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Impacts of COVID-19 on the relationship between sellers and buyers of agricultural products: a view from the Measurement Costs Economics

Impactos da COVID-19 na relação entre vendedores e compradores de produtos agroalimentares: um olhar a partir da Economia dos Custos de Mensuração

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Abstract
Considering changes caused by COVID-19, there are problems related to information asymmetry in the relationship between buyers and sellers of agrifood products. In this study, through a bibliographic discussion, we sought to understand how changes caused by COVID-19 in food distribution can impact the relationship between buyers and sellers of agrifood products, especially fruits, vegetables and greens. It was observed that the restrictions on distribution in supermarkets, open markets and online market make it difficult or prevent buyers from measuring the quality of products. In this context, buyers have their evaluation limited to the information that seller gives about quality attributes, which can lead to value appropriation problems. It is concluded that changes in the distribution of agrifood products, even though they guarantee access to supplies, bring risks to the relationship between buyers and sellers when considering information asymmetry and adverse selection.
Keywords: information asymmetry; adverse selection; value distribution.

Resumo
Face às mudanças provocadas pela COVID-19, observam-se problemas relacionados à assimetria de informação na relação entre compradores e vendedores de produtos agroalimentares. Neste estudo, através de uma discussão bibliográfica, buscou-se compreender como as mudanças causadas pela COVID-19, na distribuição de alimentos, podem impactar na relação entre compradores e vendedores de produtos agroalimentares, especialmente frutas, legumes e verduras. Observou-se que as restrições na distribuição em supermercados, feiras livres e mercado *online* dificultam ou impedem a mensuração da qualidade dos produtos por parte dos compradores. Nesse contexto, os compradores têm a sua avaliação limitada, dado que as informações acerca dos atributos de qualidade são passadas pelo vendedor, podendo implicar em problemas de apropriação de valor. Conclui-se que as mudanças na distribuição de produtos agroalimentares, em função da COVID-19, ainda que garantam o acesso aos suprimentos, trazem riscos à relação entre compradores e vendedores, quando se consideram assimetria de informação e seleção adversa.
Palavras-chave: assimetria de informação; seleção adversa; distribuição de valor.

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1 INTRODUCTION

The emergence of the new Coronavirus - SARS-CoV-2 - in late 2019 in China and its rapid spread to the rest of the world in early 2020 has brought several consequences and social, economic, cultural, and political concerns (FIOCRUZ, 2020). In Brazil, the Covid-19 pandemic has changed the dynamics of operation of the economic sectors after the discovery of the first confirmed case and its rapid spread across the national territory in mid-February and March 2020. Since then, social distancing measures and the restriction of the operation of economic activities have become subjects of discussion in the most diverse environments, especially in the scientific community, as observed in the studies of Goddard (2020), Gray (2020), Held (2020), Siche (2020), Ivanov (2020), and Hall (2020).

When considering the economic impacts, focusing on agricultural production chains, according to data from Cepea (2020), the estimate is that they are not as large as in other sectors of the economy, especially in the cases of rural producers and exporters. This is because food is a product whose demand is constant, even with fluctuations in prices and in the purchasing power of the population. In addition, the export of Brazilian products can help to mitigate the main changes in the dynamics of internal operation (CEPEA, 2020).

Although the economic impacts are not alarming, social distancing measures and circulation restriction have an effect mainly on food distribution logistics, from the producer to the final consumer of the production chain (BOTEON, 2020; FAO, 2020; GRAY, 2020; RIBEIRO-SILVA *et al*., 2020; VALADARES *et al*., 2020). According to the Food and Agriculture Organization of the United Nations (FAO, 2020), interruptions in the supply chain can impact the quality of food, in addition to hindering its distribution and affecting the food security of the population. In this article, food security is understood as the right of everyone to access sufficient quality food, without compromising access to other essential needs, in view of the health of individuals (BRASIL, 2006).

In addition, recent studies have pointed out other factors that may influence the food security of the population. According to a study by Kansiime *et al*. (2020), the decrease in the income of consumers, resulting from unemployment and the difficulties imposed by the pandemic, can influence changes in the consumption habits of society. In turn, such habits can be related to practices that reduce food waste, especially in the context of economic constraints and challenges, as noted in the recent work of Aldaco *et al*. (2020). Finally, there is also a growing call of the population for healthy and quality food, notably fruits, vegetables, and greens (FVG) – food products that are nutritious and that meet the needs of consumers (SCHNEIDER *et al*., 2020).

Thus, in order to ensure food security during the pandemic, several changes have been observed in how food is distributed because of restrictions and social distancing measures (RICHARDS; RICKARD, 2020). The main characteristic of these changes, described below, is the purchase of food at a distance, which limits the physical access of buyers to distribution locations. These actions, which rely largely on the support of information technology, aim to ensure the distribution of food while seeking to prevent contamination by COVID-19 (RIBEIRO-SILVA *et al*., 2020; VALADARES *et al*., 2020; PREISS, 2020). Therefore, in this study, we have considered that, in these conditions of changes imposed by the pandemic, buyers become dependent on the information that sellers give about the quality of products. This is because, in some cases, such as open markets and online shopping, the quality of

fruits, vegetables, and greens can no longer be measured by handling as before the pandemic (BOTEON, 2020; RIBEIRO-SILVA *et al*., 2020; VALADARES *et al*., 2020; PREISS, 2020).

On the theoretical side, this problem of quality evaluation, given the impossibility of the buyer in being able to measure, can be addressed based on the Measurement Cost Economics (MCE), as that access to the characteristics (dimensions) of quality of an asset depends on its measurement, as treated by the MCE concepts. According to this theory, in a transaction between two agents, there will be, on the one hand, the one who seeks to appropriate value and, on the other, the one who seeks mechanisms to defend against the appropriation of value. In a context of information asymmetry - in which one of the agents has better conditions to measure and know the dimensions transacted -, the risk of appropriation of value is increased (AKERLOF, 1970). Thus, for MCE, information, coming from measurement, is an essential element in the discussion of the efficiency of transactions, since it is costly to produce and complex to transmit between agents (BARZEL, 2005).

Furthermore, according to MCE, the buyer pays the price for the dimensions of the product and expects to receive the expected quality in return. For this end, some dimensions can be verified at the time of purchase, as in the case of food, by weighing, touching, looking, smelling, or even tasting the products. Other dimensions cannot be measured at the time of purchase and, in certain situations, not even the seller can ensure the expected quality of the products, which can only be measured at the time of consumption (BARZEL, 2005). As Barzel (2005) shows us, these uncertainties about quality can affect the relationship between sellers and buyers, thus increasing the time spent on purchase, bringing possible suspicions, and hindering future sales. In addition, at the limit, these uncertainties can still generate imbalances in the market by devaluing products of superior quality when mixed with products of inferior quality.

In these situations, in which the possibility of measuring quality is difficult, Barzel (2006) further states that the seller should offer as much information as possible, in addition to offering guarantees that reduce the risk of the buyer, in order to facilitate the occurrence of the transaction and long-term relationship with buyers. It is also important to consider that situations of information asymmetry also allow the occurrence of adverse selection among agents, which may benefit those who have greater access to information (AKERLOF, 1970). However, this situation may, in the future, damage the long-term relationship and new transactions.

Therefore, in this context in which the circulation of persons is restricted and the purchase of food is made at a distance, with less choice while pursuing quality, the objective of this article has been to understand how the changes caused by COVID-19 in food distribution can impact the relationship between buyers and sellers of agricultural products, especially fruits, vegetables, and greens.

This objective was based on the interest in reflecting not only on how buyers are affected by fewer choices and chances to measure quality, but also how the purchase and sale relationship can be affected by information asymmetry, which, in this case, provides the seller with a better chance of appropriating value. In addition, we have sought to discuss the importance of the long-term relationship between sellers and buyers, especially in this context of uncertainties brought about by the pandemic. Such importance is due on the side of the buyer, with reduced purchasing power and who seeks quality associated with food security, and on the side of the seller, who depends on the relationship with buyers for the survival of their business during and after the pandemic.

This article is organized in five parts. In addition to this introduction, the second section presents the theoretical framework that has guided the study, composed of the Measurement Cost Economics and discussions on information asymmetry. The third section presents the methodological procedures, and the fourth one discusses the results. Finally, the fifth section addresses the final remarks.

2 THEORETICAL FOUNDATION

The complexity of information has been central to the discussion of the governance of transaction chains (HUMPHREY; SCHMITZ, 2001; BARZEL, 2005; GEREFFI; HUMPHREY; STURGEON, 2005). In this context, the Measurement Cost Economics (MCE) has as its central problem the analyses of governance structure based on the complexity of the information that make up an asset.

The MCE is based on the New Institutional Economics, which in turn was developed based on the principles of Coase, in "The Nature of the Firm" (1937). In a context in which the free operation of the market, dictated by the price mechanism, was considered efficient, Coase (1937) questioned why there were a variety of organizational forms. The author concluded that there are costs in the transaction using the market mechanism, costs that later were referred to as transaction costs by Williamson (1985). The theorem, proposed by Coase (1960), argues that the efficiency of transactions depends on the proper definition of property rights, so that if rights are correctly allocated, transaction costs through the market will be minimized.

From this, the MCE emerged with the intention of providing an alternative to the choice of organization of companies. Barzel (2005), his precursor, argues that the efficiency of exchanges depends on information about what will be exchanged, as well as on the criteria for this exchange to occur. Unlike the Walrasian world, typical of the neoclassical economy, in which the information is perfect and there are no transaction costs, the Barzel model assumes that the information is expensive to produce and complex to be transmitted (BARZEL, 2005).

Barzel (2005) argues that an asset is made up of several attributes, and that it is information about such attributes that is responsible for giving them their property. For the author, there are two types of property rights: economic and legal rights. The first one refers to the ability to enjoy a certain commodity directly or indirectly, and the second one is the property assigned to a particular agent through a legal mechanism (Government) (BARZEL, 1997, 2005).

However, information is incomplete and there is information asymmetry between agents, given that the parties are not able to fully distinguish the real quality of an asset (AKERLOF, 1970; BARZEL, 1997). Since information is incomplete, property rights are not well defined, and thus some of the value is left in the public domain. Therefore, agents will make efforts to capture the value that is in the public domain (BARZEL, 1997, 2005; ZYLBERSZTAJN, 2018). The problems of information asymmetry arise from divergences in the holding of information about what is transacted, which may be in the possession of different agents in the chain (CLAY *et al*., 2018; OLIVEIRA *et al*., 2019; GUIMARÃES *et al*., 2020).

The difficulty in distinguishing the quality of the assets generates a problem of adverse selection [5], since products with different qualities can be found in the market being sold with the same leveling

[5] The information asymmetry problem is also considered in other aspects of the Organizational Economics, for example in the theory of the principal agent. Akerlof (1970) states that the information between parties is asymmetric and that, therefore, one of the parties has difficulties in distinguishing good and poor quality products, which creates problems in the distribution of property rights.

(AKERLOF, 1970; EISENHARDT, 1989). In addition to adverse selection, we also highlight the moral hazard problem, in which the parties offer a low performance because they are insured after conducting the transactions (EISENHARDT, 1989). Mkhabela (2018) points out that both adverse selection and moral risk directly affect the measurement of the quality of a product, given that the behavior of agents in distorting information and the difficulty in accessing information about the characteristics of an asset impair this measurement. The difficulty in knowing the real characteristics of an asset means that products, with different qualities, are marketed in the same way and for the same value. Since agents do not have the returns based on the characteristics obtained, incentives for quality production are also affected (AKERLOF, 1970; MKHABELA, 2018).

Noise in the definition of property rights from problems of information asymmetry and complexity in measurement together with the risks of adverse selection and moral risk result in positive transaction costs. Thus, agents will define how to organize activities through a mechanism that reduces the dissipation of value (BARZEL, 2005). The rationale of the MCE in this context is, therefore, based on the efficiency in adopting governance structures that have greater ability to maximize the value of the transaction through the protection of property rights over the dimensions involved in the transaction (ZYLBERSZTAJN, 2018).

Depending on the measurability of the attributes, Barzel (2005) proposes four ways to organize activities: auction and risk relationships, contractual relationships, long-term relationships, and the internal organization of the company (vertical integration), which differ from each other in terms of required information. Auction and risk relationships are the simplest types of trading, in which information can be collected before the exchange. However, this relationship is exposed to problems of information asymmetry, which can generate duplication of measurement, since both sellers and buyers do it, thus making it more expensive (BARZEL, 2005).

The second type of organization that Barzel (2005) refers to is contractual relationships. In this case, the attributes that can be contracted are those that can be verifiable and measurable. However, unlike risk relationships, in this type of exchange the attributes that can be contracted may be those in which the measurement takes place only during consumption. In these transactions, the legal mechanism (Government) can mitigate the risks associated with problems of information asymmetry (AKERLOF, 1970; BARZEL, 2005). Attributes that are difficult to be verified and therefore subject to subjective measurements (such as taste and appearance) should be traded through long-term relationships or even vertical integration (BARZEL, 2005).

Long-term relationships imply promises regarding the conformity of dimensions, which indicates that one of the parties must ensure a certain quality. Informal guarantees are especially important in reducing problems of information asymmetry (AKERLOF, 1970; OLIVEIRA *et al*., 2017). For Barzel (2005), these promises allow buyers the liberty of not taking measurements at the time of exchange and, then, carrying it out only at the time of consumption. According to the author, this is especially important for difficult attributes that are, therefore, costly to measure. Despite this, Barzel (2005) states that measurement during consumption is subjective and leaves room for the occurrence of losses.

Finally, vertical integration is adequate when measurement is difficult to perform or involves high costs (BARZEL, 2005). However, while long-term relationships can be made possible by the reputation between parties, vertical integration is relevant in cases where there

are attributes that are difficult to measure but there is no reputation between agents (CALEMAN *et al*., 2006). In cases of vertical integration, the problems of information asymmetry are minimized by themselves since the activities are carried out and monitored by an agent.

In general, Barzel (2005) states that the possibility of measurement defines the type of contract. The author proposes that dimensions that are easy to measure can be contracted, as, in case of disputes, they are protected by the Government. Dimensions that are difficult to measure are likely to be carried out via long-term relationships supported by safeguards based on the reputation of agents and formal rules or by vertical integration (BARZEL, 2005; ZYLBERSZTAJN, 2005).

Problems in how transactions are organized can generate problems of incentive to quality, as the asymmetry makes the lack of access to information about the characteristics of a product impossible to remunerate based on quality (MKHABELA, 2018). We highlight that the types of contracts are a means of defining property rights to maximize the value of the transaction by minimizing the problems of information asymmetry, adverse selection, and moral risk.

3 METHODOLOGICAL PROCEDURES

This work consists of a bibliographic research, which sought, from the collection of secondary data, to understand how the changes caused by COVID-19 in the distribution of food can impact the relationship between buyers and sellers of agricultural products, especially fruits, vegetables, and greens.

In order to provide important elements to this issue, we have carried out a word cloud based on studies published on this subject in 2020 and 2021, which describe the main impacts of the coronavirus on the capacity of food supply chains and on food security. Given the incidence of coronavirus at the end of 2019 to the present day, we chose the time frame from 2020 to March 2021 – the date of this study. The word cloud represents the main words used in the texts, considering that the more times these words appear, the bigger they will be represented in the cloud (ATLAS.TI, 2020).

Therefore, this cloud was generated from the survey of articles in two main scientific databases: Web of Science and Scopus (MALANSKI; SCHIAVI; DEDIEU, 2019). Such databases allowed us to condense the main scientific articles published in journals with an impact factor around the world (TANCOIGNE *et al*., 2014; MALANSKI; SCHIAVI; DEDIEU, 2019). Initially, the search was based on a group of terms present in the summary, title, and/or keyword. We sought studies that involved the topics related to coronavirus and supply chains. Therefore, the search terms were coronavirus and supply chain, and synonyms or related words, as we can see in the following equation:

TS=(((covid)OR(coronavirus*)OR(sars cov*))AND((agr*)OR(food*))AND(chain*)))*
Article, English, 2020, and 2021

We considered scientific articles published from 2020 until the first two months of 2021 (March 8, 2021). Scientific articles already published in English were kept, thus prioritizing research already disseminated using a universal access language. Then, an individual filtering of the articles was carried out, and we kept only those that were analyses considering the coronavirus in supply chains. After performing these filters and eliminating duplicate articles in both databases, 165 articles were used to prepare the word cloud.

We considered the content of the abstract, title, and keyword for the

elaboration of the word cloud, to the detriment of the content of the complete article, as they present in a condensed way the content of the articles, thus avoiding any type of bias in the results from the excessive repetition of words. The cloud was automatically generated with the support of the Atlas.ti® software, suitable for qualitative thematic analyses (HWANG, 2008; THOMAS; HARDEN, 2008) and included the 51 most mentioned words, this number being generated by the system itself.

In general, as the results section highlights, the word cloud shows that the main concern of the studies focuses on discussions on food security and food safety. Regarding food security, the cloud showed that there are studies concerned with analyzing the impacts of the coronavirus on the supply capacity of a chain. This is a concern that permeates the changes imposed by the presence of the coronavirus, since while it demands the subsistence of the products, social distancing and restriction measures by the pandemic have limited the means of distribution. The challenges in terms of food security, and therefore in terms of food supply, have in turn impacted food safety. Changes related to food supply caused the measurement of the quality of producers to be changed as well. The adjustments in the types of supply implied adaptations regarding the measurement of quality. These changes have also led to the resilience of the chain (MATTHEWS, 2021) and the measurement of the quality of products.

Therefore, we sought, in a second moment, to propose a discussion with a theoretical basis on how the methods of measurement and choice of food happen before and after the incidence of the virus. In this case, we discussed how buyers are affected by the fewer chances to choose and measure quality. In addition, we addressed how sellers can also be affected in the long term by this difficulty that buyers must measure. These analyses were based on theoretical texts about Measurement Cost Economics (BARZEL, 2005) and information asymmetry (AKERLOF, 1970).

The next section presents the results of the research, followed by the final remarks.

4 DISCUSSION OF RESULTS

4.1 Impacts of COVID-19 on the Relationship of Purchase and Sale of Agricultural Products

In Figure 1, we can observe that the main words related to this subject are food, pandemic, supply, demand, impact, COVID-19, chain, and security (related to food security, in most works). These words show that, because of COVID-19, a disease that spread throughout the world between 2019 and 2020, one of the concerns of the scientific community is how to ensure the supply of food, and, therefore, food security (SWINNEN; MCDERMOTT, 2020; O'HARA; TOUSSAINT, 2021; WEERSINK *et al*., 2021). The cloud shows that when it comes to food security, the focus is on the supply and access of food, especially in relation to those most vulnerable in (social, local) society, considering that, as the financial crisis worsens, the risk of more individuals falling into poverty also increases (KANSIIME *et al*., 2021; O'HARA; TOUSSAINT, 2021).

Figure 1 – Word cloud: Impact of COVID-19 on the purchase/sale of agricultural products.

Source: Elaborated by the authors.

In addition, other words also stand out: production, resilience, agriculture, disruption, system, country, and market. We can state that these words are related to the concern of researchers on how to ensure food security from the non-interruption of the chain, from production to supplying demand (O'HARA; TOUSSAINT, 2021; WEERSINK *et al*., 2021). We could see that food production activities were not interrupted and that the supply in final distribution centers is still active (SHAHIDI, 2020; O'HARA; TOUSSAINT, 2021; WEERSINK *et al*., 2021). On the other hand, problems related to import and export stands out, given the greater difficulties in terms of logistics and distribution. These problems can lead to delays, but for now, they do not imply food shortages (WEERSINK *et al*., 2021). These words show that this is a concern in different countries of the world also in terms of health, since they are not only related to the availability of the food itself but also to the importance of food being rich in nutrients to meet the needs of the general population (AIYAR; PINGALI, 2020; CULLEN, 2020; SICHE, 2020; KANSIIME *et al*., 2021).

Therefore, we can say that the changes associated with the supply of food impact the way in which its quality is measured. In other words, food security impacts food safety (AIYAR; PINGALI, 2020). In this sense, we have to understand the adjustments in the measurement process, and how to access information of a product after the incidence of the coronavirus. In addition, the word cloud also shows the importance of quality food for health, based on concerns related to health and risk reduction and diseases (AIYAR; PINGALI, 2020; GALANAKIS, 2020; KANSIIME *et al*., 2021). Therefore, according to the scientific community, the consumption of fresh and more nutritious food should be prioritized over processed and ultra-processed food (MARQUES, 2020). In addition, actions by NGOs and other governmental and non-governmental agencies are necessary to ensure the access to healthy food, especially for the most vulnerable population in society (AIYAR; PINGALI, 2020; KANSIIME *et al*., 2021). Finally, the cloud also shows that these are concerns in different countries, taking into account economic and social aspects related to distribution and nutritious food (AIYAR; PINGALI, 2020; GALANAKIS, 2020; KANSIIME *et al*., 2021; O'HARA; TOUSSAINT, 2021; WEERSINK *et al*., 2021).

4.2 The Relationship between Buyers and Sellers of Fruits, Vegetables, and Greens before COVID-19

Under normal conditions, the display of food in supermarkets and open markets provided free access for consumers to choose what they wanted to buy. In particular, fruits, vegetables, and greens (FVG) used to be chosen one by one, so that consumers could analyze the quality of the food according to their will. They could touch the food and calmly analyze the color, firmness, and ripeness of what would be purchased. As we know, the quality of vegetables, fruits, and greens is, by the very nature of these products, very variable. This variability is accentuated by the perishability of the product, since it can lose quality very quickly (ALVES *et al*., 2005).

Before the impact of COVID-19 and the risks associated with the choice of foods, the purchase of these FVG products in markets and supermarkets took place through market relations, in which these products were measured by their visual, tactile, and olfactory characteristics. In this type of relationship, buyers can check the quality and not feel hurt if, for some reason, they perceive food with a quality different from what was expected at the time of consumption, which confirms the importance of measurement along the lines proposed by Barzel (2005).

Products were evaluated mainly through the visual measurement of attributes such as appearance, freshness, color, and defects. Using touch, buyers measured the texture, as well as the ripeness of the product. Finally, buyers could measure the smell of these products, even though attributes such as taste and sweetness could not be known before purchase (AZEVEDO, 2000). This activity carried out by buyers can be characterized as picking and choosing, a process of choice as proposed by MCE (BARZEL, 2005). According to the theory, this type of measurement, on the one hand, is a guarantee for producers to be able to measure the attributes of the desired product before the exchange, thus avoiding problems of appropriation of value by sellers. On the other hand, it can involve high costs for sellers, since when making these products available for measurement and selection, producers can lose quality in the course of constant measurements.

There are also cases in which the evaluation of attributes is not possible, since products are packaged and not available for tactile and olfactory measurement, as in the case of strawberries (AZEVEDO, 2000). In this case, the quality information is the property of sellers since buyers do not have access to all the strawberries in a tray. In view of the impossibility of measurement, there are no guarantee mechanisms for buyers, thus confirming the MCE concepts.

Therefore, we can understand that the measurement difficulty in this case is due to the impossibility of carrying it out. According to MCE, one of the ways to minimize these problems of information asymmetry and appropriation of value may be the building of brands and lasting relationships between buyers and sellers. Brands are especially useful, as they aim to inform the buyer of the presence of quality attributes (BARZEL, 2005). Finally, long-term relationships imply a promise about the presence of quality attributes, which minimize the measurement costs of buyers and ensure the presence of quality. On the theoretical side, we emphasize that in these long-term relationships there is the interest of the parties in continuing the relationship, and for this reason this is a mechanism that can minimize the problems of information asymmetry and appropriation of value without resulting in high measurement costs (BARZEL, 2005).

Thus, we highlight that the emergence of COVID-19 has changed the way of measuring and selecting food, since, in most cases, buyers cannot measure food and assess its quality. The next section

presents the relationship between buyers and sellers of fruits, vegetables, and greens after COVID-19.

4.3 The Relationship between Buyers and Sellers of Fruits, Vegetables, and Greens during COVID-19

According to scientific studies and decrees published by the Brazilian Government, we can infer that the changes caused by COVID-19 in food distribution can impact the relationship between buyers and sellers of agricultural products in different ways in supermarkets, open markets, and online shopping. As the FAO documents (2020) recommend, one of the primary actions to ensure food supply and security, in addition to keeping supermarkets and open markets working, is to encourage the online delivery, with increased use of information technologies for this commercialization (PREISS, 2020; O'HARA; TOUSSAINT, 2021; WEERSINK *et al*., 2021). Thus, the impacts caused by the pandemic on the relationship between buyers and sellers of agricultural products, especially fruits, vegetables, and greens, were observed according to each of these types of distribution.

In general, in order to avoid contact between buyers and sellers, the published Brazilian municipal and state decrees show that all these establishments must adopt measures such as a distance of at least two meters between persons, reduced opening hours, limited number of individuals according to the size of places, ban on the permanence of persons from the risk group, in addition to the mandatory use of masks and 70% alcohol (DECREE 8497/April 24, 2020).

When considering supermarkets, the measurement and choice of food can still be made by consumers, including recommendations for the use of alcohol gel in the fruit and vegetable section, as noted in the decree published by municipalities in Rio Grande do Sul (DECREE 62/March 24, 2020). However, even if the choice and measurement of food by the buyer can still be made according to the theory of Barzel (2005), that is, before the purchase and evaluating the dimensions of each product, consumers themselves can, at a certain moment, be afraid to touch food to avoid contamination by COVID-19. Thus, even in supermarkets, products can still be chosen in a way that hinders the measurement of quality, leaving consumers more exposed to the risk of adverse selection and information asymmetry (AKERLOF, 1970; BARZEL, 2005).

In the case of open markets, analyzing municipal decrees[6] in the states of Paraná, São Paulo, Rio Grande do Sul, and Santa Catarina, we could observe that the choice by consumers is no longer allowed. Thus, in the case of open markets, only the seller has the possibility of manual contact with the food, choosing, weighing, and packing fruits, vegetables, and greens for the buyer. Moreover, a distance of at least 1 meter must be kept from the stall and contact with the seller happens only during payment. In other words, in this situation, the buyer depends entirely on the quality assessment and information that the seller makes available, thus becoming more exposed to risks of adverse selection and appropriation of value, as proposed by Akerlof (1970) and Barzel (2005). In addition, ratifying the MCE concepts, in the absence of guarantees, the risk and loss, if the products are not of the expected quality,

[6] DECREE No. 8,497, OF APRIL 24, 2020 – Municipality of Campo Mourão-PR-Brazil. DECREE No. 8,936, OF APRIL 08, 2020 – Municipality of Santos-SP-Brazil. DECREE No. 62, OF APRIL 24, 2020 – Municipality of Santa Maria-RS-Brazil. DECREE No. 9,561, OF MAY 11, 2020 – Municipality of São Leopoldo-RS-Brazil. DECREE No. 9,294, OF APRIL 06, 2020 – Municipality of Ipatinga-MG-Brazil. DECREE No. 8,575, OF APRIL 02, 2020 – Municipality of Brusque-SC-Brazil. DECREE No. 33,614, OF APRIL 13, 2020 – Municipality of Recife-PE-Brazil. The decrees are just some of the references used and their content is repeated in other municipalities.

end up being left to the buyer, given that the measurement by this agent is carried out only during consumption, being this the costliest way indicated by the MCE.

Another factor to be considered is the growing trend of online shopping, observed by Boteon (2020), Hobbs (2020), Preiss (2020), Valadares *et al*. (2020), and recommended by FAO (2020). This type of sale and distribution can also be configured as a risk relationship for the buyer, since, through delivery applications, the information is limited to descriptions of the quality attributes and illustrative images of the product. Such descriptions, as in the case of open markets, depend on information that sellers make available to buyers at the time of the transaction. In other words, ratifying the proposals of the MCE, the risks of adverse selection and the appropriation of value by the seller are again present given the information asymmetry between agents. As the studies of Clay *et al*. (2018), Oliveira *et al*. (2019), and Guimarães *et al*. (2020) indicate, these problems of information asymmetry in fact arise from divergences in the holding of information, so that, in this transaction, it is the seller who has the possibility of measuring and evaluating the quality of FVG products and not the buyer.

Nevertheless, even in this risky relationship, to face the pandemic, these alternatives are considered viable because they facilitate the continuity of distribution of fruits, vegetables, and greens, meeting the concerns to ensure the food security of the population, as already indicated by other studies (SWINNEN; MCDERMOTT, 2020; O'HARA; TOUSSAINT, 2021; WEERSINK *et al*., 2021). In addition, they are alternatives that already existed and should last even after the end of the pandemic. On the other hand, when considering the theoretical aspect, at times when the choice and measurement by the buyer is restricted and dependent on information that the seller makes available, it is the duty of the latter agent to expose most of the dimensions of the products as possible so that the buyer can feel secure in buying and carrying out the transaction. In addition, according to Barzel (2005), guarantees play an important role in reducing the risks assumed by the buyer, in addition to being especially important in reducing problems arising from information asymmetry (AKERLOF, 1970; OLIVEIRA *et al*., 2017).

Such guarantees and information are important, especially in the context of changes brought about by COVID-19, because they influence both the availability of quality food (food safety), which ensure food security for the population, and the long-term relationship between buyers and sellers. This is because the risks assumed by the first agent, in the current situation of changes, can be mitigated by the guarantees and information provided by the second agent, as proposed by the MCE concepts (BARZEL, 2005). Therefore, based on the theory and studies and decrees observed, so that these consumption alternatives continue to be viable and to ensure the continuity of the relationship between buyers and sellers of agricultural products, we highlight the need of sellers to act in order to facilitate the access of the buyer to information, as shown in Chart 1.

Chart 1 – Actions proposed to FVG sellers.

FVG seller (open markets; supermarkets; delivery)	- Arrangement of food on clean and organized stands; - Presence of information on the attributes of products such as date of harvest, origin, ripeness, freshness, flavor, and particularities of the production; - Pricing of products according to quality (lower quality products with a lower price than those of higher quality); - Use of trademarks, seals, and certifications (indicative of quality to the buyer); - Use of guarantees – product exchange, purchase voucher, discount voucher, among others.

Source: Elaborated by the authors.

Such actions are characterized as the disposition of food on clean and organized stalls so that consumers can identify the quality of products without necessarily having to touch them, as in the case of open markets, or avoid excessive touching in supermarkets; exposure of information on the attributes of products such as date of harvest, origin, ripeness, freshness, flavor, and particularities of production that facilitate the measurement of quality by the buyer in open markets, supermarkets, or sale through delivery; pricing of products according to quality, so that products with inferior quality have a lower price than those of superior quality; use of trademarks, seals, and certifications that are an indication of quality to the buyer. Finally, sellers in supermarkets, open markets, or delivery applications should also consider the use of guarantees – product exchange, purchase voucher, discount voucher, among others – in situations where the consumer feels dissatisfied with the quality of the product after the purchase.

Thus, in this context of changes, as shown in Chart 2, given the social distancing and restrictions to avoid contagion by COVID-19, and considering the decrease in the purchasing power of most of the population and the difficulty of survival of businesses in the most diverse sectors during the pandemic, this discussion on the availability of information and quality products in the relationship between buyers and sellers in the agricultural sector is important for three reasons.

Chart 2 – Major changes in the commercialization of FVG products during the pandemic.

Commercialization of FVG products **before** Covid-19	Commercialization of FVG products **during** Covid-19
- Buyers measured the quality of the product using the senses: touch, smell, vision; - Buyers practiced picking and choosing: → they chose and evaluated the quality of the food alone, reducing the risk of appropriation of value; - Measurement took place before purchase.	- Buyers depend on information that sellers provide; - Only vendors have manual contact with food, choosing, weighing, and packaging FVG products; - Measurement by the buyer takes place only at the time of consumption.

Source: Elaborated by the authors.

The first reason is justified by the fact that buyers increasingly seek quality products to ensure the food supply, in addition to avoiding waste and unwanted expenses in face of the reduced purchasing power. The second one is justified by the efforts of sellers to reduce the information asymmetry and offer guarantees and quality products, expected by the buyers, which influence the long-term relationship between the two agents – recurrence of buyers – and, thus, contribute to the survival of the business during and after the pandemic. Finally, as pointed out by Aiyar and Pingali (2020), changes in food supply impact the way in which quality is measured, and we can consider that actions to ensure the food security (access to food) of the population may have effects on food safety (guarantee of quality food), which justifies the importance of mechanisms that distribute information while ensuring the availability of food in the quality expected by buyers.

5 FINAL REMARKS

The objective of this article has been to understand how the changes caused by COVID-19 in the distribution of food can impact the relationship between buyers and sellers of agricultural products, especially related to fruits, vegetables, and greens. Initially, the main issues discussed by the scientific community were contextualized considering the impacts of COVID-19 on

the supply chain and food security worldwide. In addition, we have discussed the main changes in terms of the distribution of fruits, vegetables, greens and how they can impact the relationship between sellers and buyers in this segment.

We have observed that in supermarkets, open markets, and online shopping the distribution of food is working with restrictions that hinder or prevent the buyer from measuring the quality of agricultural products. Therefore, the ways to measure quality have changed, as before the pandemic measurement was carried out by sniffing, touching, weighing, or even tasting. In the current context of changes to avoid contagion of the disease, buyers, in general, have their evaluation limited to information provided by sellers about the quality attributes of a product. Such changes, as much as they guarantee the continuity of food distribution, bring risks to the purchase and sale relationship between these two agents when factors such as information asymmetry and adverse selection are considered. These risks can be mitigated as sellers of fruits, vegetables, and greens take some actions to decrease the risk of buyers in the transaction.

As managerial suggestions of the study, we can mention new ways of displaying, distributing, and marketing agricultural products to ensure that the operation alternatives in supermarkets, open markets, and online shopping can not only distribute the products to consumers but also deliver quality products, at the same time as working to improve the relationship between buyers and sellers. This would ensure, in addition to food security and supply during the pandemic, the improvement of the long-term relationship between agents during and after the pandemic.

Furthermore, as suggestions for a post-pandemic context, discussions about the importance of the availability of information should continue, given that the distance purchase and sale relationship, which was a possibility that already existed before the pandemic, intensified with the restriction measures, and it should continue as an alternative even after the end of the pandemic. For this purpose, future discussions on the articulations involving, mainly, the distribution segment to the final consumer should facilitate the process of transmitting information even after the pandemic, given the need for processes to protect the property rights of agents.

In addition, as a theoretical suggestion, we confirm the importance of analyzing both sides of a transaction, as the risks of appropriation of value by the seller harm not only the buyer but also their long term relationship and the continuity of the transaction between agents. That is, the investment in actions to reduce the risks arising from information asymmetry brings benefits not only for the buyer but also for the seller, who improves their credibility in the market and can use this moment of uncertainty to ensure the continuity of their business in the future.

Finally, it is important to note that, as all other works and research related to the subject of COVID-19, this is still a preliminary study, in which the limitation occurs because it is a phenomenon whose discussions are still initial, in a context of uncertainties and rapid changes. In addition, we must also consider the difficulty that researchers have found in going to the field given the social distancing measures. Therefore, we suggest the continuation of this study based on primary data and new studies with secondary data, seeking to understand how this problem of measurement and choice of food is present in the most diverse regions of the country, since this seems to be a reality that will last for some time or even that it will change the population's ways of buying and consuming. This study and its continuation can contribute, from theoretical and managerial suggestions, with actions to improve the relationship between sellers and buyers, especially in relation to fruits,

vegetables, and greens in this new normal reality.

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