Effect of COVID-19 pandemic on the food supply chain

Efeito da pandemia COVID-19 na cadeia de abastecimento alimentar

Geraldo Magela Jardim Barra Doutor em Administração. Universidade Federal de São João del-Rei (UFSJ) – Brasil.
https://orcid.org/0000-0001-7186-6344 gmjbar@yahoo.com.br
Caroline Miriâ Fontes Martins Doutora em Administração. Universidade Federal de São João del-Rei (UFSJ) – Brasil.
https://orcid.org/0000-0003-0697-7499 carolfontes@ufsj.edu.br

RESUMO

O objetivo deste estudo foi analisar o papel das instituições no posicionamento do Brasil para reduzir as incertezas no abastecimento de alimentos relacionadas ao COVID-19. Pretendemos demonstrar que a segurança alimentar deve estar integrada com a segurança alimentar. Esta pesquisa é um estudo exploratório dos efeitos do COVID-19 nos sistemas alimentares usando dados qualitativos. Este estudo demonstra que políticas públicas e privadas realizadas em nível internacional são necessárias para evitar novas crises sanitárias decorrentes de zoonoses. A integração de políticas públicas e privadas requer as seguintes estratégias: construir instituições fortes, fortalecer o sistema de pesquisa e inovação agropecuária, políticas públicas para agricultura sustentável, leis rígidas de controle sanitário, aprimorar as cadeias de frio da produção de proteína animal e incentivar o modelo de integração vertical em cadeias de proteínas animais. Este esquema analítico pode ser aplicado no contexto dos sistemas agroindustriais a partir de uma perspectiva institucional, permitindo pesquisar o efeito das crises nas cadeias de abastecimento agroalimentar, como é o caso da pandemia de COVID-19, bem como contribuir para a sua prevenção. Constatou-se que as demandas para prevenir novas pandemias são uma consequência da adoção efetiva de controles sanitários padronizados, coordenação de sistemas agroalimentares e políticas públicas.
Palavras-chave: COVID-19; segurança alimentar; segurança alimentar.

ABSTRACT

This study's objective was to analyze institutions' role in positioning Brazil to reduce uncertainties in food supplies related to COVID-19. We intend to demonstrate that food security must be integrated with food safety. This research is an exploratory study of COVID-19's effects on food systems using qualitative data. This study demonstrates that public and private policies carried out at the international level are needed to avoid new health crises originated by zoonoses. The integration of public and private policies requires the following strategies: building strong institutions, strengthening the agricultural research and innovation system, public policies for sustainable agriculture, strict sanitary control laws, enhancing cold chains of animal protein production, and encouraging the vertical integration model in animal protein chains. This analytical scheme can be applied in the context of agro-industrial systems from an institutional perspective, allowing research into the effect of crises on agri-food supply chains, as in the case of the COVID-19 pandemic, as well as contributing to its prevention. It was found that demands to prevent new pandemics are: an outgrowth of the effective adoption of standard sanitary controls; coordination of agri-food systems; and public policies.
Keywords: COVID-19, food security, food safety

Recebido em 07/02/2022. Aprovado em 10/07/2022. Avaliado pelo sistema *double blind peer review*. Publicado conforme normas da ABNT.
https://doi.org/10.22279/navus.2022.v12.p01-11.1775

1 INTRODUÇÃO

In December 2019, China reported Coronavirus' emergence in Wuhan, Hubei Province. Also known as Coronavirus Infectious Disease-19 (COVID-19), it is a highly contagious human disease that causes severe respiratory infection, leading to death. It initially struck China and countries in the Asia-Pacific Region. Subsequently, it spread throughout the world, achieving pandemic level in March 2020, according to an announcement by the United Nations. In addition to the loss of human life, the pandemic has resulted in increased economic losses globally (MARTY; JONES, 2020).

The COVID-19 pandemic demonstrated food supply chains' vulnerability in the face of zoonoses by creating a health crisis with great economic scope in numerous countries around the world. Actions to prevent zoonoses from returning by making changes in agri-food systems are needed. Food security and food safety have become key issues due to the risk of food insecurity in terms of supplies and health.

Understanding institutions' role in preventing disruptions of food supply chains as well as food safety issues are important. This study was guided by the following question: How could Brazil contribute to reducing COVID-19 pandemic related uncertainties by way of its institutions?

We intend to demonstrate that food security must be integrated with food safety. In other words, we must think about food safety not only in terms of quantity, but also of food quality regarding nutrition and health. The concept of "One Health" in food supply chains presents itself as an opportunity for entrepreneurs, since it offers an integrated view, considering the inseparability among human, animal, and environmental health.

This study's objective was to analyze institutions' role in positioning Brazil to reduce uncertainties in food supplies related to COVID-19. We intend to demonstrate that food security must be integrated with food safety. In other words, it is necessary to think about food safety not only in terms of quantity, but also in relation to nutrition and health.

2 CONCEPTUAL FRAMEWORK

Food security and food safety are inextricably linked. Food safety refers to ensuring food quality from handling and preparation to consumption. Food security involves guaranteeing people access to food in appropriate and nutritional quantities.

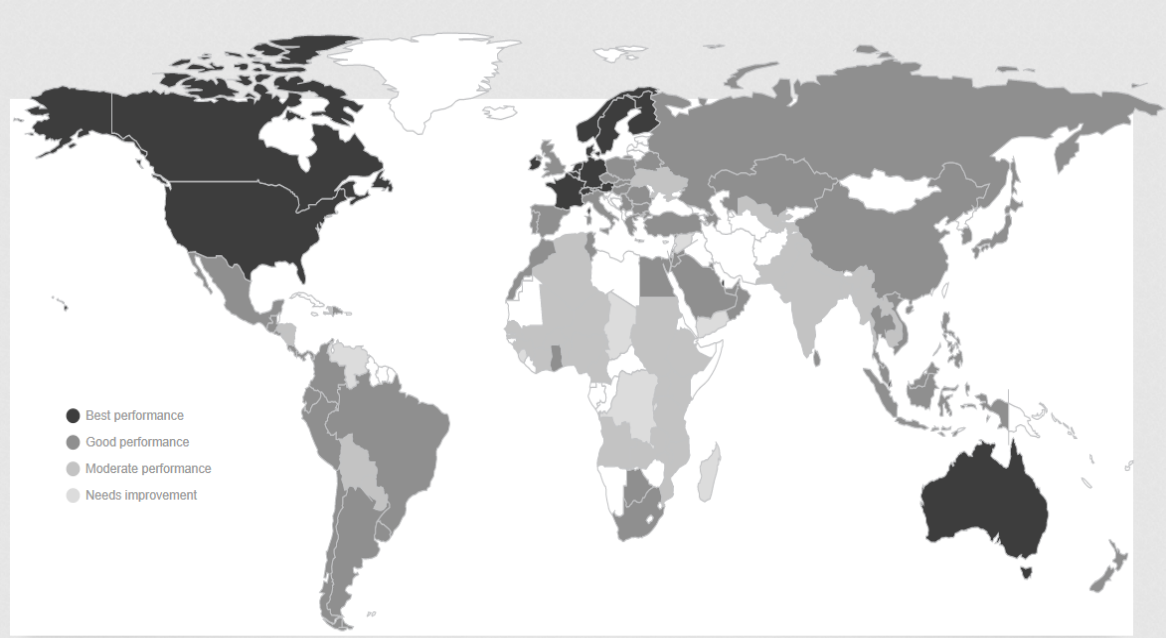
Food safety is a typical situation of information asymmetry, given that consumers will rarely have reliable information about the production process or knowledge of possible contaminants. This asymmetry represents a "market failure", suggesting Government interference, regulating operations and consumer protection (ZYLBERSZTAJN, 2000).

2.1 Food Security and Food Safety

Food security is assessed by two basic elements in relation to access to food, namely economic and physical. Economic access indicates whether people have the financial resources to buy food or not. Physical access, on the other hand, shows whether people find enough food at their disposal. Thus, the COVID-19 crisis can cause a food crisis due to issues associated with physical and economic accessibility (HOSSIAN, 2020).

Brazil occupies 39th place in the Global Food Security Index (GFSI), which evaluates 113 countries using 34 indicators that consider three criteria, namely: affordability, availability, and quality and safety. This position indicates that Brazil performs well (THE ECONOMIST, 2020) (Figure 1).

Figure 1 – The Global Food Security Index (GFSI)

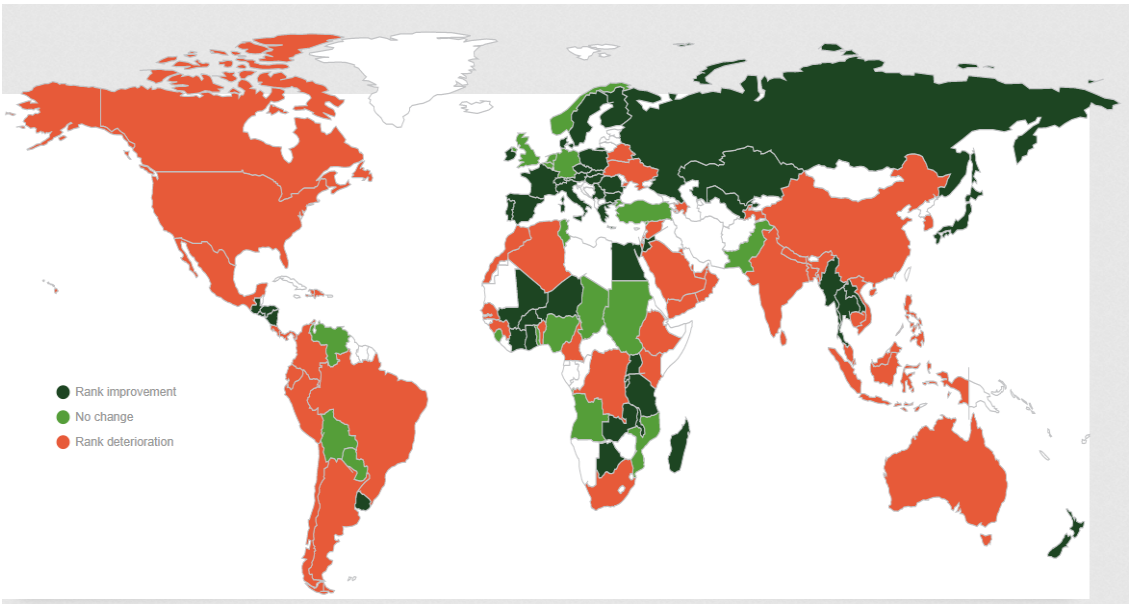


Source: The Economist, 2020.

The GFSI was established in 1996 at the Word Food Summit. It defines Food Security as a state in which all people simultaneously have physical, social, and economic access. Brazil's position rises to 43rd. when these requirements are adjusted for natural resources and resilience (Figure 2).

As for Brazil's position in each item with and without adjustments, respectively, the following is observed: affordability 43th/77th, availability 58th/58.8th, and quality and safety 14th/84th. This index points out Public expenditures on agricultural R&D and Gross domestic product per capita (US $ PPP) as being a challenge. In terms of availability, the issue of corruption and agricultural infrastructure is also a challenge (THE ECONOMIST, 2020).

Figure 2 – Impact of GFSI's natural resources & resilience category



Source: The Economist, 2020.

Finally, the field of studies on COVID-19's impact on supply chains has received increasing interest among academics, being applicable in several areas of knowledge, such as supply chain reliability (RAJEEV, *et al.*, 2020), global supply chains (Ivanov, 2020), economics and supply chain (AGRAWAL; JAMWAL; GUPTA, 2020), and resilience in supply chains (HOBBS, 2020; MUSSEL; BILYEA; HEDLEY, 2020), among others.

2.2 Theoretical Map of Studies of Agri-food Systems

Williamson (2000) proposes levels of analysis to study economic organizations that overlap because they are interrelated. The first level is composed of informal institutions, customs, and traditions. Its object of analysis focuses on the formation of a rooted social structure, in which evolution takes place from a hundred to a thousand years. The concept of embeddedness is found at this level, with contributions from Granovetter (1985).

The second level is composed of the institutional environment. At this level, formal institutions are the object of analysis. They are treated as the rules of the game, as seen by Douglas North (1990), and their evolution takes between ten years and a century.

The third level is composed of governance, where the characteristics of transactions between economic agents are analyzed. At this level, the object of analysis is focused on the governance structure, whose evolution occurs over 1 to 10 years, as seen in Oliver Williamson's study (1985, 1996).

The fourth level represent economic organizations at their lowest level and characterized by continuous evolution. At this level we see the contributions of neoclassical economic theory/agency theory.

This paper uses concepts of New Institutional Economics - NIE (COASE, 1937; WILLIAMSON, 1985; NORTH, 1990) as a backdrop, widely disseminated as they are in literature about agribusiness system coordination.

According to Zylbersztajn (1995), the concepts of NIE opened room for development of the study of agribusiness systems coordination, presenting the theory's relevance and wide range. The concepts of NIE opened the possibility studying the institutional environment that affects the mechanisms of governance, enriching the debate among business management and economics, and its application to agri-food systems.

Research on the role of institutions in world economic growth increased, where business associations make up a significant proportion of this research. In fact, research on institutions' role in economic growth has begun to emphasize business associations' activities. Studies from a variety of perspectives have shown ways in which associations in a wide variety of contexts have improved economic performance in developing countries (DONER; SCHNEIDER, 2000).

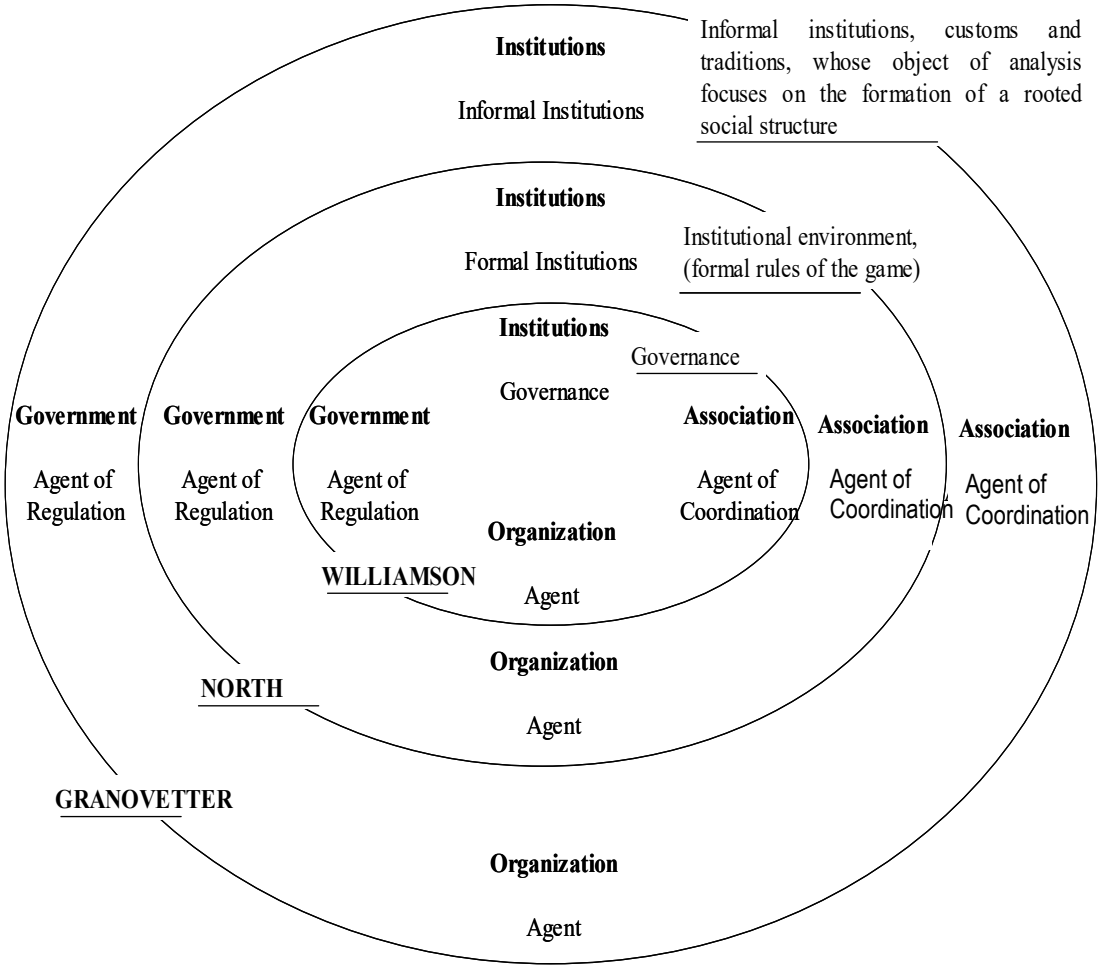
According to North (1994), institutions are the "rule of the game" while organizations and entrepreneurs are the "players". So, when combined into business associations, organizations start to develop a pressure power and, consequently, to influence changes in the institutional environment (Barra & Machado, 2014).

If institutions are the "rules of the game" and organizations are the "players" (North, 1994), we can view a Business Association as a "coach" and Government as the "judge" or "referee" with the role of regulating on behalf of the "game's" quality. As a result, there will be limits on the strategies of firms, as virtuous business practices will be encouraged. It will be up to the association to exercise the role of "coach" guiding growers and their practices from a fair-trade perspective.

In Brazil, the change in the institutional environment has been one of the fomenters of transformations in business associations. Many entities that once acted as mere interlocutors with the government have broadened their scope of performance, adopting a fresh and proactive management concept. They have also improved their contribution to the process of coordinating Agribusiness Systems - Agent of Coordination (BARRA; MACHADO, 2014).

Based on the discussions in this section, we devised a conceptual framework of analysis for an empirical and synthesized study, according to Figure 3.

Figure 3 – Theoretical map of agri-food systems studies



Source: Authors.

3 METHODOLOGY

This research is an exploratory study of the effects of COVID-19 on food systems using qualitative data.

In data collection, bibliographic and documentary analysis techniques were used. Bibliographic research was based on academic literature and theoretical references previously analyzed and published in articles indexed in national and international journals about the COVID-19 pandemic and food safety. For this research, electronic academic platforms were used, in which the terms "COVID-19", "food security", "food safety", "pandemic", and “one health” were searched.

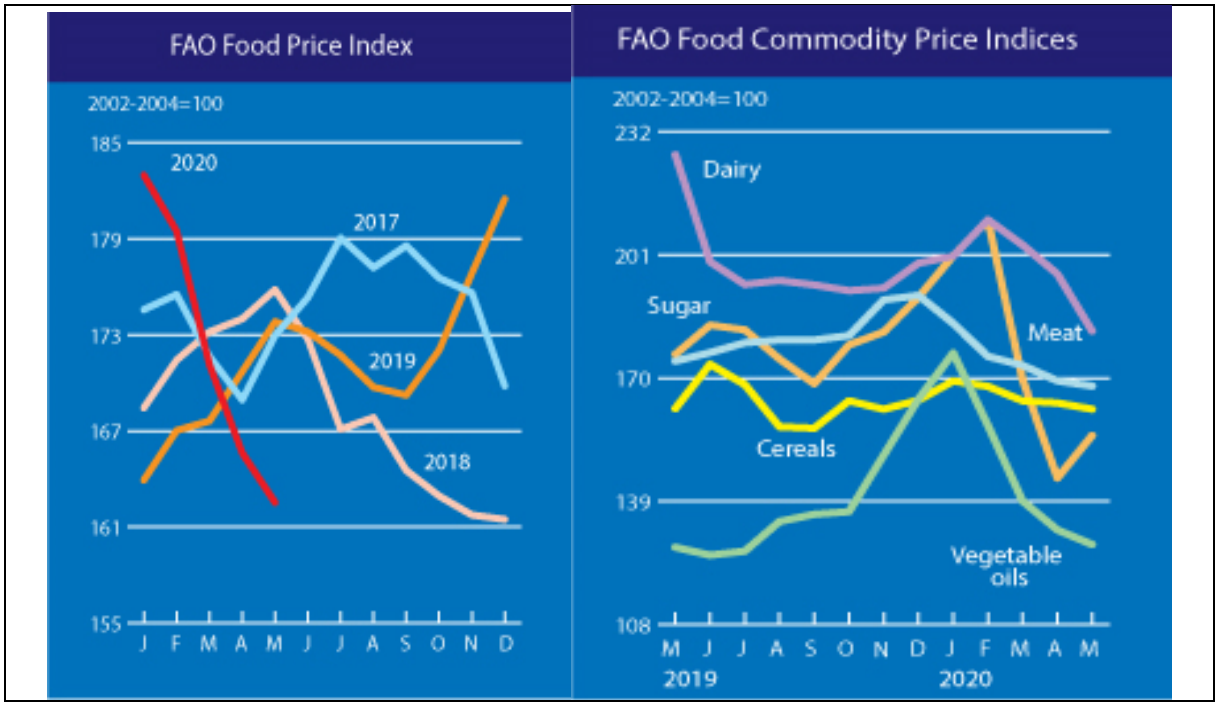
For documentary analysis, research was conducted, oriented by world level entities of the sector related to the health, economic, and food areas, as well as statistics reported by governmental and non-governmental bodies.

To understand the evolution of COVID-19 in Brazil’s agri-food sector, historical documents were analyzed. Journalistic data was selected between December 2019 and December 2020 from the major newspapers in the field of economics: “O Estado de São Paulo“ and “Valor Econômico”. Data collection was carried out using keywords previously defined after intense bibliographic research on the topic. Based on this set of documents, reports were selected for citation to build the scenario for the impact of COVID-19 on the agri-food system,

3 FINDINGS

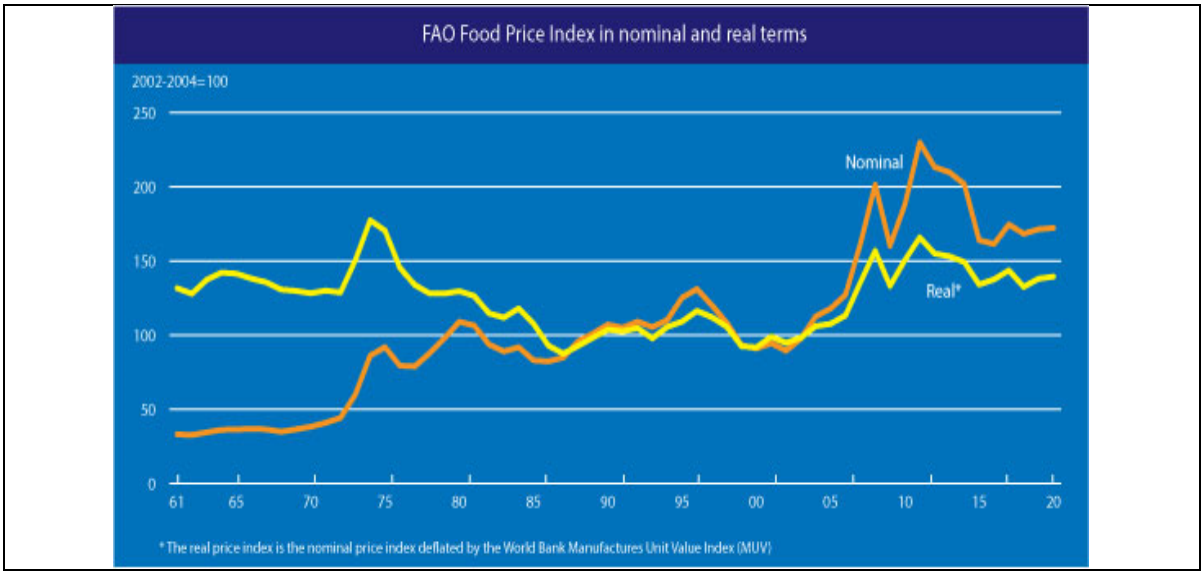
Data from the United Nation's Food and Agriculture Organization (FAO), the World Bank, and the World Health Organization (WHO) on the impact ofCOVID-19 shows the risk of a worldwide food crisis. Uncertainties about food availability can lead to restrictions on trade, challenging international regulatory bodies. In addition to the food supply problem, the pandemic highlights food security. Health crises, like "mad cow disease", have had significant impacts on food supply chains (SAES, 2020). With the COVID-19 pandemics continued negative economic effects, the FAO Food Price Index has been on a downward trend for 4 consecutive months (Figure 4). The latest drop in May reflects falling values of all the sub-indices except for sugar, which rose for the first time in 3 months (FAO, 2020). Figure 5 depicts FAO Food Price Index in nominal and real terms.

Figure 4 – FAO Food Price Index (FFPI)



Source: FAO (2020).

Figure 5 – FAO Food Price Index in nominal and real terms



Source: FAO (2020).

There is a new paradigm for food value chains related mainly to health and sustainability factors. In it, efficiency and the conscious use of resources are essential issues for competitiveness.

The COVID-19 pandemic exposed and accentuated food insecurity by challenging the competent authorities and those responsible for national and food safety control systems to come up with solutions for this pandemic and to prevent others from occurring. The pressure exerted on food supply chains has also been observed. Thus, commitment to food security and nutrition in agri-food chains is required

The COVID-19 pandemic will intensify the adoption of technical, sanitary, and phytosanitary standards related to food security. It has been recognized that the United Nations' Sustainable Development Goals (SDGs) should consider food production, climate change mitigation, biodiversity conservation, and public health in conjunction (SAES, 2020).

Table 1 presents the study's perception of the importance of public policies in preventing new pandemics.

Table 1 - Public policy in Brazil

	Public policy	
A4	This crisis requires, therefore, public policies that manage the difficult trade-off between health risks and socio-economic risks, with their respective measures and adjustments (JANK, 2020).	Public policy
A5	In this moment of crisis, it is important to guarantee the sustainability of Brazil's system of agricultural research and innovation system (VALETIN, 2020).	Research and innovation system
A1	Each society will seek appropriate responses to its environment. Those that have built strong institutions and that understand the nation as a common project among citizens will be in a better position to overcome problems (ZYLBERSZTAJN, 2020).	Strong institutions
A6	Public policies that prioritize supply and financing centres for family farmers, such as PRONAF, are currently important in making the supply of fruits and vegetables viable (SAES, 2020).	Public policy

Source: Authors (2022).

Brazil was surprised by China's decision to stop importing meat from Brazilian slaughterhouses on the grounds of health restrictions despite the lack of scientific evidence of Covid-19 transmission through fresh or processed food. It is feared that diplomatic problems may have negative repercussions on Brazil and China's commercial relationship. Beijing has also suspended meat imports from units in countries such as the United Kingdom, the Netherlands, the USA, Canada, and Australia (VALOR, 2020b). China has increased the rigor and number of inspections of food shipments to avoid a second wave of coronavirus causing a delay in the flow at ports; it is estimated that the time a container is not being used for transportation purposes has increased by 25%, as a result of being in use and cooling the load (VALOR, 2020c). It is important to note that the participation of Brazilian meat in Chinese consumption is 9%, while 10.5% of Brazilian meat is absorbed by China. Therefore, Brazilian slaughterhouses are notably dependent on Chinese meat consumption (VALOR, 2020d).

As a result of the challenges posed by the COVID-19 pandemic, Asia-Pacific countries have implemented public policies emphasizing the need for critical agricultural inputs to meet seasonal crop schedules (HOSSAIN, 2020). The Chinese government has a special budget for recovering and revitalizing the agriculture sector, including an Agricultural Relief Loan and policies to expand e-commerce and export marketing in the agri-food sector. Furthermore, the Chinese government also provides agricultural product export incentives and award benchmarks for 15 agricultural products. There has been a push to increase consumption of agricultural products through corporate group purchases and farmers' markets, encouraging

an increase in the variety of grains, increasing the shelf life of vegetables and fruits, and improved transportation efficiency (HOSSAIN, 2020).

Public policies in countries have been aimed at granting explicit or disguised subsidies in countries like New Zealand, Canada, Australia, the USA, Japan, India, France, Italy, and Austria. Australia and New Zealand have subsidized flights for the export of higher added value products. Japan, on the other hand, has created consumption incentives for wagyu beef in relation to meat from other countries. After COVID, the USA has awarded subsidies to farmers who had already received subsidies due to the trade war with China. The WTO has been concerned with questions about increased stockpiles in countries with the justification of food security, as well as the return of the flow of food stockpile disposal when international trade normalizes. Also, concerns about restrictions on or banning agricultural exports of grains and vegetables by countries like Cambodia, Egypt, El Salvador, Romania, Honduras, Kazakhstan, Myanmar, Russia, Turkey, Vietnam, Kyrgyzstan, North Macedonia, Thailand, and Ukraine (VALOR, 2020a).

Table 2 presents the study's perception of the importance of control to prevent new pandemics.

Table 2 – Control in Agri-food systems

	Control in the Agri-food systems	
A2	1) the creation and maintenance of cold chains from the slaughter of animals to food final preparation; and 2) the producer-processor "vertical integration" model (JANK, 2020).	Cold chains Vertical Integration
A3	This pandemic has shown that sanitary standards in the world are below what is needed, and sanitary standards of control will certainly be increased. To that end, Brazil has a very developed and efficient model and can show the world an enviable sanitary system, especially in the meat and food industries (RODRIGUES, 2020).	Sanitary control

Source: Authors (2022).

5. DISCUSSION

This study demonstrates that public and private policies carried out at international level are needed to avoid new health crises originated by zoonoses. The integration of public and private policies requires the following strategies: strengthening the agricultural research and innovation system, building strong institutions, strict sanitary control laws, public policies for sustainable agriculture, enhancing cold chains of animal protein production, and encouraging the vertical integration model in animal protein chains.

Agri-food systems need to be coordinated. Coordination can be carried out through collective actions of business associations. Theses are organizations that can act as a coordinating agent that provides confidence using social capital. The role of business associations in coordinating agri-food systems has become more and more common. Business associations can take responsibility for food safety in the agri-food systems.

It is up to Brazil to implement public policies that favor food systems. It is necessary to value the research and innovation system related to the agri-food sector. Governments, through bodies such as research centers, universities, technical assistance, and rural extension programs can support the global competitiveness of such arrangements. Entities linked to the Brazilian government, like EMBRAPA, for example, began playing the role of creating a space for innovation in agribusiness.

It has been observed in Brazil that there are increasing investment initiatives in technologies that are less aggressive to the environment, such as the development of expertise in production technologies using fewer chemicals and more organic and natural products. These initiatives arise from companies or rural producers, with the help of certification authorities and public institutions. With the COVID-19 pandemic, the issue of food security will lead to adopting good agricultural practices, in which information control and traceability will become even more essential (SAES, 2020).

Brazil's agricultural structure has many producers located in the green belts of areas supplying urban zones. Public policies that prioritize supplies and financing for family farmers are important in making the food supply viable. Conditions to guarantee food security in cities will be possible through public policies (SAES, 2020).

Finally, it is necessary to value agri-food systems that have sanitary control involving systemic health from the initial supplier to the final consumer. Therefore, it is necessary to follow the code of conduct of sanitary control laws in terms of productive practices compatible with the demands of the buyer´s market, as well as the demands for food safety, sustainability, quality, and traceability.

6 CONCLUSION

The objective of this study was to analyze the role of institutions in positioning Brazil to reduce uncertainties in food supplies related to COVID-19. We intend to demonstrate that food security must be integrated with food safety.

Based on the New Institutional Economics, we understand that the institutional support provided by the government and by business associations in the agri-food system is an important element in supporting competitivity. These organizations help develop trust among members, lessen asymmetry of information, and reduce transaction costs.

This study demonstrates that public and private policies implemented at the international level are needed to avoid new health crises originated by zoonoses. In this scenario, the integration of public and private policies requires the following strategies: building strong institutions, strengthening the agricultural research and innovation system, public policies for sustainable agriculture, strict sanitary control laws, enhancing cold chains of animal protein production, and encouraging the vertical integration model in animal protein chains.

The use of this set of policies can contribute positively to the One Health concept, providing improved conditions for food security and food safety. This analytical scheme can be applied in the context of agro-industrial systems from an institutional perspective, allowing research into the effect of crises on agri-food supply chains, as in the case of the COVID-19 pandemic, as well as contributing to its prevention.

We understand that food security and the safety of food are inextricably linked, becoming key issues due to the risk of food insecurity in terms of supplies and health. This research has attempted to discuss the role of institutions in Brazil's position on reducing uncertainties related to COVID-19.

Finally, analysis of this data set made it possible to outline scenarios and present discussion of possible actions to avoid new crises. It was found that demands to prevent new pandemics are an outgrowth of the effective adoption of standard sanitary controls, coordination of agri-food systems, and public policies.

REFERÊNCIAS

AGRAWAL, S.; JAMWAL, A.; GUPTA, S. **Effect of COVID-19 on the Indian Economy and Supply Chain**. Preprints. Disponível em: https://www.preprints.org/manuscript/202005.0148/v1. 2020.

BARRA, G. M. J.; MACHADO, R. T. M. Impacts of the Business Associations on Organizations and Agriculture-based Systems. RAMA: **Revista em Agronegócio e Meio Ambiente**, n. 7, p. 103-120. 2014.

COASE, R. H. The nature of the firm. Chicago: University of Chicago, 1988. Chap. 2. Trabalho original: The firm, the market and the law. 1937.

DONER, R. F.; SCHNEIDER, B. R. Business Associations and Economic Development: Why Some Associations Contribute More Than Others. **Business and Politics**, v. 2, n. 3, 2000.

GRANNOVETER, M. Economic action and social structure: the problem of embeddedness. **The American Journal of Sociology**, v. 91, n. 3, p. 481-510. 1995.

HOBBS, J. E. Food supply chains during the COVID-19 pandemic. **Canadian Agricultural Economics Society,** p. 1-6, 2020.

IVANOV, D. **Predicting the impacts of epidemic outbreaks on global supply chains**: A simulation-based analysis on the coronavirus outbreak (COVID-19/SARS-CoV-2) case. Transportation Research Part E: Logistics and Transportation Review, 136. 2020.

JANK, M. S. **Um alerta global para zoonoses e segurança do alimento**. [2020]. Disponível em: https://opiniao.estadao.com.br/noticias/espaco-aberto,um-alerta-global-para-zoonoses-e-seguranca-do-alimento,70003280974 . Acesso em: 10 jul. 2022.

JANK, M. S. O mundo global e a covid-19. **Estado de São Paulo**, São Paulo, 2020.

MUSSEL, A., BILYEA, T., HEDLEY, D. Agri-food supply chains and Covid-19: Balancing resilience and vulnerability. Agri-Food Economic Systems. 2020.

NORTH, D. C. **Institutions, Institutional Change and Economic Performance**. New York: Cambridge University Press, 1990.

NORTH, D. C. Economic performance through time. **American Economic Review**, v. 84, n. 3, p. 359-368, June. 1974.

RAJEEV, K., GOEL, J. W., SAUNORIS, SRISHTI S. GOEL. Supply Chain Reliability and International Economic Growth: Impacts of Disruptions like COVID-19, CESifo Working Paper Series 8294, CESifo Group Munich. 2020.

RODRIGUES, R. **Um novo patamar**. [2020]. Disponível em: https://www.brasilagro.com.br/conteudo/um-novo-patamar-por-roberto-rodrigues.html. Acesso em: 10 jul. 20202.

SAES, M. S. M. **Segurança alimentar e de alimentos na pandemia**. [2020]. Disponível em: https://jornal.usp.br/artigos/seguranca-alimentar-e-de-alimentos-na-pandemia. Acesso em: 10 jul. 2022.

VALOR. Pandemia motiva onda mundial de subsídios agrícolas. [2020a]. Disponível em: https://valor.globo.com/agronegocios/noticia/2020/06/12/pandemia-motiva-onda-mundial-de-subsidios-agricolas.ghtml. Acesso em: 10 jul. 2022.

VALOR. **Governo teme novas suspensões de frigoríficos pela China.** [2020b]. Disponível em: https://valor.globo.com/agronegocios/noticia/2020/06/30/governo-teme-novas-suspensoes-de-frigorificos-pela-china.ghtml. Acesso em: 10 jul. 2022.

VALOR. Inspeções na China devem atrasar fluxo nos portos. [2020c]. Disponível em: https://valor.globo.com/agronegocios/noticia/2020/07/03/inspecoes-na-china-devem-atrasar-fluxo-nos-portos.ghtml. Acesso em: 10 jul. 2022.

VALOR. **País asiático absorve 10% de toda carne bovina produzida no Brasil**. [2020d]. Disponível em: https://valor.globo.com/agronegocios/noticia/2020/07/03/pais-asiatico-absorve-10-de-toda-carne-bovina-produzida-no-brasil.ghtml. 2020d. Acesso em: 10 jul. 2022.

WILLIAMSON, O. E. **The economic institutions of capitalism**: firms, markets, relational contracting. New York: Free, 1985.

WILLIAMSON, O. E. Comparative economic organization. the analysis of discrete structural alternatives. **Administrative Science Quarterly**, n. 36, p. 269-296, June,1991.

WILLIAMSON, O. E. **The mechanisms of governance.** New York: Oxford University, p.426. 1996.

WILLIAMSON, O. E. The New Institutional Economics: Taking Stock, Looking Ahead Oliver E. Williamson **Journal of Economic Literature,** v. 38, n. 3, p. 595-613, Set. 2000.

ZYLBERSZTAJN, D. **Estruturas de governança e coordenação do agribusiness**: uma aplicação da nova economia das instituições. 1995. Tese (Doutorado) — Faculdade de Economia, Administração e Contabilidade, Universidade de São Paulo, São Paulo, 1995.

ZYLBERSZTAJN, D. A sanidade dos alimentos no Brasil. **Folha de São Paulo**, São Paulo, v. 15, p. 6-2. 2000.

ZYLBERSZTAJN, D. **Ao fim da pandemia, qual deve ser o legado do coronavírus para o futuro**? [2020]. Disponível em: https://alias.estadao.com.br/noticias/geral,ao-fim-da-pandemia-qual-deve-ser-o-legado-do-coronavirus-para-o-futuro,70003287221. Acesso em: 10 jul. 2022.