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Background Paper

January 2021

Confronting Climate Change to End Hunger

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The world has cut hunger in half over the past 30 years—an unprecedented pace of progress toward solving an age-old human problem. Making further progress on hunger is more complicated and difficult now than it was a generation ago because climate change is quickly altering the planet we know. Ironically, how climate change affects people is a topic often missing from the climate change conversation.

Adapting to the impact of climate change on agriculture and food will be vital to humanity's survival. Advances in agriculture and technology have enabled farmers to produce enough food to keep up with population growth, which is critical since the global population is expected to reach 10 billion by 2050. Feeding 10 billion people will require producing more food than the world produces now, when the global population is about 7.8 billion. Climate change will make this task harder, because climate change brings shifting weather patterns that make weather more unpredictable and extreme events such as hurricanes more intense.

It is clear that improving agricultural productivity is essential. But by itself, it is not enough to end hunger. Hunger in a world that produces enough food for all is a matter of equity. An essential ingredient in the successful effort to cut hunger in half was a strong political commitment to greater equity—a commitment demonstrated by giving more attention and allocating more resources to people in marginalized communities, which have the highest hunger rates.

Climate change is poised to reverse the progress made in the past 30 years. By 2030, there may be an additional 100 million people in extreme poverty as a direct result of climate change.[1] This means that ending hunger will not be possible without significant progress on slowing climate change.

Climate change is already creating serious problems for people. Three of the most frequently confronted are food insecurity, loss of livelihoods, and forced migration. Even worse, humanity is not yet on a path that will prevent Earth's temperature from rising further and reaching disastrous, irreversible levels.

Sometimes people say climate change threatens the planet. Well, actually the planet itself will survive. What is at stake here is humanity's ability to live on this planet.

—Kumi Naidoo, South African environmental activist

The year 2021 is a critical time to make the changes needed to significantly reduce greenhouse gas emissions, which drive climate change. Climate experts have determined that it is essential for the world to achieve net zero emissions by 2050 to prevent global warming of more than 1.5

degrees Celsius, a scenario that would carry catastrophic consequences.

A wild card that will shape the climate and anti-hunger movements for years to come appeared suddenly in early 2020: the COVID-19 pandemic. As 2020 drew to a close, almost 86 million people in every country on Earth were known to have contracted the virus, and nearly 1.9 million people had died. Quarantine, a necessity to slow transmission, caused a global economic contraction and brought much of daily life to a near-halt.

Bread for the World Institute emphasizes that although there is very little time, human capacity for resilience and change also means that the world can still end hunger and avert the worst impacts of climate change. It will take coordinated action, including adopting effective climate-smart agricultural techniques, creating and strengthening robust social protection programs, and redressing inequities and disproportionate risks based on factors such as national origin, race, gender, ethnicity, or religion.

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The rest of this background paper explores how climate change is already affecting or will soon affect the four elements of food security: availability, access, utilization, and stability.[2] **Food security** means having enough affordable healthy food to live an active daily life. Climate change undermines food security in ways both sudden and gradual. Sudden natural disasters, such as hurricanes, wildfires, or floods, can quickly destroy crops, homes, livestock, and possessions—damage that can leave survivors hungry and homeless. The number of weather-related natural disasters rose by 46 percent between 2000 and 2016.

Other impacts on food security appear gradually over years or decades. There are many such changes now underway, some of which have been recognized only in hindsight. Just a few examples: increasingly frequent and severe drought, new crop diseases and pests, and less predictable timing of planting seasons.

Availability

Availability means that to be considered food secure, people must have sufficient food of appropriate quality.[3] Increasingly, climate change complicates the task of growing enough nutritious food for everyone. Climate change is making farm livelihoods, which have always been uncertain, increasingly untenable. Many more farmers have reported disrupted planting and growing seasons than in previous decades.[4]

Most crops are highly sensitive to changes in temperature and water availability.[5] Extreme temperatures, unpredictable rains, more frequent droughts and floods, and other conditions related to climate change can quickly cause food production problems, even complete harvest failures. Extreme heat, in particular, can decimate crop yields.[6]

The summer of 2019 brought easily seen climate change impacts—floods—to two regions halfway around the world from each other. In parts of India, the regular rains came late and, when they arrived, were so intense that farmers were significantly delayed in planting rice. At roughly the same time, the Midwest region of the United States suffered such severe flooding that some farmers were unable to plant corn crops at all. Others harvested only much smaller amounts, much later in the season, because of delays in planting combined with extreme heat.[7]

In addition to posing barriers to producing food in quantities that will provide the growing world population with enough calories, climate change reduces the nutritional content of crops. As the concentration of carbon dioxide rises, plants produce fewer essential micronutrients.[8] Crops grown in conditions of elevated carbon dioxide levels have lower amounts of important minerals, including calcium, copper, iron, magnesium, phosphorus, potassium, sulfur, and zinc.[9]

Scientists have not yet determined exactly how and why climate change makes crops less nutritious. A full explanation, once available, is likely to incorporate elements of several of the hypotheses now being investigated.

In addition to its effects on plants, animals, land, and water, climate change affects the human body itself. Particularly in areas with limited resources, tools, and/or equipment, human labor is vital to food production. As the number of very hot days increases, farmers are less able to work outside for extended periods of time[10] due to the risk of heat exhaustion or, worse, heat stroke,[11] which is often fatal unless patients receive prompt medical treatment in a hospital that is equipped to treat the condition.

According to *The Lancet Countdown on Health and Climate Change*,[12] rising temperatures in inhabited areas of the planet, where temperatures have risen more dramatically than on Earth as a whole, reduced the productivity of global outdoor manual labor by an estimated 5.3 percent between 2000 and 2016. Over the same time period, an estimated 125 million additional vulnerable adults were exposed to heat waves.

At the current pace of climate change, by 2100 the Middle East and parts of North Africa, which already have extremely hot summers, could reach temperatures of 122°F. (50°C.) up to 200 days each year. The region would be essen-

tially uninhabitable. The full impact of such enormous changes on hundreds of millions of people—in global hunger and many other spheres—is beyond the scope of this paper, but scenarios such as this make the case, in no uncertain terms, for urgent action to rapidly slow, and then stop, the production of greenhouse gases.


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Further developing "climate-smart" agriculture will enable people to build resilience to respond to the challenges of producing food under difficult and erratic conditions.[13] Just a few examples: developing seeds with specific qualities such as flood resistance or heat tolerance, fortifying the seeds of staple crops with nutrients that climate change is expected to reduce, interspersing row crops with other plants (known as intercropping) in order to improve the soil and its ability to absorb nutrients, producing crops that may be unfamiliar but are suited to the new climate conditions, and cultivating trees, which trap carbon and provide shade. Government, the private sector, nonprofit organizations, and farmers with experience in similar climate conditions all have a role to play in developing the knowledge and experience needed to make successful transitions to new varieties of staple foods and/or entirely new crops.

Climate-smart agriculture is essential in countries such as Nepal, whose economy is dominated by agriculture, particularly rice production. Farming is the occupation of 65 percent of the population, but Nepal's rainfall has not been predictable for more than 10 years. Nepali farmer Durga Sunchiuri said that he has experienced monsoon seasons that last only five weeks, rather than the three to four months that were typical when he was growing up on his parents' farm.[14] Producing rice is particularly dependent on abundant rainfall during the summer monsoon, but seasonal rainfall is also essential to refilling water supplies for the year and to growing other crops, such as tea.[15]

The International Rice Research Institute has developed rice varieties that are resistant to droughts and floods, and many farmers in Nepal have begun to plant them, particularly when the rains are delayed and typical rice cannot be planted yet. The plants can also survive unusually heavy rainfall.[16]

What's next for climate-smart agriculture? Research on the effects of carbon dioxide levels on the mineral and protein contents of various crops has identified areas for future exploration: "breeding for nutrients under the context of climate change, including legumes in cropping systems, better farm management practices, and utilization of microbial inoculants that enhance nutrient availability."[17]

Access

Beyond availability, food security also requires that people have access, meaning that they have sufficient resources to acquire the foods needed for a nutritious diet. In addition to money, these resources can include community provisions in legal, political, economic, and/or social domains,[18] such as free school meals or subsidized prices for staples such as rice.

It is clear that if climate change leads to less food being available, and/or lower quantities of specific types of food being available, the prices of these products will increase. One estimate that took into account the increasing challenges of growing wheat, rice, and maize found that the prices of these staples could potentially more than double by 2050.[19]

A lack of complete data means that at this point, however, it is less clear how access to nutritious food has changed for various climate-affected communities, households, and individuals around the world. It is increasingly important for governments, development workers, and communities to collect more information on their local contexts. This is both to ensure that decisions on policies and resources respond to the actual conditions on the ground, and to establish a baseline to track changing needs as climate change slows or, in the worst-case scenarios, accelerates.

Access to nutrients is fundamentally a matter of economic inequality. In many lower-income countries, an average family spends a large portion of its income on food—up to 80 percent for some. This means that households have very

few choices if prices increase. Often, the only "option" is to buy less food. Coping strategies may include consuming less food at each meal, skipping meals, and eating cheaper, less nutritious foods. The diversity of the diet the family can afford is also compromised.[20] Recent studies have found that food price increases are associated with steep declines in the consumption of all food groups.[21]

Climate change means that social protection programs are increasingly important to strengthening community food security and enabling lower-income people to eat nutritious meals. Social protection programs help individuals and families, especially poor and vulnerable people, "cope with crises and shocks, find jobs, improve productivity, invest in the health and education of their children, and protect the aging population."[22]

The Ethiopia Productive Safety Net Program (PSNP) is one of the developing world's oldest and largest social protection programs. Millions of low-income people, including many children and elders, receive food through the PSNP. Because the program is designed to expand in times of need, Ethiopia, unlike its neighbor Somalia, largely avoided near-famine conditions during the severe drought that affected the Horn of Africa in 2016.[23]

Climate change could significantly increase the number of people with certain nutritional deficiencies due to extreme heat.

The word "productive" in the program's name reflects its strategy of involving participants who are able in public works projects that benefit their communities, such as reforestation or road repair. The PSNP meets people's immediate needs while also enabling them to build resilience to future shocks—a valuable combination that reflects the reality of what affected communities will need to do to continue to cope with climate change.

Utilization

According to the Food and Agriculture Organization (FAO), utilization is commonly understood as the way the body makes the most of various nutrients in food. Sufficient energy and nutrient intake by individuals is the result of good care and feeding practices, food preparation, dietary diversity, and intra-household distribution of food. Combined with good biological utilization of food consumed, this determines the nutritional status of individuals.[24]

Nutrition is foundational to human life and health. The most important time for people to get the right nutrients is during the period from pregnancy to the second birthday, a nutrition window often known as the "1,000 days." Good nutrition during this period of early childhood establishes a foundation for lifelong health. The opposite is also true: the damage from malnutrition during the 1,000 days, called stunting, is generally irreversible and lifelong. This is why global nutrition initiatives place a heavy emphasis on ensuring that pregnant women and very young children receive the nutrients they need. The most essential to prevent stunting are iron, iodine, zinc, Vitamin A, folate, and Vitamin B6.

Malnutrition during the 1,000-day window is a leading cause of child mortality. The world has made significant progress on child survival but still has a long way to go: every year, there are 2.4 million preventable deaths among children under 5. Survivors are at high risk of childhood stunting. The most visible sign of stunting is that children are very short for their age, but it has hidden impacts that carry lifelong consequences: chronic illness and delayed physical and cognitive development that can reduce the child's educational attainment and her/his later earnings.

Climate change could significantly increase the number of people with certain nutritional deficiencies due to extreme heat (see availability section). Researchers explain: "We analyzed the impact of elevated CO2 concentrations on the sufficiency of dietary intake of iron, zinc, and protein for the populations of 151 countries … We estimate that elevated CO2 could cause an additional 175 million people to be zinc deficient and an additional 122 million people to be protein deficient…"[25] According to the World Health Organization, zinc deficiency is "one of the most significant impediments to human development."[26]

Samuel S. Myers, M.D., a lead author of the study, provides context: "What do these numbers mean? They mean more children dying of pneumonia, malaria, diarrhea, and other infections as their immune systems are compromised by lack of zinc. They mean more women dying in childbirth and infants failing to survive because of iron deficiency … The most vulnerable people are those who are consuming simple, plant-based diets. Specifically, the populations of Africa, Southeast Asia, and the Middle East."[27]

Stability

As Bread for the World has consistently emphasized, an important part of ending hunger is ending *vulnerability* to hunger. This is closely related to the fourth component of food security, stability. The term means that households have sufficient food despite any unexpected events, including natural disasters. Stability essentially means that the first and second elements of food security, availability and access, are both in place.[28]

Stability is the component of food security that is most able to affect people regardless of their geographical location

or socioeconomic level. The impact of climate change varies around the world, but whether it is a drought or a flood, a sudden disaster such as a cyclone or a gradual change such as desertification, the consequences of climate change could compromise the food security and livelihoods of everyone in a community.

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Assets, such as money, property, or farm animals, certainly help households cope with climate shocks that affect food availability and access. Although wealthier households may have significant resources initially, they too could be at risk of hunger if conditions do not quickly improve. Increases in food prices apply to everyone, but can result in extreme hardship for low-income households.

Instability affects communities and countries in addition to individual households. A major cause of global hunger that is sometimes separate from climate change, but often one of its results, is armed conflict. Resource scarcity, particularly scarcity of essentials such as food and water, can easily ignite a conflict or worsen one that also has other causes, such as religious or ethnic tensions. Preventing the escalation of violence—up to and including regional wars—is another urgent reason to find solutions to both food insecurity and climate change.

Climate change is a root cause of migration from Honduras, Guatemala, and El Salvador to the United States. Temperatures in the region have been on the increase and are expected to rise another 1° C. to 2°C. (1.8° to 3.6° F.) by 2050. There have also been more frequent and severe natural disasters. Hunger and extreme poverty are worsening as a result of climate change, and, in turn, increased hunger and poverty can only exacerbate the widespread violent crime that is also forcing people to flee their homes.

Conclusion

Climate change and food security have many interconnections, and each affects the other in complex ways. The pandemic has proven that, when necessary, people by the billions are capable of quickly changing their behavior—offering hope that, by the same token, people can build food systems and wider economic systems that are more equitable and sustainable.

The ways of thinking and associated actions that have led to climate change have also been linked to the COVID-19 crisis. Deforestation, a significant cause of climate change, is an example. Since trees and other plants take in carbon dioxide from the atmosphere and release oxygen, deforestation means that more greenhouse gases remain in the air.

Researchers who study infectious viruses such as COVID-19 and Ebola believe that they originate in other species. Deforestation brings people into closer contact with wildlife that may carry viruses to which humans have no immunity. As deforestation continues, experts expect pandemics such as COVID-19 to become more common.

The next few years are a critical time for the global community to adopt policies that put humanity on a path to ending hunger while averting catastrophic damage to the planet. As the world responds to and recovers from the COVID-19 health and economic crises, now is the time to rethink and rebuild our healthcare systems, economies, and food systems. While there are certainly many gaps in the science that call for further research, the more difficult problem is one that is familiar to Bread members and others concerned about hunger and extreme poverty: generating the political will for U.S. and other policymakers around the world to lead their countries to carry out the necessary actions. For the United States, this starts with rejoining the Paris Climate Agreement.

As this paper has explored, however, there are policies that can help reduce the human costs of two major challenges we face today, climate change and COVID-19. These fall into two main areas. The first is ensuring food availability and utilization by better preparing farmers and the land to adapt to the impacts of climate change—a group of actions we can sum up as climate-smart agriculture. The second is ensuring food accessibility and stability by establishing well-functioning systems of social protection that save lives and create livelihoods, even in difficult circumstances.

Endnotes

1 FAO. The State of Food Security and Nutrition in the World: Climate Change, Agriculture, and Food Security. Food and Agriculture Organization of the United Nations, 2016, p.8.

2 Naylor, Rosamond L., ed. The Evolving Sphere of Food Security. New York: Oxford University Press, 2014.

3 FAO. Food Security Policy Brief. June 2006. http://www.fao.org/fileadmin/templates/faoitaly/documents/pdf/pdf_Food_Security_Cocept_Note.pdf

4 FAO. The State of Food Security and Nutrition in the World: Building Climate Resilience for Food Security and Nutrition. Food and Agriculture Organization of the United Nations, 2018, p.53.

5 Myers, Samuel S. Climate Change and Global Food Systems: Potential Impacts on Food Security and Undernutrition. Annual Review of Public Health, 2017, p. 263. http://environment.harvard.edu/sites/default/files/climate_change_and_global_food_systems_impacts_on_food_security_and_undernutrition.pdf

6 FAO. The State of Food Security and Nutrition in the World: 2018: Building Climate Resilience for Food Security and Nutrition, Food and Agriculture Organization of the United Nations, 2018, p. 44.

7 Reuters, June 16, 2019. "Everybody's So Down in the Dumps: Illinois Farmers Give Up on Planting After Floods – And Throw a Party." https://www.cnbc.com/2019/06/16/midwest-floods-llinois-farmers-give-up-on-planting-and-throw-party.html

8 Myers, Samuel S. Climate Change and Global Food Systems: Potential Impacts on Food Security and Undernutrition. Annual Review of Public Health, 2017, p. 263. http://environment.harvard.edu/sites/default/files/climate_change_and_global_food_systems_impacts_on_food_security_and_undernutrition.pdf

9 Jose C. Soares et al., "Preserving the nutritional quality of crop plants under a changing climate: importance and strategies," Plant and Soil 443, 1-26(2019). https://link.springer.com/article/10.1007/s11104-019-04229-0

10 Myers, Samuel S. Climate Change and Global Food Systems: Potential Impacts on Food Security and Undernutrition. Annual Review of Public Health, 2017, p. 263. http://environment.harvard.edu/sites/default/files/climate_change_and_global_food_systems_impacts_on_food_security_and_undernutrition.pdf

11 Harvard Medical Publishing. "Heat Stroke (Hyperthermia): What Is It?" January 2019

12 Watts, Nicks, et al. The 2018 report of the Lancet Countdown on Health and Climate Change: Shaping the Health of Nations for Centuries to Come. November 2018.

13 The World Bank. "Climate-Smart Agriculture." September 2019. https://www.worldbank.org/en/topic/climate-smart-agriculture

14 Mennonite Central Committee. "Learning to Farm with Droughts and Deluges." ReliefWeb. November 2019. https://reliefweb.int/report/nepal/learning-farm-droughts-and-deluges

15 National Geographic. Monsoon. https://www.nationalgeographic.org/encyclopedia/monsoon/

16 Rai, Om Astha. Climate Change News. "Climate resilient seeds offer hope to Nepal's farmers." July 2014. https://www.climatechangenews.com/2014/07/30/climate-resilient-seeds-offer-hope-to-nepals-farmers/

17 Smithsonian Magazine, "Climate Change Could Lead to Nutrient Deficiency for Hundreds of Millions," https://www.smithsonianmag.com/smart-news/climate-change-could-lead-nutrient-deficiency-hundreds-millions-180970149/

18 FAO. Food Security Policy Brief. June 2006. http://www.fao.org/fileadmin/templates/faoitaly/documents/pdf/pdf_Food_Security_Cocept_Note.pdf

19 Myers, Samuel S. Climate Change and Global Food Systems: Potential Impacts on Food Security and Undernutrition. Annual Review of Public Health, 2017, p. 263. http://environment.harvard.edu/sites/default/files/climate_change_and_global_food_systems_impacts_on_food_security_and_undernutrition.pdf

20 FAO. The State of Food Security and Nutrition in the World: Building Climate Resilience for Food Security and Nutrition. Food and Agriculture Organization of the United Nations. 2018, p.73.

21 Myers, Samuel S. Climate Change and Global Food Systems: Potential Impacts on Food Security and Undernutrition. Annual Review of Public Health, 2017, p. 263. http://environment.harvard.edu/sites/default/files/climate_change_and_global_food_systems_impacts_on_food_security_and_undernutrition.pdf

22 The World Bank. "The World Bank in Social Protection." April 2020. https://www.worldbank.org/en/topic/socialprotection/overview

23 Post, Todd. 2017 Hunger Report: Fragile Environments, Resilient Communities. Bread for the World Institute. 2017. http://hungerreport.org/2017/wp-content/uploads/2017/08/hunger-report-2017-full.pdf

24 FAO. Food Security Concepts and Frameworks: Lesson 1 What is Food Security? Food and Agriculture Organization of the United Nations. 2008. http://www.fao.org/elearning/Course/FC/en/pdf/trainerresources/learnernotes0411.pdf

25 Smith, Matthew R. and Myers, Samuel. "Impact of anthropogenic CO2 emissions on global human nutrition." Nature Climate Change volume 8, pages834–839. 2018. Impact of anthropogenic CO2 emissions on global human nutrition. https://www.nature.com/articles/s41558-018-0253-3

26 Thompson, Brian and Cohen, Marc J. "Increased Concentrations of Atmospheric Carbon Dioxide and Zinc Deficiency." The Lancet. October 2015. https://www.thelancet.com/pdfs/journals/langlo/PIIS2214-109X(15)00165-5.pdf

27 Myers, Samuel S. "Rising Carbon Emissions Make Crops Less Nutritious, Threaten Global Health." The Hill. August 2018. https://thehill.com/opinion/energy-environment/403749-rising-carbon-emissions-make-crops-less-nutritious-threaten-global

28 FAO. Food Security Policy Brief. June 2006. Food and Agriculture Organization of the United Nations. http://www.fao.org/fileadmin/templates/faoitaly/documents/pdf/pdf_Food_Security_Cocept_Note.pdf

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