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Post COVID logistics, strategies and actions need to be taken: evidence from small and medium scale food and beverages manufacturing sector

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***Abstract* — Food is required for both humans and animals, however during the covid-19 era, many small and medium-sized food enterprises are struggling to produce and transport food, and others are on the verge of closing down. Now is the moment to build a future strategy and action plan for the small and medium-sized food industry to mitigate the economic effects of the COVID-19 outbreak. This study's objective is to identify probable tactics, policies, and action plans and evaluate their efficacy and acceptability. This study also explores and quantifies the post-COVID effects of Covid-19 on Bangladesh's Small and Medium-Scale Food Industries. Using a non-probability sample technique, three types of self-administered questionnaires were utilized to gather data from the owner, factory in-charge, manager, and CEO of the Food and Beverage Manufacturing sector. Using SPSS software V.25, descriptive analysis was performed to display frequencies, %ages, and mean scores, while one-sample t-test was utilized to compare the value (mean) of the viewpoints (strategies & action plans) with the supplied value (test value). Results indicate that the probable strategies and action plans (14 strategies) that need to be implemented by the government is high and acceptable and that the effectiveness of other probable strategies and action plans (5 strategies) that need to be implemented by food and beverage manufacturers may also acceptable and could apply to the post-covid situation.**

***Index Terms* — Post-covid, S&M scale food industry, food & beverage, logistics, strategies and actions, one-sample t-test**

I. INTRODUCTION

Corona Virus Disease (COVID-19) outbreaks since 31 December 2019 from Wuhan, China, and thereafter it spreads around all over the world. The virus has been proven to be transmitted from person to person all over the world. Numerous deaths have been attributed to the virus's pneumonia (WHO, 2019).

COVID-19 was initially confirmed in Bangladesh on March 8, 2020, and the country was placed under quarantine from March 26 to April 4, 2020 (Shawon, 2020). This was subsequently extended to May 30 (Oman Observer, 2020). The nation eventually lifted the lockdown, but on April 14, 2021, a tougher 8-day lockdown phase with stricter controlling measures began, which was later extended for 7 more days through April 28 in reaction to daily death toll spikes (Bari & Sultana, 2021).

Around 13% of people in Bangladesh have lost their jobs because of the COVID-19 pandemic. Durinfg the COVID-19 the women who have worked in informal jobs were more likely than men to have their working hours cut because of the

pandemic (UN Women, 2020a, UN Women, 2020b). According to the Bangladesh Institute of Development Studies, the national poverty rate is expected to rise by 25.13% over the next five years from 2020 to 2025 (BIDS) (Latifee & Hossain, 2020a). Inflation and slower-than-expected economic rebound from the Covid-19 shocks among vulnerable non-poor keep the country's new poor estimate high in May 2022. In May 2022, the nationwide estimate of "new poor" is 18.54%. Per capita daily earnings grew by 27% from August 2021 to January 2022 following the second lockdown, but have started reversing by 6% between January and May 2022 due to inflation, interrupting the planned recovery of real incomes to pre-pandemic levels. Real earnings of poorer families are still 15% below pre-Covid levels two years after the outbreak (Rahman, 2022).

Most notably, the pandemic has cut exports by 16.93 %, imports by 17 %, and the average revenue for all small and medium-sized businesses (SMEs) by 66 % compared to 2019 because of the pandemic. This is because of the pandemic. Only remittances have gone up by 11% this year, which is unusual (Latifee & Hossain, 2020b). In 2021 the remittance was 22.1 billion dollar which belong to the 7th highest recipient in South Asia (New Age, 2022). The remittances was received 21.74 billion dollar in the previous year. As of April 5, 2020, Bangladesh's Prime Minister gave the country an extra $8 billion.

The World Health Organization (WHO) and the Public Health Emergency of International Concern have proclaimed the 2019–2020 pandemic as a result of the global spread of COVID-19, which was first identified in Wuhan, China in 2019. In this context, the treatment of COVID-19 is based on containment measures: in China and South Korea, the rigorous implementation of such treatments has consistently and substantially decreased the number of new cases, demonstrating that a rapid reversal of epidemic expansion is achievable. This growing pandemic and its significant breakout in Italy prompted the Italian government and later the European Union to advocate for extreme impact measures to "flatten the curve" of COVID-19 infection (Spagnuolo, De Vito, Rengo & Tatullo, 2020).

In addition to declaring COVID-19 a pandemic on 30 January 2020, the World Health Organization (WHO) has also declared this outbreak to be a "public health emergency of worldwide significance." On March 11, 2020, WHO declared Covid-19 a global pandemic. To protect their citizens from the virus, most nations have implemented strict quarantine policies. True, the entire world has come to a halt due to the COVID-19 epidemic. Therefore, countries are tightening regulations concerning health, commerce, and the economy. Some the company are at a marginal point, some of them are stopped as they are not able to run their business activities and most small and medium-sized firm are straggling more to strive asfter during covid-19 (OECD, 2020b). The food business, like every other sector of the global economy, is waiting to see how the COVID-19 epidemic will effect production. The food sector, on the other hand, is unique in that its goods are absolutely necessary for survival. Food production is also a crucial economic factor. During a pandemic, the food industry suffers unique difficulties compared to less vital industries like the travel and airline industries (Aday & Aday, 2020).

There are significant global and south Asian countries' specific impacts anticipated, with Small & Medium (S&M)'s expected to be significantly impacted. Thus, the short-term and long-term impacts of COVID-19 on the small and medium-scale food producing industry of Bangladesh (a south Asian country) have to be determined to expedite recovery and to develop measures for readiness should another such disruption occur.

After COVID-19, the government of Bangladesh should keep the focus not only on the big industry but also on the Small and medium (S&M) scale food and beverage industry to recover from the economic gap. Government should develop short-term and long-term strategies, recommendations, and restrictions (R&R) for the Small and medium (S&M) scale food and beverage industry. To protect and utilize the whole capacity of the Small and medium (S&M) scale food and beverage industry; the government of Bangladesh has to declare and provide a subsidy, special-purpose loan, financial assistance package, interest fee loan with minimum service charge, tax & rebate free for raw-material import, export facilities, unconditional cash transfer, market management platform and so on to overcome the present and future crisis (Amjath-Babu, Krupnik, Thilsted & McDonald, 2020). Since no living thing can survive without food, it's crucial that the government of Bangladesh and the food industry at large prioritize and support the S&M scale food business in the wake of the epidemic.

As Bangladesh doing remarkable economic progress in recent decades so Bangladesh had to be more responsive to this critical moment by reviewing, adjusting the business timeline, and setting up additional safeguards. During covid-19 pandemic, Bangladesh need to be more sensitive to finding out strategies or alternative ways to solve the problems due to covid-19 and plan for future recovery of Business and trade by looking for ways to leverage opportunities and soft spots, constantly reassessing and making the most of every scope. Concerned bodies and governments of Bangladesh need to take immediate steps and need to formulate a future plan to protect the Small and Medium Enterprises of food and beverage sectors as they are straggling more to sustain in this critical era (Chowdhury, Sarkar, Paul & Moktadir, 2022).

The government and the owners of small and medium (S&M) scale food-producing enterprises in Bangladesh should give this sector high importance and pay special attention so that it may help meet the needs of people and animals and boost the country's economy. A future strategy and action plan to combat the recession economy and the growth of unfavorable conditions caused by COVID-19 must now be prepared.Many small and medium (S&M) food producers are now on the verge of collapse; others are barely holding on, and a few have completely shut down. These have a great negative impact on the production of food, economic growth, and employment. So which strategies and actions need to be taken and whether those strategies and actions will be effective for the negative consequences of the pandemic has on food industry in Bangladesh are the main question of this study. To find out the answers to the above questions this research study is undertaken. This study entitled "Post covid logistics, strategies and actions need to be taken: evidence from small and medium scale food and beverages manufacturing sector" provides a comprehensive view of which probable strategies, policies, and actions need to be taken after COVID-19 to make more effective the Small & medium food producing and beverage industry of Bangladesh.

A. Novelty of the Research

This study's findings and suggestions illustrate in which way Government and Food industries can reduced the affect of pandemic on enterprises, consumers, stakeholders, and employees and provide a framework for government help. This study contributes to Bangladesh's S&M food and beverage sectors. This post-covid strategy and action plan might be implemented by other developing nations like Bangladesh. A future study might employ this strategy to measure the acceptability of post-covid policies and action plans for small and medium-sized food and beverage production enterprises in developing economies. Researchers can use these methods as a yardstick to assess other nations' S&M food and beverage strategies and action plans.

II. LITERATURE REVIEW

Since late 2019, the COVID-19 pandemic has expanded swiftly and widely over the world, posing serious threats to food security and nutrition. The spreading crisis has had an impact on food systems and has put people's access to food in harm due to a variety of factors.

The pandemic has had a significant impact on food environments. The context, and thus the way individuals engage and interact with the food system to acquire, prepare, and consume food, has changed as a result of the above-mentioned lockdown measures and supply chain disruptions (HLPE, 2020).

The COVID-19 pandemic triggered a global economic recession which has resulted in a dramatic loss of livelihoods and income on a global scale (World Bank, 2020). Developing countries have been particularly hard hit, as they were already in recession by late 2019. (UNCTAD, 2020). Global growth is predicted to slow considerably in 2020, with various reports predicting a dip of 5 to 8% for the year (International Monetary Fund, 2020; OECD, 2020a).

Food producers and food system workers' lives have been further harmed as food demand has decreased due to lower incomes: food systems are expected to lose 451 million jobs, or 35% of their formal employment all over the world (Torero, 2020).

The COVID-19 issue has exacerbated precarious and dangerous working conditions for many food industry workers. These employees are frequently underpaid and lack safety equipment (Klassen & Murphy, 2020), and in some countries, such as South and Southeast Asia, Sub-Saharan Africa, and some Latin American countries, the majority of them labor under informal arrangements (Min, 2020).

The loss of jobs and income, higher food prices, supply chain disruptions, labor shortages, closure of high-risk processing plants, uncertainty about access to markets and inputs, export restrictions, and union membership, loss of economic and social empowerment, inability to meet and organize, unequal access to ICT, temporary restrictions on the right to demonstrate and organize, and increase in export restrictions have all been experienced by food-producing businesses in Bangladesh during COVID-19. The development of post-COVID policies and action plans for the recovery of losses and to assist the expansion of the Small and Medium-Scale Food and Beverage Manufacturing Sector must be given top priority by the Government of Bangladesh and food-producing firms themselves.Food supply systems have been severely disrupted as a result of the lockdown measures, affecting food availability, pricing, and quality (Barrett, 2020).

During the COVID-19 situation at the beginning and in the early months of COVID-19 outbreak at the end; some food exporting countries implemented an embargo on major staple food products like rice and wheat in the early months of COVID-19's outbreak, causing some interruptions in the worldwide movement of these essentials as well as higher pricing for these commodities compared to all others (Laborde, Martin, Swinnen & Vos, 2020).

Due to the closure of restaurants and other food service facilities, demand for perishable commodities such as dairy products, potatoes, and fresh fruits, as well as specialty items such as chocolate and some high-value cuts of meat, has dropped dramatically (Lewis, 2020; Terazono & Munshi, 2020).

Food supply chains were also disrupted as a result of high rates of illness among food system personnel, which led to the closure of some food processing facilities, such as meat packing plants (Committee on World Food Security (CFS), 2020; Stewart, Kottasová & Khaliq, 2020).

COVID-19 has had a particularly negative impact on food system workers, particularly those who work in labor-intensive food production, such as those who rely on migrant farmworkers (discussed in more detail below), who face travel barriers and often work in crowded conditions on farms and in food production facilities, some of which have had to close temporarily to contain outbreaks (Haley, Caxay, George, Hennebry, Martell & McLaughlin, 2020).

Food availability was impacted in some cases by supply chain disruptions, particularly where supplies were unable to reach markets, putting upward pressure on the pricing of some limited items (HLPE, 2020).

The first policy move was a complete overhaul of food systems. In practice, this means shifting from a singular aim to increase food supply through specialized production and export to fundamental changes that diversify food systems, empower the vulnerable and promote sustainability throughout the food supply chain, from production to consumption (HLPE, 2020).

Another policy advised by Food and Agriculture Organization of the United Nations (FAO) is Food policy should be shaped in ways that understand inter-system links, ensuring, for example, that food, ecological, and economic systems operate together rather than against one another (HLPE, 2020).

Exchange rate volatility in countries hit by the global recession resulted in higher localized food costs for countries that rely on imported goods (UNCTAD, 2020). Food price rises have also been caused by disruptions in supply chains, which have impacted shipping costs (FAO, 2020c).

Pieters (2020) has addressed three key areas for the food companies of the U.S. that are supply chain operations, plant operations, and workforce planning during and after COVID-19 for surviving that industry. This article also summarizes certain actions, such as communicating with suppliers frequently about orders, delivery capability, and forecasting expectations. Develop fast-response teams to parachute into plants with high illness rates that threaten to impede or shut down production (FTI Consulting, n.d.). Companies in the food and beverage industry should review their sourcing strategy, optimize their product offerings, and evaluate the resilience and agility of their supply chains as well as their route-to-market channels. Networks for e-commerce and distribution should be streamlined and improved. Companies will be required to reconsider their pricing and promotion tactics in light of shifting commodity prices and other costs-to-serve, as well as measures to stimulate demand.

COVID-19 has a minor influence on food, but it will have an impact on those who work in the food industry. Food industry should be reformed by the government.

A. COVID-19's impact on Bangladesh's food industry during and after the pandemic

Bangladesh has a food production index of 109.1 in 2018, according to the World Bank. During the period 1969 to 2018, Bangladesh's food production index climbed from 33.3 indexes in 1969 to 109.1 index in 2018, increasing at an average yearly rate of 2.54% (Data World).

Bangladesh is a small South-East Asian country. Bangladesh, like many other overpopulated countries throughout the world, has seen a dramatic increase in unemployment over the previous three decades. Food production and sales are reduced due to a lack of resources and capital. In Bangladesh's food processing sector, though, there has been a breakthrough (Fan, 2017).

In recent years, the processing of more diversified goods to fulfill the changing wants of the Bangladeshi people has been one of the industry's distinguishing qualities. Bangladesh's primary food processing sub-sectors include the dairy, edible oil, sugar, rice, wheat, fruit and vegetables, tea, poultry and beef, pulses and spices, and fish processing industries, as well as the rice and wheat milling industries. The food processing industry is expected to grow even more in the next few years because of the rapid growth of Bangladesh's middle class and the growing need for more food (Haroon, 2022).

Consistent transportation disruptions had been affecting routine market operations for about a month since the lockdown began. The cost of food varies a lot. Shoppers were either unable to access the markets or are afraid to do so (due to the perception that they are no longer safe places). Sending order slips to merchants at the entrances, avoiding the

markets entirely and instead shopping online or at superstores are all examples of consumer workarounds. As a result, vendor revenue has plummeted by as much as 80% to 90% (FAO, 2020c).

Each market in Bangladesh has become an island unto itself, resulting in inconsistent pricing. Because shoppers were not encouraged or permitted to travel beyond a 2-kilometer radius, they are bound by the pricing established by surrounding stores, making it a sellers' market. In addition, supply constraints in certain areas are becoming apparent, such as seafood and soybean oil (FAO, 2020c).

According to Wang (2022),most foods cannot be imported because of COVID-19. It lowers the pace of imported food sales and raises consumer concerns about food safety. It's a vicious circle that keeps repeating itself. People must believe that the government can regulate the food supply. The food chain in small towns and rural areas is being destroyed by COVID-19. To begin with, while some large cities are able to handle food wisely and efficiently, food remains a problem in small towns and rural areas.

COVID-19 as a natural calamity could destroy the whole system of food production, distribution and delivery. So to survive during and after the COVID-19 situation; the Government and concerned authorities of food-producing firms need to develop and implement strategies and need to take practical actions. Natural disasters, such as droughts and floods, as well as human factors (local insecurity), have a significant impact on the various actors participating in local regional food supply chains. This will bring it to a halt. They have no policy or behavior in place to deal with the problem, therefore COVID-19 can easily ruin their system (Wang, 2022).

After finding the impact of COVID-19 on industry concerned authorities should reform the food industry with new strategies to cope during and after the COVID-19 situation. COVID-19 has a minor influence on food, but it will have an impact on those who work in the food industry. Before we do anything about food, we must first evaluate COVID-19's influence. Food should be reformed by the government (Wang, 2022).

In 2022, the Food market in Bangladesh would generate roughly $133 206 million in revenue. The market is anticipated to expand by 10.10% yearly (CAGR 2022-2027). In the Food industry, internet sales will account for 1.9% of total revenue by 2022. By 2027, the Food market is anticipated to reach a volume of 54,583,3 m. kg. In 2023, the Food market is anticipated to see volume growth of 5.0%. (Statista, 2021).

B. Probable strategy, policy, and action plans for fighting the pandemic situation

Pandemics like as COVID-19 are spreading over the globe, the number of infected persons and death tolls are growing daily, and people's normal routines are being severely interrupted in ways that no previous pandemic has been. Thus, the breakout of COVID-19 has had a profound effect on the emotional and behavioral aspects of human psychology, and this unusual psychological discomfort may be classified as a special phobia.

COVID-19 has also affected the suppliers of Food and Beverage Manufacturers, hence impacting production processes. Lockdowns in different countries around the world and COVID-19's effects on businesses have hurt the economy and made them less likely to last. Countries have taken a variety of steps to help the economy and keep businesses going, like financial stimulus packages, delaying loan repayments, waiving loan fees, and giving businesses help with technology. Measures taken by a few countries are shown below.

Table I: Country-wise measures for COVID-19 response.

Country	Strategy, policy and action plans (Response)	Reference
China	Alibaba, an e-commerce giant, has developed an e-commerce platform to help farmers sell unsold agricultural items and is also developing a "green channel" for fresh food. Beijing's central government established a USD 20 million subsidy for the purchase of agricultural equipment and implements. Also, it gives low-interest loans and rent discounts to businesses that want to use digital farming technology, like drones and self-driving cars. The Agricultural Bank of China is lowering the interest rate on loans to small and medium-sized businesses, self-employed individuals, and private owners in Hubei Province by 0.5 %.	(FAO, 2020a) (FAO, 2020b)
India	Implementing software to facilitate the warehouse-based trade of harvested food to alleviate market congestion.	(FAO, 2020d)

South Africa (SA)	• In a turbulent environment, de-risk the company by using a variety of service models. • Increased efficiency and effectiveness of contact centers and consumer engagement. • Virtual agents may be used to augment and automate service. • Enhance the capacity of the virtual agent to handle COVID-19-specific queries and expand Business as Usual traffic. • Suppliers and distributors who are not traditional. • Visibility of the supply-and-demand chain (digital). • Virtual work environment: Assure that workers have access to necessary apps and, most importantly, data. • Seamless networking: Ensure that all essential corporate networks, cloud applications/services, and partner networks are connected seamlessly. • Distributed continuity: Preparedness for a pandemic must be included in company planning. Keeping abreast of changes and being accessible to make timely judgments and communicate. • Workplace reconfiguration: The workplace must accommodate social distance. It is necessary to examine the number of persons on-site and inside a designated constrained location. • Re-adjustment of work hours: Schedule modifications, the introduction of shifts, and other adjustments to work hours must be considered. • Hazardous pay: It is necessary to reassess the prioritizing of labor categories depending on risk. Certain types of employees would be eligible for hazardous pay.Making remote work permanent: Employees who are capable of working remotely should be contracted to do so. This should be fostered via the use of productivity initiatives.	(Telukdarie, Munsamy & Mohlala, 2020)
Poland	Subsidized loans were made to food processing industries to ensure their continued operation.	(FAO, 2020d)
Italy	100 million euros were allocated to agricultural and fishery firms that were forced to close their doors. An extra 100 million Euros will be used to finance the project. Allowing farmers to get early payments from the European Union's subsidies.	(FAO, 2020a)
Canada	The Government of Canada's emergency package for small business owners, which includes loan guarantees and a 75% wage subsidy for qualifying businesses to cope with the economic consequences of the COVID-19 outbreak, recognizes the vulnerability of SMEs and their importance to the Canadian economy. Farm Credit Canada (FCC) will use the extra fund to provide support to food processors with lost sales because of the financial downturn related to the pandemic.	Goddard, E. (2020)
Turkey	Firms may work with stakeholders, seek help from central or local governments, and the central administration can provide a range of goods and services. Incentives and assistance from national and local governments, who are equally unprepared for the epidemic, may not always match expectations.Food may be offered free of charge to those in need, notably those in the medical profession. A food producer may take safeguards against a pandemic to ensure operational survival and customer retention. Firms may change their approach to consumers, employees, goods, marketing, and general operations.	(Yilmaz & Şahin, 2021)

III. RESEARCH QUESTIONS AND OBJECTIVES

From an operational standpoint, the food and beverage manufacturing industry are in desperate need of knowledge. To ensure employee safety, the food and beverage manufacturing industry must implement health and safety standards. Operational restrictions are important additional issues for the sector. The requirement to restructure operations to provide appropriate food items in a safe, financially viable, and ecologically sustainable manner.

This study provides a comprehensive view of which Probable strategies, policies, and actions need to be taken during and after COVID-19 to make smooth the Small & food industry.

Through this investigation, the research team hopes to find catapult possibilities. This study aims to answer the following questions:

- How did Covid-19 affect the food manufacturing industry in Bangladesh?
- Which Probable strategies, policies and actions need to be taken by Bangladesh Government for the food manufacturing industry after COVID-19?
- Which Probable recovery/mitigation measures, strategies, policies, and actions are required to be taken by the S&M scale food industry after COVID-19?

The main objective of this study is to provide post-COVID logistics, strategies, and actions need to be taken bySmall and Medium Scale Food Industries in Bangladesh.

Other objectives are-

- To understand the post-COVID scenario of small and medium-scale food-producing industries of Bangladesh.
- To find out the probable strategies, policies, and actions that need to be taken after COVID-19 by the government and food-producing industry.
- To provide some necessary suggestions to the government and concerned food industries for developing post-covid strategies and action plans.

IV. METHODOLOGY

A. Survey Design

The study's combined approach includes a search of the white paper literature, a search of the international peer-reviewed literature, a collection of benefit assessments in Bangladesh (a developing nation in south Asia), and an instrument to gauge relevance and benefit in Bangladesh's small and medium food manufacturing setting. This study starts with a thorough analysis of the most recent data, including but not limited to papers that have undergone peer review. The goal is to quickly compile contextualized data that is relevant. The study team created a data collecting and response plan based on this initial data gathering cycle. The development of significant knowledge themes begins with the collection of qualitative data, which is followed by the analysis of quantitative data to create a formal questionnaire. The people who are now employed as the owner, CEO, manager, and factory head of Small & Medium size food-producing enterprises in Bangladesh make up the population for this study. The population samples for this study were chosen using a purposive sampling technique. Anonline survey was used as a tool to collect primary data because in-person (physical) data collection was not possible due to the lockdown and pandemic situations. Primary and secondary data have been used in this study. Quantitative primary data have been collected by manually administering an online survey by sending the Google survey form (Questionnaire) to the specific participants (applying a judgmental convenience sampling technique) over emails and social communication platforms. There is no specific sample frame regarding this study area (there is no recognized list of Small &Medium scale food-producing firms of Bangladesh) so we have used the judgmental convenience sampling technique to obtain the primary data. After checking the validity and acceptability of the questionnaire the 125 responses among the 200 were found to be complete and usable for final analysis.

Secondary data have been accumulated to develop measurements and concepts which help us to develop the particulars (Survey questions). Secondary data have been gathered from various existing information sources like various research papers, journals, books and online sources.

In the questionnaire, except for demographic information (Section 1) and the present scenario and impact of COVID-19 on Small and Medium Scale Food Industries of Bangladesh (Section 2), all of the measurements were assessed using a 5-point Likert scale (1 = Strongly Disagree to 5= Strongly Agree).

The nature of the research design is both exploratory and descriptive and this research aims to measure the effectiveness of probable strategies and actions that need to be taken after COVID-19 for small and medium-scale food industries of Bangladesh. To achieve the pre-determined research objectives; a descriptive research design has been ideal for undertaking this study.

For this reason, following the necessary guidelines of Malhotra (Malhotra, 2016), by maintaining hygiene and physical distance two informal focus group discussions (FGDs) with 25 participants (60% owners of the Small & Medium food industry

and 40% experts of the food industry) have been conducted to explore the insights to develop the preliminary research questionnaire.

The survey questionnaire has been composed of three parts. The first part (Table II) consists of demographic & relevant information of respondents. The second part includes fourteen (14) questions for measuring the post-COVID scenario of small and medium-scale food industries of Bangladesh and the last and final section of the survey questionnaire includes seventeen (17) questions or statements for measuring and analyzing probable strategies, policies and actions need to be taken after COVID-19 by Bangladesh government and food manufacturing firms.

B. Data Collection

By reviewing existing literature, informal focus group discussions (FGDs) and taking the opinion of academicians and experts in the food industry we have finally selected 31 research questions/statements for the final formal survey questionnaire.

Finally, formal self-administrated survey questionnaires were distributed through an online survey with a Google Form and 200 respondents (owners and chief managers of various S&M scale food industries) from Dhaka, Manikganj, Pabna, Bogra and Joypurhat districts of Bangladesh were participated. The data collection period were April 2020 to March 2021. For data collection, a survey questionnaire was distributed online to the target demographic. For data gathering, several social media platforms (e.g., Emails, Facebook Messenger, Linkedin, Whats App, Viber, etc.) were utilized.

C. Data Analysis Method:

Data have been analyzed by using common statistical tools named MS-Excel and IBM SPSS statistical software package (version-25). The One-Sample t-test is used to assess the statistical significance between a sample mean and the mean of the entire population. Descriptive statistics including frequency distributions, % age breakdowns, and mean were generated from the processed data using SPSS V.25.

V. RESULTS

A. Demographic profile

The synopsis of the demographics of the respondents is represented in Table II. Table II shows the % age of the demographic questions regarding four types of participants, the owner, Factory in-Charge, manager, and CEO of S&M scale food-producing firms in Bangladesh. This research includes 55 participants which are Factory in-Charge (44% of total 125 respondents), 36 participants are the owner (28.8%), 25 participants are managers (20%), CEOs are 9 (7.2%) of various targeted S&M scale food-producing firms of Bangladesh. Table II also shows the Scale of the company (Small and Medium food-producing company) where the frequency of small, medium, and others are 65, 58, and 2 are chronological. According to Table II, Type of food & Beverage industries are Soft drinks (30.4%), Water (7.2%), Bakery Products (13.6%), Dairy Products (30.4%), and Baking Products (18.4%). Fig. 1 shows the Operational status of food-producing firms during COVID-19, where YES reflects 66.4% and NO reflects 33.6%. On the other hand, the Fig.2 shows the Operational status of food-producing firms after COVID-19, where YES reflects 62.4% and NO reflects 38.6%.

Table II: Descriptive Statistics for demographic questions (owners and chief managers of various S&M scale food industries).

Demographic Questions	F	% (%)
The scale of the company: Small / Medium food-producing company		
Small	65	52.0
Medium	58	46.4
Others	2	1.6
Total	125	100.0
Designation of Respondents		
Owner	36	28.8
Factory in-Charge	55	44.0
Manager	25	20.0
CEO	9	7.2

Total	125	100.0
Type of food & Beverage industry		
Soft drink	38	30.4
Water	9	7.2
Bakery Products	17	13.6
Dairy Products	38	30.4
Baking Products	23	18.4
Total	125	100.0
Directly or indirectly involved in strategy & policy making of my firm		
Yes	125	100.0
My/our firm (Business) was completely closed our physical place of business during (Lock down) COVID-19		
No	42	33.6
Yes	83	66.4
Total	125	100.0
After COVID-19 my/our firm (Business) now physically open and operational.		
No	83	62.4
Yes	42	38.6
Total	125	100.0

Table III reflects the descriptive statistics for measurement of the post-COVID scenario of small and medium-scale food industries of Bangladesh. The mean and standard deviation in Table III shows that firms' Production and Operation hours may increased because of increasing demand after the COVID-19 pandemic and lockdown with mean and standard deviation (4.40, 0.707). Firms facing difficulty accessing raw materials, goods, and services Locally and Internationally, mean and standard deviation (3.92, 0.848), Price of raw-material, transportation and logistic support has been increased (Agreed 46.4%), Facing logistical problems or import difficulties (strongly agree 50.4%), the Production cost is higher after COVID-19 (strongly agree 57.6%, mean 4.52, Std. Deviation 0.604), Number of selling is increasing after Covid situation (disagree 39.2%, mean 3.18, Std. Deviation 1.240), Difficulty of producing food due to capital shortage (agree 49.6%, mean 4.44, Std. Deviation 0.559), firm (Business) is facing the Capital problem (liquid money) after COVID-19 (strongly agree 63.2%, mean 4.60, Std. Deviation .554 and the firm (Business) is facing supply of raw-material problems after COVID-19 (agree 63.2%).

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B. The post-pandemic scenario of small and medium-scale food-producing industries of *Bangladesh*

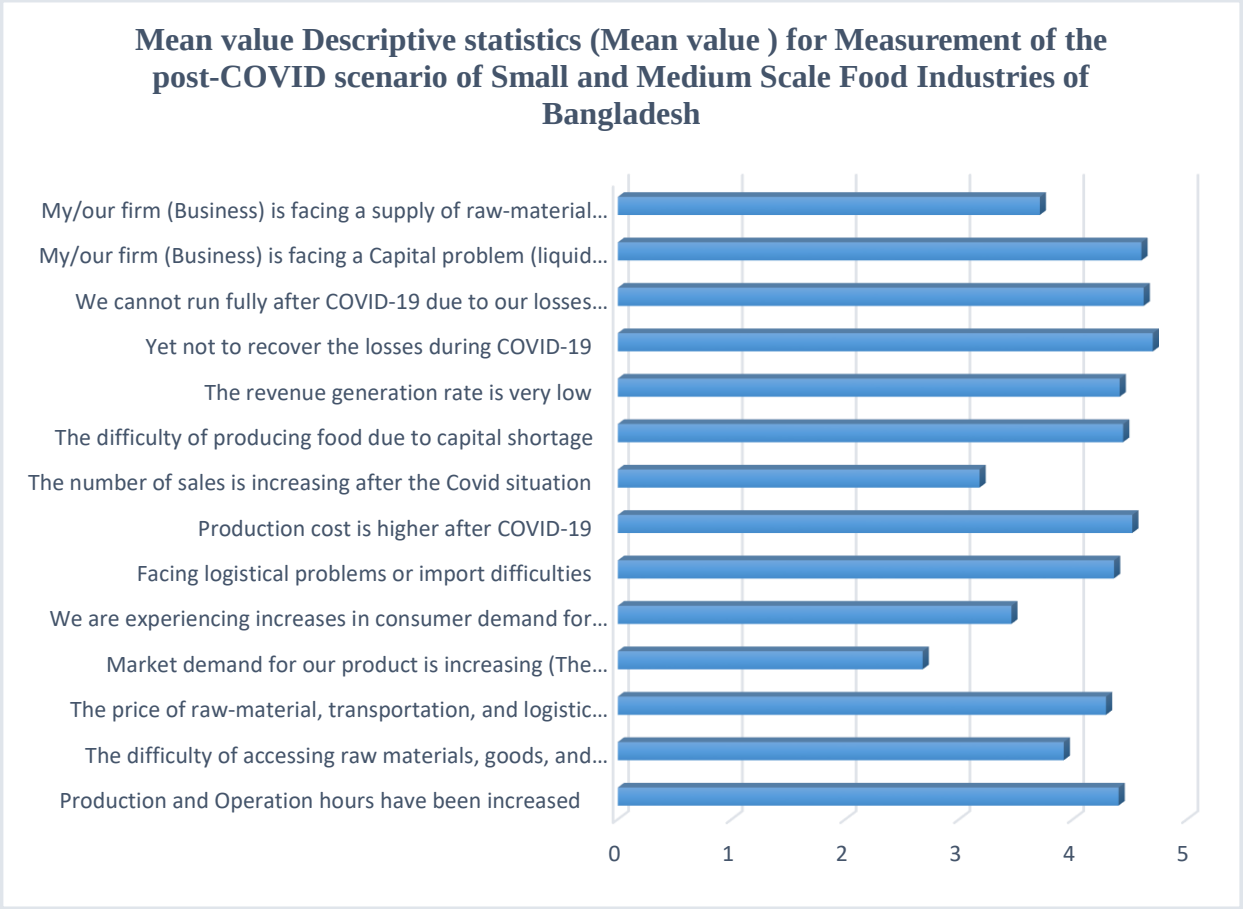

Fig. 1: Descriptive statistics for Measurement of the post-COVID scenario of Small and Medium Scale Food Industries of Bangladesh

Fig. 1 and Appendix section Table II show how the food-making industry in Bangladesh has changed since COVID. 48.0% of food-making businesses have trouble getting their hands on raw materials, goods, and services, both locally and internationally. The firms that make food and drinks also agree (46.4% of them) that the prices of raw materials, transportation, and logistical support have gone up. On the other hand, only 12.0% of the firms agree that the market demand for food and drinks has grown since COVID-19. This means that the market demand for food and drinks has not grown since COVID-19. Most of the companies that make food and drinks agree on one thing: after COVID-19, they are having trouble with logistics or importing, production costs are higher, it is hard to make food because there isn't enough money, the rate of making money is very low, we can't run at full capacity after COVID-19 because we lost money during COVID-19, and we are having trouble getting raw materials after COVID-19.

C. Measuring the Probable strategies, policies, and actions that need to be taken after COVID-19 by Government

The likely strategy and actions that the government will need to take after COVID-19 (appendix section Table I). The mean and standard deviation in Table II show that all of the questions/probable action plans could be acceptable because the mean value for all of the questions/probable action plans is more than 4.50 and the Std. The deviation range is from.499 to.559. All of the above questions, action plans, and statements are proven by more than 50% of "strongly agree" votes. This means that the government is likely to take the above strategies and actions after COVID-19.

D. Measuring the Probable strategies, policies, and actions that need to be taken after COVID-19 by Food Manufacturing firms

Fig. 2 and Appendix section Table III depicts the descriptive statistics for potential strategies and activities to be done following the implementation of COVID-19) by the food-manufacturing company. This table demonstrates that a greater

proportion of our respondents (stakeholders of S&M scale food and beverage producing companies) strongly agree that they must be more sensitive to restart/sustain the food industry after COVID-19 (mean 4.32), establish additional safeguards to restart/sustain in the food industry after COVID-19 (mean 4.48), reshape (Recast) their organizational rules/regulations to cope with the problems and scope after COVID-19 (mean 4.65), provide additional facilities to retain employees in the food industry (mean 4.42), and are in agreement (58.4%) that they must review and adjust our timeline to produce and distribute foods after COVID-19.

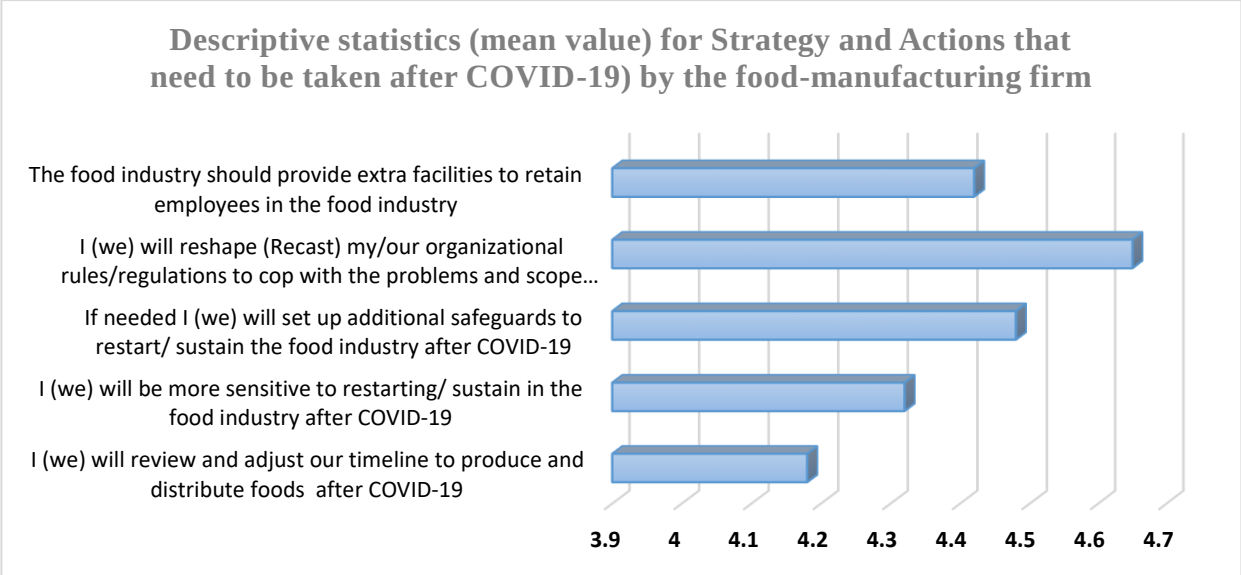

Fig. 2: Descriptive statistics for Strategy and Actions that need to be taken after COVID-19) by the food-manufacturing firm.

VI. FINDINGS AND RECOMMENDATIONS

A. Findings

Table III: Final result for "Probable Strategy and Actions need to be taken after COVID-19) By the Government and Food Manufacturing firm of Bangladesh"

Post-COVID logistics, Strategies, and Actions Need to be Taken by Government					
S.N.	***Strategies and Actions***	***Agree (%)***	***Strongly Agree (%)***	***Sig. (2-tailed)***	***Result***
01	Government should allocate liquid/cash to bust up S&M scale food industry after COVID-19	28.8%	69.6%	.000	***Accepted***
02	Government should provide loan facilities with very low interest to the S&M scale food industry	30.4%	68.0%	.000	***Accepted***
03	Government should provide Unconditional cash transfer facilities to S&M food-producing firms	33.6%	64.8%	.000	***Accepted***
04	Government should formulate Financial assistance packages	28.8%	69.6%	.000	***Accepted***
05	Government should create a policy to Maintain entrepreneurial competitiveness in S&M scale food producing company	28.8%	69.6%	.000	***Accepted***
06	Government should create a new policy for tax rebates/free on production/distribution or raw materials import.	28.8%	69.6%	.000	***Accepted***
07	If needed Government should provide more import and export facilities to S&M food Manufacturing factories after COVID-19	44.8%	55.2%	.000	***Accepted***
08	Government should implement a package for bridge financing of the working capital of S&M scale food firms after COVID-19	44.0%	56.0%	.000	***Accepted***

09	Government should create interest-free loan facilities with minimum/low service charges for S&M scale food firms after COVID-19	35.2%	63.2%	.000	***Accepted***
10	Government should provide six month grace period for paying the loan to the Borrowers (S&M scale food producing company) after COVID-19	41.6%	58.4%	.000	***Accepted***
11	If needed Government should create "entry barriers" for the new entrance for protecting the existing S&M food-producing firms.	32.8%	64.8%	.000	***Accepted***
12	Government should create a "market management Platform" to make food production & distribution smooth after COVID-19	28.0%	68.0%	.000	***Accepted***
Post-COVID logistics, Strategies, and actions that need to be taken by food-manufacturing firms					
13	I (we) will review and adjust our timeline to produce and distribute foods after COVID-19	58.4%	29.6%	.002	***Accepted***
14	I (we) will be more sensitive to restarting/ sustain in the food industry after COVID-19	52.0%	40.0%	.000	***Accepted***
15	If needed I (we) will set up additional safeguards to restart/ sustain the food industry after COVID-19	39.2%	54.4%	.000	***Accepted***
16	I (we) will reshape (Recast) my/our organizational rules/regulations to cop with the problems and scope after COVID-19	32.0%	66.4%	.000	***Accepted***
17	The food industry should provide extra facilities to retain employees in the food industry	45.6%	48.0%	.000	***Accepted***

Using the %ages of agree, strongly agree, and considerable value, Table III demonstrates that the probable Post-COVID logistics, strategies, and actions are accepted. Here are the seventeen (17) probable strategies and actions that the Government and food manufacturing firms of Bangladesh could implement after COVID-19 to recover losses and achieve sustainable growth in small and medium-scale food and beverage manufacturing firms in Bangladesh.

B. Recommendations:

After analyzing the above discussion and finding it could be summarized that the government of Bangladesh and the Small and Medium Scale Food and Beverages Manufacturing Sector could take the following Post COVID logistics, strategies, and actions to mitigate the losses during Covid-19 and to operate the Small and Medium Scale Food and Beverages Manufacturing Sector full swing. The following recommendations could be followed by the concerned bodies, food manufacturing firms also need to take Post-COVID logistics, Strategies, and Actions.

- Government should provide "fiscal stimulus" to deal with the impact of the COVID-19 pandemic.
- Bangladesh's Government should make and execute an economic stimulus plan for recovering the losses of the Small and Medium Scale Food and Beverages Manufacturing Sector during COVID-19.
- A financial package of measures can be set to support S&M scale Food and Beverages Manufacturing firms to cope with the fallout of the COVID-19 outbreak.
- The government of Bangladesh takes critical steps to ensure companies hit by the COVID-19 outbreak do not face a financial squeeze.
- Bangladesh can ramp up funding support for virus-hit regions (especially for food-producing firms in the major cities (eight divisions of Bangladesh; Barishal, Chattogram, Dhaka, Khulna, Rajshahi, Rangpur, Mymensingh, and Sylhet).
- Bangladesh Bank can cut its key rates (i.e. benchmark lending rate).
- Banks can provide cheap loan payment relief to expose food-producing factories and industries.
- State-owned commercial banks need to provide capital and liquidity packages as loans to the S&M scale food-producing firms.
- Government of Bangladesh can give special subsidies to the S&M scale food producing firms for struggling themselves after covid-19.
- State-owned commercial banks, Bangladesh banks, and specialized banks need to provide low-interest loan facilities to small and medium-scale food-producing firms.

- Bangladesh's government should make new strategies, and regulations and modify the present rules, regulations, and plans to support the S&M scale food-producing firms.

Food Manufacturing firms also need to take Post-COVID logistics, Strategies, and Actions. Following are the recommendations for the Food Manufacturing firms-

- S& M scale food-producing firms need to review and adjust our timeline to produce and distribute foods after COVID-19.
- They need to be more conscious and sensitive to restarting/sustaining the food industry after COVID-19.
- Food-producing firms need to set up additional safeguards to restart/ sustain the food industry after COVID-19.
- They require to reshape (Recast) their organizational rules & regulations to cope with the problems and scope after COVID-19.
- The food industry should provide extra facilities to retain employees in the food industry.

VII. CONCLUSION OF THE STUDY

This study will be helpful to the researchers, conscious people, and common readers to know about the real picture of food industry, agriculture, and economic development of Bangladesh. It will give the current scenario of the food, agriculture, and economy of the country.

Finally, a rational "Covid-19" action plan for the post-covid situation may impact positively the recovery of S&M scale food-producing firms in Bangladesh. A deliberate (well-planned) logistics, strategies, and action plan can be conclusive and ultimate tools to cut down (Knock off) the potential economic cost of epidemic COVID-19.

The following findings were established after doing research and evaluating data to learn about the post-COVID situation and likely strategies and action plans for the recovery and growth of the S&M scale food-producing companies in Bangladesh (n = 125).

The government of Bangladesh and concerned food-producing companies need to develop and execute the following Strategies and Action plans for fighting the post-COVID situation.

- Government should allocate liquid/cash to bust up the S&M scale food industry after COVID-19.
- Government should provide loan facilities with very low interest to the S&M scale food industry.
- Government should provide Unconditional cash transfer facilities to S&M food-producing firms.
- Government should formulate Financial assistance packages.
- Government should create a policy to Maintain entrepreneurial competitiveness in S&M-scale food-producing companies.
- Government should create a new policy for tax rebates/free on production/distribution or raw materials import.
- If needed Government should provide more import and export facilities to S&M food Manufacturing factories after COVID-19.
- Government should implement a package for bridge financing of the working capital of S&M scale food firms after COVID-19.
- Government should create interest-free loan facilities with minimum/low service charges for S&M-scale food firms after COVID-19.
- Government should provide six month grace period for paying the loan to the Borrowers (S&M scale food producing company) after COVID-19.
- If needed Government should create "entry barriers" for the new entrance for protecting the existing S&M food-producing firms.
- Government should create a "market management Platform" to make food production & distribution smooth after COVID-19.
- Food-producing firms need to review and adjust their timeline to produce and distribute foods after COVID-19.
- Food-producing firms should be more sensitive to restarting/sustaining the food industry after COVID-19.
- Food-producing firms need to set up additional safeguards to restart/ sustain the food industry after COVID-19.
- Food-producing firms need to reshape (Recast) my/our organizational rules/regulations to cope with the problems and scope after COVID-19.

A. The implication of this study

The present study provides several significant theoretical contributions to the relevant literature. Firstly, this study showed the effects of the COVID-19 outbreak on food and beverage firms from the stakeholders' perspective in Bangladesh. Food and beverage firms have taken steps such as employee-oriented, customer-oriented, product-oriented, operation–oriented and marketing-oriented to be able to recover from the crisis swiftly and to regain their customers. In a similar vein, food and beverage firms should establish a more hygienic atmosphere for their customers and enforce food safety regulations more stringently than they did in the past. Thus, the challenges faced by the food and beverage industry, the reactions it engaged in, and the precautions taken against the COVID-19 pandemic were revealed, and the actions at the onset of the pandemic and throughout the active period and the normalization process were explained.

Secondly, the study puts forward the vulnerable nature and weaknesses of the food and beverage industry, which have been brought to the agenda with the pandemic one more time. Therefore, it is considered that the study will serve as a strong and useful reference to what food and beverage firms may encounter and go through when faced with a possible crisis again. Firms will be able to develop specific strategies, taking into notice the category of challenges encountered to protect themselves against possible crises and to survive (or to continue their activities) in the crisis environment. In this context, the study provides guiding findings and contributes to the literature on what stages the food and beverage industry can go through, what kind of difficulties it may encounter, and what sort of measures it can take after the COVID-19 pandemic and similar crises that may occur in the future.

Furthermore, this type of study could be usefull for other crisis too.

B. Limitations and Future Research Direction

Although the current study made several significant discoveries, there are a few shortcomings that must be addressed in future studies. First, the research findings cannot be applied to other settings or areas since the study focuses solely on the effects of the pandemic on the food and beverage business in Bangladesh. Second, for this study, data was only obtained from the food-producing business, not from the government or the customers. We have collected data from 125 samples, however, in the future, this study might be done by collecting additional samples. Different strategies can be utilized in the future to acquire more complete data. Thirdly, the research findings solely reflect the perspectives of food and beverage sector stakeholders. For potential post-covid policies and actions, it is proposed to perform more comprehensive research to determine the perspective of customers, the government of Bangladesh, and individuals from the food ministry on the food and beverage business.

DECLARATIONS

Author contribution statement

Md. Touhidil Islam: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools, or data; Wrote the paper.

Hasibul Islam: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools, or data; Wrote the paper.

Dr. Md. Redwanuzzaman: Contributed reagents, materials, analysis tools, or data; Wrote the paper.

Dr. Masud Rana: Conceived and designed the experiments; Performed the experiments; Wrote the paper.

Dr. Md. Kamal Hossain: Conceived and designed the experiments; Performed the experiments; Wrote the paper.

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DATA AVAILABILITY STATEMENT

Data will be made available on request.

DECLARATION OF INTEREST STATEMENT

The authors declare no conflict of interest.

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APPENDIX

Table I: Descriptive statistics for Strategy and Actions need to be taken after COVID-19) by the Government

Descriptive Statistics							
Questions/Action plan/Statements	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**	**Mean**	**Std. Deviation**
Government should allocate liquid/cash to bust up S&M scale food industry after COVID-19	0.0%	0.0%	1.6%	28.8%	69.6%	4.68	.502
Government should provide loan facilities with very low interest to the S&M scale food industry	0.0%	0.0%	1.6%	30.4%	68.0%	4.66	.507
Government should provide Unconditional cash transfer facilities to S&M food-producing firms	0.0%	0.0%	1.6%	33.6%	64.8%	4.63	.516
Government should formulate Financial assistance packages	0.0%	0.0%	1.6%	28.8%	69.6%	4.68	.502
Government should create a policy to Maintain entrepreneurial competitiveness	0.0%	0.0%	1.6%	28.8%	69.6%	4.68	.502
Government should create a new policy for tax rebates/free on production/distribution or raw materials import.	0.0%	0.0%	1.6%	28.8%	69.6%	4.68	.502
If needed Government should provide more import and export facilities to S&M food Manufacturing factories after COVID-19	0.0%	0.0%	0.0%	44.8%	55.2%	4.55	.499
Government should implement a package for bridge financing of the working capital of S&M scale food firms after COVID-19	0.0%	0.0%	0.0%	44.0%	56.0%	4.56	.498

Government should create interest-free loan facilities with minimum/low service charges for S&M scale food firms after COVID-19	0.0%	0.0%	1.6%	35.2%	63.2%	4.62	.520
Government should provide six month grace period for paying the loan to the Borrowers (S&M scale food producing company) after COVID-19	0.0%	0.0%	0.0%	41.6%	58.4%	4.58	.495
If needed Government should create "entry barriers" for the new entrance for protecting the existing S&M food-producing firms.	0.0%	0.0%	2.4%	32.8%	64.8%	4.62	.534
Government should create a "market management Platform" to make food production & distribution smooth after COVID-19	0.0%	0.0%	4.0%	28.0%	68.0%	4.64	.559

Table II: Descriptive statistics for Strategy and Actions need to be taken after COVID-19) by the Government.

Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Deviation
Production and Operation hours have been increased	0.0%	0.8%	10.4%	36.8%	52.0%	4.40	.707
The difficulty of accessing raw materials, goods, and services Locally & Internationally	1.6%	2.4%	23.2%	48.0%	24.8%	3.92	.848
The price of raw-material, transportation, and logistic support has been increased	0.0%	4.0%	6.4%	46.4%	43.2%	4.29	.760
Market demand for our product is increasing (The number of Food orders is increasing) after Covid-19	3.2%	37.6%	47.2%	12.0%	0.0%	2.68	.725
We are experiencing increases in consumer demand for certain (Food) products	0.0%	16.0%	34.4%	36.8%	12.8%	3.46	.912
Facing logistical problems or import difficulties	0.0%	2.4%	9.6%	37.6%	50.4%	4.36	.756
Production cost is higher after COVID-19	0.0%	0.0%	5.6%	36.8%	57.6%	4.52	.604
The number of sales is increasing after the Covid situation	2.4%	39.2%	18.4%	17.6%	22.4%	3.18	1.240
The difficulty of producing food due to capital shortage	0.0%	0.0%	3.2%	49.6%	47.2%	4.44	.559
The revenue generation rate is very low	0.0%	0.0%	4.8%	49.6%	45.6%	4.41	.583
Yet not to recover the losses during COVID-19	0.0%	0.0%	1.6%	27.2%	71.2%	4.70	.496
We cannot run fully after COVID-19 due to our losses during COVID-19	0.0%	0.0%	1.6%	34.4%	64.0%	4.62	.518
My/our firm (Business) is facing a Capital problem (liquid money) after COVID-19	0.0%	0.0%	3.2%	33.6%	63.2%	4.60	.554
My/our firm (Business) is facing a supply of raw-material problem after COVID-19	0.0%	4.8%	25.6%	63.2%	6.4%	3.71	.658

Table III: Descriptive statistics for Strategy and Actions that need to be taken after COVID-19) by the food-manufacturing firm.

Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Deviation
I (we) will review and adjust our timeline to produce and distribute foods after COVID-19	0.0%	0.0%	12.0%	58.4%	29.6%	4.18	.623
I (we) will be more sensitive to restarting/ sustain in the food industry after COVID-19	0.0%	0.0%	8.0%	52.0%	40.0%	4.32	.617

If needed I (we) will set up additional safeguards to restart/ sustain the food industry after COVID-19	0.0%	0.0%	6.4%	39.2%	54.4%	4.48	.617
I (we) will reshape (Recast) my/our organizational rules/regulations to cop with the problems and scope after COVID-19	0.0%	0.0%	1.6%	32.0%	66.4%	4.65	.512
The food industry should provide extra facilities to retain employees in the food industry	0.0%	0.0%	6.4%	45.6%	48.0%	4.42	.612

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Logistika, strategije in ukrepi, ki jih je treba sprejeti po COVID: dokazi iz malega in srednje velikega sektorja proizvodnje hrane in pijač

Izvleček - Hrano potrebujejo tako ljudje kot živali, vendar se v obdobju covid-19 številna mala in srednje velika živilska podjetja spopadajo s težavami pri proizvodnji in prevozu hrane, druga pa so tik pred zaprtjem. Zdaj je čas za oblikovanje prihodnje strategije in akcijskega načrta za malo in srednje veliko živilsko industrijo, da bi ublažili gospodarske učinke izbruha bolezni covid-19. Cilj te študije je opredeliti verjetne taktike, politike in akcijske načrte ter oceniti njihovo učinkovitost in sprejemljivost. Ta študija tudi raziskuje in količinsko opredeljuje učinke izbruha covid-19 na bangladeško malo in srednje veliko živilsko industrijo. Z uporabo tehnike neverjetnostnega vzorca so bili uporabljeni trije tipi vprašalnikov za zbiranje podatkov od lastnikov, vodij tovarn, menedžerjev in izvršnih direktorjev v sektorju proizvodnje hrane in pijač. S programsko opremo SPSS V.25 je bila izvedena opisna analiza za prikaz frekvenc, % deležev in povprečnih vrednosti, za primerjavo vrednosti (povprečja) stališč (strategij in akcijskih načrtov) z dostavljeno vrednostjo (testno vrednostjo) pa je bil uporabljen t-test z enim vzorcem. Rezultati kažejo, da je verjetnost strategij in akcijskih načrtov (14 strategij), ki jih mora izvajati vlada, visoka in sprejemljiva, učinkovitost drugih verjetnih strategij in akcijskih načrtov (5 strategij), ki jih morajo izvajati proizvajalci hrane in pijač, pa je lahko tudi sprejemljiva in bi se lahko uporabljala v razmerah po krizi.

Ključne besede - Post-covid, S&M lestvica živilska industrija, hrana in pijača, logistika, strategije in ukrepi, t-test z enim vzorcem