IMPACTS OF THE COVID-19 PANDEMIC ON THE MANAGEMENT OF BRAZILIAN AGRIBUSINESS

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ABSTRACT: In 2021 Brazilian agribusiness was responsible for 27.4% of the GDP (Gross Domestic Product), employing one out of every three workers and accounting for 48% of Brazilian exports. World's third largest producer of food and fiber, Brazil currently ranks second in the export of agricultural products. Relevant not only quantitatively, but also for Brazilian history, agribusiness has been the field for several managerial studies, considering its strong exposure to external elements such as weather and foreign currency variations, as well as the *commodity* nature of its products. Emerging as a stalemate not only to agribusiness but to the entire global production chain, the Covid-19 pandemic had several effects on the economy, and it is expected that cost variables, prices, and rural management have been affected. This study aims to identify the main effects caused by the Covid-19 pandemic in agribusiness, considering possible impacts on costs, prices, and the rural producer's management process. Semi-structured interviews were conducted with producers in the Triângulo Mineiro and Alto Paranaíba region, which is an area of national prominence in terms of grain cultivation and processing. In the interviews the perception

of the producers about the appreciation of agricultural *commodities* and the increases in the prices of supplies, rural equipment, and in the availability of products were evidenced. There was also an appreciation of these *commodities* as never seen in previous years, which made it difficult to predict and apply strategies to manage costs.
KEYWORDS: Management Accounting, Agribusiness, Covid-19, Commodity, Cost.

RESUMO: Em 2021, o agronegócio brasileiro foi responsável por 27,4% do PIB (Produto Interno Bruto), empregando um em cada três trabalhadores e representando 48% das exportações brasileiras. Como o terceiro maior produtor mundial de alimentos e fibras, o Brasil atualmente ocupa a segunda posição nas exportações de produtos agrícolas. Relevante não apenas quantitativamente, mas também para a história do Brasil, o agronegócio tem sido alvo de diversos estudos de gestão, considerando sua forte exposição a elementos externos como clima e variações cambiais, bem como a natureza de commodities de seus produtos. Surgindo como um impasse não apenas para o agronegócio, mas para toda a cadeia global de produção, a pandemia de Covid-19 teve diversos efeitos na economia, e espera-se que variáveis de custo, preços e gestão rural tenham sido afetadas. Este estudo visa identificar os principais efeitos causados pela pandemia de Covid-19 no agronegócio, considerando possíveis impactos nos custos, preços e no processo de gestão do produtor rural. Entrevistas semiestruturadas foram conduzidas com produtores da região do Triângulo Mineiro e Alto Paranaíba, uma área de destaque nacional em termos de cultivo e processamento de grãos. Nas entrevistas, ficou evidente a percepção dos produtores sobre a valorização das commodities agrícolas e o aumento nos preços de insumos, equipamentos rurais e na disponibilidade de produtos. Houve também uma valorização dessas commodities como nunca antes vista em anos anteriores, o que tornou difícil prever e aplicar estratégias para gerenciar custos.
PALAVRAS-CHAVE: Contabilidade Gerencial, Agronegócio, Covid-19, Commodities, Custo.

RESUMEN: En 2021, el agro-negocio brasileño fue responsable del 27,4% del PIB, empleando a uno de tres trabajadores y representando el 48% de las exportaciones. Siento el tercer mayor productor mundial de alimentos, Brasil ocupa actualmente la segunda posición en las exportaciones agrícolas. Relevante no solo cuantitativamente, sino también para la historia de Brasil, el agro-negocio ha sido objeto de diversos estudios, considerando su fuerte exposición a elementos externos como el clima y las variaciones cambiarias, así como la naturaleza de materias primas. Emergiendo como un dilema no solo para el agro-negocio, sino para toda la cadena global de producción, la pandemia de Covid-19 tuvo efectos en la economía, y se espera que las variables de costos, precios y gestión rural hayan sido afectadas. Este estudio busca identificar los principales efectos causados por la pandemia en el agro-negocio, considerando posibles impactos en los costos, precios y en el proceso de gestión del productor rural. Se llevaron a cabo entrevistas con productores de la región del Triángulo Mineiro y Alto Paranaíba, un área destacada en términos de cultivo y procesamiento de granos. En las entrevistas, quedó evidente la percepción de los productores sobre la valorización de las materias primas y el aumento en los precios de insumos, equipos y la disponibilidad de productos. También hubo una valorización de estas materias primas como nunca antes, dificultando prever y aplicar estrategias para gestionar costos.
PALABRAS-CLAVE: Contabilidad de Gestión, Agroindustria, Covid-19, Materias Primas, Costo.

INTRODUCTION

Data from the Brazilian Confederation of Agriculture and Livestock (CNA) indicate that agribusiness was responsible for 27.4% of the Brazilian Gross Domestic Product in 2021. Representing the sector that employs one in every three Brazilian workers, and also responsible for 48% of the country's exports in 2021, with revenues of US$120 billion, Brazil is currently the world's second exporter of agricultural products. Due to the essence of raw material that agricultural products assume is given the relevance of cost management in their cultures, since the sales prices are defined by the foreign market, the control and management of costs are the best option in the search for the expected yields (Pereira, Ribeiro & Securato, 2012).

Therefore, agribusiness has been used as a field for multiple managerial studies, since it is not only exposed to external factors such as climate and currency variations, but also considering its high export volume (Morozini et al., 2012). Corroborating with Morozini et al. (2012) that points to the control and management of costs as the best option for farmers in the search for expected yields, for Kaneko et al (2010), information about the cost of production of a crop will be one of the most relevant elements in the decision-making process of agribusiness managers.

With high dependence on labor due to the nature of its production processes, the total unavailability or a labor force with productivity below expectations are realities that have been affecting the production costs of activities in the agricultural sector (Nuintin & Calegario, 2014). In this scenario, for the authors it will be the search for the reduction of production costs and gain of competitiveness that will lead managers to the implementation of new technologies, focused on the mechanization of work.

Then, in the context of management accounting, the contingency theory emerges, under which this research will be focused, considering that there is no absolute model of organization, but rather that there will be different models adapted to different contingency factors (Bertero, 1998). These factors may be internal, such as the technology used, the management strategies applied or even the size of the farm, or external, such as the environment, society and its consumption patterns (Espejo & Frezatti, 2008). Farina (1994) discusses the complex context of agribusiness, in which conflicts arise among market participants who are supposed to cooperate. In this scenario, according to the author, management and segmentation strategies should be aimed at the market, in order to meet consumer demands and constantly seek innovations.

Acting as a foundation for this research, the contingency theory is about the influence of contingency factors on the organization and performance of these farms (Covaleski et al., 2003), as well as the identification of major spots to a management system aggregated to certain circumstances, demonstrating an adequate match to the environment (Otley, 1980), since the success of agricultural companies will depend on their respective conditions of adaptation to foreign changes and domestic conditions (Haldma & Lääts, 2002).

In the context in which contingency factors operate, since late 2019 the world has been facing the Covid-19 pandemic, which for Ferguson et al. (2020), is the most significant occurrence of a social health crisis since the Spanish Flu in 1918. Transcending the health barriers, the pandemic quickly began to affect the economy of several countries, including, and perhaps especially, Brazil, whose economic emergency and culture of immediacy put to the test the low levels of family savings and even of many companies, which ended up getting into debt or closing their doors (Nascimento, Prado & Cunha, 2021). For Schneider (2020), despite the general growth of the rural sector, the reflection of the increase in production costs in agricultural activity could compromise the income expected by companies in this category.

The society affected by Covid-19 has been facing several changes, whose reflections should be seen even in the long term, regarding the economic aspects of supply and demand, consumption habits, availability of raw materials and labor, among other factors naturally changed both by the invisible hand of the market, and by the very resignation of society in the face of its priorities (Jordà et al., 2022). Still for Jordà et. al. (2022), even 40 years after events of high social and financial impact such as a pandemic, it will still be possible to observe significant macroeconomic consequences.

Considering the possible influences caused by the Covid-19 pandemic in agribusiness, as well as possible relations between the variables of costs and prices, the impacts caused on labor and the worldwide consequences, this research has, as a problem, the following question: what are the impacts generated by the Covid-19 pandemic on costs, prices and management variables of agribusiness from the perspective of the rural producer? It is presented as a general objective to identify whether there were and if so, what are the main effects caused by the Covid-19 pandemic in agribusiness, considering possible impacts on costs, prices, and the management process performed by the rural producer.

The research is justified by the lack of studies on cost, price, and managerial variables applied to agribusiness in environments with extreme factors such as the Covid-19 pandemic, as well as the relevance of the sector to the Brazilian economy. Moreover, the results of the research can help rural producers to anticipate the contingencies presented in the variables related to this research.

This study is organized as follows: the literature review brings an outlook of studies done so far and that address the coexistence of the Covid-19 pandemic and agribusiness, as well as the consequences of the phenomenon on the sector. Subsequently, the detailed methodology used in this research is presented, followed by the results and discussion. In the conclusion, practical implications and limitations based on the empirical findings are presented.

LITERATURE REVIEW

Although positive when looking at the economy in general, the globalized world can be one of the main reasons why Covid-19 has so quickly spread worldwide (Schneider et al., 2020). For Preiss et al. (2020), the coronavirus pandemic is responsible not only for a collapse in the healthcare system, but also for significantly affecting the economy nationally and internationally. Thus, what is experienced by society today is a health crisis whose unfolding have created an economic crisis rapidly spreading around the world, and the consequences for the economy are not yet completely measurable or predictable (Mazzucato, 2020).

Due to the uncertainty, since the beginning of the Covid-19 pandemic, several countries have been facing stringency, shortages, rationing and long queues in food stores, turning on a red light about a possible agrifood crisis (Sánchez, 2021). Through increased production costs and followed by rising sales prices, the consequence of the pandemic was inflation in the agrifood sector, which caused the fear of adverse results on the trade of these products, as well as putting global food security at risk.

Studying the effects of the Covid-19 pandemic in West Africa, Ojokoh et al. (2020) reckon that although felt across all sectors of the economy, impacts of situations like the one experienced as a result of the pandemic are most severe in the health and agricultural sectors, because especially during pandemics, medicines and food are vital for human survival.

For the year 2020, the World Bank estimated that the impacts of the Covid-19 pandemic would reduce global economic growth by 5.2%, with the decrease for Latin America foreseen at 7.2%. Furthermore, the Economic Commission for Latin America and the Caribbean (ECLAC) and the Pan American Health Organization (PAHO) estimated for the same period that the recession faced by Latin countries would be precedent for an increase in the unemployment rate, which could reach up to 13.5%. ECLAC-PAHO also predicted that the various measures to mitigate the disease would increase the poverty rate and extreme poverty, reaching 37.3% and 15.5% respectively.

Against the odds, the performance of Brazilian agribusiness during the pandemic was positive, and the good performance can be related to the production of essential goods and increased exports to countries like China (Bastos, 2020), which highlights Brazil's role as a global food supplier and allows its consolidation as one of the central subjects for world food security (Soendergaard et al., 2020). Nevertheless, considering agribusiness as a main sector for Brazil's economy and that the occurrence of the Covid-19 pandemic resulted in insecurity in international markets, several negative impacts for the agricultural sector in the country could be seen, such as increased prices and the unavailability of various supplies needed for production, as well as difficulties in obtaining qualified labor for work in the farms (Costa, 2021).

However, when analyzing exports, it is possible to identify a duality: if at the national level the job losses would impact the economic dynamics, reflecting on the population's purchasing power and inducing inflation, when considering the exports of food and basic materials, the tendency would be a selective grown, especially in agribusiness sector, considering grains, meat, and derivatives (Schneider et al., 2020).

Data from the Ministry of Economy for the year 2020 shows that, at that time, the economic crisis caused by the coronavirus had little effect on Brazilian exports, due to the high yield of the agricultural sector. It was thus confirmed that the competitiveness of Brazilian agribusiness has development capacity beyond governments and public policies, and even in a recessive scenario such as the pandemic, the sector still works effectively as a significant foment of the national economy (Mattei, 2020). Schneider et al. (2020), then conclude that the pandemic still experienced by society will be a major responsible for the international promotion of Brazilian agribusiness, since the food demand is inflated and trade disputes between foreign countries open more and more room for the export of national agricultural products.

Seeking to understand the reactions of agribusiness with Covid-19 pandemic, several researches focused on analyzing crops that, before the pandemic already had several operational weaknesses, and now face threats and deep implications for rural producers (Guido, Knudson & Rhiney, 2020). For the authors, added to the inherent risks of agricultural production, the Covid-19 pandemic makes the scenario more worrying, since the accumulation of disturbances increases the exposure of farmers to future events.

Moreover, the pandemic and its consequences have brought a new problem to agribusiness management, as many crops rely on seasonal migrant workers, especially during harvests (Guido, Knudson & Rhiney, 2020). Corroborating this statement, studying the impacts of Covid-19 on the agricultural food system in the United States and Canada, Weersink et al. (2021) observed that various parts of the agrifood supply chain had difficulty obtaining skilled labor, due to government-imposed limitations on the entry of immigrants into the countries, as well as the difficulties in containing the disease among these groups, since their working and living conditions nearby were not adequate.

In this context, innovation in the farms becomes essential considering the rural producer's desire for a more fortunate situation that allows him to deal with impacts and externalities (Fromm, 2022). According to Wulandari, Djufry, and Villano (2022), despite being necessary, the rural producer faces several limitations regarding the adoption of technologies for the field, such as the availability of funds and access to credit, making it possible to predict a slow restructuring of the agricultural sector, considering the difficulties faced in the Covid-19 pandemic scenario.

Even with the pandemic affecting food security and the stability of food supply systems in many countries, the agricultural sector is still one with a greatest capacity to withstand a contraction in economic growth (Wulandari, Djufry, & Villano, 2022). In terms

of technologies, for authors who have studied the impacts of Covid-19 on the agricultural sector in North America, it will be robotics that can offer the greatest potential to control the spread of the virus among farm workers, reduce waste (Weersink et al., 2021), and produce a standardized and certified product (Chenarides et al., 2021).

Studying coffee farms in Indonesia, Wulandari, Djufry, and Villano (2022) concluded that the Covid-19 pandemic significantly impacted the cost of agricultural supplies such as fertilizers, chemicals and organics, and pesticides. The authors attributed this to internal causes, such as a decrease in the producer's funding capacity and consequent inability to purchase supplies, and external causes, such as lockdown policies, which impacted the distribution of agricultural supplies.

Following the conclusion from Schneider et al. (2020) who analyzed the Brazilian agribusiness as a whole, Guido, Knudson and Rhiney (2020), when considering the global agriculture writes that the Covid-19 pandemic may, in addition to the challenges imposed to the producer, arise as an opportunity for agricultural activity to become fairer, considering the great disparity seen between small and large producers, as well as more productive, thanks to innovations applied on the production. With this in mind, a study of the Covid-19's effects on the agricultural sector in Ghana, an African country, made by Martey, Goldsmith, and Etwire summarize that although rising food prices is a serious threat to food security, farmers can benefit from the situation, becoming more market-oriented and investing in what they call cash crops, which are then export-oriented.

METHODOLOGY

Considering that this research will analyze the rural producer's perception regarding the possible reflexes of the Covid-19 pandemic, on aspects such as cost, price and rural management, in relation to its approach it will be classified as qualitative, since it contemplates the interactional events considering all the subjects and variables of a situation, regarding their interactions and mutual influences (Silva & Menezes, 2005).

About the procedures, the research occurred through semi-structured interview, which according to Laville and Dionne (1999) provides some flexibility to data collection, giving more freedom to the interviewee and, consequently, making the collected answers closer to reality. In the words of Manzini (2012), the semi-structured interview will be based on a script of open questions. As such, the interviewer can address complementary questions, in the search for a better understanding of the subject. As a study object, it was chosen to analyze the perception of agricultural producers whose place of operation is restricted to the Triângulo Mineiro and Alto Paranaíba region, an area of national prominence in terms of the cultivation and processing of grains, such as soybeans and corn, coffee, and sugar cane (Dos Santos, 2019).

Regarding the temporal delimitation, considering that the Covid-19 pandemic was declared in March 2020, the interviewees were asked for views covering the crops of the period 2019/20, 2020/21 and 2021/22. Thus, three different scenarios could be analyzed, being initially the production without any possible effects of the pandemic, the production with part of the crop being funded without interference and part under interference of the pandemic, and finally, the production occurring under the complete influence of the pandemic.

The focus of the interviews was then, at first, five interviewees or until the indications arising from the methodological technique *snowball*. This methodology, based on a non-probability sample, works with the initial interviewees indicating new participants and so on, successively, until the so-called saturation point is reached, that is, the contents obtained with the new interviewees no longer add relevant information to the research conducted (Wha, 1994).

The selection of the initial interviewees occurred by availability, which, according to Vergara (2005), proceeds with the selection of elements by the ease of access to them, in the case of this project, based on the network of relationships of the researcher. Furthermore, as an inclusion criterion, managers and employees of farms, over 18 years old, who were directly involved with the management of production costs and pricing of agricultural products, were interviewed.

The interview script was developed by the authors, with a total of 31 dissertative questions presented in four sessions, the first of them about the property, the second investigating the impact of the pandemic on costs, the third about the impact of the pandemic on the sales prices of agricultural products, and the last observing the other managerial variables in this scenario, such as technology applied in production and the strategies drawn up by the producer in face of the situation experienced.

Initially, a pre-test was conducted in order to verify the questions performance in a real scenario, as well as if the quiz in its original construction would require any changes seeking effectiveness when applied. To this end, and considering the Pygmalion effect, a phenomenon described by Rosenthal and Jacobson (1968), which proposes that the way questions are exposed to the interviewee may, as a result of the expectations of the interviewee on such questions, be the cause of a self-fulfilling prophecy, in the design and adjustment of the questions, we tried not to convey to the respondent expectations in relation to the answers.

The farmer to whom the pre-test was applied, manages a rural property located in the Araxá township, Alto-Paranaíba region, cultivates corn, soybeans, sorghum, wheat, and oats, in addition to raising dairy and beef cattle. The interview lasted approximately one hour, and after the recording and transcription of the interview, content analysis and similarity analysis were performed using the Iramuteq software.

After applying and analyzing the pre-test, six questions underwent changes in their presentation structure, and five questions were removed from the questionnaire. The changes and exclusions were made for various reasons, such as, for example, to adapt words to a more common talking way to the rural producer.

It is worth noting that the project of this research was sent to the Ethics Committee on Research with Human Beings of the Federal University of Uberlândia (CEP/UFU), in accordance with the Resolution of the National Health Council (CNS) No. 510/2016 (CNS, 2016), under the identification number 55179622.6.0000.5152, and was approved. It is also noteworthy that all interviews and data collection occur upon agreement of its participants, who receive the Informed Consent Form, also submitted and approved by the CEP/UFU.

After the first contact through a phone call and initial acceptance of participation, visits to the properties were scheduled, where the semi-structured interviews were conducted. In person, the interviewees were told how the interview would take place, reaffirming points made in the first contact, such as not identifying the interviewee or the property. After effectively agreeing to participate, the interviewees were given the Informed Consent Form (ICF), one copy of which was retained by the researcher, after being signed by both. At the end of the interview, the farmer was invited to indicate the next research participant.

Seven producers from the Triângulo Mineiro and Alto Paranaíba region were interviewed, and Table 1 presents the information pertinent to the interviews and their respective transcripts. Done during the month of February 2022, on varied days and times, it is possible to observe the occurrence of properties in the cities of Coromandel, Tupaciguara, Monte Alegre, Lagamar dos Coqueiros, Monte Carmelo, and Estrela do Sul, all located in the state of Minas Gerais, in the selected region, which can be seen in Figure 1.

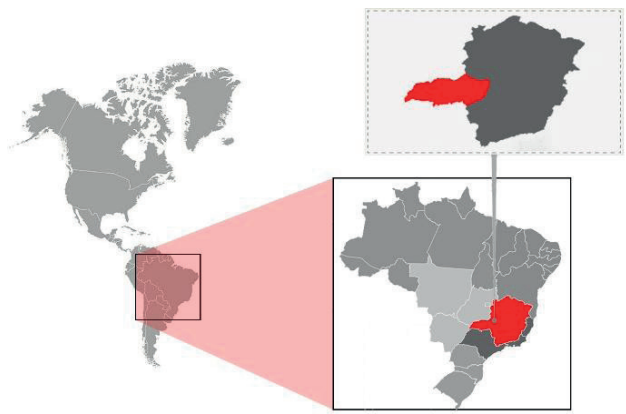

Figure 1. Geographical region of the analyzed properties.

Source: prepared by the authors.

The role held by the interviewees vary between owner/manager and administrative manager, since the profile sought was precisely of professionals who work directly in the management of the rural property, considering the comprehensiveness, in the research instrument, of issues related mainly to production costs and sales prices. In relation to the time in the business, there is a variation of one to 25 years. Regarding the transcription, the average number of transcribed pages was five pages per interviewee.

CE	Date	Schedule		City/State	Position	Time in office (years)	FROM	PT
		Home	End					
Alpha	09/02/2022	10:00	11:00	Coromandel/ MG	Owner	25	1 hour	5 p.
Beta	09/02/2022	18:00	18:30	Coromandel/ MG	Owner/Manager	6	30 minutes	5 p.
Gamma	14/02/2022	10:00	10:40	Tupaciguara/ MG and Monte Alegre/MG	Owner/Manager	5	40 minutes	5 p.
Delta	15/02/2022	21:00	21:40	Lagamar dos Coqueiros /MG	Administrative Manager	6	40 minutes	5 p.
Epsilon	21/02/2022	18:00	18:50	Coromandel/ MG (Chapadão do Pau Terra)	Owner/Manager	1	50 minutes	6 p.
Zeta	24/02/2022	09:00	9:40	Monte Carmelo/MG	Owner/Manager	6	40 minutes	6 p.
Iota	24/02/2022	14:00	14:40	Estrela do Sul/ MG	Administrative Manager	10	40 minutes	5 p.

Table 1. Registration information of the interviews

Source: survey results. Notes: CE: Interviewee Code; DE: Interview Length; PT: transcribed pages; p.: page.

Table 2 shows the classification of the properties, by the number of employees, crops planted, and the area destined to such. The number of employees shows major oscillation, with two employees on the smallest properties, and 80 employees on the largest property. In relation to crops, soy is the most frequent, followed by corn, sorghum, beans, wheat and millet. In addition, there is only coffee in two of the properties analyzed. The smallest property has a planted area of 46 hectares, while the largest has a productive area of 7,500 hectares. It is then possible to understand that the sample used did not chose only large or small producers, being able to present a big picture of rural managers with diversified realities.

Respondent Code	Number of employees	Crops planted	Total planted area
Alpha	80	Soybeans, corn, sorghum, beans	7,500 ha
Beta	5	Soybeans, corn, sorghum, beans	450 ha
Gamma	10	Soybeans, corn, sorghum	2,500 ha
Delta	6	Soybeans, corn, sorghum, beans, wheat	1,200 ha
Epsilon	10	Soybeans, corn, sorghum, beans, wheat, millet	1,450 ha
Zeta	2	Coffee	46 ha
Iota	2	Coffee	54.5 ha

Table 2. Characterization of the analyzed properties.

Source: survey results.

For processing the collected data, the software ATLAS.ti and IRAMUTEQ were used, which enabled analyses such as classical textual statistics, search for group specificities, descending hierarchical classification, similarity analysis and word cloud. Due to the qualitative nature of the data, the programs used cannot be considered as data analysis methods per se, but rather as processing tools, so that the interpretation and conclusion of the analysis is left to the researcher (Lahlou, 2001, Camargo & Justo, 2013, Kami et al.,2016).

RESULTS AND DISCUSSION

By analyzing the transcription of the interviews it was possible to observe the frequency of specific terms. This tool made it possible to conclude that the expected aspects had been properly addressed. In Table 3 it is possible to observe the predominance of the words price and cost, mentioned 137 and 119 times respectively, followed by the word increase, with 92 occurrences, which, together with the interpretation of the producer's statements, corroborates the theory that the analyzed period presented substantial variations in these aspects, considering the rural producer's routine. In this same sense, words like value, seen 43 times, and production, seen 40 times, are widely cited by the interviewees.

Terms	Frequency of occurrence	Terms	Frequency of occurrence
price	137	employee	32
cost	119	defensive	20
increase	92	organic fertilizer	25
value	43	labor	23
pandemic	36	chemical fertilizer	19
sale	34	harvest	19
supply	33	freight	16

Table 3. Most frequent relevant terms and their respective numbers of insertions in the transcripts.

Source: survey results.

Considering the production supplies, the organic fertilizer and chemical fertilizer stand out, with 25 and 19 citations each, respectively, validating the occurrence of this cost item as the one considered most impacted by the interviewed producers, also according to Table 4, presented later, when analyzing the production costs. Similarly, the word defensive, with 20 appearances, identifies the second cost item considered most impacted for the interviewees.

Focusing on services, the words employee, labor, and freight are mentioned 32, 23, and 19 times, respectively, which shows the issue faced by rural producers when it comes to hiring specialized labor for field work, as well as the difficulty in finding freight services during the harvest period.

Production costs

Table 4 presents the cost variables mentioned by the interviewees and which, according to them, caused the biggest impact on the costs of their activities during the period of the Covid-19 pandemic. It can be seen that fertilizer was unanimously pointed out as the main item impacted by the pandemic, followed by pesticides, which are mentioned as the first impacted by five of the interviewees and as the second most impacted by the remaining two interviewees.

Respondent Code	Main Cost Items Cited	Other Cost Items Quoted
Alpha	fertilizers and pesticides	machines and parts
Beta	fertilizers	agricultural defensives
Gamma	fertilizers and diesel oil	agricultural defensives
Delta	fertilizers and pesticides	diesel fuel
Epsilon	fertilizers and pesticides	diesel oil, machinery and parts
Zeta	fertilizers and pesticides	diesel oil, machinery and parts
Iota	fertilizers and pesticides	machines and parts

Table 4: Cost variables mentioned by the interviewees.

Source: survey results.

For the interviewees, the reason why fertilizers represented such a significant impact stems not only from the price variation of the supply itself, but also due to its representativeness in the total costs of the crop, so that for Gamma, fertilizers account for approximately 15% of its total costs, while for Epsilon this supply makes up 25% of total production expenses. Therefore, it is possible to corroborate the study by Wulandari, Djufry and Villano (2022) that considering coffee production in Indonesia, concluded that the Covid-19 pandemic is reflected precisely in the cost of basic supplies such as chemical and organic fertilizers, as well as pesticides.

Other cost variables referred to as impacting the cost of rural activities are diesel oil, the main fuel used in agricultural machinery and pointed out by four of the interviewees, accounting for up to 10% of costs in the production of Gamma. Likewise, agricultural equipment and parts used for their maintenance are also noted by four of the interviewees as cost variables widely impacted by the Covid-19 pandemic.

Regarding a comparison between harvests, the opinion of the producers interviewed is universal, that the 2019/20 harvest did not have representative changes in their production costs, since the supplies purchased for this period were negotiated before the announcement of the pandemic. This fact is explained by Zeta, when he points out that "[...] the reflections of the costs end up appearing not in the year in which these increases occur, considering the anticipated purchases that we make, but in subsequent periods".

Thus, according to the interviewees, it was from the following harvest, 2020/21, that the costs of rural activity began to be affected, with the greatest reflection seen so far being for the current harvest of 2021/22. According to the producers, the year 2021 contained the biggest variations considering the costs of supplies, and in this sense Beta points out the importance of adequate cost control, since "[...] costs keep rising and in this sense we have to look carefully on the cost of the operation, because if not, at the end of the harvest you can't make money and end up in the red, with a loss"

Still considering the costs, for all the interviewees, the increase in the values of the supplies mentioned in Table 4 occurred mainly due to the shortage of these products in the market, which according to producers has been a major challenge to overcome than the price increases themselves, as Zeta says: "[...] those who have to sell are asking for a price over the usual, and even if we accept to pay this amount, there is still the chance of not finding anyone to buy". This view is corroborated by Delta and by Epsilon, who adds that "[...] it has been common for companies to contact us warning that some product is in shortage and offering to close a contract at that moment".

Sales price

Investigating the effects of the Covid-19 pandemic on the price paid to the rural producer, Alpha states, considering the origin of the problem, that he believes that the price oscillations of agricultural *commodities* have been a consequence of oscillations in the market, which is within the expected normality and not directly related to the pandemic. For the producer "[...] it was a change of level due to the increasing demand in the world for food". Even so, considering a historical price, it was widely commented by producers that sales prices before the pandemic, besides being in decline, considering some crops such as coffee, also showed little significant variations between harvests: "[...] before 2020, prices did not variate much, being more stagnant, following almost a routine", comments Delta.

In the context of sales, a common practice in the agricultural world is future sales, popularly known as “locking in prices”. With this method, still during the plantation, even before the harvest occurs, the producer already sells part of his production, agreeing with the buyer that the delivery will be done when the agricultural product is harvested and processed. In this context, the decision of which portion of the production will be commercialized through a future contract will be up to the producer, as well as the management strategies adopted by him, as seen in the speech of Beta, which has as tactic the commercialization of its product through future sales contracts until it reaches an amount that covers its operation costs, such as basic supplies, diesel fuel and third party services hired. In this way, the rest of the harvest that will be sold after will be converted into profit for the producer.

Considering a financial amount, the same interviewee states that “[...] I had made a sale of 2 thousand sacks at a price of R$155, while today this same sack is at R$186. So, in short, I’m not earning more than R$70,000 in the first deal I closed”. For Gamma, the solution found, in this aspect, was to abandon the future sales technique, seeking the reduction of possible losses in sales. He affirms that after 2020, due to the instability of the economy and the sector, and consequently the strong oscillations seen in the price, the most logical thing to do was to only trade the available soybean, that is, in the post-harvest period.

Strategic Management

Precisely because producers have no control over the variables around them, to become active in a sector that faces such high risks, it is essential for the continuity of rural businesses that the manager uses its expertise to be specific to the field of cost management tools.

Seeking to identify what were the consequences of the Covid-19 pandemic for the rural producer, several managerial solutions were founded, in the search for keeping their activities profitable and with a good margin. On this aspect, all respondents pointed to cost management as an indispensable tool during the moment faced by the activity.

For Alpha, since agribusiness is an inherently risky activity, it is essential that the producer keeps up with market trends, since, unlike industry where the product’s’ sale price is determined internally, when it comes to agricultural commodities, the price will be determined precisely by the market, thus making cost control “[...] essential for success in the field, because this way it is possible to predict profitability”.

Considering also the relevance of cost control tools, Delta says that due to general changes, whether in costs or prices, he believes that it has been necessary to improve the cost control process, since it is through them that the producer has control of his activity. Investing in this area, Epsilon affirms that he saw a great need to implement technologies focused at financial management, using for this some software or mobile applications for internal control within the property. His vision was corroborated by Iota, when he states that

> "Improving the management system we use was one of the ways out we found, considering that the more control we have over costs, the more we can keep track of what is consumed during production and thus understand how inputs are allocated."

Thus, Fromm's study (2022) is reinforced, since the author concludes that the use of available technologies is essential to rural producers in their search for a profitable, competitive activity with the ability to react to contingency factors. Besides management-oriented actions, field work techniques were also developed by producers during this period, in the search for cost reduction, increased productivity, and efficiency of activities, as Gamma states: "There were challenging times, due to the increased cost of supplies, equipment, and during this period it was necessary to go beyond the basics, improve and enhance the technologies used in the farm".

In this scenario, strategies to improve the work in the farm were mentioned by producers, such as the search for a more qualified labor force; investments in equipment that enable the automation of farming, generating not only a better quality product, but also a reduction in labor costs; the use of alternative products, organic goods, cheaper and sustainable fertilizers, such as rock powder, pig manure; as well as the extensive use of precision agriculture, a technique by which the crop is analyzed in quadrants and each area will receive only the supplies specifically needed to its shortages, which, according to Gamma, is able to "provide an intelligent use of fertilization and consequent cost reduction".

In a scenario marked by several changes in production costs and sales prices, the rural producer was confronted by the need to innovate, rethink their processes and find new ways to produce, to manage their production, seeking, above all, to keep the activity profitable. In this sense, making purchases in advance, with cash payments, is widely cited. "The cost increases have been occurring exponentially, and to try to get around this situation, we are having to advance the processes that involve the purchase, whether of materials or services," says Zeta.

In view of the supplies acquisition operations, several interviewees stated that they use advance purchases as a way to control costs. In this sense, Epsilon says that even before the pandemic it had been a common practice for him to purchase agricultural supplies in advance, i.e., before the beginning of the harvest, and also opting for cash payments, this being the main solution he found to reduce production costs. The producer also states that "the closer to the planting season, the greater the demand for supplies and this consequently increases the price charged for these materials. Also for Alpha this purchase technique was essential, since according to him "[...] we could protect ourselves from these increases by buying products such as pesticides in advance".

His views are corroborated by other producers, such as Zeta, who, analyzing his operation as a whole, from the purchase of supplies to the sale of the final product, says that "the anticipated purchase in the past, together with the complement of sales in the future,

creates a more interesting average sales price". Thus, by means of this technique, producers manage to make their crop costs be disbursed at previous year's values, which added to the sales of their products based on current quotations, creates a favorable conjuncture.

Still seeking improvements in the activity as a whole, the adoption of technology is widely considered by the interviewees. Whether through soil and leaf analysis, enabling a better use of inputs, or through the use of automated machinery, which in addition to improvements in the harvesting process, is also able to reduce the need for labor.

Thus, by reducing the need for labor, producers can anticipate issues such as those raised by Guido, Knudson and Rhiney (2020) when discussing the heavy dependence of the sector on seasonal migrant workers, especially during harvest seasons. Corroborating what was exposed by Weersink et al. (2021), although this dependence, in regular scenarios, does not present risks to the activity, on occasions such as those experienced due to the Covid-19 pandemic, it creates a production bottleneck for the sector, since the closure of barriers between countries or regions, as well as the housing conditions of these workers during the harvest are factors that expose agribusiness to more vulnerability than usual.

In general, despite considering the difficulties experienced during the period of the Covid-19 pandemic, the interviewees were optimistic about the future of the sector. In Alpha's view the experience was positive for the sector: "[...] the agribusiness segment went through the period very well and even with the crisis scenario caused by the pandemic, there was no reduction in agricultural production". The producer also considers that the agricultural sector has gained prominence inside and outside the country due to its good performance in the global economic scenario, thus corroborating the view of Wulandari, Djufry, and Villano (2022) who, studying the effects of the pandemic on agribusiness in Indonesia, also come to the conclusion that the agricultural sector can still be seen as one of the economic sectors ablest to withstand a contraction in economic growth.

With a view to the future, Delta concludes that "[...] they were years of a lot of learning and for sure they will serve as a lesson to all producers, so that they can better control their costs, knowing how much was spent at the end of the process and how much profit is expected by selling their product at a specific price". Thus, the producers confirm the point of Guido, Knudson, and Rhiney (2020) who consider the Covid-19 pandemic as largely opportune for changes in the agricultural sector, making it fairer, creating parity between small and large producers, increasing the use of innovations and technologies applied on production, as well as increasing productivity levels.

CONCLUSION

Based on the objective of this work, to identify the main effects of the Covid-19 pandemic on agribusiness in the perception of rural producers, it can be seen that agribusiness was considerably affected by the occurrence of the Covid-19 pandemic, whether in terms of increased production costs due to a shortage of supplies and raw materials, or the increase in marketing prices of agricultural products.

Considering the costs, fertilizers were indicated as the most impacted in the rural activity, both for their price variation, and for their participation in the composition of the total production expenses. On the other hand, despite the high sales prices of agricultural products, the producer's profit margin has not changed significantly.

Thus, in a sector where the producer's fragility before external factors is extreme, being even hostage of the market pricing of its products, it will be the use of monitoring and cost management tools capable of making the producer active in the search for the maintenance of its activities as profitable and efficient. As a suggestion for future research, we recommend the study of other agribusiness activities from the same point of view, as well as the expansion of the analyzed period, given the possibility of understanding the effects of the Covid-19 pandemic in the sector in the short, medium, and long term.

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