

Strategies to Mitigate Uncertainty Impact on Livestock Industries and Its Supply Chain

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ABSTRACT:

Livestock animals and birds are specially kept on a farm for economic benefits. Cattle, goat, buffalo, sheep, duck, and poultry are the most common in Bangladesh. Livestock is a significant aspect of a country's prosperity since, in addition to providing draft power and leather, it also provides manure, meat, and milk to the great majority of the population. In the agricultural production domain, livestock resources are crucial. According to statistics, the livestock sector accounts for around 2.9 percent of national GDP and has a 5.5 percent annual growth rate (National Encyclopedia Of Bangladesh, 2021). Approximately 20% of Bangladesh's population earns a living from livestock and poultry farming (National Encyclopedia Of Bangladesh, 2021). For a long time, these industries have been subjected to various risks and uncertainties. During this stage, the study addressed important problems, focusing on risks and uncertainties, as well as the supply chain. Emerging illness, a lack of biosecurity, a lack of quality vaccinations and excessive vaccine prices, the influence of climate change, a marketing problem, inflation rate and a lack of an emergency fund have all been deemed comprehensive difficulties.

Keywords: Contribution, Industry, Livestock, Management, Mitigation, Strategy, Inflation, Target, Uncertainty.

1 INTRODUCTION:

- 1.1 **LIVESTOCK INDUSTRY:** Bangladesh's livestock industry has played a significant part in the country's economic development. It improves cattle, goats, chicken, and fish, as well as assisting in the processing of animal goods for consumers. With 0.3 million dairy farms and 65-70 thousand commercial poultry farms already functioning in Bangladesh (Md. SahidurRahmana, 2021), poultry and dairy are two of the most promising livestock businesses. It is regarded as a cornerstone of the global food system, contributing to poverty alleviation, food security, and agricultural growth.
- 1.2 **SUPPLY CHAIN:** The management of the flow of products and services is known as supply chain management. "Supply chain is to control the flow from supplier's supplier to customer's customer through value-added processes and distribution channels, which begins in the source of supply and ends at the end of consumption" (Stevens,1989). Supply chain management in the livestock business refers to getting livestock products to market on time. Livestock products are perishable and must be transferred to consumption areas as soon as possible or changed into less perishable forms, but processing, storage, and refrigerated transportation are underdeveloped. As a result, developing value chains for livestock products is critical.

- 1.3 **UNCERTAINTY IN SUPPLY CHAIN:** Random events with unknown probabilities are referred to as uncertainty. Supply chain uncertainty is defined as a set of unknowns that can arise at any point in a global supply chain network, resulting in either positive or negative effects (E. Simangunsong, 2011). Eliminating supply chain management uncertainty aids in securing a better competitive position and increasing the efficiency of the livestock industries. Emergency orders, illness outbreak, and the unavailability of individual animals are all examples of uncertainty in the livestock sector

2 LITERATURE REVIEW:

Supply chain uncertainty refers to change of the natural order or balance and the profitability of the supply chain which is basically caused by potential, unexpected and unpredictable events, which requires an action to maintain the balance (Bonde, 2018). In a world, where full of uncertainty lies, strategies to handle those uncertainty can minimize the loss or total breakdown of a supply chain. Events like unexpected order, social unrest, political unrest, late delivery, transportation problems, breakdown of a critical production equipment etc. can occur. Uncertainty can be categorized into 3 types, 1. Internal organization uncertainty (The uncertainties which comes from the focal company, such as control or chaos, manufacturing process, decision complexity).

1. Internal supply chain uncertainty (uncertainty arises within the focal company and its supply chain partners, such as order forecast horizon, demand amplification, end- customer demand).
2. External supply chain uncertainty (factors outside the supply chain, such as government regulations, competitor behavior, disasters, microeconomic issues) (Eliot Simangunsong, 2012)

Early preparation can minimize the loss and a proper strategy can save the supply chain from total breakdown.

Bangladesh's GDP is significantly influenced by livestock. It is an important aspect of Bangladesh's agricultural sector. This agricultural sub-sector employs 20% of the entire population full-time and 50% of the population part-time. In Bangladesh, poultry-based meat accounts for 37 percent of overall meat output (Begum et al 2011). Bangladesh's livestock industry accounts for roughly 2.9 percent of the country's GDP and is growing at a rate of about 5.5 percent (National Encyclopedia Of Bangladesh, 2021). It is a significant part of the economy. As a result, sustaining its supply chain is a major concern. We recently recovered from the COVID-19 pandemic, which was caused by the SARS-CoV-2 virus. Lockdown has been imposed across the country. The supply chain for a variety of industries was disrupted. The livestock industry was also impacted. As a result, our research will focus on developing measures to reduce the danger of a sudden breakdown in the livestock sector's supply chain. The article will examine all previous unanticipated incidents that have impacted this industry and attempt to provide a proper solution so that appropriate steps can be done when necessary. To design a successful strategy, questioners, hypotheses, and other processes will be used. The key goal will be to figure out how to lessen and mitigate the effects of unpredictable events.

3 METHODOLOGIES:

We divided the research methodologies into two separate categories. In the first section we analyzed our data using quantitative methods. We gathered data from secondary sources. They include Divisional Livestock Office, Sylhet of 4 districts. Those districts were Sylhet, Habiganj, Moulvibazar and Sunamganj. From the office we collected the data of Meat, Milk and Chicken. The data were taken from the years of 2019, 2020, 2021 and 2022. The data range from quantitative to qualitative. The quantitative data include:

1. Contribution to GDP
2. Yearly target
3. Target accomplishment.
4. Percent target accomplishment.

We took help of traditional statistical analysis tools to inspect and interpret the gathered quantitative data set. The tools include bar-chart and correlation chart.

In the second section, we analyzed the qualitative measures and their direct impact on our research hypothesis. These data include but are not limited to:

- Contemporary news,
- Private and public publications,
- Social trend and perspectives

4 RESEARCH VARIABLES:

Research variables here contains independent and dependent variables.

The independent variables are:

- Contribution to GDP: one of the most important primary data we gathered to analyze was the yearly contribution of livestock industry to our country's GDP.
- Yearly target: yearly target was the most crucial data set we have gathered along with target achieved to analyze our pre-established null hypothesis.
- Target accomplishment: Like the yearly target data set this also played a significant role in interpreting our hypothesis in a meaningful way.
- Percent target accomplishment: this data set bridged the gap between yearly target and target accomplishment.

The dependent variable is the output which came out as Increase in contribution to GDP, uncertainty, and risk indicator.

The ultimate goal to find out the uncertainty reasons and to build up a strategy to overcome those.

4.1 THE SUPPLY CHAIN DIAGRAM FOR THE LIVESTOCK:

The supply chain diagram for the livestock includes Livestock industry, processing plant, distribution, marketing and retailer, independent whole seller and lastly the consumer. There are some sub parts of the chain as well. They include Labor, vaccine, feed supplier. Internal and External transport are also included as a subbranch of the chain.

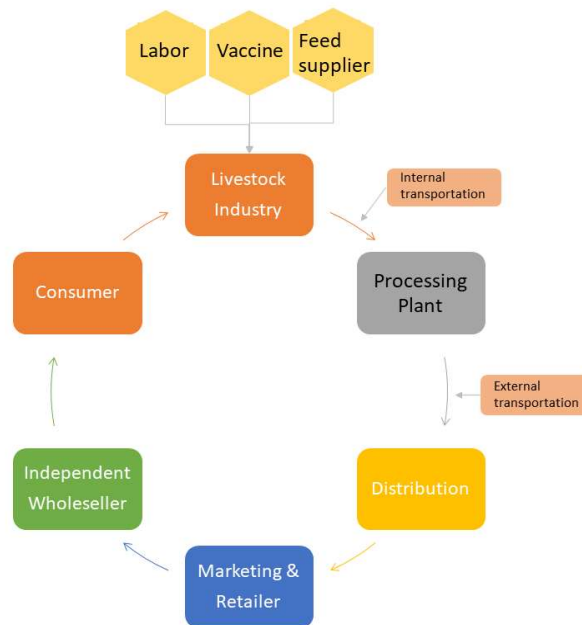


Figure (1): Livestock supply chain diagram.

5 RESEARCH HYPOTHESIS:

For this research, four null hypotheses have been developed to test the relationship between efficiency and the value of the firm.

H01: Inflation influences supply chain.

H02: Uncertainty influences supply chain.

H03: Strict govt mandates negatively impacts livestock industry.

H04: Yearly vaccination rate in the livestock industry is hampered due to economical unrest caused by lockdown mandates.

6 ANALYSIS AND INTERPRETATIONS:

These are the data collected from the divisional livestock office, Sylhet. The data are represented as their respective tables as follows:

Table 1: Contribution of Livestock in Gross Domestic Product (GDP) (Constant Prices):

(Government , 2015-2021)

Year	Contribution
20-21	1.44
19-20	1.43
18-19	1.47
17-18	1.54
16-17	1.6
15-16	1.66

Here the data of the contribution of livestock to GDP is depicted. From 2015 to 2021 six year's GDP contribution was measured. The contribution to GDP is important as it can indicate the uncertainty throughout the years. The data above indicates that the contribution of livestock to the GDP is decreasing over the years. There could be several reasons for this; a reason can be the dependency on agricultural sector is diminishing as the rapid industrialization is taking the place. Another reason could be the external uncertainty which could be possibly resulting in decreasing the contribution.

Table 2: Share of Livestock in Agricultural GDP (Current prices):

(Government , 2015-2021)

Year	Share
20-21	13.1
19-20	13.44
18-19	13.46
17-18	13.62
16-17	14.31
15-16	14.21

The table 2 is for share of livestock in agricultural GDP. This table indicates how the livestock sector is affecting the agricultural GDP. From 2015 to 2021 six year's GDP share was measured. If we took a closer look to the data, it can be observed that 2020-2021's share has been decreased than 2019-2020's share. The reasons which can be assumed are natural disasters and Covid-19 pandemic situation.

Table 3: Milk production (lakh/metric tons) 2019-20:

(Sylhet Divisonal Board of LIVESOCK Economy, 2019-2020)

District	Yearly target	Target reached	Percentage
Sylhet	1.4	1.45	103%
Moulvibazar	0.77	0.68	88%
Habiganj	0.9	0.78	87%
Sunamganj	0.93	0.82	88%
Total	4	3.73	94%

The table 3 depicts the milk production for Sylhet division in 2019-2020. The data was collected for four districts. The table 3 is designed to have the yearly target, target reached, and the percentage of target reached. The target reached and percentage gives a clear decision whether any uncertain event put on an impact on the milk production or not.

Table 4: Meat production (lakh/metric tons) 2019-20:

(Sylhet Divisonal Board of LIVESOCK Economy, 2019-2020)

District	Yearly target	Target reached	Percentage
Sylhet	1.36	1.37	100%
Moulvibazar	0.78	0.76	97%

Habiganj	0.94	0.91	97%
Sunamganj	0.93	0.81	87%
Total	4	3.85	97%

The table 4 depicts the meat production for Sylhet division in 2019-2020. The data was collected for four districts they are: Sylhet, Moulvibazar, Habiganj and Sunamganj. The table 4 is designed to have the yearly target, target reached, and the percentage of target reached. The target reached and percentage gives a clear decision whether any uncertain event put on an impact on the milk production or not.

Table 5: Egg production (crore)2019-20:
(Sylhet Divisional Board of LIVESOCK Economy, 2019-2020)

District	Yearly target	Target reached	Percentage
Sylhet	31.8	30.85	97%
Moulvibazar	20.5	20.18	99%
Hobiganj	18.35	18.1	99%
Sunamganj	24.35	24.45	100%
Total	95	93.58	99%

The table 5 depicts the Egg production for Sylhet division in 2019-2020. The data was collected for four districts they are: Sylhet, Moulvibazar, Habiganj and Sunamganj. The table 5 is designed to have the yearly target, target reached, and the percentage of target reached. The target reached and percentage gives a clear decision whether any uncertain event put on an impact on the milk production or not. Here Shunamganj accomplished with a 100% percentage.

Table 6: Milk production (lakh/metric tons)2020-21:
(Sylhet Diviosnal Board Of Livestock Economy , 2020-21)

District	Yearly target	Target reached	Percentage
Sylhet	1.8	0.46	25%
Moulvibazar	1.2	0.22	18%
Hobiganj	1.4	0.28	20%
Sunamganj	1.5	0.37	25%
Total	5.9	1.33	23%

The table 6 depicts the milk production for Sylhet division in 2020-2021. The data was collected for four districts. The table is designed to have the yearly target, target reached, and the percentage of target reached. The target reached and percentage gives a clear decision whether any uncertain event put on an impact on the milk production or not. Comparing to the 2019-2020 year of table 3 the percentage rate of achieving target is very poor. There is a massive decline in milk production in 2020-2021 comparing to the previous year. None of the four districts could reach their target and the rate is very low.

Table 7: Meat production (lakh/metric tons)2020-21: (Sylhet Diviosnal Board Of Livestock Economy , 2020-21)

District	Yearly target	Target reached	Percentage
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Sylhet	1.5	0.38	25%
Moulvibazar	1	0.27	27%
Hobiganj	1.2	0.43	35%
Sunamganj	1.22	0.27	22%
Total	4.92	1.35	27%

The table 7 depicts the meat production for Sylhet division in 2020-2021. The data was collected for four districts. The table is designed to have the yearly target, target reached, and the percentage of target reached. The target reached and percentage gives a clear decision whether any uncertain event put on an impact on the meat production or not. Comparing to the 2019-2020 year of table 4 the percentage rate of achieving target is very poor. There is a massive decline in meat production in 2020-2021 comparing to the previous year. None of the four districts could reach their target and the rate is very low.

Table 8: Egg production (crore)2020-21:
(Sylhet Divisional Board Of Livestock Economy , 2020-21)

District	Yearly target	Target reached	Percentage
Sylhet	40	10.02	25%
Moulvibazar	25	3.98	16%
Hobiganj	32	4.97	16%
Sunamganj	35	10.25	29%
Total	132	29.22	22%

The table 8 depicts the egg production for Sylhet division in 2020-2021. The data was collected for four districts. The table 8 is designed to have the yearly target, target reached, and the percentage of target reached. The target reached and percentage gives a clear decision whether any uncertain event put on an impact on the milk production or not. Comparing to the 2019-2020 year of table 5 the percentage rate of achieving target is very poor. There is a massive decline in egg production in 2020-2021 comparing to the previous year. None of the four districts could reach their target and the rate is very low. Egg production seems to have larger impact comparing to the other livestock sectors.

Table 9: District-wise target and target reached for 2019-2020:
(Sylhet Divisional Board of Livestock Economy, 2019-2020)

District	Criteria	Target for 2019-2020	Target reached for 2019-2020
Sylhet	Milk	1.4	1.45
	Meat	1.36	1.37
	Egg	31.8	30.85
Moulvibazar	Milk	0.77	0.68
	Meat	0.78	0.76
	Egg	20.5	20.18
Habiganj	Milk	0.9	0.78
	Meat	0.94	0.91
	Egg	18.35	18.1

Sunamganj	Milk	0.93	0.82
	Meat	0.93	0.81
	Egg	24.5	24.45

Table 9 is the combination of table 3, 4 and 5. This table made for a thorough view of the 2019-20 year's data for milk, meat, and egg. This combination made easy to build a bar graph to analysis the target accomplishment for year 2019-20.

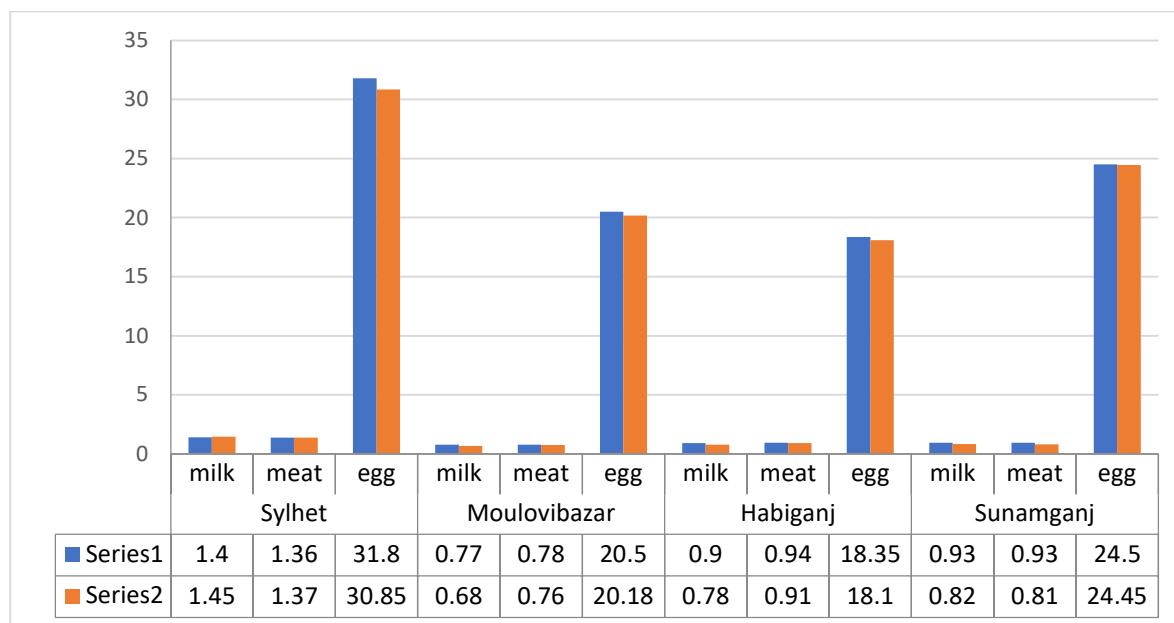


Figure (2): Chart for Table 9

The chart shows that there is a slight difference between targets given by the livestock office and the accomplishment or reaching the target. Almost in every sector (milk, meat, and the egg) the accomplishment was near the given target. Which indicates the livestock industry was not in an uncertain situation.

Table 10: District-wise target and target reached for 2020-2021

(Sylhet Diviosnal Board Of Livestock Economy , 2020-21)

District	Criteria	Target for 2020-2021	Target reached for 2020-2021
Sylhet	milk	1.8	0.46
	meat	1.5	0.38
	egg	40	10.02
Moulovibazar	milk	1.2	0.22
	meat	1	0.27
	egg	25	3.98
Habiganj	milk	1.4	0.28

Sunamganj	meat	1.2	0.43
	egg	32	4.97
	milk	1.5	0.82
	meat	1.22	0.27
	egg	35	10.25

Table 10 is the combination of table 6, 7 and 8. This table made for a thorough view of the 2020-21 year's data for milk, meat, and egg. This combination made easy to build a bar graph to analysis the target accomplishment for year 2020-21.

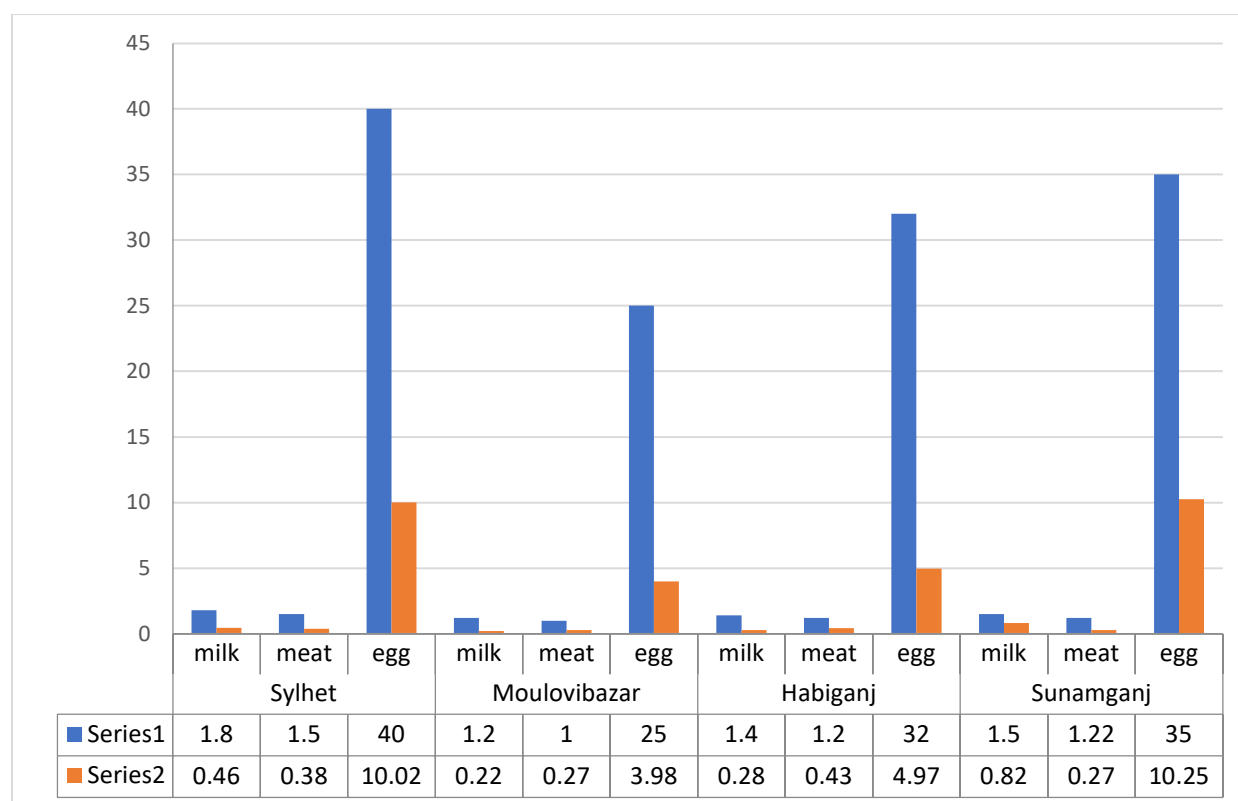


Figure (3): Chart for Table 10

The chart depicts that there is a massive decline in accomplishing the target for the year of 2020-21. Milk, meat and egg all the sector has much less percentage of the accomplishment. The result is very deteriorating. This indicates that there was a clear uncertain situation in the year of 2020-21. It can be said, because of the uncertain situation the percentage rate of accomplishment declined this much.

From the analysis of the data table 1 to 10 and figure 2 and 3 it can be said, the result has been failed to reject the second hypothesis which was, H02: Uncertainty influences the supply chain. Table 9 and 10 gives a clear indication for this. Table 10 interprets that there was an uncertain situation in 2020-21.

The result has been failed to reject the third hypothesis which was, strict government mandates negatively impact livestock industry. Indeed, the year 2020 was largely affected by the spread COVID-19 pandemic. Nationwide lockdowns and different regulations were imposed by the government. This disrupted the supply chain of the livestock.

The result has been failed to reject the fourth hypothesis which was, H04: Yearly vaccination rate in the livestock industry is hampered due to economical unrest caused by lockdown mandates. Due to the lockdowns and strict regulations, the economical unrest aroused. The normal vaccinations of the animals were halted. Many animals were dead because of this. Lack of vaccination caused an uncertain situation in this sector. Because of the strict regulation in COVID-19 situation this uncertainty aroused.

Table 11: Now, the correlation between inflation and the contribution to GDP of the livestock sector:

(Government , 2015-2021)

Year	Inflation rate	Contribution to GDP	Correlation Coefficient
2019	5.48	1.47	-0.330867613
2020	5.65	1.43	
2021	6.05	1.44	
2022	6.17	1.45	

The table 11 was constructed to build a correlation between the contributions to GDP to inflation rate. From year 2019 to 2022 the contribution to GDP data was collected. The inflation rate increased over the years and the contribution to GDP decreased. With the help of Microsoft Excel, a correlation chart was developed, and the correlation coefficient was achieved. The equation for the correlation is:

$$y = -0.0173x + 1.5487 \quad (1)$$

$$R^2 = 0.1095 \quad (2)$$

The correlation coefficient is -0.330867613, which is negative and indicates that there is a negative relationship between the increasing inflation rate and the contribution to GDP.

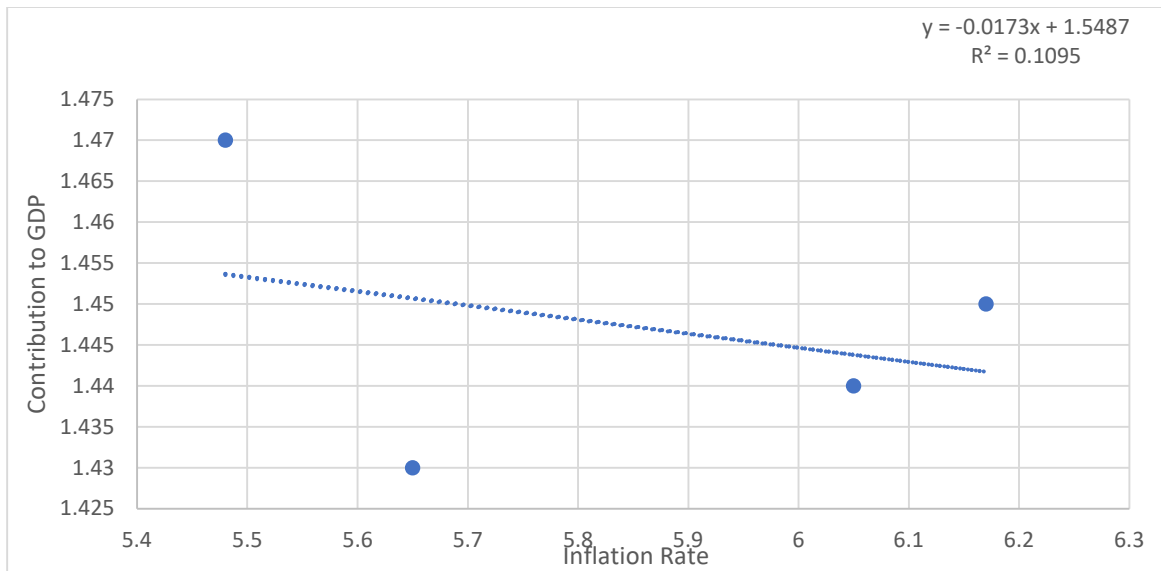


Figure 4: Correlation Between to GDP and Inflation Rate

As from the figure 4 it can be observed that, the line if the figure is downward sloping. With the increasing inflation rate the contribution is decreased. So, it can be said that inflation has a negative correlation to the GDP.

So, the result of table 11 and figure 4 has been failed to reject our first null hypothesis which was H01: Inflation influences supply chain. Thus, it can be said increasing inflation rate developed an uncertainty for the livestock industry.

7 THE UNCERTAIN SITUATIONS:

The worst aspect of uncertainty is that one can never take the exact precautions to tackle them beforehand. That doesn't simply mean we would in utter hopelessness when facing such cases.

We have detailed visualized data from previous events. We can analyze them and categories almost every single one of them into a few major categories. Of course, more nuanced situation will present themselves from time to time, but the ones listed below should cover almost every major phenomenon of uncertainty plausible for livestock industries:

1. Lack of supply.
2. Animal diseases.
3. Government restrictions.
4. Inflations.
5. Increased raw material price.
6. Natural disasters.
 - I. Flood.
 - II. Cyclone (Amphan, Sidr, Fani etc.).

7.1 The impacts of uncertain situations on supply chain of livestock industries are follows:

The impacts of uncertainty on the supply chain of livestock industries are alarmingly far reaching.

As discussed in the quantitative section of our research paper we found out that there is almost always a negative correlation between the supply chain of livestock industries in uncertain situations and the macro/micro economy of the country. These impacts are extremely far reaching and can spread to individual levels in the society. Below we tried to categorize some of the most notable macro level impacts. We limited our research variables to macro levels not to set aside the micro details but to discuss the bigger picture that might help the economy in a larger scale.

Some of these are:

1. Demand effects
2. Distribution and retail.
3. Food chain sustainability.
4. Production Facilities and Farming Inputs
5. Labor availability.

7.2 Demand Effects:

Demand effects are almost always the ones to arise at first in uncertain situations. The foremost self-evident impact on the demand can be easily visualized with Covid-19 situation.

In such situations, the developments of supply and demand and the results on costs are exceptionally volatile:

- Demand from restaurants will drop (descending weight on prices).
- Domestic consumption demand will increment, as livestock elements like chicken remains the cheapest accessible source of protein (upward weight on prices).
- Supply chain disturbances are planning to make supply side difficulties, including instability (upward pressure on prices).

7.3 Distribution And Retail:

When it comes to supply chain components of livestock industry distribution and retail always stand out as the two most influential and fundamental ones. Sustainability of the entire production-demand chain depends largely upon fruitful conveyance and hassle-free retail experience between the producers and shoppers. Consequentially, due to being a major part of livestock supply chain this portion also faces a significant number of unwarranted challenges caused by logistical deterrents as effects of uncertainties. Market analyzation can pinpoint us the major hurdles a livestock distribution and retail chains might face.

Most of the times uncertain situations doesn't not arise and affect the whole wide world or let even a single country at once. Most of the times these incidents are isolated and local that affect the local economy the most. One if not the major obstruction that local distribution and retail chains might confront is related to vehicular movement and street activity controls.

We hardly ever have to worry about uncertain situations of global scales. That changed in 2020. We saw lock-down of endless regions. Within the case of Bangladesh like many other countries we observed heavy transportation bottlenecks in fundamental streets which have influenced the local meat supply. Delays of vehicles transporting vaccines, feed additives, drugs other livestock elements debilitated to cause a deficiency until movement bans were released.

7.4 Sustainability of the food chain:

Just like most rural ventures, the production growing frameworks for animals as well as their supply chains face several planned supply intrusions. Uncertainty can hinder the sustainability of the animal chain in a number of areas, including the handling of animal products during production along with their promotion and use. Lack of availability to farming inputs, such as animal feeding resources, as well as pertinent technologies, such as rotolactor, vaccines, and other crucial production factors, can be the major production calculated interrupter. Additionally, processing animal products like milk and meat may add another barrier to the end of the generation cycle, forcing farmers to reduce output and waste products.

7.5 Infrastructure and Agricultural Attributes:

Farmers have limited opportunities for promotion because of constraints on shipping operations and local mobility that prevent them from accessing the production inputs for animals. There is a significant decrease in essential animal-cultivating supplies and offices as a result of the restriction of advancements and the interruption of regional and global exchange programs, including livestock feed, medications, antibodies, feed additives, and other agricultural inputs. There is no doubt that reductions in production inputs and its interchange can easily hinder the

productivity of animals to the profit of animal producers (typically local producers of meat and dairy), as well as the economic stability of large companies themselves.

7.6 Labor Availability:

Labor is another issue is needed to be considered. During the uncertain situation in supply chain, the labor availability is a big concern. Lack of imposing proper labor force can bring devastating situation for a particular industry.

8 MITIGATION STRATEGIES:

Now that we have done a detailed discussion thread on various uncertain situations and their impacts on the livestock industry supply chain, we can finally divulge ourselves into finding possible mitigation strategies. Better strategy can be developed with improved policies. The policy making institutions includes government policymakers, non-governmental institutions/organizations, and scientific community.

8.1 Government Policies:

Government can play a prominent role in mitigating the uncertainty of the livestock supply chain through their policies, mandates and plannings. Some of the points which can be helpful are:

1. Providing a comprehensive training from the level zero (e.g., farmers, stockman etc.). Government employees can give them a practical training to manage any critical situation on their own farm and beyond.
2. Financial support can be highly beneficial. During the time of an uncertain situation, financial crisis also sticks with it. Low interest rate of loan can provide an ease to farm owners, farmers as well as other person remaining in the chain.
3. Ensuring the access of animal husbandry and veterinary facilities to all the people who are associated with the sector. Regular vaccination program, ease of having the medicines for the animals, ease of having veterinary doctors, regular checkups and consultations can play a vital role.
4. Providing subsidies on production inputs such as machines, medicines, feeds, and other equipment can be beneficial.
5. Providing a better distribution program to the consumers. Easy consumption can increase the demand.
6. Training programs can be organized for the personnel who are directly associated with the supply chain.
7. Constant monitoring and guidance from the government authorized experts.

8.2 Scientific Community:

From the scientific community side, imminent easing procedures which will make strides the flexibility of the livestock supply chain have been proposed. Presenting modern protein sources, such as insects, algae, and dairy-processing by items (e.g., whey proteins), to the food supply chain as choices to animal protein sources is one of the suggested procedures (Mahmoud F. Seleiman, 2020-05-25) (Rossi, 2020). Another desirable option relies on the use of tissue culture technologies to generate animal muscle in vitro as an environmentally friendly production technique because methane outflow by farm animals will be reduced (Sghaier Chriki, 2020) (Hafez M. Hafez, 2020) . In any case, these procedures appear not sustainable enough for a developing nation like Bangladesh and may require moral and social acknowledgment.

8.3 Basic administrative strategies to avoid the damaging effects of uncertainty on the livestock farming system are summarized as follows:

After examining mitigation strategies from different aspect of our society we were able to come to a general understanding. We concluded that single entity of the community alone can provide solution to all our problems regarding livestock supply chain in uncertain situation. And combining the best of all worlds would be the most fruitful decision. In the following section we have done the exact thing and tried to form a list of simple administrative plans to achieve this goal.

8.3.1 Maintaining Farm biosecurity:

- a. Ensure general hygiene to animals.
- b. All machines and solid surfaces must be sanitized and cleaned.
- c. Limit the contact between wild animal and farmed animals.
- d. Regulate the joining of new animals in the herd.

8.3.2 Ensuring Human health and safety:

- Following health care regulations.
- Monitoring the welfare of the workers.
- Workers who are infected must restrained themselves from mixing up other workers.
- Following the bio security for safety.

8.3.3 Human-Animal Contact Animal Health and Welfare:

- Proper housing management for the animals.
- Ensuring sanitary in the farm.
- Using modern precision tools for farming.

8.3.4 Monitoring of Animals:

- Following animal wellbeing standards.

8.3.5 Focus on Production Cycle, Transportation, And Marketing of Livestock Supply Chain:

- Ensuring the availability of production inputs such as semen, feed, vaccines etc.
- Try to focus in using existing and local feed resources.
- Try to use the online marketing platforms and technology.
- Inspect the market demands and adjust the supply.
- Try to minimize the production waste.

9 DISCUSSIONS:

The purpose of this paper is to study the uncertainties of the livestock industry, their impact, and to find strategies to mitigate these uncertainties. In all, we have seen six uncertain situations in our study. We examined the quantitative data and concluded that the livestock industry has been affected by uncertainties in the years 2020–21. As we can see, there is a massive decline in the accomplishment of the target for the years 2020–21. The 2020–21 financial year has been dominated by COVID-19, which is a hugely uncertain situation for the livestock industry. So, our research fits with the qualitative data in our study. From the correlation between inflation throughout the years 2019 to 2022 and the contribution of livestock to the GDP, it is evident that inflation can also be considered as an uncertain situation. From the interpretations of data, we have researched the impacts of these uncertain situations on the livestock industry. The livestock supply chain is hampered at each step, from feed to reaching the consumer, by these uncertainties. At the end, we have given some mitigation strategies to improve the livestock supply chain. From the government's policymakers to the scientific community, farmers and ranchers should work on these strategies to have an advanced livestock industry for the betterment of Bangladesh.

10 CONCLUSIONS:

Uncertain situations as the name entails impossible to have a firm grasp on. But still in this paper we have tried to represent a comprehensive idea regarding all the major factors, their effects and possible solutions to a supply chain crisis associated with the livestock industry of Bangladesh in unpredictable scenarios. As for research findings both qualitative and quantitative approaches have been taken, and the quantitative data was examined through empirical means.

The study tried to identify possible appropriate risk mitigation strategies and their sustainability in the long run. There will still be a huge scope for farther research as we are bound to face more nuanced unpredictable scenarios in the future and no single study can provide an in-depth analysis for all of them.

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