



Article Challenges in Micro and Small Food Enterprises during the COVID-19 Pandemic in Ecuador

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Abstract: Micro and small enterprises (MSEs) play a significant role in developing countries such as Ecuador. The food and beverage industry is essential for Ecuador's economy, contributing approximately 5% to its GDP. Focusing on the impact of COVID-19 on the industry, this mixed research takes a qualitative and quantitative approach involving four stages: foundation, prefield, field, and reporting. The fieldwork was carried out when Ecuador's economy reopened in September 2020, which saw demand increase gradually, production capacity recovering, mobility return to normal levels, and curfew restrictions reduced. As far as biosecurity protocols were concerned, communities were allowed to resume pre-pandemic activities, provided they complied with social distancing, permanent mask wearing, and strict cleaning procedures. The effect on each company's process depends on the activities they adopted to mitigate the risk of the COVID-19 pandemic risk, e.g., service companies experienced, on average, a 22% cost increase due to the purchase of cleaning supplies, while manufacturing companies were more likely to have related measures in place and so the effect on them was on a comparatively smaller scale.

Keywords: resilience; micro and small firms; process improvement; operations; productivity

1. Introduction

Micro and small enterprises (MSEs) in developing countries are characterized by considerable heterogeneity in their access to markets, technologies, and human capital [1]. Moreover, according to the International Labor Organization (ILO), MSEs generate 47% of all employment in Latin America (equating to 127 million people) [2]. The continuing political, economic, social, and environmental crises caused by the COVID-19 pandemic have affected these companies' performance, and they have had to focus on surviving in different ways. The present study focuses on food sector MSEs, which are constantly operating in globalized markets and are therefore limited by legislation [3]. Food industries are essential to communities' health and nutrition, and the Latin American food chain is considered one of the largest in the world [4]. Therefore, operations must be consistent in their execution, efficiency, and safety while taking into account COVID-19 pandemic conditions.

Since the middle of the last century, through resolutions issued by international organizations such as the United Nations and the World Health Organization, countries have been regulating their food sources, production, distribution, and quality [5]. When the COVID-19 pandemic began, awareness of and requirements for biosafety measures increased due to the rapid viral transmission and associated risks [6]. Among the COVID-19-related biosafety recommendations made by the World Health Organization (2020) were social distancing, facemask wearing, hand washing, and remaining in open environments.



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Copyright: © 2022 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https:// creativecommons.org/licenses/by/ 4.0/). As to the effectiveness of these measures, social distancing has been found to reduce the spread by up to 49%, while wearing masks can block 95% of small particles [7]. Likewise, it was shown that the efficacy of hand hygiene was directly proportional to the frequency of this practice [8]. These actions had to be implemented by all kinds of industries, no matter the size. In the case of food supply chains, prior experience with similar outbreaks of similar viruses (e.g., MERS-CoV, SARS-CoV) suggested that transmission through food was unlikely [9]. However, precautions are necessary to avoid exposure to agents likely to harbor the viral agents [10].

Thus, some studies have focused on how micro and small entrepreneurs were affected during the COVID-19, mainly in Asia and Africa, performed a qualitative study in the rural area of Malaysia during the pandemic outbreak [11] to understand and characterize the business strategy of two micro-entrepreneurs. Their main findings, obtained through unstructured phone interviews, concerned the ability of entrepreneurs to sustain their business through product delivery and marketing strategies. In turn, researchers developed a theoretical framework for sustainability among small and medium enterprises in Indonesia [12] given the social and physical limitations on travel and consumption during the COVID-19 pandemic. Their study found that SMEs were forced to change because of the pandemic, and the digital transformation this entails needs to go hand in hand with governments and stakeholders.

In addition, ref. [13] carried out an analysis of the early impacts of COVID-19 on micro-, small-, and medium-sized agri-food enterprises from 17 countries, of which 59% were from Africa and 41% from Asia. After collecting and processing data obtained via an online survey, they found that most enterprises witnessed a decrease in their production volume and sales. For their part, [14] conducted an empirical study, involving an online survey administered to 184 MSMEs from Pakistan, that explored the problems entrepreneurs faced with the pandemic, and the strategies adopted in response. Based on this characterization, a policy framework was proposed to preplan and learn from the crisis.

However, as far as we know, no previous studies have conducted a characterization and analysis of the strategies applied by MSEs in Latin America in the context of the COVID-19 pandemic.

The present research compares biosafety protocol implementation in response to the COVID-19 pandemic among food MSEs in Ecuador to propose operational tools and best practices and improve their productivity. The study focuses on MSEs' resilience and discusses their strengths, weakness, and challenges. The main questions this study seeks to consider are:

- 1. What biosafety practices did the MSEs apply?
- 2. Which areas and processes were successful in mitigating the COVID-19 pandemic crisis?
- 3. How did the adoption of biosafety practices support operational efficiency in the COVID-19 pandemic context?

This research contributes to characterizing the effects of the COVID-19 pandemic as a hazard of natural or biological origins with humanitarian consequences—on food companies [15]. Communities' vulnerabilities—monetary, food, and labor—have already been well documented. However, when it comes to the global situation, cash flow in the pandemic strongly impacts populations at different levels, as described in Brown and Rocha [16]. For instance, during confinement measures, 60% of companies had enough cash to survive for thirty days, while vulnerable communities do so for three days. According to INEC [17], focusing on Ecuador, unemployment increased by 1.5% from March 2019 to January 2021. All companies, especially MSEs, suffer significant economic losses. Their economic recovery will be slow, caused by supply chain disruptions, uncertainties, and continuous adaptation during this period [1].

The objective is to understand to what extent these new biosafety activities have affected productivity in the macro-processes of micro and small food and beverage producers in Pichincha, Ecuador. The main contribution of this study is the characterization of MSEs during the COVID-19 pandemic, taking into account the objectives of economic revival and pandemic management. This research differs from previous studies by measuring a distinct type of waste caused by environmental, health, and safety problems that affect the regular operations of food and beverage companies.

The paper is structured as follows: Section 2 presents the relevant methodological process and theoretical framework. Section 3 describes data collection outlines and discusses the results. Finally, Section 4 addresses conclusions and recommendations for future research.

2. Materials and Methods

The methodological process yielded a qualitative and quantitative perspective on the economic environment as well as a procedure to support decision-making. These cases are aligned to the initial stages using different data sources to explain multiple characteristics in a particular context [18]: namely, the COVID-19 pandemic. The systematic guidelines of Rashid et al. (2019) were followed [19].

2.1. Foundation Stage

This phase followed food sector MSEs in the COVID-19 context by way of official data sources, implemented by Ecuador's Emergency Operations Committee (Comité de Operaciones de Emergencia Nacional Coe-N, Ecuador), the National Agency for Health Regulation, Control and Surveillance (Agencia Nacional de Regulación, Control y Vigilancia Sanitaria, Eduador), the World Health Organization (WHO), and the Good Manufacturing Practices (GMP) guidelines.

A survey was prepared to identify essential biosecurity-related activities pursued in the food and beverage sector during the pandemic. It was formulated based on the following documents: the Biosafety Protocol for the Industrial and Commercial Sector [20], the Protocol for Collective Food Establishments, and the Protocol for Food Delivery and Preparation [21].

2.2. Pre-Field Stage

For the pre-field stage, it was necessary to understand the context of the selected enterprises (Rashid et al., 2019) [19]. MSEs were chosen because they account for 97.94% of all companies in Ecuador [17]. The Andean Community's classification of the micro, small, medium, and large companies, was employed for these purposes. Enterprises that met the inclusion criteria of having fewer than 50 employees, less than one million dollars in annual sales, and at least three years of operations (after this period they have the operational stability and financial sustainability to be categorized as a growing organization) were considered. A database was created using secondary data from the public directories' tax and technical oversight agencies and filtered based on the International Standard Industrial Classification of economic activities (ISIC), taking into account the food production processes in which these enterprises are engaged [22].

Finally, the profiles were defined by probabilistic distribution. After an initial virtual meeting with stakeholders, six referential micro and small food and beverage enterprises considering manufacturing and service operations were selected. These enterprises were chosen by convenience sampling, in which they met the requirements of being distributed in different areas of the Ecuadorian territory and having a high market share.

2.3. Field Stage

After the first meeting, the research group received training on proper data, recording and avoiding biased responses [23]. Supported by the Fulcrum application, this stage entailed a survey and interview with the enterprises that covered the following:

- 1. General business profile (54 questions);
- 2. General information on COVID-19 (36 questions);
- 3. Interview about biosafety activities in their production processes.

At this stage, the focus was on acquiring detailed secondary and nonrelational information through the survey. The data analysis process was two-fold. First, the qualitative analysis provided insights for each category to identify similarities and differences between the evaluated MSEs; their production, customers, and costs; and an inventory of the personal protective equipment (PPE) they used in their different processes. Second, a quantitative analysis allowed us to understand the biosafety implications on productivity (See Table 1). Video recordings documented unplanned activities related to key performance indicators (KPIs) as classified tasks (add or not add value), identified unclear activities, and found productivity factors.

KPI	Formula	Detail
Availability rate	$\frac{Operating\ time}{Loading\ time} imes 100\%$	Operating time = Loading time – Unplanned downtime Loading time = Total available time – Planned downtime
Idle time	$rac{NonProductive time}{Loading time} imes 100\%$	Loading time = Total available time – Planned downtime
Performance rate	$\frac{Actual \ output-Speed \ loss}{Theoretical \ output} \times 100\%$	Actual output = Units produced—Defects Theoretical output = Units produced

Table 1. Productivity KPIs.

2.4. Reporting Stage

The quality of a case study depends on empirical data collection, analysis, and reports [24]. To share all the findings with the MSEs, the research group drafted a report for each participant company, divided into four sections: introduction, objectives, analysis, and recommendations. More specifically, the reports included the most relevant findings obtained from the survey; explained each business's main strengths and weaknesses in the four areas investigated (reception and storage, production process, finished product handling, and delivery); and presented a prioritized list of improvement recommendations for each company.

3. Results

3.1. Qualitative Analysis

The information yielded through the surveys and interviews is shown in Figure 1, with the critical challenges during the research period.

After the confinement measures of the early months of the pandemic, Ecuador's return to work in September 2020 presented new challenges related to personal protection equipment (PPE) and biosecurity procedures. For instance, employees felt that wearing PPE and implementing biosecurity procedures increased downtime and reduced their productivity. The challenges representing this 20% were companies surviving with low cash flow, loss of customers, and low demand [25]. The consequences of reduced cash flow were layoffs and other essential personnel-related requirements to fulfill demand. Customers' demand reduction directly impacts production levels. However, it was found that MSEs avoid implementing manufacturing practices certificates and biosafety protocols, despite government recommendations, as shown in Table 2. This is because the informal or black economy, with its focus on everyday survival, does not consider regulations; the enterprises did not have records, data, or evidence supporting their actions.

Regarding the sampling method, non-probabilistic convenience sampling was used to select the participating MSEs. For the data collection stage, representatives of MSEs in the food sector were contacted to arrange a virtual meeting in which to explain the project and its scope and ascertain the companies' availability and willingness to participate. As a result, a sample of six micro and small food and beverage companies willing to participate voluntarily was obtained. In each case, only the managers answered the survey (See Appendix A). Table 2 shows the general characteristics of the participating MSEs.

Enterprise	Size	Туре	N° Employees	Time in Operation	Manufacturing Practice Certification
А	Micro	Services—Restaurant	2	8 years	No
В	Micro	Services—Restaurant	3	25 years	No
С	Micro	Services—Restaurant	3	6 years	No
D	Micro	Manufacturing—Fruit Pulp	8	20 years	No
Е	Small	Manufacturing—Granola Bars and Cookies	11	20 years	Yes
F	Small	Manufacturing—Dairy Products	10	10 years	No

Table 2. General characteristics of participating MSEs.



Problems during the COVID-19 pandemic

Figure 1. Problems detected during the COVID-19 pandemic.

SIPOC diagrams (supply, input, process, output, and customer) were used to identify obstacles faced by the enterprises during the implementation of COVID-19 policies, taking into account their internal and external customers as well as the manufacturing process [26]. These diagrams were developed for each company in the early stages, using the information gathered from the surveys and interviews. The information was cross-checked with managers to ensure the accuracy of the data presented. Then, the six MSEs were classified based on their business structure (manufacturing- or service-based business model). Figure 2 presents a SIPOC diagram for the manufacturers, taking into account the make-to-stock process strategy that each pursues.



Figure 2. SIPOC for food manufacturing companies.

Next, Figure 3 presents the make-to-order strategy utilized by the food and beverage service companies. The process starts with customer orders, continues with food processing, and finally, consuming food and paying bills. Under this model many companies implement delivery and pick-up services; customers send orders by telephone or the internet, and in response, the company prepares and packages the food and then delivers it to its customers.



Figure 3. SIPOC for food and beverage service companies.

In Ecuador, amid the pandemic, government entities established requirements to provide a safe environment for employees. Likewise, wholesalers were subject to new conditions to maintain commercial agreements, and customers requested documentation that certified compliance with biosafety protocols upon product delivery. Meanwhile, service companies were also expected to meet customer requirements and expectations regarding biosafety protocols, within restaurants or upon delivery, to feel safe throughout the entire service.

Table 3 presents the COVID-19 biosafety protocols to resume operations. All the MSEs applied symptom control measures at the entry to their premises, such as measuring temperature, disinfecting hands with alcohol or gel alcohol, and disinfecting shoes with cleaning products. Two companies printed their biosafety protocol, while the others did

not have formal documentation. Two service and three manufacturing enterprises created a contingency plan in the event of a COVID-19 outbreak on their premises. All companies ran ongoing communication campaigns to inform staff of COVID-19 preventive protocols. In turn, three service and two manufacturing companies displayed signage to reinforce preventive protocols for the employees. Only one implemented a mobility plan to avoid contagion using public transportation. Finally, no one utilized procedures to identify and monitor COVID-19 cases in their facilities.

Table 3. COVID-19 biosafety practices.

	Services				Manufacturing			ng
COVID-19 Biosafety Protocols	Α	В	С	Total	D	Ε	F	Total
Written biosafety protocol			~	2	~		~	2
Own occupational health personnel or party responsible for COVID-19 cases				0				0
Symptoms controlled at the entrance		\checkmark	\checkmark	3	\checkmark	\checkmark	\checkmark	3
Mobility plan to prevent contagion		\checkmark		1			\checkmark	1
Contingency plan if a case is reported on-site		\checkmark	\checkmark	2	\checkmark	\checkmark	\checkmark	3
Ongoing communication campaigns		\checkmark		2	\checkmark	\checkmark	\checkmark	3
Signage to reinforce COVID-19 prevention protocols	\checkmark	\checkmark	\checkmark	3	\checkmark		\checkmark	2

One question explored the cost of cleaning materials for COVID-19 prevention, as shown in Figure 4. It was found that the costs for manufacturing companies increased by 3%, while those for service companies did so by 25%. One reason for these differences is sanitary practices and policies before the pandemic. Some interviewees remarked on the increase in protocols such as cleaning areas and handwashing.



Figure 4. Increment in the cost associated with cleaning materials.

Another question was about incorporating KPIs to measure productivity or efficiency. Figure 5 shows that all the manufacturing companies had at least one KPI, while only one service company implemented two KPIs. Thus, by a clear margin, the manufacturing companies were better at implementing production KPIs.



Figure 5. Key performance indicators for each enterprise.

The COVID-19 pandemic impacted companies' finances in various ways. However, in this particular study, two manufacturing firms did not experience an effect on the number of units produced. Table 4 shows that all service companies decreased their units produced due to demand decline. It was harder for restaurants to attract customers because of mobility and capacity restrictions, and these businesses incurred extra costs by incorporating home deliveries that entailed new commercial strategies.

	Services		l	Manufacturing	g	
Units Produced	Α	В	С	D	Ε	F
No change				\checkmark	\checkmark	
Decrease	\checkmark	\checkmark	\checkmark			\checkmark

Table 4. Change in the number of units produced due to COVID-19.

3.2. Quantitative Analysis

During the extended interviews, company managers explained the challenges of implementing new activities and requirements. Service companies had to reinforce their biosafety activities and increase their cleaning frequency to ensure a safe environment for employees and customers. In contrast, manufacturing companies had already adopted activities related to food safety. Thus, they needed to implement fewer new cleaning measures. Tables 5 and 6 show these results. Planned downtime encompasses all activities carried out regularly before the pandemic, while unplanned downtime includes all new activities and biosafety controls.

KPIs are calculated taking into account planned and unplanned downtime activities, as shown in Table 7. The performance rate was calculated for manufacturing companies because this KPI focuses specifically on machinery [27]. The KPIs were processed in all macro-processes to measure changes involved in implementing new biosafety activities. The KPIs were necessary as a form of process evaluation, yielding process visibility and improvement points [28].

Planned Downtime	Unplanned Downtime Related to COVID-19
Wearing PPE or clothing	Symptoms controlled at the company's entrance
Performing disinfection activities	Increased frequency of disinfection activities
Handwashing breaks	Increased frequency of handwashing breaks to three times
Changing disposable gloves	Increased changes of disposable gloves
Lunch break	Symptoms monitored during labor hours

Table 5. Activities considered for manufacturing companies.

Table 6. Activities considered for service companies.

Planned Downtime	Unplanned Downtime Related to COVID-19
Performing disinfection activities	Symptoms controlled at the company's entrance Increasing the frequency of disinfection activities from two to three times
Handwashing breaks	Increased frequency of handwashing breaks from three to five times
Changing disposable gloves	Increased changes of disposable gloves from one to two times
Lunch break	Symptoms monitored during labor hours

Table 7. KPIs.

Manufacturing Companies	Service Companies
Non-value-added activities	Non-value-added activities
Availability rate	Availability rate
Idle time	Idle time
Performance rate	

The percentages displayed in next sections represent the differences in each applied KPI, as described in Table 1 of the methodology section, between the historical data and that of the implementation of new biosafety activities as part of operations.

3.2.1. Non-Value-Added Activities

Value-added activities are those which add value for the customer who, in turn, is willing to pay more for a more valuable final product [29]. Muda is one of the "3Ms" in the Japanese lean manufacturing methodology and represents waste in a process aimed at its elimination [29]. Muda is broken down into seven types: delay, over-processing, inventory, transportation, motion, over-production, and defects [30]. On this basis, unplanned downtime activities constitute a form of waste, in which efficiency loss represents a loss of money [29,30]. Moreover, under the waste classification, the research group identified new biosafety measures such as delay muda.

The results in Table 8 show that increased frequency of disinfection activities and handwashing breaks increased the percentage of activities that do not add value to the final product. The percentages were obtained from a quotient between the duration of the new non-added value activities (unplanned downtime) versus the total duration of the activities carried out throughout the day.

Table 8. Non-value-added activities.

Manufacturer	Percentage	Service	Percentage
M1	3.70%	S1	9.39%
M2	2.96%	S2	6.85%
M3	1.95%	S3	4.76%

3.2.2. Availability Rate

The results in Table 9 confirm that the unplanned percentage downtime attributed to new biosafety protocols for each company had the effect of reducing availability. The results indicate that increased disinfection frequency and breaks affected production and service time.

Table 9. Availability rate decrease caused by the implementation of new biosafety protocols.

Manufacturer	Percentage	Service	Percentage
M1	6.40%	S1	7.28%
M2	5.00%	S2	8.33%
M3	2.50%	S3	5.45%

3.2.3. Idle Time

Idle time refers to non-productive machinery or employee time that directly impacts the cost or a productive time interrupted for other activities that do not add value [31]. Table 10 shows the results.

Table 10. Idle time increase attributed to new biosafety activities.

Manufacturer	Percentage	Service	Percentage
M1	4.30%	S1	7.28%
M2	5.00%	S2	7.71%
M3	2.50%	S3	5.45%

This table shows that the companies effectively redistributed their tasks, with employees seeing an increase in their activities and adding more time to their routine.

3.2.4. Performance Rate

The performance rate was affected by idling and speed reduction at the production stage. Table 11 shows the extent of the performance rate decrease. When the expected demand returned during the resumption of trading, the time spent on these activities caused many units to be lost per day.

Table 11. Performance rate decreases and units are lost due to biosafety activities.

Manufacturer	Percentage
M1	4.00%
M2	3.00%
M3	3.00%

4. Conclusions

The effects on each company's process depended on the activities adopted to mitigate the risk of COVID-19; thus, because not all companies implemented the same activities to the same extent, the effects differed. One tendency that can be observed in service companies is the greater frequency of disinfection activities during the daily routine: a result that translated into a 22% increase in costs for cleaning supplies and activities. Before the pandemic, the manufacturing companies had more biosecurity controls in place; for this reason, the cost effect in their case was less pronounced than for service companies. As a resilience and survival strategy, companies adapted their processes, assumed new activities, restarted their operations, and considered the cost and the value to their customers.

As discussed, both types of companies had to adapt and implement biosecurity activities because of government regulations. The manufacturing and service companies analyzed in this study incorporated at least four new activities (symptom monitoring at the site entrance, increase in the frequency of disinfection activities, increase in the frequency of handwashing breaks, and symptom monitoring during labor hours) to be able to work in the "new normal" of the pandemic. Consequently, the availability rate decreased because workers had to be more careful with cleanliness, while the time spent on these new activities caused a decrease in operating time. Moreover, PPE had to be incorporated into daily routines throughout the food supply chain, meaning there was an increase in the time spent on unplanned activities. However, the Ecuadorian food MSEs participating in the study did not keep records, data, or evidence related to COVID-19 implementation strategies, causing difficulties in documenting their performance on these matters. Lean tools are therefore recommended for process improvement and could help standardize processes, reduce errors, and decrease production costs.

Given the difficulties that the pandemic inflicted on the MSEs—service companies were unable to attract customers to their places of business due to mobility restrictions and limited capacity while manufacturing companies experienced a decrease in their performance rates—adaptability was a key factor for these companies to survive in the adverse environment left behind.

This research has provided a detailed characterization and analysis of how a sample of Ecuadorian MSEs in the food supply chain was affected during the pandemic, while this systematic documentation and the knowledge generated can be of assistance in planning for similar global disasters in the future. That said, future research should consider a bigger sample of enterprises and the post-pandemic scenario to enable more general conclusions and evaluate how companies have adapted to the new normal.

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Appendix A. Health and Safety Questionnaire

Table A1. Questionnaire about company's general information.

General Profile				
Code	Code Digi- talization	Question	Answer	
Manager Profile				
MA1	MP1	Full name of the decision-maker interviewed		
MA2	MP2	Gender of the interviewee		

Table A1. Cont.

	General Profile						
Code	Code Digi- talization	Question			Answer		
MA3	MP3	Age of the interviewee					
MA4	MP4	Phone number of the interviewee					
MA5	MP5	Email address of the interviewee					
MA6	MP6	Last academic degree obtained					
MA7	MP7	Job title of the interviewee					
MA8	MP8	For how long has the interviewee been working for the company?					
MA9	MP9	How many hours per week does the interviewee dedicate to the company?					
		Co	ompany Prof	ile			
CO1	CP1	Name of the company					
CO2	CP2	When was the company established?					
CO3	CP3	Sector					
CO4	CP4	Subsector					
CO5	CP5	Is the company a family business?			Further comments		
CO6	CP6	Number of permanent workers at this moment					
CO7	CP7	Number of temporary employees at this moment					
CO8		How has the number of employees changed as a consequence of the COVID-19 pandemic?					
CO9	CP8	What is the weekly work schedule of the company?					
CO10	CP9	Does the company purchase when it is out of stock, on a periodic basis, or when a minimum threshold is attained?			Further comments		
CO11	CP11	What is the company's production strategy?			Further comments		
CO12	CP12	Who is the company's main customer?			Further comments		
CO13	CP13	How does the product make it to market?			Further comments		
CO14	CP14	In which markets does the company sell its products? (mark all that apply)	Loca	l (city)	Regional (nationwide)	International (e	exports)
CO15	CP15	How many direct competitors does the company have?					
CO16	CP16	What is the current differentiation strategy for the company (how do you try to beat your competitors)?	Product	Service	Distribution channel Relationship	Reputation	Price
CO17	CP17	How do the customers pay for their purchases?	Credit	Upfront	Barter	Other	
CO18	CP20	How have the incomes of your company changed in the last 6 months?			Further comments		

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Table A1. Cont.

			General Profile				
Code	Code Digi- talization	Question	Question Answer				
CO19	CP21	How have the costs of your company changed in the last 6 months?	Further comments				
CO20		Which were the main changes in the company as a result of the pandemic?					
CO21	CP22	What is your company's main strength?					
CO22	CP23	What is your company's biggest weakness?					
CO23	CP24	Which of the following indicators do you consider crucial to measure your	Customer Productivity satisfac- tion	Quality	Utilization rate	Fill rate	Further comments
		company's performance?					
CO24	CP25	Which of the following indicators do you measure at least once a month?	Customer Productivity satisfac- tion	Quality	Utilization rate	Fill rate	Further comments

 Table A2. Questionnaire about company's operations.

Company Information						
#	Туре	Options	Questions			
1	Open	-	What was the line of business in 2019?			
2	Open	-	What is the line of business now?			
3	Time	-	When is the time of entry?			
4	Time	-	When is the departure time?			
5	Multiple choice	1, 2, 3, 4	What is the number of daily shifts that have been established?			
6	Multiple choice	4 hours, 6 hours, 10 hours, 12 hours	How many hours does each shift have?			
7	Category	Yes/No	Is the company certified Good Manufacturing Practices (GMP)?			
8	Date	-	What date was the certification obtained?			
9	Category	Yes/No, N/A	Do you measure any indicators related to quality or productivity at least once a month? (Produced units, production times, accepted products, rejected products, standardized weight) Put			
10	Open	-	Which indicators?			
11	Category	Yes/No, N/A	Has there been any change in your number of customers between 2019 and 2020? N/A if you do not know			
12	Category	Yes/No	Has the number of customers decreased in 2020 from 2019?			
13	Single choice	-	By what percentage has the number of customers decreased?			
14	Category	Yes/No	Has the number of customers increased in 2020 from 2019?			
15	Single choice	-	By what percentage has the number of customers increased?			
16	Category	Yes/No, N/A	Has there been any change in the number of units produced of the best-selling product in 2020 from 2019?			
17	Category	Yes/No	Has there been any decrease in the number of units produced of the best-selling product in 2020 from 2019?			
18	Numeric	-	By what percentage has the number of units produced decreased?			
19	Category	Yes/No	Has there been any increase in the number of units produced of the best-selling product in 2020 from 2019?			
20	Numeric	-	By what percentage has it increased?			
21	Open	-	Observations			

	General Information Related with COVID-19					
#	Туре	Options	Questions			
1	Category	Yes/No	Has there been any biosafety protocol created for preventing the spread of COVID-19 in accordance with the standards established by the Health Authority?			
2	Category	Always, sometimes, never	Have the biosecurity measures and actions established in the protocol to prevent the spread of COVID-19 been disseminated/disseminated weekly?			
3	Category	Yes/No, N/A	Do you have ongoing communication campaigns to make staff aware of COVID-19 prevention measures?			
4	Category	Yes/No	Has signage been implemented to reinforce COVID-19 prevention measures?			
5	Category	Yes/No	personnel or other staff members responsible for identifying and monitoring COVID-19 cases?			
6	Category	Yes/No	Is the person in charge trained to attend and follow up on cases of COVID-19?			
7	Category	Yes/No	identified and registered? (Over 60 years old, disabled, those with lung conditions or chronic diseases, pregnant women. and those in charge of older adults with chronic diseases)			
8 9	Category Open	Yes/No -	Has a teleworking system been implemented? In what areas have teleworking been implemented?			
10	Category	Yes/ No	Is there a contingency plan in place in the event that a positive case is identified within the company?			
11	Open	-	operations suspended, shifts increased). Explain in as much detail as possible			
12	Category	Yes/No	Has a mobilization plan been established for company personnel to avoid contagion when using public transport?			
13	Open	-	What does the mobilization plan entail? Explain in as much detail as possible			
14	Category	Yes/No	or PCR) to enter the workplace?			
15	Category	Yes/No	Have workers had rapid testing?			
16	Category	Yes/No, N/A	Has the company covered the costs of these tests? N/A is partially or don't know			
17	Single choice	Every week, every 15 days, every month	How often are the tests done?			
18	Single choice	Only once, every week, every 15 days, every month	How often should the employee take the tests and present them at the company?			
19	Category	Yes/No	Is the monitoring of symptoms associated with COVID-19 carried out daily at the entrance to the premises?			
20	Category	Yes/No, N/A	sensors in place at the entrance(s) to the premises?			
21	Category	Yes/No	Does the company have contagion prevention kits? (Gel, antiseptic alcohol, masks, other face covering)			
22	Numeric	-	What is the percentage of additional costs necessitated by supplies related to the COVID-19 pandemic (cleaning)?			
23	Category	Yes/No	Does the company have open and ventilated communal spaces?			
24	Open	-	What activities are permitted in the communal spaces?			
25	Category	Yes/No	Do you have a collective dining area?			
26	Category	Yes/No, N/A	Do you share dishes and kitchen utensils?			
27	Multiple choice	handling of finished production	provided. (Select all that apply)			
28	Multiple choice	handling of finished product	cleaning and disinfection of surfaces. (Select all that apply)			

 Table A3. Questionnaire about company's general information related with COVID-19.

General Information Related with COVID-19					
#	Туре	Options	Questions		
29	Single choice	Yes/No, Sometimes	Are cleaners, sanitizers, and other toxic chemicals kept away from food?		
30	Single choice	All, some, none	Are all the cleaning and disinfection product containers correctly labelled?		
31	Single choice	All, some, none	When handling cleaning products, do you follow the manufacturer's recommendations for usage and usage volumes as specified on the product label?		
32	Category	Yes/No, Sometimes	Are the cleaning staff trained in how to prepare the chemicals for cleaning and disinfection?		
33	Category	Always, sometimes, never	Do you allocate part of your daily schedule to carrying out biosecurity activities?		
34	Category	Always, sometimes, never	The workday includes stops/breaks to carry out biosecurity activities		
35	Numeric	-	How long does it take on average to carry out activities related to biosecurity?		
33	Single choice	Always, sometimes, never	Is waste classification carried out? (Separation of biological waste from regular waste).		
34	Single choice	1, 2, 3, 4, 5 or more	What is the weekly frequency of waste disposal?		
35	Category	Yes/No	Has training related to cross-contamination been carried out?		
36	Open	-	Observations		

Table A3. Cont.

 Table A4. Questionnaire about company's reception and storage.

Reception and Storage						
#	Туре	Options	Questions			
1	Category	Yes/No	Do you have a reception and storage process? N/A if a physical space is not needed or completely isolated from production			
2	Checkbox	Mask, Gloves, Goggles, Face shield, Rubber boots, Suit, Apron, Hairnet	What types of personal protective equipment is used in the reception and storage area?			
3	Category	Yes/No	Is there a policy that prohibits the use of watch, rings, earrings, bracelets, belt, etc. in the reception and storage area?			
4	Category	Yes/No	Is compliance with this policy verified?			
5	Category	Yes/No	Is there a policy that requires nails to be kept clean, short, and unpainted in the reception and storage area?			
6	Category	Yes/No	Is compliance with this policy verified?			
7	Category	Yes/No	Has the number of people who work in the reception and storage area decreased?			
8	Numeric	-	If so, by what percentage?			
9	Category	Yes/No	Is a distance of two meters between workers in reception and storage area kept?			
10	Single choice	1, 2, 3, 4, 5 o more	How often is cleaning carried out in the reception and storage area?			
11	Category	Yes/No	In cleaning and sanitizing procedures, is there a combination of physical and chemical methods for surface cleaning, scrubbing, brushing, and sanitizing?			
12	Category	Yes/No	Are antiseptics used to remove microorganisms from hands (soaps, alcohol, quaternary ammonium compounds, iodine compounds, hypochlorite) in the reception and storage area?			
13	single choice	1, 2, 3, 4, 5 or more	What is the policy for daily hand washing frequency in the reception and storage area?			
14	Category	Yes/No	Is compliance with policy verified?			
15	single choice	1, 2, 3, 4, 5 or more	What is the policy regarding how often disposable gloves are to be changed in the reception and storage area?			
16	Category	Yes/No	Is compliance with policy verified?			
17	Category	Yes/No, N/A	Are the characteristics that correspond to each type of product, such as smell, color, flavor, aroma, and texture, verified?			

Reception and Storage						
#	Туре	Options	Questions			
18	Category	Yes/No	Is the expiration date of all products verified when they are received?			
19	Single choice	Reject and return to the supplier, reject and throw them away, fix the container, try to recover the product, content	What is done when a product is delivered with damaged and/or defective packaging?			
20	Category	Yes/No	Is food stored immediately in appropriate places and at the temperature conditions required for each one?			
21	Single choice	Always, sometimes, never	Is contact with the floor avoided during reception and storage of food (at least 15 cm of separation)?			
22	Single choice	Always, sometimes, never	Is the product stored in accordance with the manufacturer's specifications? e.g. if the product requires to be frozen, should it be stored at freezing temperatures?			
23	Single choice	Always, sometimes, never	Is bulk food stored in closed, contamination-free containers?			
24	Single choice	Always, sometimes, never	Are products stored away from exposed or unprotected drains, far from walls and ceiling?			
25	Open	-	Observations			

Table A4. Cont.

Table A5. Questionnaire about company's productive process.

Productive Process				
#	Туре	Options	Questions	
1	Open	-	Do you have a production process established?	
2	Checkbox	Mask, Gloves, Goggles, Face shield, Rubber boots, Suit, Apron, Hairnet	What personal protective equipment is used in the production area?	
3	Category	Yes/No	Is there a policy that prohibits the use of watches, rings, earrings, bracelets, belt in the production area?	
4	Category	Yes/No	Is compliance with this policy verified?	
5	Category	Yes/No	Is there a policy that requires nails to be kept clean, short, and unpolish in the production area?	
6	Category	Yes/No	Is compliance with this policy verified?	
7	Category	Yes/No	Has the number of people who work in the production area decreased?	
8	Numeric	-	If so, by what percentage?	
9	Category	Yes/No	Is a distance of two meters kept between workers in the production area?	
10	Single choice	1, 2, 3, 4, 5 or more	How many times per day daily is the production area cleaned?	
11	Category	Yes/No	In your cleaning and sanitizing procedures, is there a combination of physical and chemical methods for surface cleaning, scrubbing, brushing, and sanitizing?	
12	Category	Yes/No	Are antiseptics used to remove microorganisms from hands (soaps, alcohol, quaternary ammonium compounds, iodine compounds, hypochlorite) in the production area?	
13	Single choice	1, 2, 3, 4, 5 o more	What is the policy for daily handwashing frequency in the production area?	
15	Single choice	1, 2, 3, 4, 5 or more	What is the policy for daily change of disposable gloves in the production area?	
16	Category	Yes/No	Is compliance with this policy verified?	
17	Open	-	Observations	

	Handling the Finished Product				
#	Туре	Options	Questions		
1	Open	-	Is a finished product handling process in place?		
2	Checkbox	Mask, Gloves, Goggles, Face shield, Rubber boots, Suit, Apron, Hairnet	What types of personal protective equipment are used in the finished product handling area?		
3	Category	Yes/No	Is there a policy that prohibits the use of watches, rings, earrings, bracelets belts etc. in the finished product handling area?		
4	Category	Yes/No	Is compliance with this policy verified?		
5	Category	Yes/No	Is there a policy that requires keeping nails clean and short, without polish in the finished product handling area?		
6	Category	Yes/No	Is compliance with this policy verified?		
7	Category	Yes/No	Has the number of people working in the finished product handling area decreased?		
8	Numeric	-	If so, by what percentage?		
9	Category	Yes/No	Is a distance of at least 2 metres kept between workers in the finished product handling area?		
10	Single choice	1, 2, 3, 4, 5 or more	How many times per day is the finished product handling area cleaned?		
11	Category	Yes/No	In cleaning and sanitizing procedures, is there a combination of physical and chemical methods for surface cleaning, scrubbing, brushing, and sanitizing?		
12	Category	Yes/No	Are antiseptics used to remove microorganisms from hands (soaps, alcohol, quaternary ammonium compounds, iodine compounds, hypochlorite) in the finished product handling area?		
13	Single choice	1, 2, 3, 4, 5 or more	What is the policy for the daily frequency of changing disposable gloves in the finished product handling area?		
14	Category	yes/ No	Is compliance with this policy verified?		
15	Single choice	1, 2, 3, 4, 5 or more	What is the policy for the daily frequency of changing disposable gloves in the finished product handling area?		
16 17	Category Open	Yes/No	Is compliance with this policy verified? Observations		

 Table A7. Questionnaire about company's delivery.

Delivery					
#	Туре	Options	Questions		
1	Open	-	Is a delivery process established?		
2	Category	Yes/No	Does the company have its own home delivery service (company vehicle) for its products?		
3	Checkbox	Mask, Gloves, Goggles, Face shield, Rubber boots, Suit, Apron, Hairnet	What types of personal protective equipment are used in the delivery area?		
4	Category	Yes/No	Is there a policy that prohibits the use of watches, rings, earrings, bracelets, belts, etc. in the delivery area?		
5	Category	Yes/No	Is compliance with this policy verified?		
6	Category	Yes/No	Is there a policy that requires keeping nails clean and short, without polish in the delivery area?		
7	Category	Yes/No	Is compliance with this policy verified?		
8	Category	Yes/No	Has the number of people working in the delivery area decreased?		
9	Numeric	-	If so, by what percentage?		
10	Category	Yes/No	Is a distance of at least 2 metres kept between workers in the delivery area?		
11	Single choice	1, 2, 3, 4, 5 or more	How many times per day is the delivery area cleaned?		
12	Category	Yes/No	Is the vehicle disinfected before loading the product?		
13	Category	Yes/No	Is the vehicle ventilated? (Without using air conditioner.)		
14	Category	Yes/No	In your cleaning and sanitizing procedures, is there a combination of physical and chemical methods for surface cleaning, scrubbing, brushing, and sanitizing?		

Delivery			
#	Туре	Options	Questions
15	Category	Yes/No	Are antiseptics used to eliminate microorganisms from hands (soaps, alcohol, quaternary ammonium compounds, iodine compounds, hypochlorite) in the delivery handling area?
16	Single choice	1, 2, 3, 4, 5 or more	What is the policy for daily hand washing frequency in the finished product handling area?
17	Category	yes/ No	Is compliance with this policy verified?
18	Single choice	1, 2, 3, 4, 5 or more	What is the daily policy for changing disposable gloves in the delivery area?
19	Category	Yes/No	Is compliance with this policy verified?
20	Category	Yes/No	Is food transported in closed, covered or completely sealed containers?
21	Category	Yes/No	Is the transportation of food along with cleaning products or toxic substances prohibited/avoided?
22	Open	-	Observations

Table A7. Cont.

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