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Horton, Benjamin Peter; Horton, Peter

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COVID-19 and the climate emergency – do common origins and solutions reside in the global agrifood system?

Benjamin Horton[1] and Peter Horton[2]

[1]The Earth Observatory of Singapore, Nanyang Technological University, Singapore; [2]Department of Molecular Biology & Biotechnology, University of Sheffield, UK.

The 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 events have the same underlying causes, and therefore common solutions, and if they are rooted in a failing global agrifood system.

Common origins of pathogenic viruses and the climate emergency

The novel coronavirus SARS-CoV-2 that caused 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 viral source is thought to be bats, transmitted by human contact with an unknown intermediary species. Outbreaks of such zoonotic human diseases have risen during the late 20th and 21st 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 in biodiversity. Decline in biodiversity is a key factor in the increased outbreaks of zoonotic disease because, as animals lose habitats, contact between species and with humans increases[3].

We are thus in a continuous 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, wild fires, 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. Firstly, the human consumption of meat from wild animals is clearly a risk factor in viral transfer. Secondly, more generally, the industrialisation of food production that occurred during the Great Acceleration is the origin of many adverse environmental impacts that cause the climate emergency and the collapse in biodiversity, including: 30% of global greenhouse gas emissions from practices such as fertiliser use and livestock rearing; clearing of forests and savannahs; soil degradation; 70% of global freshwater use; and eutrophication of water courses[4]. Hence, although the 'Green Revolution' was a period of extraordinary food crop productivity growth that 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 8 million and caused the death of more than 400,000 individuals. As with all environmental shocks, the most vulnerable are disproportionately impacted, 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 spectre of three million deaths in these countries[5]. But even in high income countries, serious illness and death from COVID-19 is associated with underlying ill-health, particularly diabetes and heart disease[6], both in part linked to an unhealthy diet. The double burden of malnutrition denotes the 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 reduction in harvesting, processing,

or transport, 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 lack of resilience of the agrifood system to COVID-19 may have further longer term effects - firstly, there are predicted to be huge amounts of food loss and waste, from unused food stockpiles to unharvested crops and underfed animals. Secondly, 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

While short-term efforts focus on dealing with the pandemic and the aftermath of the various storms, floods and wild fires 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 of food[4]. This reform of the agrifood system should be based upon 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 the 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.

Agrifood system reforms to reduce infectious disease

There have been many plans set out describing how the agrifood system can be changed to mitigate against 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. When compared to 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 problems 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 towards increasing their food safety standards, perhaps by pointing out the financial benefits of avoiding disease outbreaks. Second, consumption of meat from wild animals is a significant part of the diet in many countries, providing 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. Third, substituting with meat from livestock also raises problems – apart from environmental impact, there are higher costs and risks from high incidence of livestock disease. Therefore, reduction in zoonotic disease depends upon increased access and acceptability of alternative sources of nutrition.

Increasing biodiversity.

Restoring biodiversity depends upon reducing the amount of land used to cultivate crops and rear livestock. The key question is can agricultural land-use be reduced whilst meeting the estimated 60% increase in food demand for mid-21st century? Although the 'Green Revolution' saved nearly 30 Mha of land by increasing crop yields per unit land area[14], yields have now plateaued, and so it is thought that the greatest impact on land-use will come from reduction in livestock rearing[10]. It has been estimated that 540 Mha could be saved through the global adoption of a vegetarian diet compared to the meat-rich diet that is the norm for high income countries and those transitioning to increased wealth[8]. Biodiversity can then be restored in newly available land, whilst 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 and in particular in those parts of the world where the potential for zoonotic disease emergence is highest.

Delivering Sustainable Development Goal Zero Hunger (SDG2)

Relief of global malnutrition, embodied in SDG2, requires reforms that cut across multiple related SDGs[10]. The need for two particular reforms has been highlighted during the COVID-19 pandemic. Firstly, joined-up actions are necessary to harmonise and integrate global standards in agriculture, nutrition, food safety, public health and environmental impact. These are numerous but include: establishing best practice for all parts of the food production process, including decreasing water and agrochemical use, conserving soils, and reducing in-field and post-harvest losses; strategies for developing new high yielding crops that are adapted to climate change; plans for healthy diets that take into account local cultural, socio-economic and environmental circumstances, including the likely higher costs associated with sustainable food production. Progress could be made if SDG compliance was 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 agrifood cultures.

Secondly, 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 reducing agricultural land use. This does not mean rejecting globalisation, but finding new approaches that allow both beneficial global food trade and food sovereignty.

Lessons from the COVID-19 pandemic

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

Stronger intergovernmental organisations.

The COVID-19 pandemic has exposed deficiencies in intergovernmental co-operation and collaboration, with countries differing substantially in the extent to which they followed World Health Organization (WHO) advice. The WHO has no ability to bind or sanction its members and its operating budget, only about $2bn in 2019, is split amongst a multitude of public health and research projects. 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 in nutrition and modes of food production. Moreover, to meet such an expanded remit, WHO has to work closely with the other key agencies, which 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 mobilised, across academia, business and government agencies. For public trust, this process has to be open, transparent and democratised. The policies that follow inevitably involve trade-offs between different objectives and these need to be justified, explained, communicated and deliberated. Protocols exist as to how to do this[15]. We have seen remarkable levels of collaboration and remobilisation in the search for treatments for COVID-19[16]. This has to become the norm as we go forward and reform the agrifood system.

Behaviour change with leadership.
Some very significant changes in behaviour have occurred during the pandemic response. Research is needed to analyse and understand if the experience of the pandemic has changed attitudes, which can have a powerful influence over behaviour. 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 co-incidence that the unprecedented global call for racial justice following the death of George Floyd has occurred during this pandemic? However, although individual actions and mass campaigns have essential parts to play, sustained change depends upon 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, communicating transparently with the empathy and care, creating and sustaining a trusting relationship, and long-term planning. 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 upon a complex, fragile, inefficient agrifood system that is a major contributor both to the climate emergency and 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, co-ordinated and enforceable action. The beauty is that the measures outlined here that reform the agrifood system also mitigate against 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 all the people on earth - let this be the legacy of the hundreds of thousands of people who have lost their lives.

References

1. Wu, F., Zhao, S., Yu, B. et al. (2020) A new coronavirus associated with human respiratory disease in China. Nature 579, 265–269. doi.org/10.1038/s41586-020-2008-3.
2. Jones, K.E., Patel, N.G., Levy, M.A., Storeygard, A., et al. (2008) Global trends in emerging infectious diseases. Nature 451, 990-993 (2008). doi.org/10.1038/nature06536.
3. Johnson, C.K., Hitchens, P.L., Pandit, P.S. et al. (2020) Global shifts in mammalian population trends reveal key predictors of virus spillover risk. Proc. R. Soc. B. 287, 20192736. doi.org/10.1098/rspb.2019.2736.
4. Horton, P. (2017). We need radical change in how we produce and consume food. Food Security 9, 1323–1327. doi.org/10.1007/s12571-017-0740-9.

5. International Rescue Committee (2020). World risks up to 1 billion cases and 3.2 million deaths from COVID-19 across fragile countries. https://www.rescue-uk.org/press-release/world-risks-1-billion-cases-and-32-million-deaths-covid-19-across-fragile-countries.
6. Guan, W., Liang, W., Zhao, Y., Liang, H. et al. (2020) Comorbidity and its impact on 1590 patients with Covid-19 in China: A nationwide analysis. Eur. Resp. J. doi: 10.1183/13993003.00547-2020.
7. Torero, M. Without food, there can be no exit from the pandemic. Nature 580, 588-589 (2020).
8. Tilman, D., and Clark, M. (2014) Global diets link environmental sustainability and human health. Nature 515, 518-522
9. Horton, P. and Horton, B.P. (2019) Re-defining sustainability: Living in harmony with life on Earth. One Earth 1, 86-94. doi.org/10.1016/j.oneear.2019.08.019.
10. Willett, W., Rockstrom, J., Loken, B., Springmann, M. et al. (2019). Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. Lancet Commissions 393, 447-492.
11. Eshel, G., Shepon, A., Makov, T. and Milo, R. (2014) Land, irrigation water, greenhouse gas, and reactive nitrogen burdens of meat, eggs, and dairy production in the United States. Proc Nat Acad Sci 111, 11996-12001.
12. Zhong, S., Crang, M. and Zeng, G. (2020). Constructing freshness: the vitality of wet markets in urban China. Agriculture and Human Values 37, 175–18
13. Poto, M. (2011) Food and nano-food within the Chinese regulatory system: No need to have overregulation. European Journal of Law and Technology, 2, Issue 3.
14. Stevenson, J.R., Villoria, N., Byerlee, D., Kelley, T. et al. (2013) Green Revolution research saved an estimated 18 to 27 million hectares from being brought into agricultural production. Proc Nat Acad Sci USA 110, 8363-8368. doi: 10.1073/pnas.1208065110.
15. Donnelly, C.A., Boyd, I., Campbell, P., Craig, C. et al. (2018) Four principles to make evidence synthesis more useful for policy. Nature 558, 361-364 doi.org/10.1038/d41586-018-05414-4.
16. Kupferschmidt, K. and Cohen, J. (2020) Race to find COVID-19 treatments accelerates. Science 367, 1412-1413.

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