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REVIEW PAPER

Overview of the impact of coronavirus on the environment, food and sustainable agriculture in Iran

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Highlights

- Study of coronavirus as a threat to public health and its gradual crisis on the global economy.
- Investigating the effects of coronavirus on agriculture and global food security, which endanger life and livelihood?
- Investigating the effects of coronavirus on the link between agri-food systems and the environment.

Graphical Abstract

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Abstract

Coronavirus began in early 2020 while posing a serious threat to agricultural production. A natural sucker for assessing risk between family farms provides answers. Unlike other types of risk, this disease does not directly affect family farms. It affects economic conditions, rising and falling prices for commodities and raw materials, relations between countries and their governments, and comments from experts and economists around the world. In countries already experiencing severe food insecurity, the issue is not only access to food, but also food production. The spread of coronavirus in Iran will also have a major impact on the domestic economy, agriculture, environment, and food. The damage caused by the Covid-19 epidemic to the agriculture and food industries is largely due to decreased demand, restrictions on importing and exporting agricultural and food products, and a reduction in the seasonal workforce due to the ban on driving and the closure of companies that produces agricultural products, packaging, and produce. Finally, if the spread of the coronavirus is not controlled, the damage will increase significantly. This will make the continuation of many businesses involved in agricultural and food production a serious challenge. The economic, health and social impacts of COVID-19 have direct and indirect links to the natural environment and to the way agri-food systems are organized. On the other hand, the growing environmental constraints in Iran reduce the potential of the agricultural sector to play a key role in the economy and ensure food security. Covid-19 therefore forces national programs and budgets to cope with growing ecological constraints. Therefore, the present case study refutes the hypothesis that Covid-19 has no effect on food security in Iran.

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1. Introduction

At the moment, an estimated 820 million people worldwide experience chronic hunger, that they do not have enough food energy for a normal life. Of these, approximately 113 million are struggling with acute insecurity and extreme hunger, which it poses immediately, threatens their lives or livelihoods and makes them rely on foreign aid to get by. Therefore, these people cannot ill-afford In the face of possible subsequent disruption in livelihood or access to food that comes through the coronavirus (HLPE, 2020). The coronavirus began in early 2020, and at the same time posed a serious threat to agricultural production. A natural teat for assessing the risk between family farms provides answers. This disease, unlike other types of risk, doesn't directly affect family farms. These side effects are due to measures of anti-epidemic that affect the behavior of family farms. So, the coronavirus creates instability for the food market in the world that may cause fluctuations in food supply and prices (Du et al., 2020).

1.1. Epidemic of coronavirus

The coronavirus was first discovered in China in late 2019 and has since become a global epidemic, becoming one of the most difficult human tests in modern world history. By affecting health systems, the virus is killing more victims, shaking the world's economic base, including agriculture and food, and creating lasting geopolitical developments. Strict efforts are being made around the world, to contain what has become a profoundly destructive epidemic. Small-scale farmers are one of the most vulnerable groups, which may prevent them from working on their land, restrictions on access to markets to buy seeds and other essential resources or sell their produce, or struggle because of rising food prices, decreased purchasing power due to limitations, and also millions of children lose hope relying on the meals they were previously given at school. According to the HLPE (2020), based on past health crises, all of these can have a significant impact on food security, especially in vulnerable communities (HLPE, 2020).

For example, at the time of the outbreak of the Ebola virus in Sierra Leone (2014-2016), quarantine and panic increased malnutrition and hunger. With the imposition of traffic flowrestrictions, the suffering worsened. There was a shortage of labor at the time of harvest, and even other farmers weren't able to offer their agricultural products in the market. The systemic effect is similar to an earthquake and shows how important strategies of risk reduction and prevention are at present. Fig. 1 shows the dynamic mechanisms of COVID- 19 to affect the food supply chain and has symbolized that rising food prices ultimately increase poverty and food insecurity. Corona restrictions, including access to agricultural inputs and labor in Senegal, changed the production of four strategic crops including rice, maize, sorghum, and millet (Jha et al., 2021). Middendorf et al., studying the shock shocks of the coronavirus on food security and livelihoods of Senegalese families, found that 82.5% of households had difficulty accessing adequate food (Middendorf et al., 2021). Fig. 1 shows the dynamic mechanisms of COVID-19 on the food supply chain, indicating that as food prices rise, so does poverty and food insecurity.

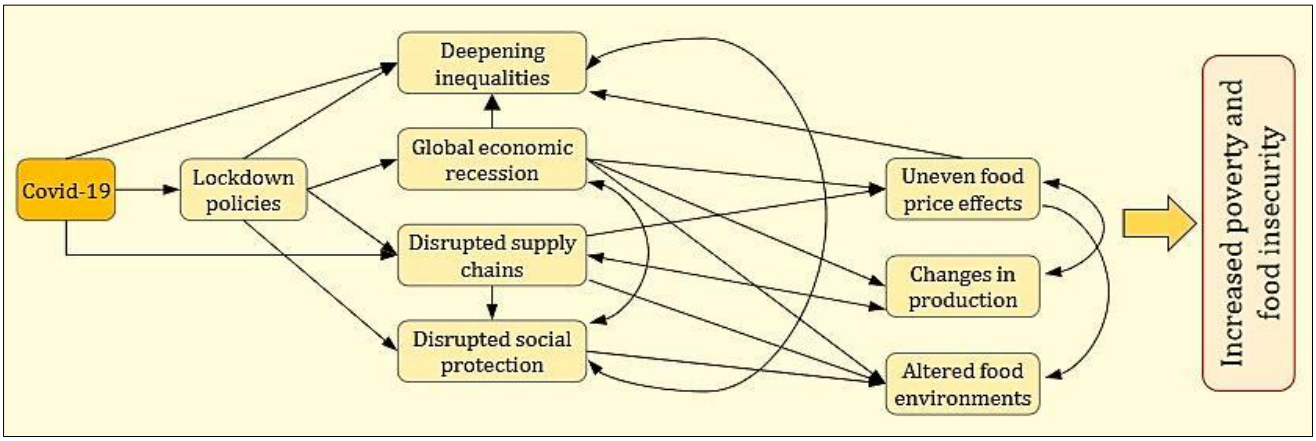

Fig. 1. The dynamic mechanisms of coronavirus on the food supply chain (HLPE, 2020).

With the outbreak of coronavirus in Iran, the government has decided to subsidize low-income households to prevent food insecurity and food supply. Under these circumstances, this decision was not an effective strategy to improve food security (Pakravan-Charvadeh et al., 2020). As can be seen in Fig. 2, considering the relative increase in subsidies and workers' wages in 2020-2021, the purchasing power of each Iranian has decreased by about 30% compared to previous years (Akpan and Aya, 2009). Also, the ineffective policies of the government to deal with the consequences of the economic crisis of the coronavirus have led to a significant increase in food prices and a decrease in people's incomes at the same time, which ultimately leads to malnutrition in low-income households. Fig. 2 shows the trend of a significant increase in the price of various foods from 2017 to 2020.

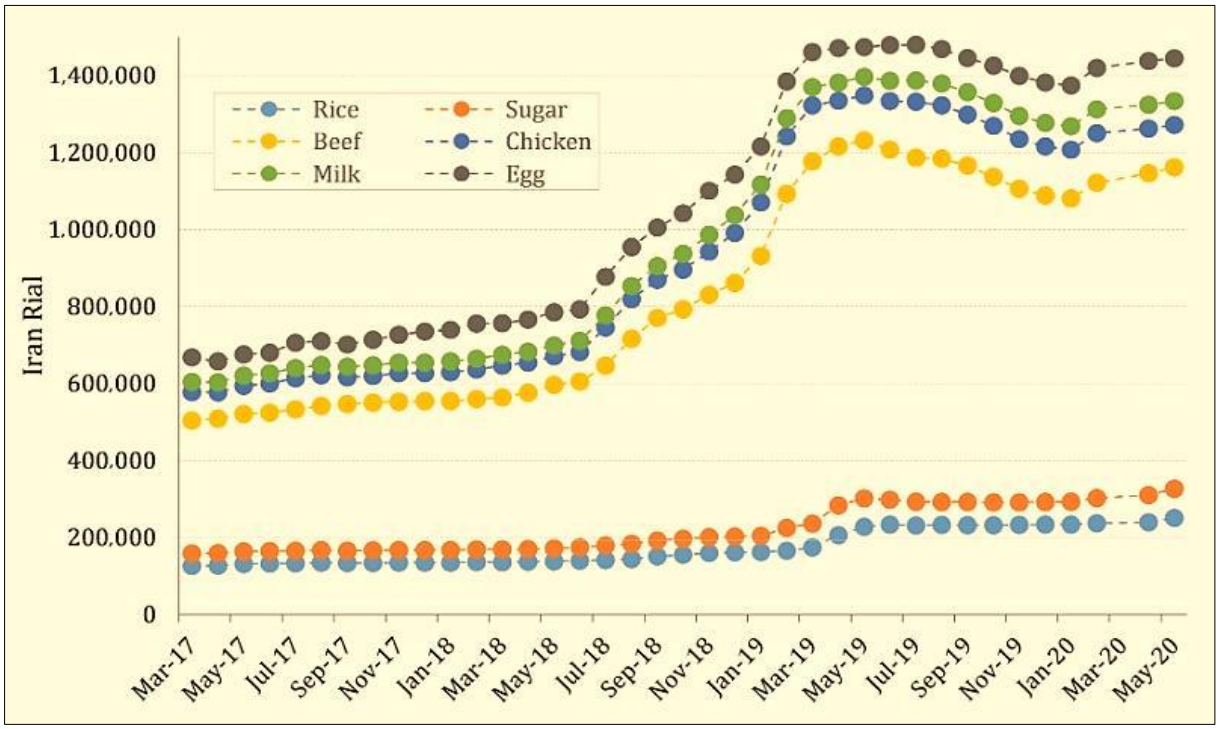

Fig. 2. Prices of foods and beverages in Iran from 2017 to 2020 (Rial per kg^{-1} for rice, beef, sugar, and chicken; Rial per liter for milk; Rial per piece for egg) (Akpan and Aya, 2009).

Found that after the enhancement in the price of eight food groups, including meat, cooking oil, cereals, sugar, coffee, tea, dairy products, vegetables, and fruits, the abundance of vulnerable families raised by 10.63%. Despite the crucial role of a healthy diet in combating COVID-19, nutritional support is essential to prevent infection of individuals (Thomas and Azevedo, 2013). If environmental constraints are reduced, agriculture can support a dynamic and sustainable economy and maintain food security. The consequences of the outbreak of Coronavirus in 2019-2020 Iran can be divided into sustainable and new challenges. In addition to disrupting the food system, environmental constraints can continuously threaten food security in Iran. Climate change, soil erosion and salinity and water crisis are important factors that lead to reduced productivity of agricultural products (Rad et al., 2021).

1.2. Effect on supply and demand

Coronavirus disease incidence is rapidly increasing. This issue isn't a regional problem but it is a global problem, to which the whole world is responsible (HLPE, 2020). The disease will eventually be controlled, but we do not know how quickly it will be controlled. This is almost abnormal because it impresses remarkable elements of the demand and supply of food and agricultural products: (a) the supply chain will be disrupted due to the impact of this virus on people's lives and well-being, but efforts are still being made to mobility constraints and the high cost of doing business because of supply chain constraints and tightening of credit; and

(b) demand has also declined because of more uncertainty, increased cautious behavior, restraining efforts, and increased financial costs, which decrease the ability of people to spend (HLPE, 2020).

1.3. Covid-19 and new economic challenges

The Covid-19 crisis was first and foremost a threat to public health, but it has gradually become a global economic threat. Although there is no way to determine the economic damage caused by the new coronavirus epidemic, there is a consensus among economists that the epidemic will have a severe negative impact on the global economy. The Organization for Economic Co-operation and Development (OECD) has warned that in the coming months, some of the world's major economies will enter recession and it will take years for Covid-19 economic damage to be offset (Louhichi et al., 2020). Both life and livelihood are at risk from the COVID-19 virus pandemic, which has negative effects on agriculture and global food security. Although in some countries the epidemic prevalence is slowly decreasing and in some cases increasing, in other countries the virus is increasing or spreading rapidly. This is a global problem that needs to be addressed. Unless immediate action is taken, emergency states a threat to global food security. This threat to food security can have devastating long-term effects on hundreds of millions of children and adults. The result of this risk causes to lack of availability of food and in some cases reduced incomes and increased food prices. Countries that have already been experienced severe food insecurity aren't just concerned with access to food, but also because of food production. Du et al., in a study entitled the term and long-term effects of coronavirus outbreak on family farms in China-Evidence from 2,324 farms showed that (Du et al., 2020):

1) As the incidence of all coronaviruses increases, so does it have a short-term effect on family farms? In particular, the efficiency of family farms and the allocation of resources with the incidence of the disease show adverse effects.
2) Closing Village jobs remarkably enhancement the short-term impact of the coronavirus on family farms. It mainly affects transportation, purchasing agricultural materials, hiring workers and doing daily chores.
3) Farmers' greater understanding of the corona disease, affects the short-term behavior of their efficiency and function of the farm, prompting them to take urgent and timely action.
4) Personal characteristics of family farms do not have much effect on the overall short-term effects of the coronavirusepidemic on family farms.
5) Farm scale and duration did not remarkably enhancement on the short-term impact of the coronavirus epidemic on family farms.
6) Conventional agriculture has different impacts on the short-term impact of the coronavirus epidemic on family farms.
7) Insuring agricultural products can reduce the short-term impact of the coronavirus epidemic on family farms.
8) The coronavirus epidemic hasn't less influence on family farms in poor cities than farms in other regions. In many areas, consumption poverty reduction and other methods have been used in poor areas to the treatment of agricultural products with characteristic treatment.

Although the impact of coronavirus on agriculture is not yet fully understood and requires more data and information, agriculture has been considered because it is essential in providing food for human and living organisms, and linked with the concept of the sustainable development goals (Jámbor et al., 2020). The main challenge in the coming months, if the virus persists, could be the restrictionof agricultural production due to lack of access to agricultural institutions, restrictions on the production of agricultural inputs, the market for the sale of agricultural products and the import and export of these products. However, in this article, we intend to discuss the effects of this virus on sustainable agriculture and its effects on environment and food security.

1.4. Challenges and actions

If the spread of the coronavirus is not controlled, the damage will increase significantly. So that the continuation of many businesses active in the field of agricultural and food products will face a serious

challenge. One of the first steps taken by the government in the agricultural sector in Iran was the establishment of a "Corona Disease Management Headquarters in the Ministry of Jihad for Agriculture". In the field of supporting producers, the Agricultural Bank also postponed the repayment of installments of Qard al-Hasan facilities (Alimadadi et al., 2020).

One of the problems of this virus is the ban on public movement. Seasonal workers have important effects on agricultural production, so any measures that affect the free movement of people can affect the production and world market prices of agricultural products. In agriculture, in many crop production systems (such as permanent crops, fruits, production of vegetables and wine), there is a great deal of dependence on seasonal workers for production and harvesting. In particular, the need for seasonal labor in vegetable production begins with the planting process and continues throughout the growing season. In the other study, reported that the epidemic effects of coronavirus in agriculture can be categorized into demand, demand, labor, security of food, the safety of food, business, and other cases (Jámbor et al., 2020).

However, all these measures can have a negative impact on agricultural production and trade. For example, many countries disrupt the transportation system by controlling more jeopardizing shipping to quarantine the virus. Coronavirus affects the economy of households and the agricultural sector in the short and long term: by affecting the supply chain, demand and liquidity of enterprises, the supply of labor, consumption of goods and services and especially by reducing the income of consumers and producers of agricultural products. Statistical evidence showed a 7.8% prevalence of the virus in the consumption sector and 10% in the export sector in March 2020 in Iran. The minimum amount of damage caused by this crisis in March 2020 was estimated at 3.250 billion tomans in the consumption sector and 700 billion tomans in the export sector. The extent of damage in the agricultural sector increased exponentially as the outbreak of the virus continued (Salamzadeh and Dana, 2021).

1.5. Supply of food

One of the most important concerns of published reports (articles and newspapers) about the supply of food. Many reports have expressed worrying over stopping production due to the outbreak of coronavirus by farmers, so less food would exist at higher prices if available (Blandon et al., 2019). Food security is ensured when there are adequate food indicators, access (physical and economic), healthy food and healthy and active life (Fami et al., 2021). The agricultural supply chain includes a complex network of interrelationships between factors such as inputs, producers, transportation, processing industries, trade, and so on. Since the decision was made to produce agricultural products in Iran before the outbreak of the virus, the agricultural, livestock and horticultural sectors have not suffered much damage. However, a reduction in consumption or trade with a time lag can have significant effects on manufacturer or distributor decisions. In the distribution sector, because the distribution of agricultural products is not banned, this sector has not suffered much. But in the consumption sector, estimates suggest that the decline in consumption has reduced the income of suppliers of agricultural products and food by 7.8%. Due to the control and restrictions imposed on the country's customs bases, the trade sector has also faced a loss of 10% (Salamzadeh and Dana, 2021).

Some consumers don't buy many vegetables, meat, fish and fruits, because of the fear of the coronavirus in it, which causes don't sell products and reduces revenue. Therefore, this limits demand increases supply and spreads poverty (Hobbs, 2020). One of the suitable opportunities created by coronavirus conditions is the development of conversion industries, processing and packaging. As the disease continues, the culture of using packaging materials for both internal and export use is increasing (Luckstead et al., 2021). The next itemlies in the pattern of proper cultivation, Richard Nephew, the architect of Iran's sanctions, which focuses on imports into Iran, especially animal inputs. Therefore, to supply protein, the cultivation pattern should be used towards the cultivation of legumes such as chickpeas, lentils, beans, Broad bean, Mung bean, Vicia ervilia, and Vetches, which have good potential in production and rotation with cereals, which is both demands driven and is not dependent on foreign and imported inputs. On the other hand, increasing production can replace meat, which

leads to increased food security, prevention of currency outflows, agricultural development and sustainable production (Aday and Aday, 2020).

Lack increase of revenues as much as inflation will reduce real purchasing power and remove some inflated foods from their food basket (such as meat and fish) and replace them with other foods (such as beans and dairy). On the one hand, endangered household health and on the other due to the increase in demand for alternative goods, increase their price in the market, which will again cause the consumer to face the inflation of alternative goods (Fami et al., 2021). Therefore, the cultivation pattern should move towards legume cultivation. Certainly, with the increase in the price of inputs, the price is over of the product has increased and this price increase can be a threat to the country's food security from three perspectives (Fami et al., 2021):

1) By increasing the input price and increasing the production cost, the cost price of the product will increase and affect the market price and will increase the price of the product for the consumer.
2) With the increase in the price of inputs and the increase in production costs, if there is price suppression in the country (increase in supply prices as much as the increase in costs) that exists and the market regulation headquarters applies,it reduces production incentives and continues the process of business closure or reduced production capacity, reduces and raises the market price again. Increasing the price of the product in the market makes it difficult for the household to access the economy.

It is important to note that in the food security index, economic access, i.e. economic ability and income, is a very important factor.

2. *Conclusion*

The devastating effects of the coronavirus on food security, agriculture and environment must be turned into opportunities. Changes in production, lack of exports, increased production costs, impact on transportation, reduced consumption and other destructive effects of coronavirus in agriculture. Iran's unique climatic diversity, native agricultural knowledge and the potential of micro-agricultural lands make it possible to successfully manage and turn coronavirus into an opportunity. Quaid-19 has created an opportunity for production to be demand-driven rather than supply-driven. In this system, the production chain to consumption is considered. With the outbreak of coronavirus in Iran, the government has decided to subsidize low-income households to prevent food insecurity and food supply. Also, the ineffective policies of the government to deal with the consequences of the economic crisis of the coronavirus have led to a significant increase in food prices and a decrease in people's incomes at the same time, which ultimately leads to malnutrition in low-income households. The coronavirus causes direct and indirect damages and interruptions to the agriculture sector by limiting the production of some crops and disregarding environmental protection policies, due to economic losses because stable ecological problems such as salinity and soil erosion can threaten sustainable agricultural production in the future.

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