

The Aspects of Food Security Formation in the Context of Epidemiological Restrictions in the USA

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Abstract. In conditions of food instability, exacerbated by environmental, political, demographic processes, the state regulation of the economy is of particular importance to maintain food security and social stability. The development of technologies (both agri-food and digital) significantly improves the process of providing the population with food through the prism of their availability, accessibility and security. The aim of this study is to thoroughly analyze the current trends under the influence of epidemiological restrictions due to the spread of COVID-19 in the United States, and to identify the main strengths and weaknesses of the food security system in the United States, which may become a model for other countries that follow similar principles of national economies due to its flexibility and sustainability. The methodological basis of the study involves thorough analysis of indicators describing the dynamics of food security and consumer behavior in a pandemic. In addition, the study used methods of synthesis, deduction, induction, generalization, systematization, benchmarking and others. The article considers the main aspects of food security formation in the context of epidemiological restrictions in the USA. The dynamics of consumer spending on food during the COVID-19 pandemic and the corresponding costs with the indicators of the years before the pandemic (since 2010 to 2019) were studied. The state of the labor market in the restaurant business was analyzed and its main tendencies were clarified. Consumer benefits for food during the pandemic and mechanisms for meeting consumer needs were analyzed. Given the significant impact of factors, such as natural disasters, military conflicts, etc., which may pose a threat to food security, in addition to the COVID-19 pandemic, an effective mechanism should be developed to counteract such risks

Keywords: food availability, food safety, COVID-19 pandemic, US food policy, governmental support, food

INTRODUCTION

The country's food security is a comprehensive definition that includes the availability of quality food in economic and logistical dimensions with minimal negative impact on the environment. As a component of national security, food security becomes a modulator of scientific and technological progress, a factor in intensifying production, a stimulus to the growth of the productive forces of society. The issue of food security has always been a priority in shaping US public policy.

Hunger prevention must be at the heart of the COVID-19 response. Providing food for everyone is essential for a medical response. With a combined population of 4.5 billion people [1] with food production for their livelihoods and those in the wage-earning sector, food systems have a critical role to play in the socio-economic response. Society now recognizes more

than ever the need to accelerate action to strengthen the resilience of food systems and make them compatible with ecosystems of the planet. The issue of food security has always been a priority in shaping US public policy. Given the epidemiological constraints caused by the spread of the COVID-19 virus, the problems of ensuring a sufficient level of food security are particularly relevant. Thus, a comprehensive assessment of food security is through the measurement of indicators of economic affordability of food, its physical accessibility and well-established distribution system, food safety for the human body and the environment. Examining aspects of the formation of US food security in the context of these four components will analyze the current state of the food security support system, assessing its strengths and weaknesses.

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The main indicators of food security, as well as the methodology of their calculation were studied by M. Babych and A. Kovalenko [1]. This study identifies priority risk areas that are the first to be affected by factors that disrupt food security. This study is purely theoretical, the empirical aspect of this study is presented in our article. General studies of environmental sustainability as an integral part of national food policy were conducted by K. Brown, N. Venkateshmurthy, C. Law, F. Harris, K. Suneetha, B. Shankar, S. Mohan, D. Prabhakaran and C. Knai [2]. The assessment by measuring the metrics of sustainable development in the space of three spheres (economic, environmental and social) in the context of quality and safety of life was performed by O. Kotykova and O. Albeshchenko [3]. The current study details the previous article and expands it on the basis of a new object of study. The relationship between economic affordability of food and the average monthly wage in the country is formulated in terms of food security regulation O. Shebanina, A. Klyuchnik, A. Burkovska and D. Caruso [4], as well as S. Sumane, M. Dionisio, T. Pinto-Correia, etc. [5]. In their work, the authors emphasize that consumer expectations shape buying behavior, which often leads to the purchase of products in the range or quantity that has never been inherent in consumers. This hypothesis is confirmed in our study on the example of increasing consumer expenditures on groups of products that they believe may be in short supply or increase in price.

S. Kugelberg, F. Bartolini, D. Kanter, A. Milford and A. Leip [6] as well as E. Shkarupa, P. Perehodov and I. Ulanova [7] researched a food system approach for policy agenda-setting design, which was used as an implication for our own research in the sphere of the governmental policy to support food security in the region. J. Sol, M. Van der Wal, P. Beers and A. Wals [8] created a paradigm of food security in the future on the basis of sustainability transitions, which induced us to conduct our research of the topic closely connected to the one discussed above. E. Totin, J.R. Butler, A. Sidib'e, S. Partey, P. Thornton and R. Tabo [9] regarded food security through the environmental issues, meanwhile, taking into account the outcomes of the research mentioned above, the research team broadened the scientific paradigm, shifting focus from environmental issues solely to the complex framework of social, demographic and economic factors that mainly predetermine the recent change in consumption. The possible solutions to the current problems regarding food security in USA were inspired by J. Rockstrom, O. Edenhofer, J. Gaertner and F. DeClerck [10] who made a huge input into modeling the global food system that would embrace available recourses and comply them with existing needs.

The purpose of this article is to identify priority areas of food security that are most vulnerable to the impact of economic, political, natural, etc. shocks to offer a model of food stability in the United States that can be replicated by other countries.

MATERIALS AND METHODS

The methodological basis of the study involves the analysis of secondary information, which provides a description of the subject of the study and confirms previous hypotheses about the reaction of consumers to fluctuations in food markets in a pandemic. Methods of theoretical generalization, analysis and synthesis were used to form a theoretical overview of the situation in the United States due to the pandemic. The obtained analytical results were presented using methods of visualization.

In the course of the research the methods of theoretical cognition were used, namely the methods of induction and deduction. The processes of analysis, conducted from specific cases to general scope allowed to scale the results of the analysis to other regions of the world, assuming that the initial factors that determine food security are stable. The method of cognition, focused on areas from general to specific ones, allowed to identify the most vulnerable areas of the food security system that needed further research.

Benchmarking was used to investigate how consumer habits change depending on gender. In addition, the comparative analysis allowed us to rank the items of expenditure, depending on how they tend to increase according to the results of subjective assessment of consumers.

Methods of systematization, classification and monographic method were used to analyze the scientific works of other scientists. Based on the analysis of scientific works on the topic, the sphere of scientific interest was formed and research areas were outlined. Secondary statistical information from international statistical databases (incl. Statista and its supplementary services) containing time series and survey databases of American respondents was used to find answers to the questions that arose during the study. Thus, in the course of work on the scientific problem, the results of surveys conducted by the research agency "Ask Statista Research" were used, which collected information on a wide range of issues of food security among the US population through telephone interviews during the period from October to November 2019 (the number of respondents comprised 2227 people within the age group of 18 years and older).

RESULTS AND DISCUSSION

Due to the limiting impact of the pandemic on the economies of many countries, the United States is developing its own policy to ensure food stability. Inspired by D. Debnath, S. Babu, P. Ghosh and M. Helmar [11] and S. Mittal, V. Hariharan, S. Subash [12] the research team decided to replicate their research of national food security policy on domestic and international markets. Thus, primarily, we need to analyze the impact of governmental measures taken in the sphere of information disclosure and maintenance of social stability by providing a strong supportive mechanism by the implication of current trends. Moreover we suggest combining previous researches with those conducted by P. Panagos,

G. Standardi, P. Borelli, E. Lugato, L. Montanarella and F. Bosello [13], A. Maysou, M. Tafadzwanashe, M. Festo [14] and E. Rajala, I. Vogel, A. Sundin, D. Kongmanila, M. Nassuna-Musoke, R. Musundire, M. Mulangala, L. Chiwina-Karlton, U. Magnusson and S. Boqvist [15] to broaden the scope by implying macroeconomic factors that often become a game changer in product markets.

Trends in the country's food security sector affect consumer demand, social stability, the structure of savings and spending. Thus, at the beginning of the COVID-19 pandemic in April 2020 [16], consumers expected their own expenditures to increase for certain groups of goods and services (Fig. 1).

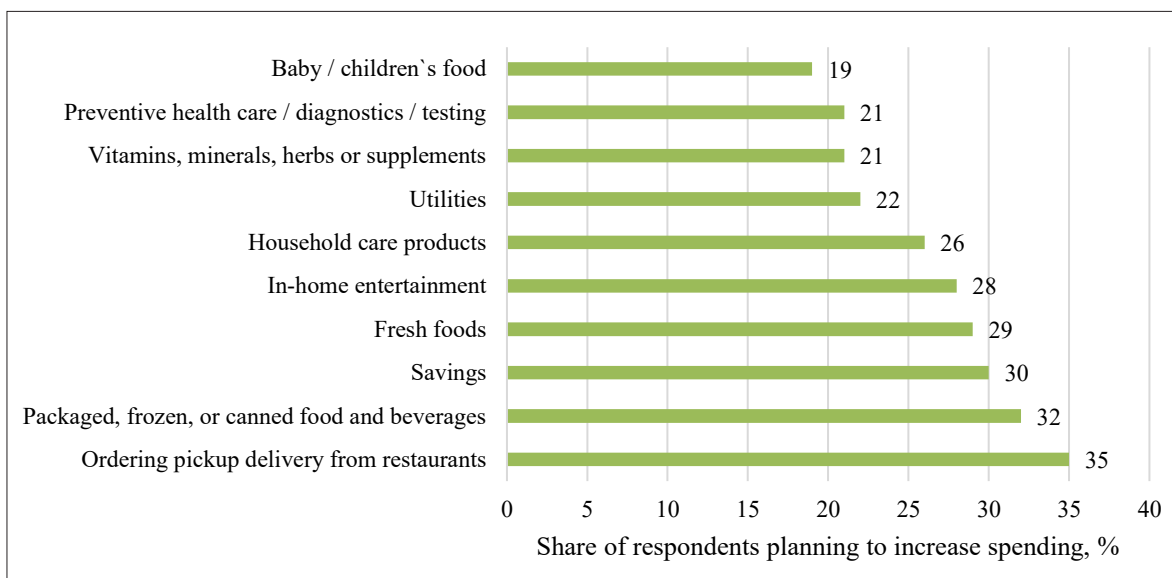


Figure 1. Increased consumer spending expectations due to the COVID-19 pandemic in the United States, by type
Source: built by the authors on the basis [16]

Thus, 35% of U.S. consumers reported that they expected to increase their spending on ordering pickup delivery from restaurants; respectively 32% of U.S. consumers reported that they expected to increase their spending on packaged, frozen, or canned food and beverages in the next six months [16]. In addition, a large proportion of consumers (33%) at the beginning of the

pandemic expected a likely increase in their own spending on savings, home entertainment, medicines and more.

During the first year of the pandemic in the United States, total household spending on food fell due to a significant reduction in food spending in catering establishments. At the same time, the cost of food at home increased compared to previous periods (Table 1).

Table 1. Average annual food expenditures of United States households (in U.S. dollars)

Years	Average annual food away from home expenditures of United States households	Average annual food at-home expenditure of United States households	Average annual household food expenditure in the United States
2010	2505	3624	6129
2011	2620	3838	6458
2012	2678	3921	6599
2013	2625	3977	6602
2014	2787	3972	6759
2015	3008	4015	7023
2016	3154	4049	7203
2017	3365	4364	7729
2018	3459	4464	7923
2019	3526	4643	8169
2020	2375	4941	7316

Source: built by the authors on the basis [17-19]

This statistic depicts the average annual household food expenditure in the United States from 2010 to 2020. In 2020, the average food away-from-home expenditure of the U.S. households amounted to about 2,375 U.S. dollars [17], which indicates a negative trend. Compared to 2019 this is a significant drop that is more

than likely a result of the COVID-19 pandemic. Thus, the COVID-19 pandemic mainly did not lead to a general reduction in food consumption, but to a reduction in the cost of food outside the home (Fig. 2). Thus, in general, the consumption of semi-finished products needed for home cooking also shows an increasing trend (Fig. 3).

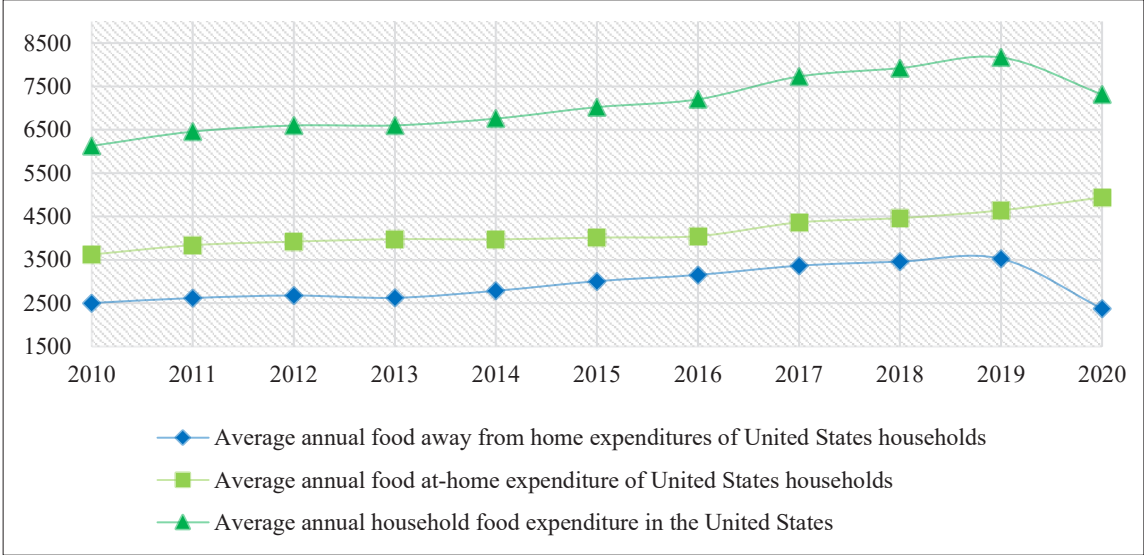


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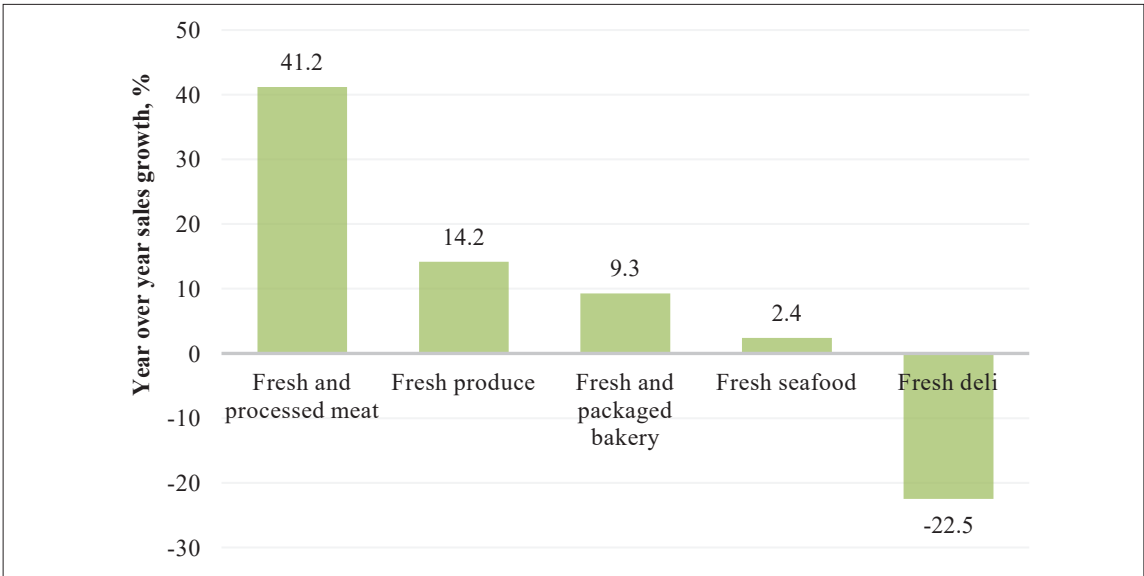


Figure 3. Sales growth of fresh foods due to Corona virus pandemic in the United States in 2020
Source: built by the authors on the basis [20]

The increase in sales of semi-finished products is due to the increase in consumption at home, in contrast to the consumption of food in catering establishments. Thus, fresh and processed meat was the fastest growing fresh food category during the Coronavirus outbreak in the United States in 2020. For example, fresh and processed meat sales grew by 41.2% compared to 2019. In addition, in contrast, fresh deli product sales declined by over 22% [20].

The trend of increasing consumption of semi-finished products did not extend to the consumption of delicacies. Thus, the consumption of delicacies in the study period decreased by 22.5% [20], due to reduced consumer incomes during the pandemic.

The US government’s food security system cares for low-income citizens by providing them with food aid (Table 2). Thus, targeted food aid is the provision of food aid to the most hard-up citizens or families, taking into

account their financial situation and average monthly total income, according to transparent registers of recipients of such assistance and confirmed by relevant documents and mechanisms (e.g. Supplemental Nutrition Assistance Program (SNAP) [21]). Transparency of the process is ensured by the involvement of non-profit public organizations (NGOs) and various forms of social entrepreneurship (including NGO's like Feed the

Future, Global Giving, Center for Food Safety and other humanitarian organizations), which is checked during the survey of the material condition of individuals, including their income. The essence of targeted food aid is to ensure full personal accessibility of everyone in need of basic food, or direct provision of the necessary set of food at minimum cost and maximum return on expenditure.

Table 2. Use of food pantries and emergency kitchens in the United States in 2020, by household food security status (in 1,000 people)

	Food pantries	Emergency kitchens
Food-secure households	3719	126
Households with low food security	2648	130
Households with very low food security	2305	195

Source: built by the authors on the basis [22]

The task of creating a transparent state of food security raises a number of agreed issues on determining consumption standards for different types of vulnerable groups, developing practices to balance regional and national needs for food aid in dynamics. Good nutrition plays a key role in maintaining the health of the nation and improving the living standards of the population.

Important factors in ensuring the safety of food for the human body are: compliance of food ingredients with the requirements established by the relevant technical documentation; ensuring food safety is possible only by enshrining the relevant conditions in the regulatory and technical documentation for each type of food product.

To ensure a healthy diet it is necessary to take into account: the quality and energy value of products, their storage conditions; the method of cooking, which should provide both taste and nutritional properties of dishes, as well as their energy value; conditions, multiplicity and time of eating; the amount and caloric content of food consumed per day; changes in diet during intense exercise.

The increase in the share of home food in the overall structure of food consumption in the United States, in addition to economic and epidemiological factors, could have other grounds. Thus, a survey of consumers about their fears of food poisoning showed that food in public institutions is often perceived as a source of potential danger by most respondents (Table 3). The survey was conducted by Ask Statista Research [23].

Table 3. U.S. adults that believed food poisoning is common due to the ways in which food is prepared at home / at restaurants as of 2019

Respondents' choice	Poisoning is common due to the ways in which food is prepared at home	Poisoning is common due to the ways in which food is prepared at restaurants
Very common, %	15	30
Sowhat common, %	40	45
Not very common, %	45	25

Source: built by the authors on the basis [23]

Against the background of the global economic crisis, when most producers are making every effort to reduce the cost of their products, there is a real threat of deteriorating food quality in general and the lower price segment in particular [14]. At the same time, there is a significant impoverishment of the population, declining solvency and an increase in the number of people who buy food in the lower price segment [24]. Economic inaccessibility of natural food products, on the

one hand, and the efforts of producers to reduce the cost of their products due to non-food ingredients, on the other — will lead to significant changes in the diet of all segments of the population [14]. The general decline in consumer demand for catering, cafes and restaurants due to the unfavorable epidemiological situation has led to a downward trend in the number of people employed in the industry in 2020 with a gradual increase in the number of employees in 2021 (Fig. 4).

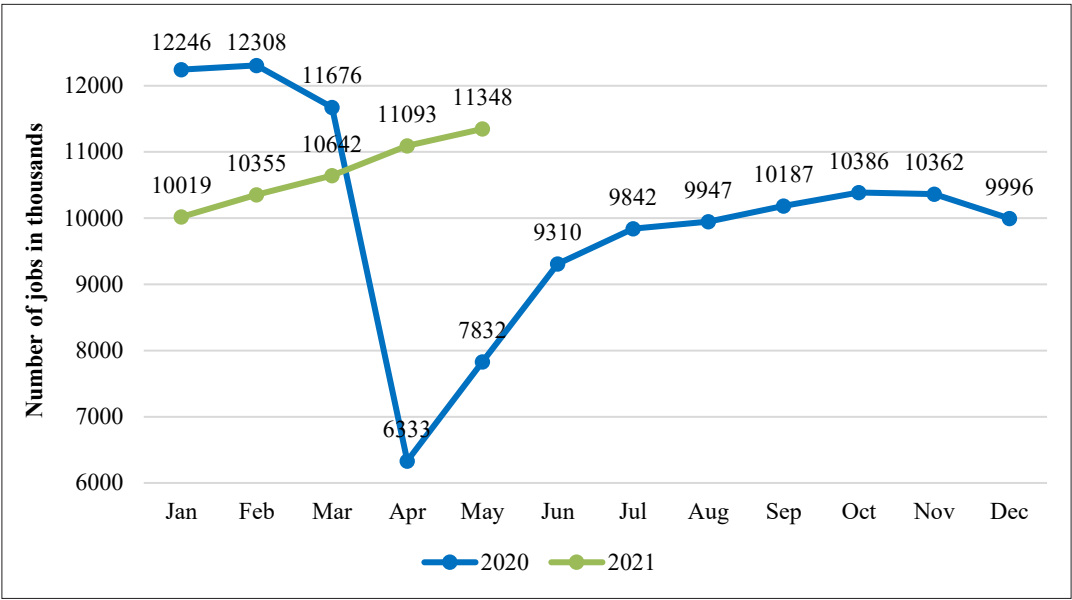


Figure 4. Number of jobs at eating and drinking places in the United States from 2020 to 2021, by month (in 1,000s)
Source: built by the authors on the basis [20]

The coronavirus (COVID-19) pandemic hit the food and drink services industry hard in 2020, which had a direct impact on changes in the labor market in the industry. Thus, during the first three months of the year (until the significant spread of infection), employment figures at eating and drinking places remained relatively stable in the United States, which illustrates the corresponding graph. However, this figure dropped significantly in April to 6.33 million as a result of the significant spread of the infection and the introduction of a ban on visiting public places. While the number of jobs

increased steadily throughout the year, it did not reach pre-coronavirus levels and ultimately saw another slight drop in December. As of September 2021, the number of food and drink service jobs in the U.S. reached approximately 11.38 million [13].

Although labor market trends in the restaurant business show declining trends, the food delivery segment is developing particularly fast. Thus, Figure 5 shows the growth of individual market leaders in food and food delivery in a highly competitive environment.

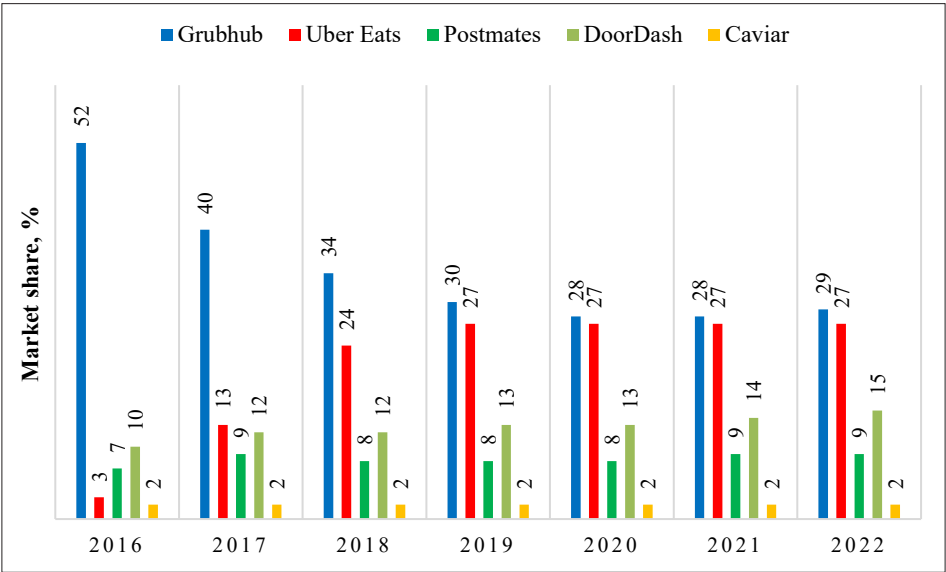


Figure 5. Market share of food delivery services in the United States from 2016 to 2022
Source: built by the authors on the basis [25]

In 2018, food delivery company Grubhub held 34% of the total food delivery market in the United States (the company's share of the market is predicted to decrease to 29% by 2022); Uber Eats held 24% of the total

food delivery market in the United States (the company's share of the market is predicted to rise to 27% by 2022); food delivery company Postmates held an eight percent of the total food delivery market in the United

States (the company's share of the market is predicted to rise to nine percent by 2022); food delivery company DoorDash held 12% of the total food delivery market in the United States (the company's share of the market is predicted to rise to 15% by 2022); food delivery service Caviar held two percent of the total food delivery market in the United States (the company's share of the market has remained the same since 2016 and is predicted to stay the same until the end of 2022, which seems quite possible due to the current trends) [25].

Fear of contact during the pandemic forced people to cut back on public places to rest and supermarkets for groceries and forced them to use home delivery services. A promising segment of the food delivery market is the delivery of products and food kits from supermarkets, which will be actively developed in the future.

One of the important factors hindering the growth of this market is the distrust of customers in the quality of products. This segment should be considered from the standpoint of a possible additional sales channel for semi-finished products or other food sets with a high degree of readiness and long shelf life.

In recent times, agriculture has begun to change rapidly from "traditional" to "industrial" and GMO production. Against the background of such technological changes in agricultural production, the demand for healthy food has appeared in society. Organic production is aimed at providing consumers with safe and high-quality food products that have a special label on the shelf and are clearly different from inorganic foods. In addition, even during the pandemic, consumers in the United States continue to prefer organic foods (Fig. 6).

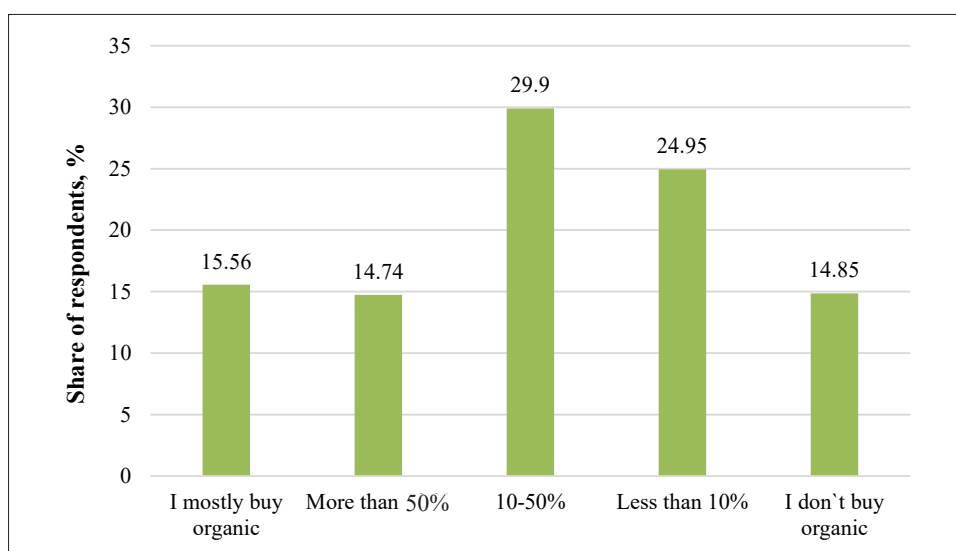


Figure 6. Organic food consumption in the USA (survey done in 2020 results presentation)

Source: built by the authors on the basis [26]

According to a poll conducted in 2020, people in the United States (U.S.) were attracted by organic products when doing grocery shopping, which indicates a high commitment of American consumers to organic products. Indeed, almost 30% of the respondents stated

that between ten and 50% of their grocery shopping consisted of organic products [26]. In addition to a conscious attitude to the formation of their own diet, consumers in the United States are prone to irrational use of food, according to a survey conducted in 2019 (Fig. 7).

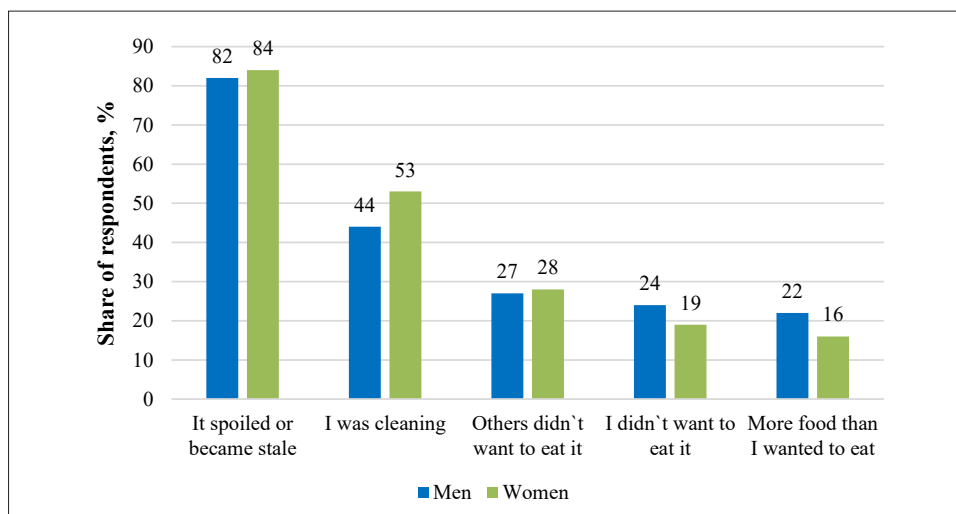


Figure 7. Reasons for discarding food in the United States in 2019, by gender

Source: built by the authors on the basis [27]

In 2019, the most frequent reason for discarding food among both male and female respondents was that the food spoiled or became stale, with approximately 82% of male respondents (among 100% of male respondents) and 84% of female respondents (among 100% of female respondents) naming this as a reason to discard food. Moreover, according to the same survey, 44% of male respondents stated that they were cleaning as a reason for discarding food, while others (56%) have never experienced such an issue. This figure was slightly higher among their female counterparts, with approximately 53% naming this as a reason to discard food, while others (47%) have never experienced such an issue. Meal leftovers were ranked as the most commonly discarded type of food among the respondents. Approximately 74% of respondents (out of 100% participants of a panel group) ranked meal leftovers among their three most frequently discarded food types (the other two types of the most frequently discarded food were naturally spoiled and expired products); while others (26%) did not

report such an issue. Least frequently thrown away were milk alternatives, with approximately 10% of respondents (out of 100% participants of a panel group) ranking them in their top three [27].

Regardless of social and economic status in society, the whole population must have access to a sufficient number of quality and safe food. A balanced diet is the basis of the normal functioning of the human body, provides it with everything necessary for cell structure, energy production and regulation of metabolism. It is extremely important that a person receives all the vital nutrients with food, the amount of which could meet the needs of the body. After all, a person's health directly depends on the quality of food and beverages he consumes. However, food may contain hazardous ingredients that can harm the human body, including nitrates, food additives, pesticides and antibiotics. That is why, according to the survey conducted by Ask Statista Research [28], consumers of restaurant menus in the United States prefer simple dishes made from local ingredients with minimal impurities (Fig. 8).

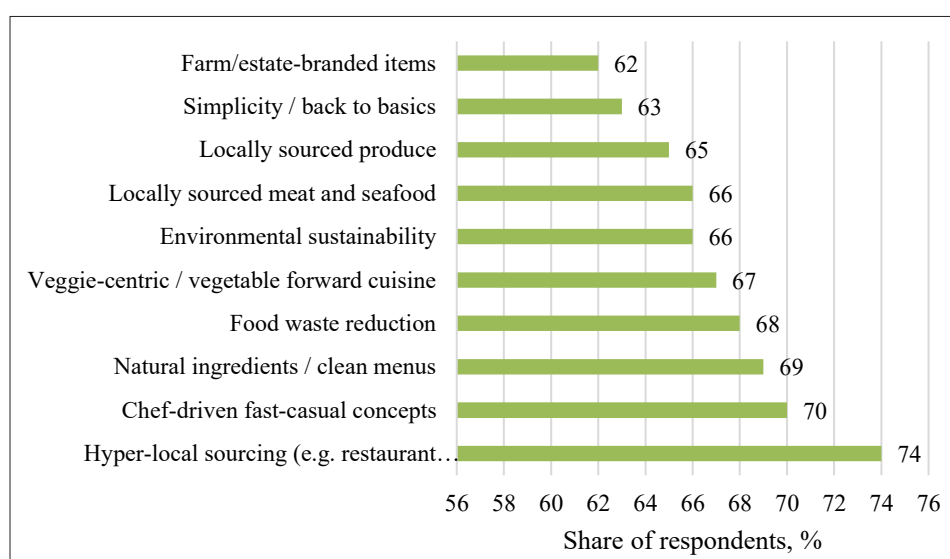


Figure 8. Leading trends in culinary themes on restaurant menus in the United States in 2018

Source: built by the authors on the basis [28]

This statistic shows the leading ten trends in culinary themes on restaurant menus in the United States as forecasted by professional chefs for 2018. During the survey, 66 percent of the respondents stated that environmental sustainability would be a "hot trend" for restaurant menus in 2018 [28].

During a pandemic, consumers try to buy more food for fear of rising prices or supply volatility, which leads to an artificial shortage of goods and provokes social tensions. In addition, the problem of many households is the creation of large amounts of food waste that is unfit for consumption due to the expiration date. To avoid this, it would be appropriate to introduce the following measures: detailed planning of food consumption for the timely adjustment of the distribution system to consumer needs; establishing communication between households that have a problem of irrational use of food and households that do not have a sufficient level of purchasing

power to purchase enough food; strengthening social support programs for vulnerable groups; providing advice and assistance in finding a job for people who lost it due to an unfavorable epidemiological situation; financing entrepreneurial initiatives aimed at creating safer business conditions during the pandemic and creating new jobs, etc.

To combat the threat to food security in the United States, it is advisable to develop not only development strategies, but also a mechanism to ensure the reform of the entire agro-industrial sector. This system should include a set of organizational, economic and legal measures to prevent economic threats, namely:

- monitoring of the economy in order to identify and forecast internal and external threats to food security;
- lending and state support to the national food producer, ensuring its competitiveness;
- partnership and cooperation of food producers;

- high level of protection of health and life of food consumers;
- balance of food products of different age and professional groups.

During a pandemic, consumers try to buy more food for fear of rising prices or supply instability, which leads to an artificial shortage of goods and provokes social tensions. In addition, the problem of many households is the creation of large amounts of food waste that is unfit for consumption due to the expiration date. To avoid this, it would be appropriate to introduce the following measures:

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- strengthening social support programs for vulnerable groups;
- providing advice and assistance in finding a job for people who lost it due to an unfavorable epidemiological situation;
- financing entrepreneurial initiatives aimed at creating safer business conditions during the pandemic and creating new jobs, etc.

Once the pandemic is overcome around the world, modern consumption patterns will lose their relevance, but the principles that ensure food stability in crisis-free development will become relevant. Thus, in addition to providing a food reserve system and strengthening response mechanisms, associated with temporary crises in food logistics, the government should focus on the following steps to prevent quantitative hunger:

- invest in the intensification of agricultural production and development of efficient food technologies;
- support environmental projects to reduce waste and food losses, as well as the deterioration of fertile land;
- support the creation of agricultural enterprises whose activities are aimed at food production, etc.

In the post-pandemic period, the main threat to food stability in the world is likely to remain climate change, which has a negative impact on agricultural production. To combat the threats of the post-coronavirus

world, the USA should implement solutions that correlate with the major programs of leading international organizations. Thus, by focusing on the basic principles that are considered the goals of sustainable development by the United Nations, the USA will be able not only to overcome current risks, but also to ensure long-term stability, which is advised to be the subject of further research.

CONCLUSIONS

In the conditions of unfavorable epidemiological situation in the world, the issue of food security in the middle of the country becomes especially relevant. During the study period (of the second half of 2020) in the United States there were negative trends in the development of service industries (including food networks personnel redundancy, logistics chains deceleration, consumers purchasing power reduction, etc.), which is associated with limited contact between people due to the threat of infection. At the same time, the market share of food and food delivery companies continues to grow. Relevant changes are taking place in the structure of employment and consumer spending.

The pandemic has challenged the world community by forcing approaches to food production, distribution and consumption. Along with monitoring food safety, the state is trying to ensure its availability to the most vulnerable populations through free food distribution points, the organization of field kitchens, etc.

Given that the most vulnerable element of food security has been the affordability of food, it is necessary to ensure compliance with social standards and expand programs to support the population in crisis. Drawing on the successful experience of tackling the food crisis during the pandemic, other developed countries, such as North America, the European Union, Australia and others with similar economic background and resource potential can also build a high-level food security support system that will strengthen social stability and get rid of the negative effects of food shortages. The further thorough study of technological re-equipment problems for more efficient production, logistics of food supply optimization, ensuring economic stability of the state as a guarantee of food security are required.

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Аспекти формування продовольчої безпеки в контексті епідеміологічних обмежень у США

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Анотація. В умовах продовольчої нестабільності, що загострюється екологічними, політичними, демографічними процесами, державне регулювання економіки має особливе значення для підтримки продовольчої безпеки та соціальної стабільності. Розвиток технологій (як агропродовольчих, так і цифрових) значно покращує процес забезпечення населення продуктами харчування через призму їх наявності, доступності та безпеки. Метою цього дослідження є ґрунтовний аналіз сучасних тенденцій під впливом епідеміологічних обмежень через поширення COVID-19 у США, а також визначення основних сильних і слабких сторін системи продовольчої безпеки в США, яка може стати взірцем для інших країн, які дотримуються подібних принципів національної економіки завдяки своїй гнучкості та стійкості. Методологічною основою дослідження є ретельний аналіз показників, що описують динаміку продовольчої безпеки та поведінку споживачів в умовах пандемії. Крім того, у дослідженні використовувалися методи синтезу, дедукції, індукції, узагальнення, систематизації, бенчмаркінгу та інші. У статті розглянуто основні аспекти формування продовольчої безпеки в контексті епідеміологічних обмежень у США. Досліджено динаміку споживчих витрат на продукти харчування під час пандемії COVID-19 та відповідні витрати з показниками років до пандемії. Проаналізовано стан ринку праці в ресторанному бізнесі та з'ясовано його основні тенденції. Проаналізовано споживчі переваги продуктів харчування під час пандемії та механізми задоволення споживчих потреб. Враховуючи значний вплив таких факторів, як стихійні лиха, військові конфлікти тощо, які можуть становити загрозу продовольчій безпеці, окрім пандемії COVID-19, слід розробити ефективний механізм протидії таким ризикам

Ключові слова: доступність харчових продуктів, безпека харчових продуктів, пандемія COVID-19, харчова політика США, державна підтримка, продукти харчування