppliers and employee training. On the other hand, caused the more frequent food quality and safety inspections, shortages of the employees and supplies, and economic losses.

Keywords: food, food standards, COVID-19 pandemic, pandemic effects

1. Introduction

Codex Alimentarius is one of the basic document on food safety. It defined food as “any substance, whether processed, semi-processed or raw, which is intended for human consumption, and includes drink, chewing gum and any substance which has been used in the manufacture, preparation or treatment of “food” but does not include cosmetics or tobacco or substances used only as drugs”. Food safety is important for the whole society as it has the direct influence on our lives and the lack of food safety causes big losses for the economy (Niewczas-Dobrowolska, 2020). Safe food is hazard-free food. “Hazard” means a biological, chemical or physical agent in a

food or feed, or the condition of a food or feed that may cause adverse health effects (Regulation 178/2002).

Food safety - all conditions that must be met regarding in particular:

- Additives and flavorings used.
- The levels of pollutants.
- Pesticide residues.
- Conditions of food irradiation.
- Organoleptic characteristics.

and actions that must be taken at all stages of food production or circulation in order to ensure human health and life.

Food safety is about preventing hazards to the health and life of consumers, caring for the welfare and health of plants and animals, caring for the human environment, surrounding, agricultural production and

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processing, as well as concern for the economic safety of consumers (Obiedziński, 2004). Food safety can be described as the strategies and activities aimed to protect foods from biological, chemical, physical, and allergenic hazards that may occur during all stages of production, distribution, and consumption (Paparella, 2020).

The COVID-19 pandemic has drawn the public's attention to the need for safety in various dimensions, for example: economic safety, food safety, safety of life. Before the pandemic we were got used to the feel of safety and stability of food production, food supply, consumer behavior etc. The COVID-19 pandemic introduced unexpected stresses on food systems, creating many immediate challenges. It has affected different stages of the food chain, simultaneously affecting farm production, food processing, transport and logistics, and final demand. Food processing was disrupted by labour shortages and shutdowns. Some employees were sick or some leaved their jobs out of fear from the infection (OECD, 2020, Barman et al., 2021).

Dudek & Śpiewak (2021) said COVID-19 affected the functioning of all elements of the system and the relationships between them, involving the following segments: supply of means of agricultural and food production, primary production of agricultural raw materials and products, agri-food processing, wholesale and retail food trade, marketing, logistics and transport, food preparation and consumption, by-product management, edible energy. Kalinowski & Wyduba (2020) and Zielińska-Chmielewska et al. (2021) concluded that the COVID-19 pandemic changed the whole food system in Poland.

2. The COVID-19 pandemic and food standards

In January 2020 the World Health Organization (WHO) announced the first appearance of COVID-19 virus. Since then

the citizens around the world as well as the companies had to face a situation they had never faced before. In Poland the first case of COVID-19 infection was dated on the 4th of March 2020. From this date the government introduced many restrictions, for example: close the restaurants, limit the number of clients in shops, limit the possibility to travel. In order to limit the transmission of the virus, remote work was recommended and many industries were closed or their activities were limited. These restrictions changed the reality we had known. Our basic activity as consumers that is buying and consuming was limited. We had to plan our shopping and started to prepare meals at home more often. For this reason consumers started to pay attention to products they eat.

Food processing, however, could not be shut down because it provides the basic goods necessary for survival. Therefore, companies operating in this industry had to quickly adapt to the new situation and implement mechanisms that would allow them to survive. The WHO published guidance documents addressed the food companies and the food authorities to support the food supply chain (WHO, WHOa, 2020). The main recommendations were: people who are feeling unwell should stay at home, staff working in food premises should be provided with written instructions and training on how to prevent the spread of COVID-19, Food safety practices in food premises should continue to be delivered to the highest hygiene standards in line with established FSMS (Food Safety Management System), keep good staff hygienic practices, the primary focus of any additional hygiene and sanitation measures implemented by food businesses is on keeping the COVID-19 virus out of their businesses. The virus will enter business premises only when an infected person enters or contaminated products or items are brought into the premises. Tips for food authorities were the following: to preserve the integrity of the national food safety

control system and to support international trade and the food supply chain, multi-agency cooperation and contingency, maintaining a functioning national food safety inspection programme planning, staff training. WHO also indicated the role of food safety standards in COVID-19 spread prevention. Prerequisite Programmes must ensure that COVID-19 infected workers and their contacts are excluded from food premises. Staff who are unwell or who have any symptoms of COVID-19 should not work. A procedure to allow staff to report illness by phone (or email) should be established so that workers with early stages of COVID-19 can receive reliable information and be quickly excluded from work environments. Very similar recommendations can be found in standard requirements in GHP (Good Hygienic Practice) and GMP (Good Manufacturing Practice) in staff hygiene requirements.

The COVID-19 pandemic showed the food industry the value and the meaning of hygiene restrictions as well as the role of staff behavior in the process of food safety assurance. As Djekic et al. (2011, 2021) wrote food safety management systems (FSMS) both obligatory (GHP, GMP, HACCP) or voluntary (ISO 22000, BRC, IFS) have several common elements: (1) prerequisite programs (PRPs) are the basis of any FSMS, (2) HACCP or similar hazard-based approaches are important for identifying, controlling and decreasing food safety risks in the food supply chains; (3) food safety legal compliance is necessary; and (4) food-based crisis management is important to anticipate and respond to various threats such as incidents associated with the product (like recalls, withdrawals and food fraud), or emergencies affecting food companies such as natural disasters, food safety issues and food defense.

Hazard Analysis and Critical Control Point (HACCP) is a preventive programme aiming at producing and providing safe food products (Gehring & Kirkpatrick, 2020; Motariemi & Warren, 2023). It is an

obligatory standard that has to be implemented by all food chain participants. HACCP is based on seven principles: (1) Conduct a Hazard Analysis, (2) Determine Critical Control Points (CCPs), (3) Establish Critical Limits, (4) Establish Monitoring Procedures, (5) Establish Corrective Actions, (6) Establish Verification Procedures, (7) Establish Record-keeping and Documentation Procedures. HACCP is implemented together with GHP and GMP practices which show the basic hygienic requirements at the work place and in the food manufactory. Food operators can also use the voluntary standards, for example ISO 22000, AiB, IFS, BRC and others. The main goal of each food standard is to ensure the food safety. Food safety is a complex issue and many external and internal factors implement it. These standards deal with food hazards mainly in a traditional division between biological, physical and chemical hazards. The pandemic appeared to be on of the external hazards that hadn't been considered. However, both in food standards and prevention of the pandemic the hygienic requirement/principles play the main role.

3. Changes in the food industry caused by the COVID-19 pandemic

The major concern in food companies was to keep the production and health of their staff (Aday & Aday, 2020). Many companies had to face the labour shortage (Stephens et al., 2020). As Limon (2021) shows the pandemic allowed to increase the online sell of food goods as well as emphasized the need to maintain hygiene principles in the foodchain. Maiberger & Sunmola (2023) presented the important aspects of food safety standard that are useful during the pandemic: FSMS knowledge; 2) rigorous prerequisite programmes; 3) FSMS verification and audit processes; 4) FSMS culture and 5) legal regulations. The restrictions and shutdowns resulted from the pandemic influenced the food suppliers and

customers affecting jobs, economic growth, mobility (Rizou et al., 2020; Laborde et al., 2020; Knorr & Khoo, 2020). Covid-19 has also emphasized the role of human health as a core consideration in assessing supply chain resiliency. Attention to hygiene practices and social distancing measures within manufacturing plants reduce the risks of spread within the workforce, helping to protect the health and welfare of workers (Hobbs, 2021). Also the food standards helped to obey the rules of hygienic behavior. As Rejeb et al. (2020) showed pandemic poses unprecedented challenges for food supply chains. It has raised food insecurity and food safety concerns, increased supply chain and logistics costs and radically changed consumer behavior. On the positive side, the pandemic has improved the need for hygienic principles.

In the report EIT Food „Food Foresight: Impact of COVID-19 on the agri-food sector in Central and Eastern Europe” published in December 2020 four scenarios of COVID-19 impact on agri-food sector: (1) the most optimistic called “full recovery” in which the lifting of restrictions facilitates the movement of labor, taking the pressure on farmers to earn money. At the same time, the pre-crisis scale of consumption returns, also in the HoReCa sector, driving related market segments. The agri-food industry is again experiencing the previous scale and directions of development, and the most noticeable change left after the restrictions of recent months is the continued development of e-commerce platforms; (2) “new consumer” - moderate scenario, emphasizing the long-term maintenance of pandemic consumer behavior, placing more emphasis on the nutritional value of food and how it is sourced locally. According to these assumptions, there will also be a shift from the use of catering establishments to home-cooked meals, which will result in an increase in demand for basic consumer goods and the need for the agri-food industry to adapt adequately; (3) “a new rulebook” - in this case, in opposition to the previous

scenario, consumers are willing to return to their previous habits and ways of doing things, but they cannot do so due to the constraints they maintain. As a consequence, the scale of consumption is limited while maintaining the structure of the sector; (4) “distortion & disruption - this is the most pessimistic approach, in which both economic and political factors are arranged in the most unfavorable way. The simultaneous maintenance of restrictions, continued unfavorable trade conditions and the lack of sufficient political support result in a decline in consumer and business confidence and the persistence of domestic demand at a crisis level. As a result, a downward trend is growing.

Other scenarios elaborated by the Directorate-General for Research and Innovation (European Commission) in 2022 titled “After the new normal. Scenarios for Europe in the post-COVID-19 world” are consisted of five scenarios called: (1) The long recession, (2) The back to ‘normal’, (3) Big tech shapes Europe, (4) Circular trials and real-life errors, (5) Green Utopia – New Hope. The long recession scenario is a very pessimistic, it shows the world under the crisis caused by the COVID-19 pandemic, and this crisis lasts for 20 years. The supply chains, travel industry and investment flows have not only been temporarily disrupted but at different times and for longer periods. They play a different economic role in 2040 compared to 2020. People, at least those with regular jobs, are saving and not spending their money, fearing even worse times. This behaviour is further fuelling a severe and long-term depression that defines the economy of 2040. In the second scenario people want to go back to “normal” so to the world we knew before the pandemic. this world is not ideal, characterized by social inequalities, varying levels of economic growth and food insecurity. The third scenario shows the possibilities and the need for the development of new technologies, also in everyday life. Companies focusing on innovation will gain an advantage, consumer

behavior and forms will become more global. In the fourth scenario a focus on making chains resilient, and raising the quality of products and services to include more players in the markets, to provide many jobs, and to play on a level field, small and medium-sized companies hand in hand can be found. In emergent circular economies, adaptivity to find new customers and flexibility to react to offers or changing circumstances are more important principles than efficiency and lean production process optimisation. This scenario shows the need for circular economy and emphasis on national self-efficiency. The last scenario pays a big attention to the value of quality. Quality in many dimensions is more important than quantity, also the quality of food. Good quality food should be available for each consumer, the meaning of the local food will grow. People will take more responsibility for their own health.

Deloitte perceived changes in the food industry and food consumption caused by the pandemic. People will search for local food, natural, with a positive impact on their health. Globalization in the food industry will not be popular and increasing. The food chains will be then shorter. Moreover, safety will play the main role, that is why food standards and requirement will be tightened. The pandemic showed the meaning of safety as well as the need for food availability. Local and regional product will have a bigger share in the production and consumption. New IT technologies will be implemented to the food chain so it will be possible to trace the food very quickly, and also to avoid problems with food supply. Local is the word that can be often found when we search for some recommendations toward food industry after the pandemic (DuPuis et al., 2022). Local food system should be developed because it is more resistant to future crises as it was more resistant to the pandemic. Local chains also help to deal with disruptions in supply chains because these supplies are shorter so the risk can be controlled to a greater extent.

Some trends in the food industry were created as a result of the pandemic (Vandrunen farms). The first one is the growing demand for frozen and shelf-stable foods. Consumers will prefer this kind of food to prevent food waste and to minimize the time for food preparation. Consumers still expect high food quality and safety and the clean label. Food they buy should be as natural as it is possible and little processed. The second trend is food convenience. Food product should be convenient so easy to prepare. As a result of the pandemic and the restrictions consumers started to consume food at their homes as restaurants were closed or limited. The trend of food consumption at home will be continued as is seen to be more safe and also cheaper. The food should also be easy to buy. The third trend shows the need for new tastes, from various countries. The food products should be healthy, convenient and offer a wide variety of products. It doesn't mean they should be globally produced, still local food is required but with new tastes. And the last trend is 'decadent indulgences' that means consumers are characterized by the desire for low-sugar and all-natural ingredients what will shape consumers' preference for decadent snacks and desserts.

4. Materials and Methods

71 enterprises operating in Poland in the food industry and food processing took part in the study. The survey was conducted using the CAWI method and was addressed to the managers of the quality department, managers and persons responsible for ensuring food quality and safety. The main purpose of the study was to determine the usefulness of the functioning of management systems and food quality and safety assurance systems during the pandemic and to identify the changes that the pandemic caused in this regard. In the preparatory phase of the study, a literature review and face-to-face interviews with 20 people responsible for ensuring food quality and

safety were conducted in order to determine possible answers to be chosen in the survey. The first question asked about the impact (on a scale of 1 to 5) of the pandemic on selected aspects of the company's functioning in terms of ensuring food quality and safety, such as: remote audits, more frequent employee training on hygiene principles and preventing the spread of COVID-19, more frequent quality inspections, the need for tightening cooperation with suppliers (cooperation with suppliers for whom we are sure in terms of compliance with safety requirements, difficulties with the purchase of raw materials / timeliness of deliveries, difficulties in meeting production schedules,

staff shortages, other. The second question asked about the usefulness of food quality and safety assurance standards during the pandemic. The aim of the next questions was to determine the positive and negative effects of the pandemic in terms of food quality and safety and the functioning of the company. The survey was conducted in 2022. The companies participating in this survey were characterized by the number of the years of experience in business, the number of the employees (Figures 1 and 2) and the branch. The operating in various sectors of food processing that reflects the real situation in the food industry in Poland.

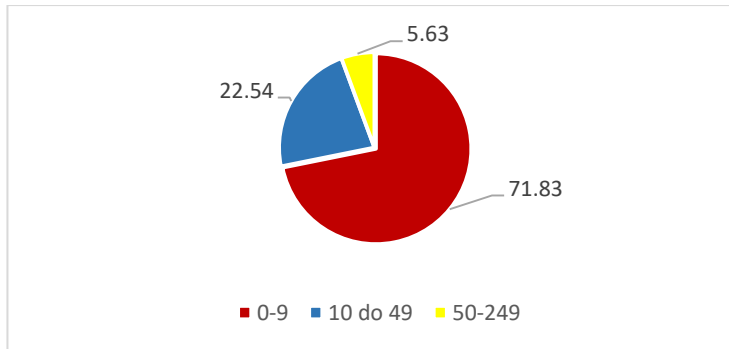


Figure 1. Number of the employees in the companies participating in the survey, in %
Source: own elaboration

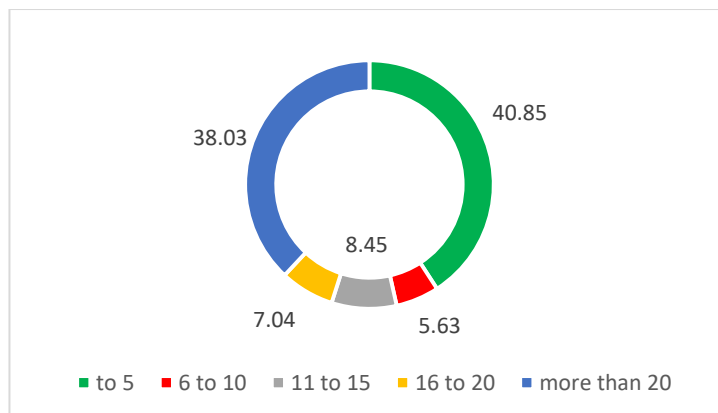


Figure 2. Number of the years of experience of the companies participating in the survey, in %
Source: own elaboration

According to Statistics Poland in 2018, 16.9 thousand companies conducted production activities in the food industry, mainly of them were SMEs (67.6%). The food industry is one of the most important and fastest growing branches of the Polish economy. The Research and Markets analysis shows that by 2025 at the latest, the market of food products in Poland will break the barrier of USD 100 billion, but it may happen even faster. This is the most stable industry, the development of which even the COVID-19 pandemic did not have a major impact. The report "Data & Trends 2021" - the European organization of food producers Food Drink Europe - shows that Poland is the 4th largest food producer in the EU after France, Germany and Spain (PARP, 2022).

5. Results

The respondents were asked to indicate the changes the COVID-19 pandemic causes in the process of food quality and safety assurance and business operations (on the scale 1 to 5, where 1 is the lowest rank, 5 the highest). On the basis of their average ranks it can be said that the most important changes were more frequent employee training on the principles of hygiene and preventing the spread of the COVID-19 and strengthening cooperation with suppliers (cooperation with suppliers to which we are sure to meet the food safety requirements) (Figure 3). Considering the number of years of the experience in business the answers were varied (Figure 4).

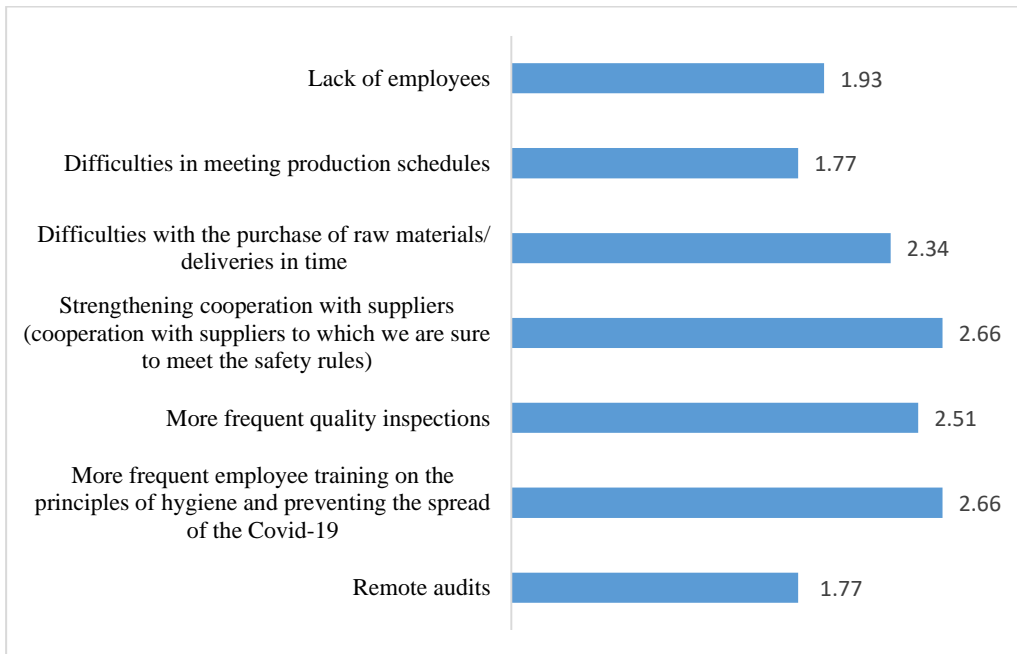


Figure 3. Changes in the functioning of food quality and safety assurance and business operations caused by the pandemic, on a 5-point scale. Source: own elaboration

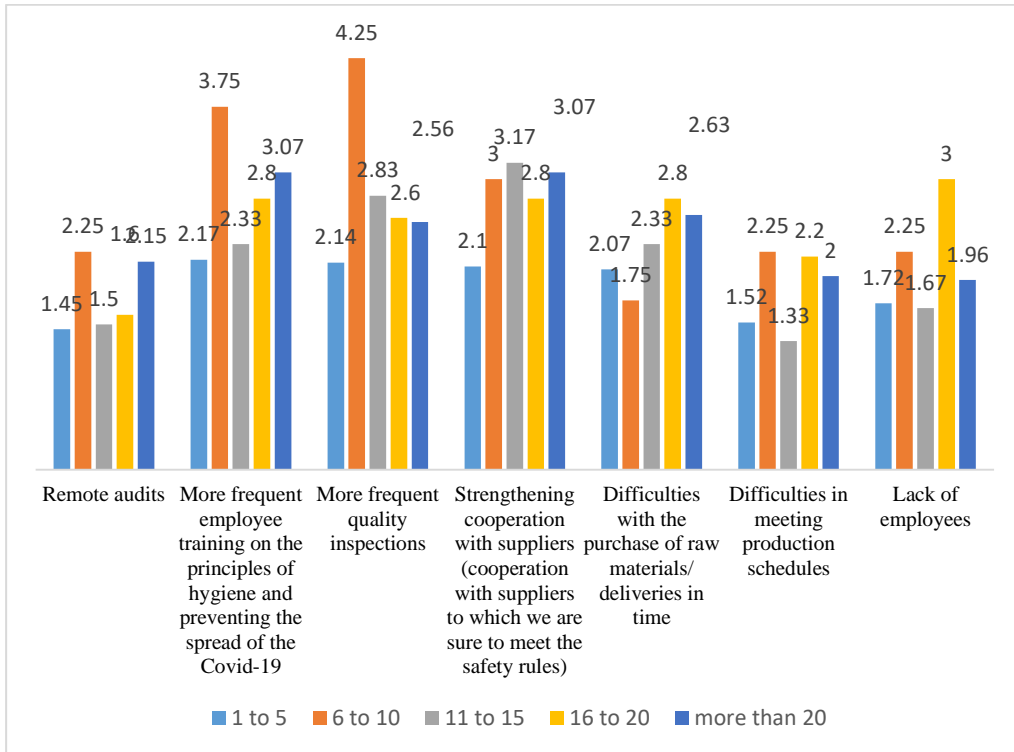


Figure 4. Changes in the functioning of food quality and safety assurance standards and business operations caused by the pandemic considering the number of experience (in years)
Source: own elaboration

For example, the companies operating in the food industry for 6 to 10 years indicated as the most important change the more frequent quality inspections as well as more frequent employee training on the principles of hygiene and preventing the spread of the COVID-19. Companies with less experience tended to downgrade changes caused by the pandemic. When we look at the answers on the basis of the number of employees of the companies we can see that the bigger companies usually gave higher ranks of changes caused by the pandemic (Figure 5). HACCP, GHP and GMP are to obligatory standards in the food industry. Companies operating in the food chain can also

implement other standards such as ISO 22000 (Food safety management systems. Requirements for any organization in the food chain), IFS Food (International Featured Standard Food) or BRC Food (British Retail Consortium Food). Representatives of the companies taking participation in the survey were asked to decide if these standards were useful during the pandemic. 40.8% companies agreed that these standards were useful during the pandemic, however 25% of them didn't agree with this opinion and 34.2% were not able to evaluate the usefulness. The reasons why these standards were assessed as useful during the pandemic are presented in the Figure 6.

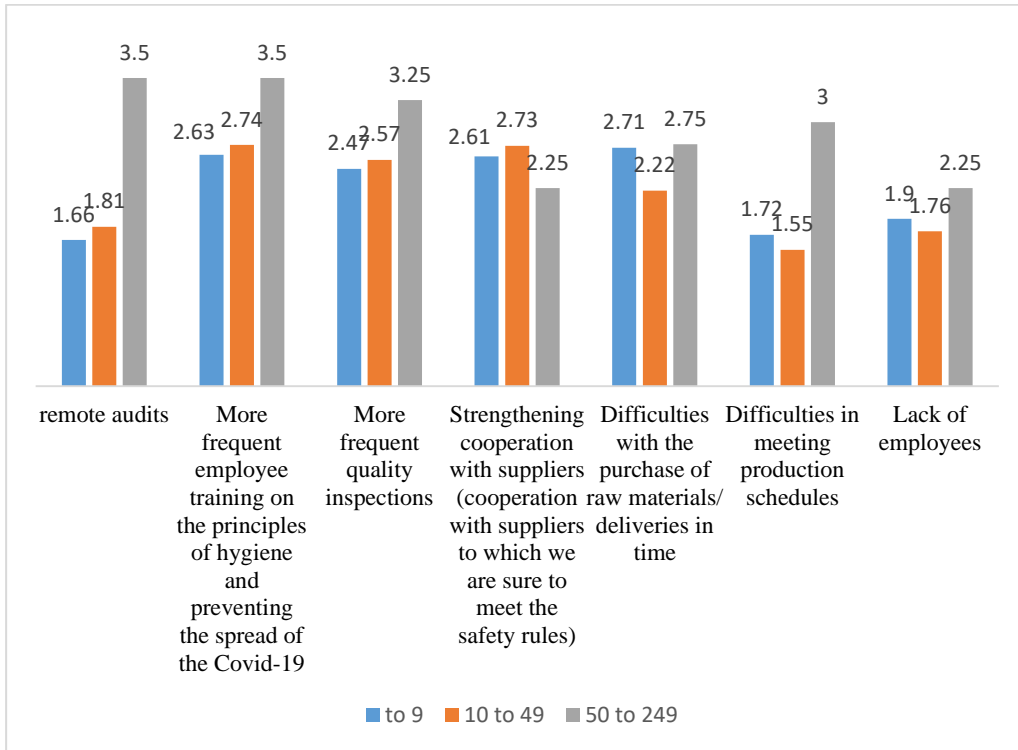


Figure 5. Changes in the functioning of food quality and safety assurance standards and business operations caused by the pandemic considering the number of employees
Source: own elaboration.

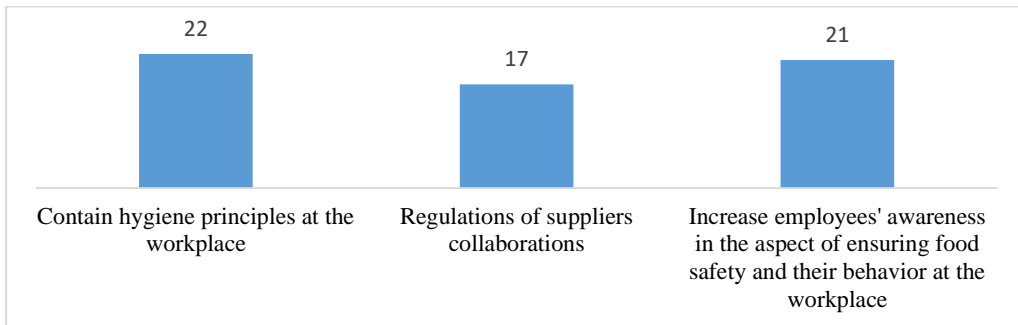


Figure 6. Reasons for food safety standards usefulness during the pandemic. Number of indications
Source: own elaboration.

The pandemic has generally drawn attention to the need for good hygiene and also the need for safety in various dimensions. Companies with 1-5 years of experience as well as companies with more than 20 years

of experience more often than others indicated the answer about the usefulness of food safety standards during the pandemic. For companies with little experience food standards helped to organize their processes

in the field of food safety assurance. For companies with bigger experience these standards showed the need and value of their implementation and continuous development.

5.1. Negative and positive effect of the pandemic

Companies were asked to indicate the positive and the negative effects of the pandemic. Among the positive effect they could choose: (1) the increase of the employees' awareness in the aspect of ensuring food safety and their behavior at the workplace and (2) reorganization of work, or indicate their own opinions. 40% of the respondents didn't notice the positive effects

of the pandemic. The increase of the employees awareness was most often mentioned by the participants (40%). Among other positive aspects were in descending order of indications: the development of online sales, increased sales, increased number of food inspections, the possibility of obtaining funding. Apart from the positive aspects of the pandemic, survey participants also indicated negative ones from a closed list (conducting more frequent training, which requires more work and financial outlays; difficulties with the purchase of raw materials/deliveries in time; difficulties in meeting production schedule; lack of employees) and could propose their own answers (Figure 7).

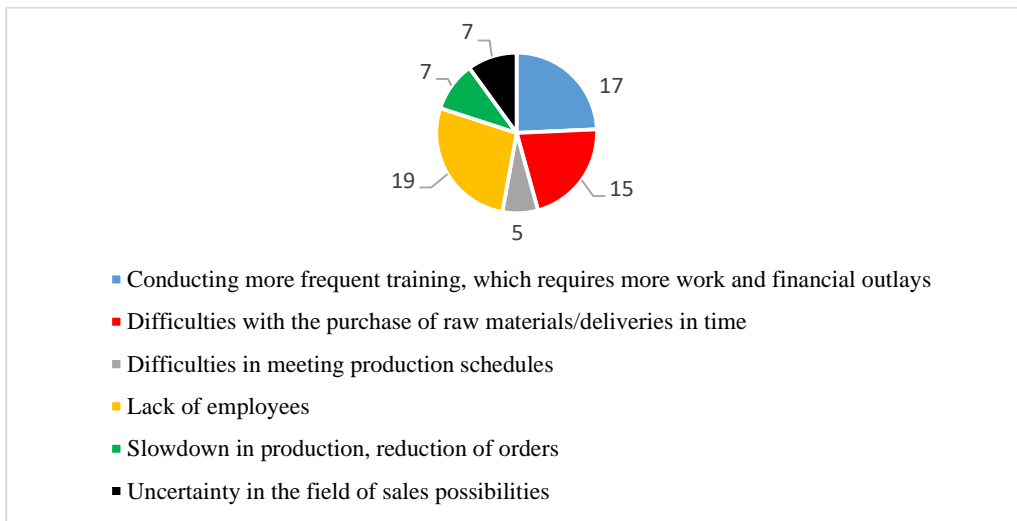


Figure 7. Negative aspects of the pandemic. Number of indications

Source: own elaboration

Companies having less experience (1 to 5 years) indicated the higher numbers of the negative aspects of the pandemic what may show that they were less prepared for the unpredicted situations and have less ability to cope with risks from the company external environment. As other authors showed staff awareness and hygiene are two of the most important attributes derived from the COVID-19 pandemic affecting food safety.

6. Discussion

Dudek & Śpiewak (2022) on the basis of their analysis elaborated effective ways for the food system's actors to deal with the changing socio-economic situation (best practice) during the COVID-19 pandemic, these are: establishing, maintaining, developing and shortening direct relations with food consumer customers; increasing

the added value of offered products by increasing their health benefits, specifying production locations (local product), highlighting the products' flavour value, producing food in an environmentally friendly way (certified organic food); diversifying the channels and ways of selling products (middlemen, processing businesses, wholesalers and retailers, own sales outlets, including online shops); pursuing a pro-employee hiring policy (e.g., appropriate wages, good work conditions, maintaining long-term relationships with employees); launching food deliveries directly to customers (food boxes); following sanitary norms related to the pandemic during food production, such as social distancing, disinfection, wearing mouth and nose coverings, quarantine, extended work hours and shift work as well as increasing the emphasis on compliance with food safety and work safety rules.

Szczepaniak et al. (2020) concluded that food chains dealt well with the pandemic, there are no major difficulties in the functioning of food chains. There are segments in the food industry for which the COVID-19 pandemic created opportunities for an increase in production volume (e.g. products with a longer shelf life), as well as those whose sales collapsed partially or completely (e.g. products manufactured for the needs of the HoReCa sector). In a fast-growing period part of the spirits industry, namely alcohol producers, also benefited from the pandemic ethyl alcohol, as the demand - both domestic and foreign - for spirit as a disinfectant increased sharply.

7. Conclusions

The food sector turned out to be resilient to the external risk of the COVID-19 pandemic. Due to the provision of basic goods necessary for survival, food production could not be closed. For this reason, the food sector had to adapt to the new pandemic reality and restrictions very quickly. To a large extent, food processing is manual work

and limiting interpersonal contacts was also difficult. The food industry, as far as possible, introduced the recommendations of social distancing, wearing masks and disinfection, i.e. the 3 main recommendations of the government. In meeting these recommendations, the requirements of mandatory and optional food quality and safety assurance systems helped, i.e. disposable gloves, hygiene rules, protective clothing. Hygiene principles have always played a central role in food processing. Employees participated in training on maintaining hygiene at the workplace, in addition, the pandemic emphasized the importance of maintaining hygiene during food production. Business owners organized more frequent training in this area.

The COVID-19 pandemic as an external risk difficult to predict, has become an opportunity for some companies and a threat for others. It was, for example, an opportunity to increase production – for example food with a long shelf life, spirit. Other companies producing mainly for gastronomy or hotels had to limit their production due to smaller orders caused by the closure of gastronomy and hotels. For many companies, it was also an opportunity to start selling online. The implemented food standards helped to adapt to the pandemic situation due to the knowledge of the requirements of behavior at the workplace, the role of maintaining hygiene rules, quality and safety inspections, and generally standardization of processes. The pandemic has also shown the need for proper collaboration with suppliers and trust in the food chain. On the other hand, the only aspect in which the food standards did not help the functioning of the food industry during the pandemic was the lack of employees.

Summarizing, the food industry was the least affected by the negative effects of the pandemic among other industries, and the implemented food standards made it easier to adapt to the rapid changes in the external

environment caused by the pandemic. However, as it was shown there are new challenges ahead in the food industry resulting from changes of consumers behavior and companies expectations caused by the COVID-19 pandemic. The food industry should collect the lessons learned from the pandemic and be well prepared for the future difficult to predict situations. The pandemic also showed that the trends in the market can change so it is important to monitor consumers requirements and answer them as much as it is possible. Another conclusion resulting from the pandemic is that it is worth strengthening what is good, for example to continue the high standards of food quality and safety, hygienic requirements, locally produced food with clean label. The pandemic also showed the need and possibilities of new technologies in the wide food sector, for example on line selling, traceability systems, new technologies for food preservation.

One of the strategies in SWOT analysis

(Strengths, Weaknesses, Opportunities, Threats) in the strategy maxi-mini what means that companies should strengthen their advantages, skills and minimize the threats from the outside. This strategy would be very good for the food sector for the time of the pandemic or after the pandemic. Food standards help to increase the strengths (and are the strengths in themselves) so to be more resistant to external threats like the pandemic or any other crisis that could come.

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