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Commentary

# COVID-19 and the Climate Emergency: Do Common Origins and Solutions Reside in the Global Agrifood System?

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The coronavirus disease 2019 (COVID-19) pandemic and the climate emergency are devastating symptoms of the unsustainability of human society and the decreasing resilience of an unhealthy planet. Here, we discuss whether both COVID-19 and the climate emergency have the same underlying causes, and therefore common solutions, and whether they are rooted in a failing global agrifood system.

## Common Origins

The novel coronavirus SARS-CoV-2, which caused coronavirus disease 2019 (COVID-19), originated in the Hubei district of China in late 2019 as a result of animal-to-human transmission, possibly in a wet market in Wuhan.[1] The virus is thought to have originated in bats and been transmitted via human contact with an unknown intermediary species. Outbreaks of such zoonotic human diseases have increased during the late 20$^{th}$ and 21$^{st}$ centuries.[2] During this period, known as the Great Acceleration, the activities of a growing human population have changed the climate and caused widespread environmental degradation, including a collapse of biodiversity. Declining biodiversity is a key factor in the increased outbreaks of zoonotic disease because as animals lose habitats, contact between species and with humans escalates.[3]

We are , therefore, in a continual race to find treatments and vaccines to keep up with zoonotic human diseases. Simultaneously, we are facing a climate emergency of increasing temperatures, extreme storms, droughts, wildfires, floods, and sea-level rise across large parts of Earth and risking further biodiversity collapse. Evidence points to the agrifood system as a root cause of both of these global problems. First, the human consumption of meat from wild animals is clearly a risk factor in viral transfer. Second, more generally, the industrialization of food production during the Great Acceleration is the origin of many adverse environmental impacts that are causing the climate emergency and the collapse of biodiversity; these impacts include soil degradation, the clearing of forests and savannahs, the eutrophication of water courses, the fact that 30% of global greenhouse gas emissions come from practices such as fertilizer use and livestock rearing, and the use of 70% of global freshwater withdrawals for agriculture.[4] Hence, although the "Green Revolution" was a period of extraordinary growth in food-crop productivity and saved millions of lives, it has become a principle driver of the climate emergency and a cause of the biodiversity loss that promotes zoonotic disease.

## Pandemic Impact and Inequality

At the time of writing, the COVID-19 pandemic has infected over nine million people and caused the death of more than 400,000 individuals. As with all environmental shocks, the most vulnerable are disproportionately affected, and here too, food plays a role. In many low-income countries (and low-income areas in high-income countries), high levels of malnutrition enhance the effects of the pandemic. A recent report raises the specter of three million deaths in these countries.[5] But even in high-income countries, serious illness and death from COVID-19 are associated with underlying ill health, particularly diabetes and heart disease,[6] both of which are partly linked to an unhealthy diet. The double burden of malnutrition denotes ill health both from insufficient access to healthy food and from excessive consumption of food of poor nutritional quality. It is the hallmark of an inefficient and failing agrifood system[4] and a key determinant of the risk to human life from COVID-19.

The agrifood system and COVID-19 have further acted together to enhance existing inequalities. The complex networked supply chains that provide food for the urban populations of high-income countries have been put under strain by the pandemic through a reduction in harvesting, processing, and transport, and this has been exacerbated by panic buying and stockpiling.[7] With real or perceived food scarcity, donations to food banks dry up, affecting people and families with low incomes. The consequential anxiety and stress add to pandemic-related mental-health problems.

The agrifood system's lack of resilience to COVID-19 could have additional, longer-term effects. First, there are predicted to be huge amounts of food loss and waste ranging from unused food stockpiles to unharvested crops and underfed animals. Second, there could be food shortages in subsequent years as reserves, crops, and livestock are depleted and as some countries restrict exports to preserve their own supplies.

## Solutions for a Sustainable Future

Whereas short-term efforts focus on dealing with the pandemic and the aftermath of the various storms, floods, and wildfires that are enhanced by the climate emergency, in the longer term, we need to change the way we live. An essential part

of this change is to radically reform how we produce and consume food.[4] This reform of the agrifood system should be based on two guiding principles. The first is the inextricable link between human health and a healthy planet—measures that relieve the double burden of malnutrition by providing equitable access to safe nutritious food will mitigate climate change and restore degraded environments.[8] The second is the principle that humans do not have the right to exploit everything on Earth for their own benefit regardless of the consequences.[9] The agrifood system should protect the land, the oceans, and the atmosphere and enable us to live in harmony with the other species that inhabit Earth. By following these two principles, the system would meet all the aspirations for human development within planetary boundaries, as embodied in the UN Sustainable Development Goals (SDGs).

## Agrifood System Reforms to Reduce Infectious Disease

Many plans have been set out to describe how the agrifood system can be changed to mitigate and adapt to climate change.[10] A central theme is to highlight the environmental impact of meat production, particularly from ruminants such as beef cattle. Compared with the production of staples such as potatoes, wheat, and rice, beef production requires 160 times more land and produces 11 times more greenhouse gases per calorie.[11] Here, two aspects of this suggested reform are examined in the context of preventing outbreaks of diseases such as COVID-19.

### *Curtailing Consumption of Wild Animal Meat*

Wet markets are a familiar sight in many countries. Selling fresh, locally grown produce—including live fish, chickens, and wildlife, as well as fresh fruit and vegetables—they get their name from the melting of ice used to preserve goods, as well as to wash the floors clean of blood from butchered animals.[12] Outbreaks of foodborne disease have increased public and institutional concern over food safety and public health in these markets. However, there are barriers to imposing reforms that would reduce animal-human viral transfer.[13] The first are cultural—consumption of so-called bush meat is part of a way of life. Wet-market stakeholders (and their customers) need to be nudged toward increasing their food safety standards, perhaps by being reminded of the financial benefits of avoiding disease outbreaks. Second, the consumption of meat from wild animals is a significant part of the diet in many countries and provides essential animal protein. Elimination must involve increased access to other protein sources. Unfortunately, the current agrifood system focuses on monoculture—high outputs of single crops, which are good sources of calories but often deficient in other nutrients. Substituting bush meat with meat from livestock also raises problems—apart from the environmental impact, higher costs and risks are associated with high incidence of livestock disease. Therefore, reduction in zoonotic disease depends on increased access and acceptability of alternative sources of nutrition.

### *Increasing Biodiversity*

Restoring biodiversity depends on reducing the amount of land used for cultivating crops and rearing livestock. The key question is whether agricultural land use can be reduced while still meeting the estimated 60% increase in food demand for the mid-21$^{st}$ century. Although the Green Revolution saved nearly 30 Mha of land by increasing crop yields per unit of land area,[14] yields have now plateaued, and so it is thought that the greatest impact on land use will come from a reduction of livestock rearing.[10] It has been estimated that 540 Mha could be saved through the global adoption of a vegetarian diet rather than the meat-rich diet that is the norm for high-income countries and those transitioning to increased wealth.[8] We can then restore biodiversity in newly available land while also protecting important ecosystem services. This rationale helps meet the climate emergency because these restored ecosystems take $CO_2$ out of the atmosphere to store carbon in above- and below-ground biomass. The key challenge is whether meat consumption can be curbed globally, particularly in those parts of the world where the potential for zoonotic diseases to emerge is highest.

## Delivering SDG 2: Zero Hunger

Relief of global malnutrition, embodied in SDG 2, requires reforms that cut across multiple related SDGs.[10] The need for two particular reforms has been highlighted during the COVID-19 pandemic. First, joint actions are necessary for harmonizing and integrating global standards in agriculture, nutrition, food safety, public health, and environmental impact. These are numerous but include establishing (1) best practices for all parts of the food-production process, including decreasing water and agrochemical use, conserving soils, and reducing in-field and post-harvest losses; (2) strategies for developing new high-yielding crops that are adapted to climate change; and (3) plans for healthy diets that account for local cultural, socio-economic, and environmental circumstances, including the likely higher costs associated with sustainable food production. Progress could be made if SDG compliance is a binding condition of all (i.e., not just food) international trade agreements, even when they involve nations at different phases of development and/or with different agrifood cultures.

Second, we need much more resilience in our food supply chains so they can cope better with global shocks. One solution is to simplify the supply chains by increasing local food production, including harnessing the latest technologies for urban agriculture.[4] Locally grown food has multiple additional benefits: important economic opportunities, physical and mental-health improvements, and the reduction of agricultural land use. This does not mean rejecting globalization but rather finding new approaches that allow both beneficial global food trade and food sovereignty.

## Lessons from the COVID-19 Pandemic

Implementation of agrifood reforms depends on several overarching transformations in human society. These involve technological advances and, most importantly, very significant changes in human behavior and practice.[4] How this might happen has been visible during the pandemic response.

### *Stronger Intergovernmental Organizations*

The COVID-19 pandemic has exposed deficiencies in intergovernmental cooperation and collaboration, such that countries differ substantially in the extent to which they follow World Health Organization (WHO) advice. The WHO has no ability to bind or sanction its members, and its operating budget, only about $2 billion in

2019, is split among a multitude of public-health and research projects. The WHO needs the resources and governance to enforce recommended actions through binding international agreements in which all nations agree to specific standards and procedures not only in public health and disease control but also in nutrition and modes of food production. Moreover, to meet such an expanded remit, the WHO has to work closely with the other key agencies that tackle trade, agriculture, environment, and climate change.

### *Collaborative, Transparent, Multidisciplinary Research*

Solutions to viral disease, sustainable food production, and the climate emergency require evidence based on science. Rigorous investigations and analyses are needed, and the skills and experience of multiple disciplines need to be mobilized across academia, business, and government agencies. For public trust, this process has to be open, transparent, and democratized. The policies that follow inevitably involve trade-offs between different objectives, and these need to be justified, explained, communicated, and deliberated. There exist protocols as to how to do this.[15] We have seen remarkable levels of collaboration and remobilization in the search for treatments for COVID-19.[16] This has to become the norm as we go forward and reform the agrifood system.

### *Behavior Change with Leadership*

Some very significant changes in behavior have occurred during the pandemic response. We need research to analyze and understand whether the experience of the pandemic has changed attitudes, which can have a powerful influence over behavior. Changes in attitudes are suggested by the appreciation shown for the vital contribution of health and other key workers in essential sectors, such as in the food supply chain. In the UK and US, there is widespread concern that COVID-19 has differentially affected BAME (Black, Asian, and minority ethnic) communities. Could this indicate a yearning for transformation to a more equitable and just society? Is it a coincidence that the unprecedented global call for racial justice after the death of George Floyd has occurred during this pandemic? However, although individual actions and mass campaigns have essential parts to play, sustained change requires political leadership to formulate the right policies and carry them through. We have seen how some countries have dealt with the pandemic better than others. They have done this by being guided by science, by communicating transparently with empathy and care, by creating and sustaining trusting relationships, and by planning long term. This is exactly what we need to transition to a sustainable modern society.

## Conclusions

Humankind has created a trap from which an escape will not be easy. A huge, and growing, global population depends on a complex, fragile, inefficient agrifood system that is a major contributor both to the climate emergency and to the incidence and impact of viral pandemics, both of which put food production under further strain. It is hoped that the extreme climate events in 2019 and the scale of the COVID-19 pandemic will induce all nations to deliver bold, coordinated, and enforceable action. The beauty is that the measures outlined here to reform the agrifood system also mitigate climate change, improve public health, and reduce viral disease outbreaks. Healthy people, a healthy planet, and a healthy economy are not alternatives but can be mutually supportive and achievable together. When we emerge from the pandemic, the world has an opportunity to transform itself, to have a sustainable future, and to create a fairer, healthier, and happier way of life for everyone on Earth—let this be the legacy of the hundreds of thousands of people who have lost their lives.

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