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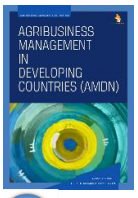

REVIEW ARTICLE

A SYSTEMATIC REVIEW ON IMPACT OF COVID-19 ON AGRICULTURAL PRODUCTIVITY, FOOD SECURITY AND RURAL LIVELIHOODS IN BANGLADESH

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ABSTRACT

Due to the COVID-19 pandemic, the world is facing severe economic challenges as it has slowed down human activities all over the world. COVID-19 spread rapidly after the first occurrence of infection was identified on December 31, 2019 in China and it has massive consequences on the health and livelihoods of the people of developing country es like Bangladesh. Food security and livelihoods are the most important aspects of agri-food systems. Besides human health concern, agricultural productivity is declined and food security is threatened globally. The basic aim of this paper is to understand the impacts of COVID-19 on agricultural productivity, food security and rural livelihoods in the context of Bangladesh. In Bangladesh, the farming activities and food supply process are greatly disrupted during the lockdown period of March to May 2020. The marginal and smallholder farmers aside by the rural areas in Bangladesh characterized by poor socio-economic condition are so much vulnerable during this crisis period. As a result, the rural poor farmers are the worst sufferers and faces a wide range of constraints throughout the process of crop cultivation, harvesting and marketing. Furthermore, the disruption of demand and supply chain causes low market price of agricultural products accounts for enormous economic loss of farmers. Therefore, the government of Bangladesh should act promptly and undertake combined initiatives involving all the concerned departments to mitigate the adverse effects of pandemic on agri-economy and food systems in Bangladesh.

KEYWORDS

COVID-19, Agri-economy, Food systems, Challenges, Bangladesh

1. INTRODUCTION

Plagues and epidemic diseases have devastated humanity during its presence, frequently changing the course of historical record while still demonstrating the end of our civilization. Three devastatating epidemics to be mentioned are the Spanish flu (1918-1920), the Asian flu (1957-1958) and the H1N1 Swine flu pandemic (2009-2010). The coronavirus pandemic that broke out in the city of Wuhan, China on December 2019 and later spread to other parts of the world from early February, 2020 has expectedly worsened the fate of the poor people living in developing countries like Bangladesh (World Bank, 2020). Now, humanity is affected across the globe by this COVID-19 which is popular as Corona virus (Paul, 2021). Since the early breakout of coronavirus, the world economy, especially the agricultural sector has been facing many problems.

Agricultural farming consists of a series of activities to cultivate wide range of crops having economic value (Moran, 2021). The agriculture sector of B angladesh is characterized by rice based cropping pattern where majority of the farmers belong to marginal or smallholder group (BBS, 2018). The marginal, and smallholder farmers are accounts for producing lion portion (70%) of agricultural production are severely affected by the COVID-19 pandemic (FAO, 2020). A huge number of population are being employed in the total process of food production and value chain (planting, harvesting, processing, marketing). The process of food supply and marketing value chain is complicated in nature involving multiple stakeholders. The COVID-19 pandemic has damaged the agricultural food system worldwide while about two billion people in South Asia have been affected by this pandemic (Mohan, 2021). The major concern for Bangladesh is to alleviate poverty and hunger to fulfill the sustainable development goals. On the other hand, Bnagldesh is one of the most vulnerable countries facing extreme climatic events like floods, drought, salinity intrusion, cyclone almost every year (Uddin et al., 2020).

During the lock down period the regular activities of human being become minimized due to the restritions imposed by the government to prevent the rapid spread of this deadly virus. People are bound to saty inside the room. All the activities related with food production, processing and supply cahin are affected badly (Barman et al., 2021). The changing demand of the consumers is another reason for the disruption of food supply chain. That's why the government should facilitate the people involved in the process of food production, processing, marketing and distribution of food products to satisfy consumer needs (Aday and Aday, 2020). The covid-19 pandemic critically afftets the rural farming community and causes a serious threat of food crisis all over the world (Barman et al., 2021). The farming activities are hampered because of unavailability of agricultural inputs (seed, fertilizer, pesticide, feed, vaccine etc.) and low market price of agricultural produces due to break down of transporationa and marketing system (Workie et al., 2020). The pandemic has made the life so difficult for the people of working class to earn their bread and butter. Almost two billion workers have lost their works all on a sudden (ILO, 2020). The corona pandemic has destroyed thousand of emerging business and social entrepreneurs by restricting their regular business activity (Bateman and Ross, 2020). In developing country like Bangladesh, where majority of people lives aside rural areas

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with serious concern of poverty and food security (Hossain, 2021). About 43% of the total labor force depends on agriculture sector for their livelihood (BBS, 2018). During the pandemic a large number of people lost their job which causes deterioration of physical health and mental unstability due to unemployment (Posel and Oyenubi, 2021). As COVID-19 is a buring issue now adays, studies conducted by (Gautam et al., 2021) on health, economic and environmental impacts of COVID-19. Another study accomplished by (Nobi et al., 2022) on socio-economic impact of COVID-19 and adapation challenges while (Shammi et al., 2022) conducted a study on strategic assessment of COVID-19 pandemic in Bangladesh. Zabir et al., (2021) conducted a study on COVID-19 and food supply scenario in Bangladesh. As Bangladesh is an agrarian country, it is so crucial to investigate the impacts of COVID-19 on agricultural economy and rural livelihoods. But no study has been conducted exploring the impacts of COVID-19 on rural economy in the context of Bangladesh. So, this review study attempts to inspect the impacts of COVID-19 on agricultural productivity, food security and rural livelihoods in Bangladesh.

2. Materials and Methods

To accomplish this study a systematic method of literature review called Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) was used (Tricco et al., 2018). This is an effective and mostly preferred method to review the latest literature which allows to discover new knowledge in the field of interest (Colicchia and Strozzi, 2012). This method of literature review brings an insight and logical diagnosis of formerly conducted research or current knowledge in the field of study to conduct the review. Moreover, a systematic literature review is more accurate and trustworthy process of literature review without any biasness (Mallett et al., 2012). This commonly used method of literature review enables the author to recognize, composite and evaluate all the available evidence or documents (qualitative or quantitative) for successful completion of the study (Mallett et al., 2012; Van der Knaap et al., 2008).

2.1 Scope of The Study

COVID-19 is a burning issue now a days and it has devastating impact on agricultural productivity and livelihoods of rural people. For maintain steadiness and keep the research on the targeted area of research constantly this study only considered those were conducted specifically in the field of agricultural productivity, food security and livelihoods of rural people during COVID-19. To accomplish this review study the data sources used including Scopus, Web of Science, Science Direct and JSTOR. Those databases were used because of containing a good number of peer reviewed research articles in divergent areas of science (Baier-Fuentes et al., 2019; Dias et al., 2019). The articles from databses were identified and used because of being peer reviewd and indexed in widely accepted scientific databases. Besides the peer-reviewd articles we also considered the relevant documents of different UN specialized organizations such as the World Health Organization (WHO), Food and Agriculture Organization of the United Nations (FAO), United States Department of Agriculture (USDA), World Trade Organization (WTO) and daily newspapers that have local and universal coverage, high circulation and ensure quality (journalistic standards) (Schmidt et al., 2013). Online versions of the newspapers were selected because they have broad geographic coverage and are readily accessible to researchers through online databases (Gugsa et al., 2016). Furthermore, the online version of the newspaper is more influential than the print version (Schmidt et al., 2013).

2.2 Searching Procedure

To search the articles the keywords such as *COVID-19**, *impact**, *agricultural or farm**, *productivitivity**, *food security**, *rural** and *livelihood** were used in the title of the study. Additionally the terms *employment**, *food demand**, *supply**, *labour market**, *employment** and *Bangladesh** were also used. This review was confined to the peer-reviewd articles and trusted documents published in English because the dispersal of useful scientific information and knowledge is primarily done in this language across the globe (López-Fernández et al., 2016).

2.3 Screening of The Documents

At the screening stage, the relevant research articles were identified by using the above mentioned keywords while the other documents were excluded. To execute the review process a muti-stage screeing technique was followed which involves go through the title or abstract of the study while the full or partial text of the articles were also read when it is required. A good number of articles were eliminated due to the duplication in nature. Based on the specific subject area, the irrelevant articles were eliminated while the studies those are relevant and related to COVID-19 and its impact on agriculture sector and consequences were finalized to accomplish this study.

2.4 Data Extraction and Synthesis

All the relevant and necessary information were extracted by reading the selected articles. The impact of COVID-19 on agricultural productivity, labour market disruption, demand and supply of agricultural commodities etc. are the major points of the study. Efforts were also given to discuss the emerging challenges of agricultural economy in the upcoming days as well as the overcoming ways to mitigate the deleterious impact of pandemic on humankind.

3. Results and Discussion

3.1 Agricultural Economy During the Pandemic

Agriculture contributes to more than 1 billion people worldwide and is the lifeblood of developing countries. In case of Bangladesh, agriculture sector contributes 12.65% in the GDP (The Global Economy, 2022). While the contributions of crop and fisheries sectors to agricultural GDP are about 56% and 23% respectively, contribution of animal farming (livestock) is about 13% (BIDS, 2020). In case of creating employment opportunities, agriculture sector is responsible to create employment opportunity for 38% people of Bangladesh (World Bank, 2021), The pandemic's prevention tactics are impeding the agricultural production and transportation. Agricultural production is a lengthy process that requires effort at many stages, from planting to nurturing to harvesting to commodity export. As a result of their reliance on market value chains, the food and agriculture sectors are deemed less resilient. Travel restrictions imposed by countries over the world to reduce the risk of transmission of the coronavirus have impeded these efforts. Agriculture farming system is a high-input sector and the reliance on each factor of production can vary dramatically, exposing agriculturalists and planters to increase price of agricultural inputs (seed, fertilizer, pesticide, feed, vaccines etc.). Densely populated ports or highways, immigration and custom delay causes transportation interruptions and a lack of access to finance. All of these factors factors resulted in higher cost of production. These added expenditures make agricultural production less economical, perhaps resulting in an enormous economic loss for farmers (Workie et al., 2020). The limited physical movement causes hindrance to transporatation and marketing of daily necessities especially the perishable agricultural commodities. The price of the daily necessities goes higher due to the inconsistency between demand and supply of the products. As a result, marginal and smallholder farming households of the developing countries like Bangladesh become vulnerable to maintain their livelihoods. COVID-19 has claimed a significant number of lives around the world and represents a serious and unexpected threat to public health, food systems and the workplace. The pandemic has devastated the economy and society, putting ten millions of people at risk of falling into poverty (WHO, 2020). The COVID-19 seems to have the ability to obstruct or even reverse progress made toward the Suatainable Development Goals (SDGs). Throughout the lockdown period restrictions imposed by governments to prevent the spread of the virus, the food security dependet goals (SDG-1 'no poverty' and SDG-2 'zero hunger') will be heavily affected, particularly in developing countries like Bangladesh. (Workie et al., 2020). In such a difficult situation, the rural poor people relies primarily on agriculture, are likely to face unemployement and food insecurity. As a result of inadequate and imbalance feeding habit, starvation, malnutrition and lack of income adversely impact their health status and daily well-being (United Nations Department of Economics and Social Affairs, 2020).

3.2 Farming and Farmers During the Pandemic

The importance of agriculture sector for the economic growth and development of the country is beyond the sectorial contributions to the country's GDP while 67% of the total population belongs to the countryside. In the last two decades the country achieves success to reduce overall poverty but the proportion of people living in rural areas is still three times higher than in urban areas (BBS, 2018). The agriculture sector of Bangladesh is mostly dominated by small, fragmented farm and rice based cropping systems. Bangladesh consists of 25.35 million of rural farming households of which major portion belongs to small farm size (0.05-2.49 acre). The marginal, and smallholder farmers are accounts to produce lion portion (70%) of agricultural production (Ministry of Agriculture, 2021). The marginal and smallholder farmers do not have adequate access to resources like land, labor, capital and capacity to adapt with the vulnerability caused by any natural hazards or pandemic (Chambers and Ghidyal, 1985). The unavailability of agricultural inputs cause a sudden rise of market price. The travel restriction causes hindrance to import necessary farming input causes unwanted delays

during the planting seasons whis is vital to maintain good agricultural productivity (Schmidhuber et al., 2020). This drastically reduces the agricultural productivity and causes threat to food security (FAO, 2020). The imposed lockdown has severely hampered the timely cultivation and harvesting of Rabi (winter) crops followed by sowing of Kharif (summer) crops due to shortage of labor, trasporation and marketing facilities (Cariappa et al., 2020). Daily workers who earns their livelihood by working in others farm are facing increasing threats to maintain their livelihoods and food security. Staying inside the house is not an option for them, as they need daily income to survive every day. As a result, an all-encompassing and well-organized plan is required to mitigate the impact of such unforeseeable catastrophes, particularly for the vulnerable sections of developing countries.

3.3 Food Supply and Security Crisis

During the global crisis, the major concern for the humankind is the availability of food. Many findings revealed that as a result of pandemic the global food production might be reduced resulting in unavailability and higher price of food products (CNN, 2020). The perishability of the products make the farm produce useless after a certain period of storage was another issue with the food supply. The disruption of demand and supply chain has made the agricultural markets more volatile than before (NBC, 2020). As a result of the drop in wages and remittances, depressions and food insecurity have emerged throughout the country (World Bank, 2021). Shortage of labor disrupts the whole process from production to marketing of the products affecting industry owners, manufacturers and processing units (Schmidhuber et al., 2020). The pandemic has restricted the movement of workers, changing the demand of the consumer, closure of manufacturing facilities, restrictive food trade deals, and economic tensions in the food production chain. In this situation government should facilitate the movement of workers and support financially to the vulnerable workers (Aday and Aday, 2020). Food security becomes a serious concern especially among the disadvantaged and low income families of developing conutries like Bangladesh (Raj Singh et al., 2021). During the pandemic panic shopping and hoarding were arguably the most prominent effects among the solvent afmilies. Fearing that they would be imprisoned for longer, many have begun to stockpile large quantities of durable food in a short amount of time, causing retailers to struggle (Daily Democrat, 2020). To mitigate the food crisis, backyard gardening becomes so popular and spread rapidly among the mass people than before (Huffington, 2020).

3.4 Labor Disruption

Agricultural labor disruption during the pandemic makes the harvesting laborious and time consuming resulting in higher price of agricultural products for customers (Fork, 2020). At the very beginning of this pandemic, the whole world was stopped for full hours. At that time the crisis of food was severe but we failed to realize the inconvenience caused due to shortage of labor. The workers across the world have lost their job in a sudden and found it difficult to earn their livelihood (ILO, 2020).

Table 1: Projected Scenario of Reduction of Working Hours and Employment Between Q4 2019 and Q2 2020

	Number of jobs lost in full-time (millions)		Total hours of paid work lost (%)
	Assuming 40 hrs/week	Assuming 48 hrs/week	
G20	320	265	14.0
Leading economy	70	55	14.2
Developing economy	250	210	13.9

Source: (ILO, 2020)

COVID-19 brought a lot of difficulties for the working women. They become so helpless and are unable to support their families because of losing their job without any notice (Bateman and Ross, 2020). Some of them became ill, be quarantined, or be compelled to stay at home, exacerbating the early effects (EUobserver, 2020). Longer shifts and increased stress on workers might jeopardize their physical and emotional health, perhaps leading to further shortage of staffs (Politico, 2020).The opportunities to work in the agriculture sector during planting and harvesting season also become shrinked due to restriction in physical movement (European Commission, 2020). Agriculture sector employs a significant number of part-time and seasonal workers and the virus has certainly led to a shortage of on-farm labor. Furthermore, a major portion of this labor is made up of migrant workers from far-flung nations who cannot be replaced in the short term (Aljazeera, 2020). In agriculture dominated country like bnagldesh where Boro rice is a major crop. Farmers' highly rely on human labor to harvest the crops while acute shortage of labor brings difficulties to harvest the mature crops in time. This also increases the harvesting loss and delaying of planattion of succeeding crops (Mahmud, 2020; Rahman 2020).

3.5 Market Price of Foodstuff

During the corona virus, the market price of agricultural products (cereals, meet, milk, egg) increased to a great etent. According to the Bureau of Labor Statistics the food price index increased by 1. 5% during the pandemic period (BLS, 2020). The market price index of fish, meat, and poultry increased by 4.3% while in case of cereals and bakery products the price inde increased by 2.9% (Johansson, 2021).

Table 2: Change in Retail Price Index for Major Food Groups

Major food	Retail price changes (%)
Eggs	16.1
Fish, Meat and Poultry	4.3
Nonalcoholic beverage	2.9
Cereals and bakery	2.9
Fruits and Vegetables	1.5

Source: Bureau of Labor Statistics, (2020)

According to FAO, during the corona pandemic the price of various food products increased 2% to 9%. Due to the restriction of the whole system (food production, food processing, transportation, marketing, and consumption by consumers) during pandemic condition, the prices of various food products in the global market rises suddenly (Mogues, 2020). The cultivation and supply of high-value food items like vegetables, meat, fish and fruits reduced. As a result the economic growth of many emerging agriculture based industries ceased down (Workie et al., 2020). Similarly, the impact of pandemic on animal farming should not be overlooked. It is primarily due to the availability to feed, vaccines, fall down of consumers demand with lack of transportation and marketing facilities. Farmers of Bangladesh do not receive the fair price of their farm products (vegetables, pineapple, milk) which makes them so disappointed (Ahmed, 2020; Chakma, 2020; Mansur, 2020). The huge economic loss caused by the pandemic is quite irreparable for the marginal and smallholder farmers of Bangladesh.

3.6 Pandemic Scenario and Challenges

This corona virus has spread throughout the globe in a relatively quick period of time and had disrupted economic growth (Chalabi, 2020). Bangladesh, along with many other countries, is suffering from such a crisis and also experiencing the devastating consequences of the pandemic (Bhuiyan, 2020). In addition to public health, the coronavirus has had an impact on the country's economy, trading activities, food industry, transportation and marketing system (Begum, 2020). The food supply in Bangladesh as well as that of other countries around the world has been affected due to shutdown (Khan, 2020). Furthermore, due to the shortage of human labor and less mechanized farming systems, it is projected that the globe may face a food crisis in the future (Troskie, 2020). As a result of the lockdown, transportation routes are being blocked, fresh food supply lines are being disrupted. As a result food loss and wastage of foods are increasing throughout the country (Roy, 2020). The country has had immense success in agricultural producitivity in recent years but food demand and supply become unbalanced due to broken down of supply chain.

Although Bangladesh has established an emergency transportation system for agriculture sector, a large amount of perishable food is still wasted every day due to the lack of an appropriate transportation and marketing system. Bangladesh is also in need of transporting some necessary foods from overseas, but transporting them across the country is challenging during the pandemic. As a result, if essential steps are not taken immediately, the country's overall food supply chain may worsen. Due to the inadequate number of buyers and traders in local markets, farmers were also forced to sell their vegetables at low prices (Bhuyan, 2020). Figure 1 depicts the lockdown condition in covering geographic areas of Bangladesh. The shutdown had a severe impact on farming activities and entire agriculture industry restricting the production and supply chain.

4. Points Should Be Considered To Cope Up The Challenges

First and foremost, an institutional committee should be formed consisting of experts from diversified field to investigate the impacts of

COVID-19 on the food value chain of the country. This committee will be responsible in monitoring progress and recommending ways to mitigate COVID-19 impacts on farm productivity and food supply chain. The committee members should engage multiple actors for effective implementation of the strategies (FAO, 2020). To mitigate the negative consequences caused by the pandemic the following recommendations could be followed to meet the sustainable development goals by 2030 (Workie et al., 2020).

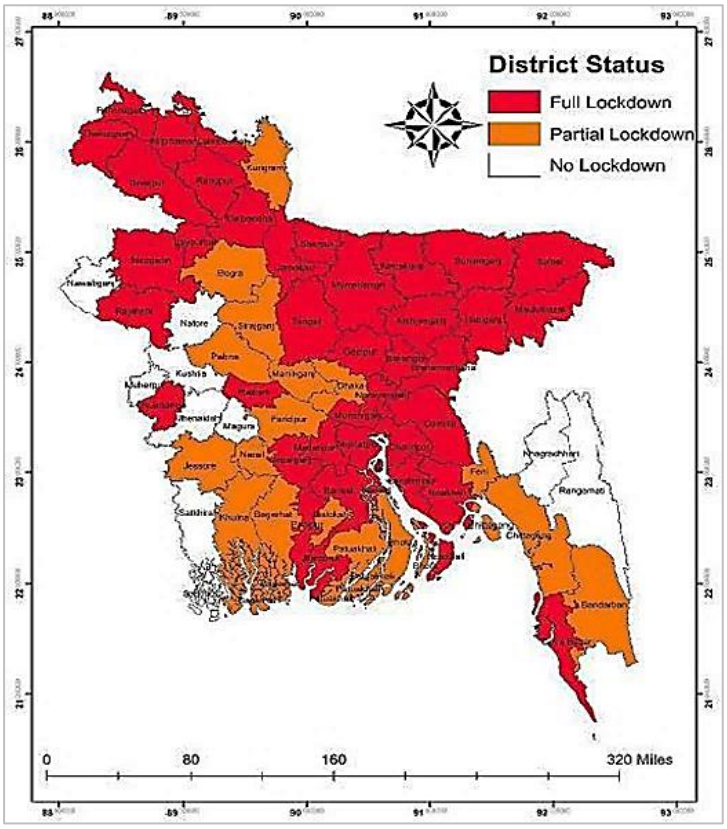

Figure 1: Lockdown status of Bangladesh (Kabir and Chowdhury, 2021)

Table 3: Major Challenges of Agriculture Sector in Bangladesh Due to COVID-19 Pandemic

The key challenges	Description
Farmers' financial crisis and challenges for undisrupted supply chain and market activities.	Due to the nationwide lockdown, farmers were unable to sell their harvested field produces. In addition, the supply of essential farm inputs for daily farm operations were hampered. Due to COVID-19, the trade and commerce in local, national and international markets were hampered and farmers are facing an enormous economic loss.
The impulsiveness of the market price and the higher cost of purchasing inputs leads to the wastage of farm products.	Due to their inability to acquire food, a huge number of low and middle-income people are already modifying their eating habits. This in turn rises the concern of food insecurity and malnutrition among the rural poor people. harms the market price. Farmers are unable to sell their farm produces because of interrupted transportation, processing and marketing system causing farm products to deteriorate in the field.
Due to a labor shortage and the occurrence of regular extreme climatic events, farm activities are greatly hampered.	Bangladesh is extremely vulnerable to natural hazards like untimely rainfall, flash food, salinity intrusion etc. (IPCC, 2014). For timely harvesting of the mature crops like Boro rice farmers are in need of human labor during the peak harvesting season.

4.1 Food Assistance Program

It is critical to strengthen community food security programs, particularly among the rural poor community, to supply food and other requirements to farm families with significant income earning opportunities (Barrett, 2020).

4.2 Credit Support Service

An alternative and effective coping strategy for the food and nutritional assistance program in which disadvantaged groups of the society including landless, migrants, laborers, lactating and pregnant women and others can be given a set amount of credit to meet their basic economic needs.

4.3 Proper Management of The Supply Chain

During pandemic, the majority of underdeveloped countries experienced disruptions of supply chain. Therefore, proper initiatives to increase the storage capacity of buffer stock, processing and distribution will result in mitigating the negative imapcts (Financial Express India, 2020).

4.4 Technological Reformation

By utilizing different information and communication technologies the efficiency of marketing and supply chain can be greatly improved amid the pandemic. To enhance the marketing of agricultural products e-marketing system based on mobile networks could be facilitated (Kumar et al., 2020).

4.5 Decentralized Food System

A decentralized farming system should be developed to assist the emerging enterprises or start up business to become self-sufficient while also aims at protecting local food systems. This will also aid in the achievement of a better food system (Nature India, 2020).

4.6 Fair Trade Policy

To address the domestic food demand resulting from the crisis, there is an urgent need to remove restrictions on importing food items and reduction

of taxes on consumable commodities to serve the basic needs of human life (Arumugam et al., 2020).

4.7 Relief Package to Tackle The Post Disastrous Condtion

The marginal and smallholder farmers and the people belongs to working class are most vulnerable during the pandemic peiod. The poor, vulnerable farmers and disadvantaged people should be included in emergency aid programs undertaken by the government.

4.8 Initiatives for Self-Sufficiency

During the pandemic period the farming activities become hampered due to restrictions in physical movement. The government should focus on promoting income generating activities like small businesses and local entrepreurial activities which will result economic solvency of farming households (Cariappa et al., 2020; Taffesse and Minten, 2020).

4.9 Global Partnership

For sustainable development strong global cooperation is required especially during the crisis period. The developed countries should extend their support (financial, technological and logistic) to developing counties to save the people from the recent economic crisis and allowing them to recover quickly.

4.10 Public Awareness

Public awareness should be developed so that people are aware to maintain basic health and sanitataion rules to remain safe during the pandemic and encourage them not to stock basic commodities to mainatain human life . For an effective response, control, and prevention of the pandemic an integrated global response with co-ordinated efforts are required.

5. Conclusion

Agriculture is one of the most volatile industries all over the world. This principle appears to be even more valid in developing countries like Bnagladesh where marginal and smallholder farmers are predominant. The resource poor farmers have poor access to resources like land, labor, capital etc. to cope up with the vulnerability due to COVID-19 pandemic. Farmers, food processors, merchants, and almost every stakeholder in the industry are now wondering what will happen next. During a pandemic, maintaining supply in food and agriculture sector, which is one of the most important sectors besides health, is crucial for avoiding food crisis and mitigating the harmful impact on the global economy. As a matter of fact, every country must recognize the gravity of the condition and should take intrgrated approach involving multiple stakeholders to minimize the economic loss of farming community. The network of the food productivity and supply chain should also be strengthen enough to accommodate the challenges.Therefore, the innovative approaches with provision of incentives for the resource-poor farmers the are highly required to combat the challenes of agricultural economy. Emphasis should be given to create alternative income earning opportunities with provision of hands-on training and financial support to alleviate rural poverty. The government of Bangladesh should pay more attention to consider vulnerable condition of rural farmers to address their needs, interest and opportunities for sustainable agriculture and rural development.

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