NHSMUN

National High School Model United Nations

2023

BACKGROUND GUIDE: FAO

Topic A: Diseases and the Global Food Supply Chain

Topic B: Reducing Food Waste to Combat Hunger

NHSMUN
National High School Model United Nations

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Dear delegates,

Hello! Welcome to the Food and Agriculture Organization at NHSMUN 2023! My name is Daniela Trujillo, and I'm very excited to serve as your Director for session one. We're looking forward to hearing you all debate and will do everything in our hands to make sure that all our committee sessions are both lively and substantive. My co-director Paige and I have worked closely with this year's topics, and we know you will be as excited as us to debate these important yet underrated topics!

This is my second time on staff! Previously, I was the Assistant Director for the IBRD. I attended NHSMUN once as a delegate, and I also participated in other international and regional conferences in my hometown, Cancun, Mexico! Model UN opened so many doors for me that, thanks to it, I know what I want to study! It has allowed me to develop so many skills, such as social interaction and public speaking, apart from being one of the best experiences of high school. I hope that your time at NHSMUN can bring many opportunities for you to grow and learn, as it did for me!

To share more about myself, I was born in Mexico and lived all my life in Cancun. I am currently studying at Masaryk University in Brno, Czech Republic, majoring in International Relations and European Politics. In the future, I would love to pursue a second degree in world history or geography.

Beyond academics, I'm a big fan of a rubber man called Luffy and his crew, and I also love traveling. My long-term goal is to know at least one city in every country in Europe before I'm 30. I also enjoy discovering new music genres and learning about others' musical tastes. If you have any musical recommendations, reach out to me at the conference in spring, and I will be glad to hear them!

This year my co-director, Paige, and I have put together a *riveting* background guide on two exciting topics: reducing food waste to combat hunger and diseases and the global food supply. When preparing for committee, I highly recommend utilizing these background guides as a foundation for further research on your country's policy and perspectives on these issues. We are ready and excited to provide answers to questions, general comments, or responses to concerns regarding your research.

I look forward to working with you all at NHSMUN 2023!

Best,

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Dear Delegates,

I am so thrilled to welcome you all to the Food and Agriculture Organization of the United Nations at NHSMUN 2023! My name is Paige Watanabe, and I am this year's Director for Session II. My co-Director, Daniella Trujillo, and I are so excited to have you on our committee this year. We look forward to fostering fruitful discussion, discourse, collaboration, and learning experiences in our committee as we participate in debate and explore these important topics during our time together.

This is my second year on staff here at NHSMUN and my first year serving as a Director. During NHSMUN 2022, I served as the Assistant Director for the FAO for Session II, and I am elated to be continuing my work with this committee here at NHSMUN! I attended NHSMUN as a delegate in 2020 and have participated in Model UN throughout my high school experience. The skills and experiences I have gained through Model UN have been the most invaluable and rewarding experiences of my life. My passions for exploring diplomacy and global collaboration have influenced both my academic and personal life and have inspired me to pursue a career in this field.

Currently, I am a sophomore at Chapman University, majoring in health sciences and minoring in peace studies. My interests in these fields include the intersectionality of healthcare, molecular genetics, and conflict resolution. On campus, I am involved with the pre-health professions clubs and my school's orientation preparations program. In my free time, I enjoy spending time with my friends and family and partaking in relaxing activities. I love to bake/cook, crochet, read, hike, and honestly do anything to get my mind off of school! I am also currently obsessed with reality TV, which is my new guilty pleasure.

Our topics for this conference encompass many pressing issues, including food security, human health, sustainability, and hunger. FAO's Topic A, "Diseases and the Global Food Supply," and Topic B, "Reducing Food Waste to Combat Hunger," contain subjects that are key to the United Nations Sustainable Development Goals and have widespread applications. Topic A invites delegates to observe the relationship between health and food security and how emerging diseases threaten the current supply chain. Innovative ideas will assess the current faults in these systems and strive for the protection of the global food system. Topic B showcases the often overlooked linkage between food waste and overproduction and mismanagement of foods. Delegates should come to the committee with fresh perspectives on these issues and how environmental and socioeconomic implications worsen these issues.

I am incredibly excited to hear the ideas, perspectives, and solutions formulated around these topics in March, and I hope this Background Guide serves as an informative aid during your research. Please feel free to reach out to Daniella and me with any questions you may have!

Best,

Paige Watanabe
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A Note on the NHSMUN Difference

Esteemed Faculty and Delegates,

Welcome to NHSMUN 2023! We are Ming-May Hu and Ana Margarita Gil, and we are this year's Secretary-General and Director-General. Thank you for choosing to attend NHSMUN, the world's largest and most diverse Model United Nations conference for secondary school students. We are thrilled to welcome you to New York City in March!

As a space for collaboration, consensus, and compromise, NHSMUN strives to transform today's brightest thinkers into tomorrow's leaders. Our organization provides a uniquely tailored experience for all in attendance through innovative and accessible programming. We believe that an emphasis on education through simulation is paramount to the Model UN experience, and this idea permeates throughout NHSMUN.

Realism and accuracy: Although a perfect simulation of the UN is never possible, we believe that one of the core educational responsibilities of MUN conferences is to educate students about how the UN System works. Each NHSMUN committee is a simulation of a real deliberative body so that delegates can research what their country has said in the committee. Our topics are chosen from the issues currently on the agenda of that committee (except historical committees, which take topics from the appropriate time period). This creates incredible opportunities for our delegates to conduct first-hand research by reading the actual statements their country has made and the resolutions they have supported. We also strive to invite real UN, NGO, and field experts into each committee through our committee speakers program. Moreover, we arrange meetings between students and the actual UN Permanent Mission of the country they are representing. No other conference goes so far to deeply immerse students into the UN System.

Educational emphasis, even for awards: At the heart of NHSMUN lies education and compromise. Part of what makes NHSMUN so special is its diverse delegate base. As such, when NHSMUN distributes awards, we de-emphasize their importance in comparison to the educational value of Model UN as an activity. NHSMUN seeks to reward students who excel in the arts of compromise and diplomacy. More importantly, we seek to develop an environment in which delegates can employ their critical thought processes and share ideas with their counterparts from around the world. Given our delegates' plurality of perspectives and experiences, we center our programming around the values of diplomacy and teamwork. In particular, our daises look for and promote constructive leadership that strives towards consensus, as real ambassadors do in the United Nations.

Debate founded on strong knowledge and accessibility: With knowledgeable staff members and delegates from over 70 countries, NHSMUN can facilitate an enriching experience reliant on substantively rigorous debate. To ensure this high quality of debate, our staff members produce detailed, accessible, and comprehensive topic guides (like the one below) to prepare delegates for the nuances inherent in each global issue. This process takes over six months, during which the Directors who lead our committees develop their topics with the valuable input of expert contributors. Because these topics are always changing and evolving, NHSMUN also produces update papers intended to bridge the gap of time between when the background guides are published and when committee starts in March. As such, this guide is designed to be a launching point from which delegates should delve further into their topics. The detailed knowledge that our Directors provide in this background guide through diligent research aims to increase critical thinking within delegates at NHSMUN.

Extremely engaged staff: At NHSMUN, our staffers care deeply about delegates' experiences and what they take away from their time at NHSMUN. Before the conference, our Directors and Assistant Directors are trained rigorously through hours of workshops and exercises both virtual and in-person to provide the best conference experience possible. At the conference, delegates will have the opportunity to meet their dais members prior to the first committee session, where they may engage

one-on-one to discuss their committees and topics. Our Directors and Assistant Directors are trained and empowered to be experts on their topics and they are always available to rapidly answer any questions delegates may have prior to the conference. Our Directors and Assistant Directors read every position paper submitted to NHSMUN and provide thoughtful comments on those submitted by the feedback deadline. Our staff aims not only to tailor the committee experience to delegates' reflections and research but also to facilitate an environment where all delegates' thoughts can be heard.

Empowering participation: The UN relies on the voices of all of its member states to create resolutions most likely to make a meaningful impact on the world. That is our philosophy at NHSMUN too. We believe that to properly delve into an issue and produce fruitful debate, it is crucial to focus the entire energy and attention of the room on the topic at hand. Our Rules of Procedure and our staff focus on making every voice in the committee heard, regardless of each delegate's country assignment or skill level. Additionally, unlike many other conferences, we also emphasize delegate participation after the conference. MUN delegates are well researched and aware of the UN's priorities, and they can serve as the vanguard for action on the Sustainable Development Goals (SDGs). Therefore, we are proud to connect students with other action-oriented organizations to encourage further work on the topics.

Focused committee time: We feel strongly that face-to-face interpersonal connections during debate are critical to producing superior committee experiences and allow for the free flow of ideas. Ensuring policies based on equality and inclusion is one way in which NHSMUN guarantees that every delegate has an equal opportunity to succeed in committee. In order to allow communication and collaboration to be maximized during committee, we have a very dedicated administrative team who work throughout the conference to type up, format, and print draft resolutions and working papers.

As always, we welcome any questions or concerns about the substantive program at NHSMUN 2023 and would be happy to discuss NHSMUN pedagogy with faculty or delegates.

Delegates, it is our sincerest hope that your time at NHSMUN will be thought-provoking and stimulating. NHSMUN is an incredible time to learn, grow, and embrace new opportunities. We look forward to seeing you work both as students and global citizens at the conference.

Best,

Ming-May Hu
Secretary-General

Ana Margarita Gil
Director-General

A Note on Research and Preparation

Delegate research and preparation is a critical element of attending NHSMUN and enjoying the debate experience. We have provided this Background Guide to introduce the topics that will be discussed in your committee. We encourage and expect each of you to critically explore the selected topics and be able to identify and analyze their intricacies upon arrival to NHSMUN in March.

The task of preparing for the conference can be challenging, but to assist delegates, we have updated our **Beginner Delegate Guide** and **Advanced Delegate Guide**. In particular, these guides contain more detailed instructions on how to prepare a position paper and excellent sources that delegates can use for research. Use these resources to your advantage. They can help transform a sometimes overwhelming task into what it should be: an engaging, interesting, and rewarding experience.

To accurately represent a country, delegates must be able to articulate its policies. Accordingly, NHSMUN requires each delegation (the one or two delegates representing a country in a committee) to write a position paper for each topic on the committee's agenda. In delegations with two students, we strongly encourage each student to research each topic to ensure that they are prepared to debate no matter which topic is selected first. More information about how to write and format position papers can be found in the NHSMUN Research Guide. To summarize, position papers should be structured into three sections:

I: Topic Background – This section should describe the history of the topic as it would be described by the delegate's country. Delegates do not need to give an exhaustive account of the topic, but rather focus on the details that are most important to the delegation's policy and proposed solutions.

II: Country Policy – This section should discuss the delegation's policy regarding the topic. Each paper should state the policy in plain terms and include the relevant statements, statistics, and research that support the effectiveness of the policy. Comparisons with other global issues are also appropriate here.

III. Proposed Solutions – This section should detail the delegation's proposed solutions to address the topic. Descriptions of each solution should be thorough. Each idea should clearly connect to the specific problem it aims to solve and identify potential obstacles to implementation and how they can be avoided. The solution should be a natural extension of the country's policy.

Each topic's position paper should be **no more than 10 pages** long double-spaced with standard margins and font size. **We recommend 3–5 pages per topic as a suitable length**. The paper must be written from the perspective of your assigned country and should articulate the policies you will espouse at the conference.

Each delegation is responsible for sending a copy of its papers to their committee Directors via myDais on or before **February 24, 2023**. If a delegate wishes to receive detailed feedback from the committee's dais, a position must be submitted on or before **February 3, 2023**. The papers received by this earlier deadline will be reviewed by the dais of each committee and returned prior to your arrival at the conference.

Complete instructions for how to submit position papers will be sent to faculty advisers via email. If delegations are unable to submit their position papers on time, please contact us at info@imuna.org.

Delegations that do not submit position papers will be ineligible for awards.

Committee History

The Food and Agriculture Organization (FAO) was created in October 1945. It is the oldest permanent specialized agency of the United Nations. Its main objective is to eliminate hunger by helping the world increase agricultural productivity. This is done by improving efficiency in food production, uplifting rural communities, and expanding the global economy to ensure food security.[1] Currently, the FAO believes hunger is no longer the greatest problem that humanity faces. The newest threat is climate change. Food production has been greatly impacted by global warming, and its effects will continue to grow.

The FAO has assumed a lot of the responsibility for achieving the 17 Sustainable Development Goals (SDGs) since the 2015 Paris Agreement. Although food security has increased in many regions due to technological developments and new innovative practices for production systems, there is still progress to be made in regions like sub-Saharan Africa and South Asia. There are still many global challenges to limiting hunger and increasing food security.[2]

The FAO has 49 members elected for three years, and the conference meets every other year.[3] The FAO is active in more than 130 countries and has 194 Member Nations, two Associate Members, and one Member Organization, the European Union (EU).[4] The main headquarters is in Rome, and there are additional sub-regional offices in 130 member states.[5] The EU is one of the largest voluntary resource partners to the FAO. The partnership has pinpointed five key areas that need to be addressed. The first four are monitoring food systems, climate change, and biodiversity, increasing food security, and sustainable food chain investments. The last is digitizing systems to help monitor resources, such as the AQUASTAT and the Global Livestock Production and Health Atlas.[6] AQUASTAT helps monitor water usage and storage, while the Global Livestock Production and Health Atlas helps monitor information on the livestock sector of the global economy.

The FAO has had many significant accomplishments, including maintaining the world's most detailed statistical database on food and agriculture. Additionally, the FAO created the Port State Measures Agreement, which is the first binding international agreement on the combatting of illegal fishing.[7] In 2011, thanks to the efforts of an FAO coordination program, rinderpest, a deadly livestock virus, was eradicated. Similarly, in 1974, the WHO, FAO, UNDP, and World Bank helped eradicate onchocerciasis (river blindness) in 12 West African countries. In more recent years, FAO initiatives like Brazil's "Zero Hunger" project or CELAC's (Community of Latin American and the Caribbean States) Plan for Food Nutrition Security have halved the number of hungry in Latin America and the Caribbean.[8] The FAO has had many great accomplishments and a rich history that continues to grow.

1 Karen Mingst, "Food and Agriculture Organization," Encylopedia Britannica, accessed September 21, 2022, https://www.britannica.com/topic/Food-and-Agriculture-Organization.
2 "FAO: New challenges after 75 years of history," CEMAS, October 15, 2020, https://cemas.global/en/fao-new-challenges-after-75-years-of-history-2/.
3 "What Are Un Specialized Agencies, and How Many Are There? - Ask Dag!" United Nations, accessed September 21, 2022, https://ask.un.org/faq/140935.
4 "Food and Agriculture Organization of the United Nations (FAO)," INITIATIVE 20X20, accessed September 21, 2022, https://initiative20x20.org/partners/food-and-agriculture-organization-united-nations-fao.
5 "Worldwide Offices," FAO, accessed September 21, 2022, https://www.fao.org/about/who-we-are/worldwide-offices/en/.
6 "FAO and EU Partnership," Food and Agriculture Organization of the United Nations, accessed September 21, 2022, https://www.fao.org/europeanunion/eu-partnership-home/en.
7 Isabella Cavalletti,"Food and Agriculture Organization (FAO) - Eco-Nnect," *Eco-nnect*, April 27, 2022. https://eco-nnect.com/2018-11-27-food-and-agriculture-organization-fao/.
8 "In Action," Food and Agriculture Organization of the United Nations, accessed September 21, 2022, https://www.fao.org/in-action/en/.

FAO

NHSMUN 2023

TOPIC A:
DISEASES AND THE GLOBAL FOOD SUPPLY CHAIN

Photo Credit: Leo Li

Introduction

Healthy animals and plants are key to the success of the global food supply chain. The global food supply chain supports the international food trade industry. This includes multiple industries that account for food production and distribution worldwide.[1] Globalization has created a global reliance between countries to supply one another with food and to ensure accessibility to food variety and quantity.[2] This system supports countries that rely on imports of food products and offers economic opportunities to countries that export these products. When the global food supply chain works effectively, people have greater access to foods at more affordable rates. This boosts food security and is essential for ending global hunger and providing nutrition to people worldwide.[3]

The human food chain describes the pathway of food products that tie together animals, plants, human health, and the global economy. It is a delicate system that connects all life on Earth to people's health and food quality. Public health concerns are growing as global disease outbreaks are rising.[4] Animal and plant diseases are increasing in occurrence and severity, thus leaving human populations vulnerable to transmission. Meanwhile, increased human and animal interactions and reliance on animal products expose individuals to infectious diseases. These can disrupt the food supply chain and emphasizes the need for better preventative health measures. Pandemics and outbreaks of infectious diseases are detrimental to the food supply chain and result in unemployment, inflation of products, and worsening food insecurity. With over 2.4 billion people suffering from food insecurity, the global community cannot afford pandemics and disease outbreaks that cause setbacks in achieving zero hunger.[5] Protecting the health of plants and animals is essential to attain food security, protect livelihoods, and boost global economic growth.

Emerging and re-emerging diseases also severely threaten the global food supply chain.[6] Emerging diseases are those that have newly appeared within a population or have a rapid increase in infection rate.[7] Re-emerging diseases reappear after a significant decline in infection rate or a period of dormancy where no outbreaks occur.[8] Both types of diseases can wreak havoc on the global food supply chain and endanger the status of global food security. Disease outbreaks disrupt the cultivation, production, and distribution levels, which can completely delay or destroy the supply chain.

Understanding the relationship between mitigating disease outbreaks and achieving food security is essential to protect the food supply chain. The Food and Agriculture Organization (FAO) and the global community must discuss preventative health measures and supply chain safeguards to protect all from the impacts of disease outbreaks.

History and Description of the Issue

The Global Food Supply Chain and Food Security

As globalization increases and agriculture trade booms, the food supply chain is growing across continents.[9] The global food supply chain encompasses all stages of food production and distribution. It is crucial to transport food from producers

1 "The Food Supply Chain," Too Good to Go, accessed August 11, 2022, https://toogoodtogo.com/en-us/movement/education/the-food-supply-chain.
2 "Globalization's Role in Ending Hunger," World Economic Forum, last modified May 23, 2022, https://www.weforum.org/agenda/2022/05/food-for-thought-globalization-s-role-in-ending-world-hunger/.
3 World Economic Forum, "Globalization's Role in Ending Hunger."
4 "Resilience," Food and Agriculture Organization of the United Nations, accessed August 11, 2022, https://www.fao.org/resilience/areas-of-work/food-chain-crisis/en/?page=2&ipp=10&tx_dynalist_pi1%5Bpar%5D=YToxOntzOjE6IkwiO3M6MToiMiI7fQ%3D%3D.
5 "Food," United Nations, accessed August 11, 2022, https://www.un.org/en/global-issues/food.
6 Food and Agriculture Organization of the United Nations, "Resilience."
7 "Emerging Infectious Diseases/Pathogens," National Institute of Allergy and Infectious Disease, accessed August 11, 2022, https://www.niaid.nih.gov/research/emerging-infectious-diseases-pathogens.
8 "Emerging Infectious Diseases," Johns Hopkins Medicine, accessed August 11, 2022, https://www.hopkinsmedicine.org/health/conditions-and-diseases/emerging-infectious-diseases.
9 Rajeev Bhat and Ivi Jõudu, "Emerging Issues and Challenges in Agri-Food Supply Chain," *Science Direct* (2019): 10.1016/B978-0-12-813411-5.00002-8.

to consumers.[10] This system involves the collaborative labor of millions and relies on the global trade network to distribute products internationally.[11] The health of the food supply chain is imperative, as the global food system accounts for USD 8 trillion, almost ten percent of the global economy.[12]

The FAO defines food security as when "all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life."[13] Over 30 percent of the global population (2.4 billion people) were moderately or severely food-insecure in 2020. From 2019–2020, the number of food-insecure people grew by 320 million. These numbers are alarming because food security is essential for human well-being. If someone does not have dependable access to nutritious food, they may develop short and long-term health issues. For instance, food insecurity can cause stunting (impaired growth and development) in children. 149.2 million children suffered from stunting in 2020.[14] In pregnant mothers, food insecurity impacts the baby through slow development and increased risk of infant mortality.[15]

The issue of food insecurity is not necessarily a lack of overall supply. We are currently producing enough food to feed the global population. However, the entire system is vulnerable to failure because of the interdependence of each part of the supply chain.[16] There are two primary ways disruptions to the food supply chain connect to food security.

For one, over USD 1.1 trillion in global agricultural trade occurs each year, playing a critical role in food access. Trade diversifies the products available to consumers and offers more affordable prices for goods and services.[17] Without this, countries face widespread food shortages and a limited variety of products. The prices of food goods drastically inflate when the food supply chain is disrupted.[18] Food costs

10 "The Food Supply Chain," The Movement Against Food Waste, accessed July 17, 2022, https://toogoodtogo.com/en-us/movement/education/the-food-supply-chain.
11 Stephen Wood et al., "Trade and the Equitability of the Global Food Nutrient Distribution," *Nature Sustainability* 1, (January 2018): 10.1038/s41893-017-0008-6.
12 "Do the Costs of the Global Food System Outweigh its Monetary Value?" Martien Nieuwkoop, last modified June 17, 2019, https://blogs.worldbank.org/voices/do-costs-global-food-system-outweigh-its-monetary-value.
13 Leanna, Parekh, "The basics of food security (and how it's tied to everything)," *World Vision,* last modified June 28, 2022, https://www.worldvision.ca/stories/food/the-basics-of-food-security.
14 "Goal 2," United Nations, accessed October 27, 2022, https://sdgs.un.org/goals/goal2.
15 Parekh, "The basics of food security."
16 Parekh, "The basics of food security."
17 "Stonger Open Trade Policies Enable Economic Growth for All."
18 "Food Security Update," The World Bank, last modified July 15, 2022, https://www.worldbank.org/en/topic/agriculture/brief/food-security-update.

A US inspector examines a foreign shipment of meat in New Orleans

Credit: U.S. Department of Agriculture

become unaffordable for many, creating food security risks for vulnerable populations.[19] According to the FAO, over three billion people cannot afford healthy food globally.[20] In 2020, the percentage of countries suffering from high food prices rose from 16 percent in 2019 to 47 percent.[21]

Secondly, the food supply chain disruptions impact jobs and productivity. The food supply chain typically stimulates local economies by providing jobs. People can find agriculture, livestock, transportation, and delivery jobs.[22] When disruptions occur, workers in these industries face unemployment or worsened working conditions.[23] This can affect personal food supply, as they rely on their income to purchase goods. In addition, the disruptions can cause a worker shortage. These shortages further disrupt the flow of the supply chain by diminishing the quantity of food produced and delivered. Therefore, global food access is impaired.

Food supply shocks derive from catastrophes such as animal diseases, plant pests, pandemics, and climate change. These disruptions threaten the productivity and longevity of the food supply chain. When there is a global pandemic, labor restrictions and regulations lead to increased unemployment and disrupt food transportation. When there is a disease outbreak, decreased crop yields and animal product production lessen the overall food supply. The following subtopics will further discuss these causes of food supply chain failures and the critical role of FAO in addressing them.

Disease Outbreaks

Regular access to safe and nutritious food is vital for sustaining healthy human lives. This human right to nutrition is threatened by the ever-growing quantity and severity of diseases around the globe. The human food chain crisis is the cascading effect of agriculture and livestock health on human health and the global economy.[24] This crisis often starts from disease outbreaks that contaminate and spread through animal and agricultural facilities. These outbreaks have varying origins and can be transmitted through plant pests and transboundary animal diseases.[25]

The presence of diseases among livestock and crops poses a severe risk of food contamination through farming practices and production facilities.[26] Contamination is most common when contaminated water is used to irrigate crops and when meat products are improperly butchered or slaughtered.[27] Food contamination creates food-borne illnesses that adversely affect human health and well-being.

Addressing food-borne illnesses requires acknowledging their growing severity and human health impact. Every year, over 48 thousand people get sick, and 3 thousand deaths occur from food-borne illnesses.[28] With more than 250 varieties of food-borne diseases, the need for proper preventive actions is crucial.[29] Food-borne illnesses impact productivity and economic profit for many countries. These costly expenses most burden low and middle-income countries.

Children are the most vulnerable to foodborne-related illnesses and deaths because their immune systems are still developing. They are unable to fight infection as easily as adults. [30] Children make up only nine percent of the global population. Nevertheless, 40 percent of victims of food-

19 The World Bank, "Food Security Update."
20 "Get caught up on World Food Day 2021," United Nations, accessed October 27, 2022, https://www.un.org/en/delegate/get-caught-world-food-day-2021?gclid=CjwKCAjw2OiaBhBSEiwAh2ZSP7p_FciAyWnJRvvenD19ydoSS_Q7cLhOiGh67Rn3GqPNlWp8kgI6FhoCNCQQAvD_BwE.
21 Parekh, "The basics of food security."
22 "Feeding the World Sustainability," United Nations, last modified June 2012, https://www.un.org/en/chronicle/article/feeding-world-sustainably.
23 "US Food Supply Chain: Disruptions and Implications from COVID-19," Ignacio Felix, Adrian Martin, Vivek Mehta, and Curt Mueller, last modified July 2, 2020, https://www.mckinsey.com/industries/consumer-packaged-goods/our-insights/us-food-supply-chain-disruptions-and-implications-from-covid-19.
24 "Food Chain Crisis," Food and Agriculture Organization of the United Nations, accessed June 30, 2022, https://www.fao.org/policy-support/policy-themes/food-chain-crisis/en/.
25 Food and Agriculture Organization of the United Nations, "Food Chain Crisis."
26 "World Food Safety Day Highlights Need to Improve Health, Prevent Foodborne Risks," *UN News*, June 7, 2022, https://news.un.org/en/story/2022/06/1119872.
27 "Food Safety," Centers for Disease Control, last modified September 5, 2017, https://www.cdc.gov/foodsafety/production-chain.html.
28 "Estimates of Foodborne Illness in the United States," Centers for Disease Control, last modified November 5, 2018, https://www.cdc.gov/foodborneburden/index.html.
29 "Foodborne Germs and Illness," Centers for Disease Control, last modified March 18, 2020, https://www.cdc.gov/foodsafety/foodborne-germs.html.
30 "People at Risk of Foodborne Illness," U.S. Food and Drug Administration, last modified September 4, 2020, https://www.fda.gov/food/consumers/people-risk-foodborne-illness.

Testing packaged meat for the listeria bacteria
Credit: Pontificia Universidad Católica de Chile

borne illness and 30 percent of food-borne related deaths are children.[31]

During 2017 and 2018, South Africa faced the largest known outbreak of listeriosis, a bacterial disease. The disease was transmitted through consuming contaminated meat products, leading to over 917 cases and 216 deaths.[32] It had the greatest impact on those with a predisposed condition or compromised immunity.[33] Listeriosis, similar to many bacterial food-borne infections, has various symptoms, including fever, diarrhea, and meningitis, in extreme cases. Since listeriosis has a 3-week incubation period, the disease was difficult to track.[34] Various strains of listeriosis were also found in patients, signifying the illness' adaptability.[35]

In the aftermath of this event, the Southern African Development Community (SADC) Health Ministers held a meeting in March 2018. The SADC pursued recall and compliance notices.[36] Even after these actions, food-borne illnesses still significantly threaten public health and the global food economy. The links between food-borne illness and food contamination, serious illness, and fatality are challenging to identify and, thus, tricky to target adequately.[37]

Disease outbreaks can also originate from transboundary animal diseases (TADs) and zoonotic diseases. The FAO defines TADs as diseases that cause great socioeconomic impacts and can quickly spread across countries. Because of their high transmissibility, they can cause global epidemics. Zoonotic diseases, referred to as zoonosis, are diseases and infections that can transmit directly from animals to humans.[38] There are over 200 known zoonotic diseases that come from both domesticated and wild animals.[39]

Zoonotic pathogens spread to humans through conditions such as direct contact, ingestion, and inhalation. Workers in

31 "Food-borne Illness Costs US$ 110 Billion Per Year in Low and Middle Income Countries," World Bank, last modified October 23, 2018, https://www.worldbank.org/en/news/press-release/2018/10/23/food-borne-illnesses-cost-us-110-billion-per-year-in-low-and-middle-income-countries.
32 Christ-Donald et al, "Listeriosis Outbreak in South Africa: A Comparative Analysis with Previously Reported Cases Worldwide," *National Library of Medicine* 8, no.1 (January 2020): 10.3390/microorganisms8010135.
33 "Listeriosis-South Africa," World Health Organization, last modified March 28, 2018, https://www.who.int/emergencies/disease-outbreak-news/item/28-march-2018-listeriosis-south-africa-en.
34 "South Africa Responding to Largest Ever Listeria Outbreak," United Nations, last modified January 12, 2018, https://news.un.org/en/story/2018/01/1000322.
35 World Health Organization, "Listeriosis-South Africa."
36 World Health Organization, "Listeriosis-South Africa."
37 Centers for Disease Control, "Food Safety."
38 "Zoonoses," World Health Organization, last modified July 29, 2020, https://www.who.int/news-room/fact-sheets/detail/zoonoses.
39 World Health Organization, "Zoonoses."

the livestock and farming industries are typically in direct contact with animals, increasing zoonosis transmission. As urbanization expands infrastructure into rural environments and habitats are destroyed by climate change, people's contact with animals becomes more frequent. These interactions increase the risks of spreading zoonotic.[40] These diseases pose severe dangers to human health and the economic systems that rely on human and animal interactions.

The human immunodeficiency virus (HIV) originated in African primates. Once transmitted to humans, the virus mutated into strains that only infect and impact humans.[41] HIV is a disease that causes an infection that attacks the body's immune system.[42] HIV was once considered deadly. In the 1980s and 1990s, the HIV pandemic swept across the globe without treatment or a cure.[43] Since this time, over 70 million people have been infected with the disease. Over 35 million have died from AIDS, the most lethal stage of HIV.[44] Although there is still no cure, the disease is now treatable through advancements in modern medicine.[45] Today 22 million people are living with HIV through treatment.[46] The example of HIV highlights the importance of awareness and the need to prevent zoonoses.

Diseases limit the function of the food supply chain by removing viable products vital to the chain's success. Decreasing the number of products that can enter the market increases disparities in consumer access. These diseases are destructive to the livelihoods of those who work in these industries and impact people's overall food security. With global disease outbreaks on the rise, the state of the food supply chain is unpredictable.

Agriculture and Livestock Health

The health of animals and crops is directly linked to human health and the health of the surrounding environment.[47] Healthy animals and crops contribute to sustainable food production, reducing food inequality and achieving food security.[48] Crops are essential for sustenance, economic development, and environmental improvement.[49] Carbon sequestration in soil and absorption by plants helps to mitigate the effects of global emissions.[50] Both agriculture and livestock serve as a source of income for many families and small farms that stimulate local economies.[51]

As countries' economies boom, more people can afford animal products, thus increasing demand. Animal products are now being produced and consumed at over four times the rate in 1961.[52] As a result, more crops are needed to accommodate growing livestock populations.[53] Both livestock and the global food supply rely on healthy crops and agriculture. Crops are essential for producing globally traded goods such as feed, fibers, and oil.[54] Feed crops provide grain for livestock consumption, while fiber crops produce cotton and hemp to produce textiles.[55] Additionally, human nutrition relies heavily

40 Catherine Bradley and Sonia Altizer, "Urbanization and the Ecology of Wildlife Diseases," *National Library of Medicine* 22, no.2 (November 2006):10.1016/j.tree.2006.11.001.
41 Paul Sharp and Beatrice Hahn, "Origins of HIV and the AIDS Pandemic," *National Library of Medicine 1*, no.1 (September 2011): 10.1101/cshperspect.a006841.
42 "About HIV/AIDS," Centers for Disease Control, last modified June 30, 2022, https://www.cdc.gov/hiv/basics/whatishiv.html.
43 "History of AIDS," History, last modified July 13, 2017, https://www.history.com/topics/1980s/history-of-aids.
44 History, "History of AIDS."
45 "HIV Treatment," Centers for Disease Control, last modified July 14, 2022, https://www.cdc.gov/hiv/basics/livingwithhiv/treatment.html.
46 "Why the HIV Epidemic is Not Over," World Health Organization, accessed July 10, 2022, https://www.who.int/news-room/spotlight/why-the-hiv-epidemic-is-not-over.
47 "Animal Health," Food and Agriculture Organization of the United Nations, accessed July 12, 2022, https://www.fao.org/animal-health/en.
48 Food and Agriculture Organization of the United Nations, "Animal Health."
49 "UN Focus on Plant Health, Crucial for Boosting Food Security Worldwide," United Nations, last modified May 12, 2022, https://news.un.org/en/story/2022/05/1118102.
50 "Cover Crops for Climate Change Adaptation and Mitigation," Environmental and Energy Study Institute, last modified February 25, 2022, https://www.eesi.org/articles/view/cover-crops-for-climate-change-adaptation-and-mitigation.
51 Food and Agriculture Organization of the United Nations, "Animal Health."
52 Hannah Ritchie and Max Roser, "Meat and Dairy Production," last modified November 2019, https://ourworldindata.org/meat-production#global-meat-production.
53 "The Future of Food," National Geographic, accessed July 13, 2022, https://www.nationalgeographic.com/foodfeatures/feeding-9-billion.
54 "Crops," National Geographic, accessed July 14, 2022, https://education.nationalgeographic.org/resource/crop.
55 National Geographic, "Crops."

on agriculture, with rice, corn, and wheat accounting for 60 percent of global food energy intake.[56] These agricultural products are essential to life. Increased animal and plant pest outbreaks increasingly threaten these critical systems. When one facet of the agricultural supply chain is unhealthy, the productivity of the entire chain is crippled.

In 2001, an outbreak of foot and mouth disease (FMD) in the United Kingdom had disastrous economic and social impacts. FMD is a highly contagious virus that affects hooved animals, resulting in high fever and oral ulcers. These symptoms make it difficult for animals to eat, breathe, and move.[57] This outbreak spread through the movement of infected pigs.[58] Although safeguards were in place for a livestock epidemic, they were only suited to handle small outbreaks with few cases. The FMD outbreak reached a scale that surpassed all preparedness and resources available.[59]

Since there are no effective treatments for FMD, preventative health measures, such as a vaccine, could not be used.[60] Without preventative health measures, the virus quickly spread throughout livestock and resulted in GBP 8 billion in economic losses. Over 6 million livestock animals were slaughtered to prevent the spread.[61] Delayed reporting, movement of undiagnosed animals, and favorable climate conditions all contributed to the escalation of this outbreak into an epidemic.[62] FMD is just one example of animal viruses endangering the economy and agriculture supply chain. Livestock diseases around the world increase animal mortality rates, reducing the amount of product available.[63]

In addition to animal diseases, plant pests are dangerous to crop production.[64] Plant pests interfere with the growth of crops and diminish the quality and quantity of farmers' harvest yield.[65] The prevalence of plant pests and crop disease outbreaks is increasing as the global climate crisis worsens. Climate change increases favorable living conditions for pests.[66] Over 15 species of plant pests have spread or have the potential to spread due to the ongoing climate crisis.[67] Plant pests and crop diseases destroy 40 percent of global agriculture annually, contributing to the growing issue of food insecurity.[68]

Plant pests are not only increasing in abundance, but they are also evolving and adapting to environments. One of these pests, the fall armyworm, is wreaking havoc on many crops needed for food production. While traditional armyworms feed on only grass species, fall armyworms feed on grasses, soy, legumes, root vegetables, cotton, and many other vital crop species.[69] They destroy crops by feeding on the foliage, leaf, and fruit of plants. Fall armyworms can fly over 100 kilometers per day. The fall armyworm has spread over seventy countries and regions in Africa, Asia, and North America.[70] Once they have settled in a new territory, their rapid reproduction rates make them impossible to eradicate.[71] The FAO estimates that over 17 million tons of corn, worth USD 6.5 billion, are lost annually due to this pest.[72] This loss is disastrous for the farmers who rely on crop yields to support

56 "Staple Foods: What do People Eat?" United Nations, accessed July 14, 2022, https://www.fao.org/3/u8480e/u8480e07.htm.
57 "Foot and Mouth Disease Factsheet," ACVP, last modified July 2012, https://www.acvp.org/page/Foot_Mouth_Disease.
58 "Foot and Mouth Disease," Georgie Atton, last modified January 25, 2021, https://ridgewayresearch.co.uk/foot-and-mouth-disease/.
59 "The 2001 Outbreak of Foot and Mouth Disease," National Audit Office, last modified June 4, 2019, https://www.nao.org.uk/report/the-2001-outbreak-of-foot-and-mouth-disease/.
60 Atton, "Foot and Mouth Disease."
61 Atton, "Foot and Mouth Disease."
62 National Audit Office, "The 2001 Outbreak of Foot and Mouth Disease."
63 Alyson Barratt, et al, "Framework for Estimating Indirect Costs in Animal Health Using Time Series Analysis," *Frontiers in Veterinary Science* (June 2019): 10.3389/fvets.2019.00190.
64 BBC News, "Plant Pests: The Biggest Threats to Food Security?" *BBC News,* November 9, 2011, https://www.bbc.com/news/science-environment-15623490.
65 "Plant Pests," Science Direct, accessed July 14, 2022, https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/plant-pests.
66 "Invasive Pest Spread Another Fallout From Climate Change," United Nations, last modified June 2, 2021, https://news.un.org/en/story/2021/06/1093202.
67 "Invasive Pest Spread Another Fallout From Climate Change."
68 Science Direct, "Plant Pests."
69 "Unusual Fall Armyworm Outbreaks are Taking Many by Surprise," Agronomic Crops Network, accessed July 15, 2022, https://agcrops.osu.edu/newsletter/corn-newsletter/2021-29/unusual-fall-armyworm-outbreaks-are-taking-many-surprise.
70 "FAO Global Action for Fall Armyworm (FAW) Control," Food and Agriculture Organization of the United Nations, accessed July 15, 2022, https://www.ippc.int/en/the-global-action-for-fall-armyworm-control.
71 "About Fall Armyworm," Food and Agriculture Organization of the United Nations, accessed July 15, 2022, https://www.ippc.int/en/the-global-action-for-fall-armyworm-control/about-fall-armyworm/.
72 "About Fall Armyworm."

their livelihoods.

The economic impacts of animal diseases and plant pests can be through direct or indirect losses. Direct losses are the explicit loss of product. When there is a disease outbreak, crop death and livestock mortality lower short-term and long-term production. Indirect losses are funds needed to mitigate the effects of the disease.[73] This is most notable in the livestock sector through actions such as livestock vaccinations, health monitoring, and enclosure regulations.[74] Land preparation, crop operations, and pesticide use are to preserve crop health.[75] These actions come with significant financial, labor, and human health costs.

In the end, both direct and indirect losses impact the global food supply. Healthy crops and livestock are instrumental to the sustainability of the global food supply. The FAO must provide prevention and rapid response measures to animal diseases and pest outbreaks to ensure the future of nutrition and food supply.

The COVID-19 Pandemic

Pandemics are outbreaks of infectious diseases that spread across large geographical areas.[76] Typically, pandemics are caused by new diseases.[77] New diseases pose serious dangers for global health, as treatment methods are not always effective or created for the particular strain of the disease.[78] Most recently, the SARs-CoV-2 virus has caused the ongoing COVID-19 pandemic.[79] Since the emergence of the disease in 2019, over 88 million cases and one million deaths have been reported.[80] COVID-19 has zoonotic origins, showing the perils of these highly transmissible diseases.[81] In addition, the pandemic had catastrophic effects that still impact the global food supply chain today.

73 Barratt, "Framework for Estimating Indirect Costs in Animal Health Using Time Series Tables."
74 "Farm Animals," Centers for Disease Control, last modified March 8, 2022, https://www.cdc.gov/healthypets/pets/farm-animals.html.
75 "Crop Production," Food and Agriculture Organization of the United Nations, accessed July 15, 2022, https://www.fao.org/sustainable-agricultural-mechanization/guidelines-operations/crop-production/en/.
76 "Pandemic," Britannica, accessed July 10, 2022, https://www.britannica.com/science/pandemic.
77 "Pandemic Influenza," Centers for Disease Control, last modified May 12, 2020, https://www.cdc.gov/flu/pandemic-resources/index.htm.
78 "Understanding Emerging and Re-Emerging Infectious Diseases," National Library of Medicine, accessed July 11, 2022, https://www.ncbi.nlm.nih.gov/books/NBK20370/.
79 "Coronavirus Disease (COVID-19)," World Health Organization, last modified May 13, 2021, https://www.who.int/news-room/questions-and-answers/item/coronavirus-disease-covid-19.
80 "The Best Defense," Centers for Disease Control, accessed July 11, 2022, https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/index.html.
81 Edward Holmes, "COVID-19-Lessons for Zoonotic Diseases," *Science* 375, no. 6585 (March 2022): 10.1126/science.abn222.

The fall armyworm caterpillar

Credit: Frank Peairs, Colorado State University, Bugwood.org

The abrupt and rapid spread of COVID-19 caused labor shutdowns, quarantine measures, and health risks that drastically reduced the flow of food. These disruptions included harvesting delays and failures, production shutdowns, and worker shortages.[82] Additionally, border restrictions inhibited global trade.[83] Since the start of the pandemic, trade networks have not operated at the same level as before.[84] Countries that rely on agriculture imports lost access to vita foods. On the other hand, countries that rely on agriculture exports lost crucial streams of revenue.[85]

Those employed and unable to work remotely faced increased exposure to the disease.[86] Workers in the agriculture and livestock sectors were particularly at risk. Protective measures and regulations in these industries are less enforced, making workers more vulnerable to exploitation.[87] These impacts manifested throughout the food supply chain, causing disruptions from farmers and livestock workers to food transportation and grocery workers.[88] Because of these restrictions and risks, global economic output decreased by over USD 8.5 trillion between 2021 and 2022.[89] These massive disruptions decreased food variety and access to foods worldwide.

For instance, in 2020, several European countries faced extreme economic loss from white asparagus crops.[90] The white asparagus crop is highly sought-after in Germany. More than 138,000 tons are consumed annually.[91] Harvesting these crops requires the work of migrant field workers. Germany typically relies on over 300,000 migrant workers for seasonal agricultural work. However, due to border lockdowns, migrant workers were restricted. The crops remained unharvested, resulting in devastating financial loss and business closures.

Supply chain disruptions during the pandemic, like the one that affected the white asparagus crop, had harsh economic impacts. Food prices skyrocketed because the supply could not meet the demand. As a result, the already decreased food supply became less affordable. The economic fallout also resulted in extreme unemployment, with the pandemic expected to contribute to the unemployment of 200 million people.[92] Unemployment decreases people's purchasing power for food, increasing food insecurity. The combined effect of increased prices and decreased income devastated global food security.

Not only did the food supply chain change during the COVID-19 pandemic, but the way global consumers utilized the supply chain also changed. During the outbreak, consumer demand for restaurants and in-person dining experiences decreased. Instead, consumers turned to online food delivery systems and mobile grocery retailers.[93] This caused increased strain on the delivery systems in place. At the same time, food service businesses struggled to stay open and maintain current employees.[94] Food and beverage business closures from the COVID-19 pandemic surpassed one hundred thousand.

The COVID-19 pandemic propelled global hunger to higher

82 "COVID-19 has Broken the Global Food Supply Chain," Deloitte, last modified February 19, 2021, https://www2.deloitte.com/ch/en/pages/consumer-business/articles/covid19-has-broken-the-global-food-supply-chain.html.
83 Stephens, "Impacts of COVID-19 on Agricultural and Food Systems Worldwide."
84 "COVID-19 and World Trade," World Trade Organization, accessed July 17, 2022, https://www.wto.org/english/tratop_e/covid19_e/covid19_e.htm.
85 "COVID-19 and Food Security in Vulnerable Countries," UNCTAD, last modified April 14, 2020, https://unctad.org/news/covid-19-and-food-security-vulnerable-countries.
86 "Impact of COVID-19 on People's Livelihoods, Their Health, and Our Food Systems," World Health Organization, Last modified October 12, 2020, https://www.who.int/news/item/13-10-2020-impact-of-covid-19-on-people%27s-livelihoods-their-health-and-our-food-systems.
87 World Health Organization, "Impact of COVID-19 on People's Livelihoods, Their Health, and Our Food Systems."
88 World Health Organization, "Impact of COVID-19 on People's Livelihoods, Their Health, and Our Food Systems."
89 "COVID-19 to Slash Global Economic Output," United Nations, accessed July 12, 20222, https://www.un.org/en/desa/covid-19-slash-global-economic-output-85-trillion-over-next-two-years.
90 "German Asparagus Season Faces Peril as Coronavirus Shuts Out Pickers," Reuters, last modified March 26, 2020, https://www.reuters.com/article/us-health-coronavirus-germany-food/german-asparagus-season-faces-peril-as-coronavirus-shuts-out-pickers-idUSKBN21D2XX.
91 "Germany: Distribution of Gross Domestic Product (GDP) Across Economic Sectors from 2010 to 2020," Statista, last modified February 15, 2022, https://www.statista.com/statistics/375569/germany-gdp-distribution-across-economic-sectors/.
92 "COVID Crisis to Push Global Unemployment Over 200 Million Mark in 2022," United Nations, last modified June 2, 2021, https://news.un.org/en/story/2021/06/1093182.
93 Jeff Luckstead, Rodolfo Nayga, and Heather Snell, "Labor Issues in the Food Supply Chain Amid the COVID-19 Pandemic," *National Library of Medicine* 43, no.1 (March 2021): 10.1002/aepp.13090.
94 Luckstead, "Labor Issues in the Food Supply Chain Amid the COVID-19 Pandemic."

levels than ever before.[95] An estimated 9.9 percent of the global population faced hunger due to food insecurity from the pandemic.[96] In 2020, around 811 million people suffered from hunger due to high food costs.[97] As previously mentioned, issues of food insecurity disproportionately affected those already suffering from a lack of regular food access. Young children and women are most vulnerable to unemployment and food insecurity.[98]

Without the global food supply chain, the variety of products available on the global market would be vastly limited. The rapid growth and transmission of disease across people have devastating impacts on the global economy and the future of food security. The COVID-19 pandemic is one case study that can be used to inform future actions. Proper preventative measures and preparedness for future pandemics are vital to ensure every person has continuous access to food. Countries must work to ensure the future of food production and distribution as well as the longevity of the global food trade network.

Past FAO Initiatives

The FAO has taken many actions to secure the future of food security by strengthening the global food supply chain. The FAO's work revolves around sustainable agriculture and livestock farming processes that protect the health of animals, people, and the environment globally. This work seeks to end hunger and food inequities by promoting sustainable food production that lowers food loss throughout the production process and food supply chain.[99] Bodies collaborating with the FAO include governments, regional bodies, other UN Organizations, developmental agencies, and laborers in the private and public sectors.[100]

The foundation of the food supply chain depends on the success of livestock and farms. The FAO works on initiatives to increase the resilience of agriculture and agriculture-based livelihoods against global crises.[101] Protecting the health of crops and livestock starts by targeting the diseases and pests that threaten the productivity and safety of livestock and crops. This is done by implementing preventative health measures and strengthening preparedness for future outbreaks.

One example of the FAO's success is the rinderpest virus. Rinderpest was a deadly and highly contagious disease that primarily impacted cattle and cloven-footed animals.[102] When infected, animals showed symptoms, including fever, diarrhea, and mouth ulcers, that ultimately led to death.[103] Rinderpest ravaged Europe and Asia for many centuries without successful eradication before the disease traveled to Africa.[104] Once rinderpest reached Africa in the late 1800s, the disease exponentially spread through the cattle populations, causing devastating economic and social consequences. Rinderpest killed over ninety percent of all cattle in central and southern Africa and cost an estimated USD 1.9 billion.[105]

Not only is the disease notable for its impacts on animal health, but the outbreak is responsible for famine and disease that led to human deaths.[106] The death of cattle populations meant that farmers could not use cattle to plow their fields or fertilize crops. Thus, crops could not be cultivated or

95 "UN Report: Pandemic Year Marked by Spike in World Hunger," World Health Organization, last modified July 12, 2021, https://www.who.int/news/item/12-07-2021-un-report-pandemic-year-marked-by-spike-in-world-hunger.
96 "Food," United Nations, accessed July 12, 2022, https://www.un.org/en/global-issues/food.
97 United Nations, "Food."
98 United Nations, "COVID Crisis to Push Global Unemployment."
99 "Seeking End to Loss and Waste of Food Along Production Chain," Food and Agriculture Organization of the United Nations, accessed July 17, 2022, https://www.fao.org/in-action/seeking-end-to-loss-and-waste-of-food-along-production-chain/en/.
100 "5 Steps We all Must Take to Ensure Food Safety," Food and Agriculture Organization of the United Nations, last modified June 6, 2019, https://www.fao.org/fao-stories/article/en/c/1194118/.
101 "Resilience," Food and Agriculture Organization of the United Nations, accessed July 17, 2022, https://www.fao.org/resilience/background/en/.
102 Food and Agriculture Organization of the United Nations, "Resilience."
103 "How Rinderpest was Eradicated," Sophie Ochmann and Hannah Behrens, last modified September 30, 2018; Food and Agriculture Organization of the United Nations, "Resilience."
104 "Eradication Isn't the End of the Rinderpest Story," Food and Agriculture Organization of the United Nations, last modified November 22, 2018, https://www.fao.org/newsroom/detail/Eradication-isn-t-the-end-of-the-Rinderpest-story/en.
105 Martyn Jeggo, Roland Geiger, and James Dargie, "Animal Health: Supporting Africa's Campaign Against Rinderpest," accessed July 17, 2022, https://www.iaea.org/sites/default/files/publications/magazines/bulletin/bull36-3/36301084855.pdf.
106 David Morens, Edward Holmes, Sally Davis, and Jeffery Taunbenberger, "Global Rinderpest Eradication: Lessons Learned and Why Humans Should Celebrate Too," *National Library of Medicine* 204, no.4 (August 2011): 10.1093/infdis/jir327.

harvested.[107] Food insecurity rose, and people were forced to relocate to new areas. The death of half the population in affected parts of Africa can be attributed to hunger and hunger-related violence from the rinderpest outbreak.[108]

Efforts to eliminate rinderpest began with measures to limit the spread. These included quarantine, improved sanitation, and mass slaughter.[109] In 1960, Walter Plowright developed a successful rinderpest vaccine for livestock. His vaccine induced lifelong immunity and was inexpensive to produce.[110] The development of the vaccine was an essential factor in eradicating rinderpest, but further actions were needed to ensure global safety.

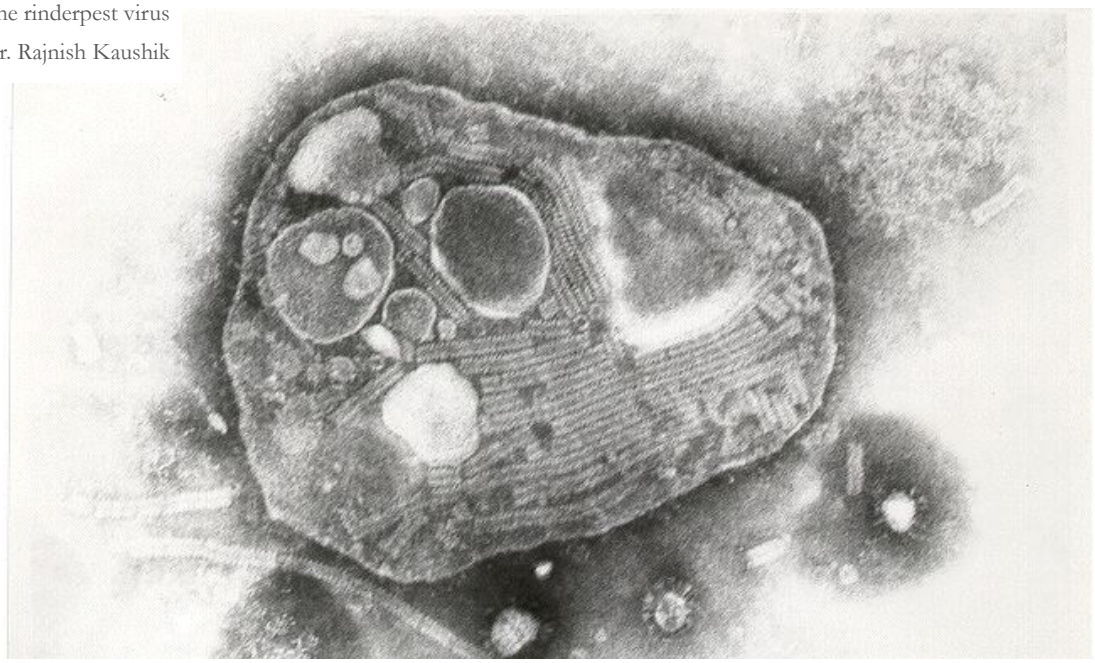
The Global Rinderpest Eradication Programme (GREP) is an international operation by the FAO, the International Atomic Energy Agency (IAEA), and the World Organization for Animal Health (WOAH). The GREP commenced in 1994 and aimed to achieve a world free from rinderpest by 2010.[111] It was a notable achievement toward the future of livestock health and preventing TAD outbreaks. The GREP outlined the actions needed to prepare for, respond to, and recover from outbreaks of rinderpest.[112] This program's work centered around global surveillance and vaccination efforts. It worked with countries to strengthen the health and productivity of livestock sectors through resources to better diagnose and treat infected animals.[113]

In 2011, the United Nations declared the world completely eradicated from rinderpest at an FAO meeting in Rome.[114] Since its eradication, the FAO ensures that no future outbreaks of rinderpest will occur by eliminating all lab samples of the disease globally.[115] The actions of the FAO through the GREP ultimately helped the world move closer to achieving global food security.

A more recent example of the FAO's work is on the desert locust upsurge in 2020. The desert locust is an insect closely

107 Morens, "Global Rinderpest Eradication."
108 Morens, "Global Rinderpest Eradication."
109 Ochmann, "How Rinderpest Was Eradicated."
110 Ochmann, "How Rinderpest Was Eradicated."
111 Ochmann, "How Rinderpest Was Eradicated."
112 "Global Rinderpest Action Plan," Food and Agriculture Organization of the United Nations, accessed July 17, 2022, https://shop.un.org/books/global-rinderpest-action-plan-86961.
113 "Animal Production and Health Division," Food and Agriculture Organization of the United Nations, accessed July 17, 2022, https://www.fao.org/agriculture/animal-production-and-health/en/.
114 "UN Declares Deadly Cattle Plague Eradicated After Global Campaign," United Nations, last modified June 28, 2011, https://news.un.org/en/story/2011/06/379902-un-declares-deadly-cattle-plague-eradicated-after-global-campaign.
115 Food and Agriculture Organization of the United Nations, "Eradication Isn't the End of the Rinderpest Story."

A cell infected by the rinderpest virus
Credit: Dr. Rajnish Kaushik



related to grasshoppers. During a particular hormone phase, desert locusts experience increased movement and appetite.[116] When the locusts form swarms, they can destroy crops and reduce agricultural growth over wide areas.[117] This makes the desert locust the most destructive migratory plant pest in the world and has caused a global crisis.[118]

Starting early in 2020, the most devastating desert locust upsurge in over 25 years swept over parts of the Middle East, Africa, and Asia.[119] Locust swarms pose a danger to agricultural productivity, as the swarms can destroy entire crops by eating away at the stem, leaf, and root of the plants.[120] One square meter of locust swarm can destroy crops equal to the amount of food 35,000 people consume in one day.[121] The locust upsurge has resulted in threats of famine and starvation in over 60 countries.[122]

In response to the desert locust crisis, the FAO and partnering agencies mobilized over USD 163 million to curb the spread of locust swarms and implement proper surveillance of these insects.[123] The actions taken by the FAO encompass three main goals: locust survey and control, livelihood protection, and coordination and preparedness.[124] The FAO Locus Hub is a part of these ongoing initiatives that track desert locust activity in real-time and provides response resources.[125] The FAO led groundwork with aerial and ground spraying of crops and vulnerable areas in over 10 countries where locusts caused the most damage.[126] Over 240,000 hectares of arable land were treated with pesticides.[127] These pesticides are successful in eliminating locust swarms. However, there are potentially devastating human health consequences for people who interact directly with these pesticides or come into contact with pesticide residues on crops.[128] With the collaborative work of the FAO and international governments, the desert locust upsurge was declared over in December 2021. That being said, monitoring locust populations is imperative to mitigate future upsurges.[129]

Current Status

Emerging Diseases and Global Response

Public health in the global community is continuously threatened by emerging and re-emerging cases of zoonosis. Over the past 60 years, the rate of emergence of new diseases per decade increased by over ten times.[130] This upsurge can be attributed to increases in international travel, exposure to wildlife, and disease adaptations.[131] These factors allow for the growth and spread of disease, especially in densely-populated areas and those with limited health services.[132] Emerging and re-emerging diseases threaten the global food supply by limiting food production and distribution and increasing prices.

Emerging and re-emerging diseases thrive in environments

116 "Locusts," National Geographic, accessed July 17, 2022, https://www.nationalgeographic.com/animals/invertebrates/facts/locusts.
117 National Geographic, "Locusts."
118 "Desert Locust," Food and Agriculture Organization of the United Nations, accessed July 17, 2022, https://www.fao.org/locusts/en/.
119 "Evaluation at FAO," Food and Agriculture Organization of the United Nations, accessed July 17, 2022, https://www.fao.org/evaluation/evaluation-digest/desert-locusts/en/.
120 National Geographic, "Locusts."
121 Food and Agriculture Organization of the United Nations, "Desert Locust."
122 National Geographic, "Locusts."
123 Food and Agriculture Organization of the United Nations, "Evaluation at FAO."
124 Food and Agriculture Organization of the United Nations, "Evaluation at FAO."
125 "Locust Hub," Food and Agriculture Organization of the United Nations, accessed July 17, 2022, https://locust-hub-hqfao.hub.arcgis.com/.
126 "FAO Continues to Fight Desert Locust Upsurge in East Africa and Yemen Despite COVID-19 Constraints,"United Nations, last modified April 14, 2020, https://www.un.org/africarenewal/news/fao-continues-fight-desert-locust-upsurge-east-africa-and-yemen-despite-covid-19-constraints.
127 "FAO Continues to Fight Desert Locust Upsurge."
128 "Toxic Pesticides Deployed in the Control of Desert Locusts," Greenpeace, last modified February 19, 2021, https://www.greenpeace.org/africa/en/blogs/13147/toxic-pesticides-employed-in-the-control-of-desert-locusts/.
129 "FAO Emergencies and Resilience," Food and Agriculture Organization of the United Nations, accessed July 17, 2022, https://www.fao.org/emergencies/crises/desert-locust-crisis/en.
130 "The World is Not Ready for the Next Pandemic," Bryan Walsh, *Time*, Last modified May 4, 2017, https://time.com/4766624/next-global-security/.
131 Bruce Clements and Julie Casan,. "Emerging and Re-Emerging Infectious Disease Threats," *Disasters and Public Health*, no.2 (2016): 10.1016/B978-0-12-801980-1.00010-6.
132 "Emerging Infectious Diseases," Baylor College of Medicine, accessed August 5, 2022, https://www.bcm.edu/departments/molecular-virology-and-microbiology/emerging-infections-and-biodefense/emerging-infectious-diseases.

where there are dense populations, impoverished communities, and ecological changes.[133] Cities and schools are common transmission locations because of the close living conditions. Over 55 percent of the global population lives in urban areas, and this is expected to increase to 68 percent by 2050.[134] This urbanization boom will make cities epicenters for disease transmission and worsen existing problems of access to sanitation and health resources.[135] Access to clean water, sanitation, and healthcare is essential to preventing disease outbreaks. Thus, people living in regions without adequate infrastructure will become even more vulnerable.

Adequately addressing emerging diseases is difficult. To mitigate an outbreak, governments must respond rapidly with measures to stop further spread. Since emerging diseases are unknown and often spread quickly, it is challenging to have rapid responses or treatments prepared. Re-emerging diseases expose inadequacies in public health policies against prior outbreaks.[136] Even more concerning, emerging and re-emerging diseases are known for their ability to adapt to increase their transmissibility and harmfulness.

Diseases are becoming more transmissible among humans by changing their infection methods. Diseases that are only transmissible through the exchange of bodily fluids are more difficult to contract because they require direct contact. Diseases that transmit through indirect contact are more challenging to prevent. Some diseases can even adapt to become transmissible through the air or survive on inanimate objects.[137] The spread of these diseases threatens global health, risking global food security.

Furthermore, microbial evolution allows diseases to withstand medical advancements. The most threatening adaptations include diseases that become antimicrobial resistant (AMR). AMR occurs when bacteria, viruses, and parasites change, making them unresponsive to medicines or immunizations.[138] This limits the effectiveness of antibiotics and antimicrobial drugs. In turn, diseases can harm human and animal health more easily, decreasing food security and safety worldwide. The FAO, World Health Organization, and International Organization of Epizootics urge that national and international policies for antibiotic use are adopted. Agencies should monitor antibiotic use and enforce policies to reduce AMR of these re-emerging diseases.[139] Recently, the FAO and other UN bodies have increasingly prioritized emerging diseases and their impact on food security, which is discussed in the next section.

Current UN Actions

In response to the rise of emerging diseases, the UN has taken action to mitigate impacts on public health and food security. UN agriculture, food, and health initiatives help promote sustainable farming practices and increase food security globally. The FAO Strategic Framework aligns the FAO with goals such as more efficient, resilient, inclusive, and sustainable agriculture and food production systems.[140]

FAO's One Health initiative, in collaboration with the United Nations Environmental Programme (UNEP) and the World Organization for Animal Health (WOAH), is a global initiative to promote the health of people, ecosystems, and animals.[141] This approach to global health views animals, the environment, and people as one connected system. The health of one sector improves the health of others. Overall, the program promotes sustainable agriculture, food safety, food security, and the reduction of antimicrobial resistance.[142] It targets transboundary diseases, zoonoses, and global hunger

133 Polgreen, "Emerging and Re-Emerging Pathogens."
134 "Urban Health," World Health Organization, last modified October 29, 2021, https://www.who.int/news-room/fact-sheets/detail/urban-health.
135 World Health Organization, "Urban Health."
136 Philip Polgreen and Evelyn Polgreen, "Emerging and Re-Emerging Pathogens and Diseases, and Health Consequences of Climate Change," *Infectious Disease*, no.1 (2017): 10.1016/B978-0-7020-6285-8.00004-6.
137 Chia Wang, et al, "Airborne Transmission of Respiratory Viruses," Science 373, no.6558 (August 2021): 10.1126/science.abd9149.
138 "Antimicrobial Resistance," World Health Organization, last modified November 17, 2021, https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance.
139 Jason R. Rohr, et al., "Emerging human infectious diseases and the links to global food production," *Nature Sustainability* 2 (June 2019): 445-456, https://www.nature.com/articles/s41893-019-0293-3.
140 "Strategic Framework 2022-31."
141 "The Development Law Service," Food and Agriculture Organization of the United Nations, accessed August 6, 2022, https://www.fao.org/legal-services/resources/detail/en/c/1477431/.
142 "One Health," Food and Agriculture Organization of the United Nations, accessed August 6, 2022, https://www.fao.org/one-health/

by leading programs that improve early warning systems and action response plans.[143]

The early warning systems aim to warn the global community better when outbreaks of animal and plant pests or zoonoses start. The FAO Global Animal Disease Information System (EMPRES-i) is software that generates maps of potential threats and shares that information with the WHO and WOAH.[144] These maps help highlight vulnerable locations and better prepare countries for potential outbreaks. The FAO seeks to improve action response plans through collaboration with national governments. This is done by sharing information, resources, and financial aid.[145] The FAO Emergency Centre for Transboundary Animal Disease field missions delivers veterinary assistance emergency services during an outbreak.[146] The One Health approach unites the global community through the shared goal of achieving food security and creating resilient agriculture practices.

On January 11, 2021, the fourth One Planet Summit was held in France. The summit brought together global leaders, NGOs, and members of the UN to discuss biodiversity and the protection of the environment with links to human health.[147] It encouraged global corporations to commit to substantial changes to preserve biodiversity. The summit focused on key ideas, including preserving marine and terrestrial life, promoting sustainable agriculture, mobilizing financial resources for biodiversity, and protecting human health.[148] It is imperative to recognize the links between the environment, agriculture, and human health. All of these actions protect the environment, which in turn protects humans and our food systems.

Beyond these actions, the UN is also targeting the impacts of health, economic, and humanitarian crises caused by COVID-19.[149] The United Nations Comprehensive Response to COVID-19 emphasizes reducing vulnerabilities to future

en.
143 Food and Agriculture Organization of the United Nations, "One Health."
144 "Five Ways FAO Fights for Animal Health," Food and Agriculture Organization of the United Nations, last modified January 24, 2020, https://www.fao.org/fao-stories/article/en/c/1258497/.
145 "Early Warning Early Action," Food and Agriculture Organization of the United Nations, accessed August 6, 2022, https://www.fao.org/3/CA3127EN/ca3127en.pdf.
146 "Five Ways FAO Fights for Animal Health."
147 "One Planet Summit," United Nations, accessed August 6, 2022, https://www.un.org/sustainabledevelopment/blog/2021/01/one-planet-summit-2/.
148 United Nations, "One Planet Summit."
149 "UN Response to COVID-19," United Nations, accessed August 6, 2022, https://www.un.org/en/coronavirus/UN-response.

UK Prime Minister Theresa May speaking at the One Planet Summit in Paris

Credit: Prime Minister of the United Kingdom

pandemics and overcoming systemic inequalities exposed by the pandemic.[150] For example, it targets the disproportionate food insecurity burden placed on vulnerable communities.[151] In response to supply chain disruptions from the pandemic, the UN is creating new networks for vital.[152] The UN aims to support food security by ensuring that critical food supply chains remain open.[153] It is working to make supply chains more efficient while reducing negative impacts on the environment.[154] The various UN efforts focus on the impacts of disease outbreaks on access to food to help ensure food security during times of global hardship. Still, more can be done to protect the future of food everywhere.

Sustainable Development Goals

The United Nations Sustainable Development Goals (SDGs) are vital to address issues surrounding diseases and the global food supply chain. The UN SDGs were adopted in 2015 and call for the global community to act toward the execution of 17 goals. Together, these goals aim to achieve a peaceful and prosperous world by 2030.[155] FAO's Strategic Framework embodies the SDGs through principles that target people, the planet, prosperity, peace, and partnership.[156] Work done by the FAO aligns with all SDGs but specifically targets SDGs 1, 2, 3, 6, 10, and 15.

SDG 1: No Poverty calls for the end of poverty in all forms through eradicating extreme poverty and implementing social protection systems.[157] Extreme poverty is measured as people living on less than USD 1.25 per day. Economic stability plays a vital role in achieving food security. Global food inflation and fallout from the pandemic have worsened food accessibility and made nutritious food unaffordable for many. Ensuring every person can afford safe and nutritious food is a human right that this goal aims to achieve.[158] This SDG recognizes how lessening the number of impoverished people directly correlates to increased food security.

SDG 2: Zero Hunger calls for an end to hunger and achieving food security for all. Hunger is the leading cause of death globally, stemming from unequal access and inefficient food handling systems. SDG 2 encourages countries to collaborate on sustainable agriculture and fair distribution systems.[159] This SDG aligns with the work of the FAO to ensure universal access to safe foods and to end malnutrition, recognizing how minority groups face increased disparities. Zero hunger supports small-scale food producers and works to secure income for farmers and agricultural workers. SDG 2 aims to correct and prevent trade restrictions and disruptions as a means to protect the global food supply and distribution systems.[160]

SDG 3: Good Health and Wellbeing calls for promoting well-being and healthy lives for people of all ages.[161] SDG 3 seeks to prevent childhood and maternal mortality, fight treatable diseases, and achieve universal healthcare. This goal aligns with minimizing disease outbreaks and ensuring access to health services for all people. Access to health services, such as vaccines and medicine, is crucial to protecting public health and improving quality of life.[162]

SDG 6: Clean Water and Sanitation calls for the sustainable management of water resources and the improvement of sanitation.[163] One in three people lives without access to

150 United Nations, "UN Response to COVID-19."
151 United Nations, "UN Response to COVID-19."
152 "Supply Chain and COVID-19," United Nations, accessed August 6, 2022, https://www.un.org/en/coronavirus/supply-chain-and-covid-19-un-rushes-move-vital-equipment-frontlines.
153 "Keep Critical Supply Chains Operating to Save Lives During COVID-19," United Nations, last modified April 21, 2020, https://news.un.org/en/story/2020/04/1062192.
154 United Nations, "Keep Critical Supply Chains Operating to Save Lives."
155 "The SDGs in Action," United Nations Development Programme, accessed August 6, 2022, https://www.undp.org/sustainable-development-goals.
156 "FAO and the Sustainable Development Goals," Food and Agriculture Organization of the United Nations, accessed August 7, 2022, https://www.fao.org/about/strategy-programme-budget/strategic-framework/fao-sdg/en.
157 "No Poverty," The Global Goals, accessed August 7, 2022, https://www.globalgoals.org/goals/1-no-poverty/.
158 The Global Goals, "No Poverty."
159 "Zero Hunger," The Global Goals, accessed August 7, 2022, https://www.globalgoals.org/goals/2-zero-hunger/.
160 The Global Goals, "Zero Hunger."
161 "Good Health and Well-Being," The Global Goals, accessed August 7, 2022, https://www.globalgoals.org/goals/3-good-health-and-well-being/.
162 The Global Goals, "Good Health and Well-Being."
163 "Clean Water and Sanitation," The Global Goals, accessed August 7, 2022, https://www.globalgoals.org/goals/6-clean-water-and-sanitation/.

sanitation resources, contributing to disease proliferation and death. SDG 6 aims to provide safe, affordable drinking water to all people, including expanding water and sanitation services.[164] Sustainable water management ensures equal access to water and promotes healthy lifestyles.

SDG 10: Reduced Inequalities calls for the reduction of wealth disparities and the promotion of equality regardless of gender, race, religious beliefs, or economic status.[165] This goal aims to reduce income inequalities and promote inclusivity through adopting fiscal and social policies. Eliminating inequalities is essential for achieving other SDGs by ensuring equal access to necessary resources.[166] Reducing inequalities is deeply connected with mitigating the disparaging impacts of global catastrophes, including pandemics and disease outbreaks.

SDG 15: Life on Land calls for protecting and restoring terrestrial ecosystems to protect biodiversity and safeguard the health of plants and animals.[167] SDG 15 works to restore habitats and degraded land and promote the environment's health. These goals align with improving livestock farming and agricultural practices by ensuring animal and plant well-being.[168]

Bloc Analysis

In the discourse on diseases and their impact on the global food supply chain, there is some disagreement over the level of intervention the global community should take. The impacts of diseases on the global food supply chain devastate food security. Outbreaks disrupt supply chains by limiting available products and impacting livelihoods that rely on the global food supply chain.[169] This issue greatly affects countries that rely heavily on the global trade network to export and import agricultural products. The interconnectedness of the global market causes countries to have a vested interest in the health and productivity of the global food supply chain. However, countries unable to produce food internally are more vulnerable to the effects of supply chain disruptions. Countries that are net exporters of food products gain more money from exports of food goods than they spend on importing foods. Countries that are net importers of food spend more to import food products than they do on food exports.[170] Additionally, countries with large populations demand greater access to food products and benefit enormously from the success of the food trade industry.

The Global Food Security Index (GFSI), developed by the independent analyst organization the Economist Impact, is a quantitative and qualitative system that measures factors of food security across the globe.[171] This index is updated annually to account for changes in factors impacting food security. This system evaluates countries based on food affordability, availability, quality, safety, and the availability of natural resources and resilience.[172] This is important for recognizing vulnerabilities in future access to food and viewing how countries achieve food security. Utilizing this index in tandem with comparisons to agricultural exports allows for examining the relationship between food security and self-sufficiency.

High Global Food Security Index and Net Exports of Agricultural Products

Members of this bloc have high food security scores on the GFSI and are net exporters of agricultural products. Members of this block are self-sufficient food producers, allowing them to have a decreased dependence on the global trade network to achieve food security. Based on the GFSI, countries in this bloc also obtain high scores in natural resources and resilience, emphasizing the relationship between domestic food production and food security.[173]High-income states typically lead the index, correlating well-funded food programs with

164 The Global Goals, "Clean Water and Sanitation."
165 "Reduced Inequalities," The Global Goals, accessed August 7, 2022, https://www.globalgoals.org/goals/10-reduced-inequalities/.
166 The Global Goals, "Reduced Inequalities."
167 "Life on Land," The Global Goals, accessed August 7, 2022, https://www.globalgoals.org/goals/15-life-on-land/.
168 The Global Goals, "Life on Land."
169 "Global Food Security and Market Stability," G20 Insights, last modified December 10, 2020, https://www.g20-insights.org/policy_briefs/global-food-security-and-market-stability-the-role-and-concerns-of-large-net-food-importers-and-exporters/.
170 G20 Insights, "Global Food Security and Market Stability."
171 "The Global Food Security Index," Economist, accessed August 7, 2022, https://impact.economist.com/sustainability/project/food-security-index.
172 Economist, "The Global Food Security Index."
173 "Global Food Security Index: Rankings and Trends," Economist, accessed August 7, 2022, https://impact.economist.com/sustainability/

A shipment of UN food aid in Kenya
Credit: Matt Murphy and the US Department of State

increased global food security. These countries also score high across all four pillars of food security: Affordability, Quality and Safety, Availability, and Resilience.[174]

Additionally, these countries more easily adapt to global disasters and face fewer impacts of hunger from supply chain disruptions. These countries can keep food costs down for consumers, especially for essential products. In the wake of crises such as COVID-19, these countries did not experience as significant consequences to their GFSI scores as others.[175] As net exporters of agricultural products, countries in this bloc recognize the importance of the global food trade. However, most food goods are produced internally, so more interest lies in the economic prosperity of the supply chain overall. Members of this bloc would include countries such as the United States, Canada, Ireland, Austria, and the Czech Republic.

High Global Food Security Index and Net Imports of Agricultural Products

Members of this bloc have high food security scores on the GFSI and are net importers of agricultural goods.[176] These countries may produce food domestically, but many do not produce enough to satisfy the population's consumption needs. However, they have the economic means to import needed food.[177] As net importers of food products, countries in this bloc depend on the global food trade. Countries in this bloc score highly in food affordability and availability but receive low scores in natural resources and resilience.[178] Members of this bloc face challenges in food access during global catastrophes. Therefore, they are vulnerable to food insecurity from supply chain disruptions. This bloc includes Japan, the United Kingdom, Singapore, Russia, and China.

project/food-security-index/Index.
174 "2021 Overview," Global Food Security Index, accessed September 14, 2022, https://impact.economist.com/sustainability/project/food-security-index/Index/Overview.
175 "Ireland ranked first in Global Food Security Index, whilst Canada overtakes US," *New Food Magazine*, November 29, 2021, https://www.newfoodmagazine.com/news/159325/global-food-security-index/.
176 "Trade and Food Security," United Nations Conference on Trade and Development, last modified June 7, 2021, https://unctad.org/news/trade-and-food-security-when-agreement-delayed-becomes-human-right-denied.
177 "Food security and trade: an overview," in *Trade Reforms and Food Security: Conceptualizing the Linkages,* (Rome: FAO, 2003) https://www.fao.org/3/y4671e/y4671e05.htm.
178 Economist, "Global Food Security Index: Rankings and Trends."

Low Global Food Security Index and Net Exports of Agricultural Products

Members of this bloc have low food security scores on the GFSI and are net exporters of agricultural products. Many of these countries show resilience in their natural resources but still rely on exporting these goods for their economic infrastructures.[179] These countries may appear to be food self-sufficient, with enough domestic products to support the population. However, these products do not always include staple crops. In reality, many households in these countries suffer from food insecurity and malnutrition. They are unable to access the necessary agricultural products for their families.[180]

As net exporters of food products, these countries rely heavily on the global food trade to support their economies. Countries in this category face an issue where more food is produced than needed. Nevertheless, high levels of food insecurity are still present because of rising food costs and high populations of impoverished people.[181] This is reflected in the low affordability, natural resource, and resilience scores.[182] These countries already face impacts of food insecurity and, as net exporters, have vulnerabilities to potential supply chain disruptions. Members of this bloc include countries such as Indonesia, Brazil, Paraguay, and Ghana.

Low Global Food Security Index and Net Imports of Agricultural Products

Members of this bloc have low food security scores on the GFSI and are net importers of agricultural products. This relationship between GFSI and imports of food products reflects how food is becoming an expensive commodity. Countries in this bloc import more food than they export, often leading to inflated food prices. These countries are at a higher risk of experiencing hunger, malnutrition, starvation, and hunger-related violence.[183] Supply chain disruptions from global catastrophes leave these countries more vulnerable. Members of this bloc recognize the importance of a productive global food supply chain but face internal risks of hunger regardless of the supply chain's success. Many of these countries have growing populations of low-income and impoverished people, which contributes to limitations in food accessibility. Countries in this bloc obtain low scores in the food affordability, food availability, natural resources, and resilience categories.[184] Members of this bloc include countries such as Saudi Arabia, Sudan, Uzbekistan, and Bangladesh.

Committee Mission

The Food and Agriculture Organization (FAO) is tasked with working to end hunger and achieve food security for all people.[185] Achieving food security requires continual access to high-quality foods for people to lead healthy and active lifestyles. The FAO leads international efforts to ensure regular access to nutrition and works to ensure food safety and quality through targeted work in food cultivation and safety regulations.[186] The global food supply chain is imperative to achieving these goals by promoting food accessibility and affordability. Thus, the health and productivity of the supply chain are significant concerns for the FAO. Addressing the many facets of this issue, including disease proliferation and impacts from pandemics, is vital to certify the future of the supply chain and defeat food insecurity.

As a specialized agency of the UN, the FAO works closely with international governments, other UN bodies, and independent agencies. Together, they coordinate actions to make farming, agriculture, and management of land resources more efficient and sustainable.[187] The FAO focuses on inter-agency collaboration and develops strategic partnerships for

179 Global Food Security Index, "2021 Overview."
180 "Food security and trade: an overview," in *Trade Reforms and Food Security*.
181 United Nations Conference on Trade and Development, "Trade and Food Security."
182 Economist, "Global Food Security Index: Rankings and Trends."
183 "Food Insecurity Soaring Across 20 Hunger Hotspots," United Nations, last modified January 27, 2022, https://news.un.org/en/story/2022/01/1110742.
184 Economist, "Global Food Security Index: Rankings and Trends."
185 "About FAO," Food and Agriculture Organization of the United Nations, accessed August 12, 2022, https://www.fao.org/about/en.
186 "5 Steps We all Must Take to Ensure Food Safety," Food and Agriculture Organization of the United Nations, accessed August 12, 2022, https://www.fao.org/fao-stories/article/en/c/1194118/.
187 "Partnerships," Food and Agriculture Organization of the United Nations, accessed August 12, 2022, https://www.fao.org/partnerships/en/.

combined efforts towards shared goals.[188] By working with farmers, production facilities, and international governments, the FAO aims to change the current faults in the system while preventing future deficits.

The FAO must support the international community's efforts toward the health of livestock and crops, the protection of the global food supply chain, and preventative health initiatives. These factors are vital to improving global access to food and protecting the livelihoods and economies that rely on the global food trade. Delegates should focus on solutions that support and improve current FAO frameworks while creating feasible solutions to emerging challenges.

188 Food and Agriculture Organization of the United Nations, "Partnerships."

FAO

NHSMUN 2023

TOPIC B:
REDUCING FOOD WASTE TO COMBAT HUNGER

Photo Credit: Starr

Introduction

The world produces 60 percent more food than necessary, yet 40,000 people die of hunger daily. About 828 million people do not have enough food to lead healthy, active lives. Nearly one in nine people worldwide and an estimated 8,500 children die daily from severe malnutrition.[1]

Food loss and waste occur at all stages of the food chain: the farm, processing industries, distribution, restaurants, and consumers' homes. The causes vary according to the type of product, stage of production, storage mode, transport, packaging, and consumer habits. Food waste at the household level accounts for 11 percent of all food waste worldwide.[2] Food losses and waste represent a lost opportunity to feed a growing world population. In the current economic context, reducing food waste is an essential preliminary step to combating hunger and improving the nutrition of the most disadvantaged populations.

Food waste also generates a significant environmental impact. Finite natural resources such as water, land, or marine resources used for producing wasted food are lost. Similarly, the poor distribution and management of food waste in many regions contribute to climate change. The food degradation process generates greenhouse gases, such as methane and carbon dioxide. If food waste were a country, it would rank third in carbon emissions, with more than three gigatons of greenhouse gas (GHG) emissions.[3]

We have to link the problem of hunger with food waste in the world. The world produces enough food to feed up to 12 billion people. Therefore, the problem is not in production but in waste and inequitable distribution. In order to ensure the well-being of humans worldwide, the FAO and the international community cannot ignore the global food waste problem.

History and Description of the Issue

Understanding Food Insecurity and Hunger

Food security guarantees that all the people in a community have permanent access to safe, balanced, and sufficient food to cover their nutritional needs. It includes ensuring access to food derived from the cultural components of each population and allowing for an active, fully healthy life.[4] The international human rights standards state that every human has the right to adequate food and be free from hunger. Continuous access to resources is necessary to enable someone to produce, earn, or purchase enough food to ensure health and well-being.

The concept of food security emerged in the mid-1970s due to the global food crisis. During this crisis, inadequate global supply to meet the food demand caused rising food prices internationally.[5] At that time, concern was focused on fluctuations in food availability at the country or regional level. Policy recommendations focused on food production and storage.[6] However, large numbers of the population in countries with sufficient food still had below-adequate consumption or were hungry. Thus, sufficient food does not necessarily translate into adequate food consumption at the household or individual level.[7] In this way, the definition of food security evolved to emphasize access to food rather than food production. It also explicitly included the need for a healthy diet with nutrients, not just sufficient calories.

At the household level, food insecurity is the combination of two problems: one of access and one of food use. Access refers to the ability of a household and its members to have

1 "Hunger in Times of Plenty," Global Agriculture, accessed July 23, 2022, https://www.globalagriculture.org/report-topics/hunger-in-times-of-plenty.html.
2 "World Food Situation," Food and Agriculture Organization, accessed July 23, 2022, https://www.fao.org/worldfoodsituation/foodpricesindex/en/?_=1393604860.
3 Food Wastage Footprint, *Food wastage footprint: Impacts on natural resources - Summary report* (Rome: Food and Agriculture Organization, 2013), https://www.fao.org/3/i3347e/i3347e.pdf.
4 The Global Food Banking Network, *Food Banks as a Green Solution to Hunger* (The Global FoodBanking Network, 2019), http://www.foodbanking.org/wp-content/uploads/2019/03/GFN_WasteNot.pdf.
5 Eric Schewe, "Global Food Security: A Primer," *JSTOR Daily*, May 10, 2018, https://daily.jstor.org/global-food-security-a-primer/.
6 Overseas Development Institute, "Global Hunger and Food Security after the World Food Summit," *ODI*, March 6, 2022.
7 Overseas Development Institute, "Global Hunger and Food Security after the World Food Summit."

sufficient food through its production, exchange, transfer from third parties (usually food or income support), or purchase. For proper access, an adequate food supply must be available all year round at the national level and in the community. Households must also have economic access to a sufficient quantity, quality, and variety of food. Food use refers to adequate food storage, preparation, and consumption.[8] Without these factors, more households will not get the nutrition they need, and more food will go to waste.

An additional element of food security is temporal stability. This refers to solving cyclical or seasonal food insecurity conditions. Chronically food insecure people are those whose food consumption is below requirements or are persistently hungry for long periods. In contrast, food-insecure people face below-adequate consumption levels for defined seasonal or temporal periods. Due to agricultural seasons, some crops are only available at certain times of the year.[9] Seasonal reductions in food production can impact supply and demand as well as employment opportunities. This dramatically impacts people living in rural areas during pre-harvest periods. Additionally, environmental circumstances such as climate change, increased frequency of forest fires, or damage from coastal storms can damage crops.[10]

After decades of successfully improving the world's hunger situation, the number of people suffering from hunger began to increase again in 2015 slowly. In 2021, approximately 820 million people were hungry.[11] Furthermore, an estimated 3 billion people cannot afford a healthy diet. Hunger is a problem that affects people all over the world. However, the situation is more difficult in some regions. In Africa, hunger affects 21 percent of the population.[12] 57 percent of the sub-Saharan African and South Asian population cannot afford healthy food. Hunger is considered the greatest pandemic of the 21st century, killing 3.1 million children yearly.[13] Not only does this worsen people's health, but it also slows progress in many other areas of development, such as education and employment. Right now, one-thrid of the food produced globally is wasted. In a world where 828 million people are malnourished and hungry, and natural habitats are destroyed for agriculture, food waste can no longer be ignored.[14]

Chronology of Food: From Farm to Table

Many of the products we consume daily must travel hundreds of miles to get to where they are purchased. This process is known as the food supply chain and comprises six stages. The first stage is the place and form of production. This phase produces food through agricultural, livestock, and aquaculture activities. Food production can also include extracting environmental resources through fishing, hunting, or the exploitation of mineral resources. The most prominent activities within this phase are dairy production, marine and inland harvesting, farming, egg, honey, meat production, hunting, extraction of food minerals (like salts), and cultivation of oilseeds, fruit, vegetables, and cereals.[15]

The second stage is transformation, which refers to the manipulation of foods to improve their characteristics and increase their shelf life. Not all products are processed, as many are consumed fresh. Food processing includes washing, peeling, cutting, grinding, extracting juices, fats, or other components, refrigeration, freezing, sterilization, mixing different ingredients, culinary treatments, and packaging.[16]

8 The Global Food Banking Network, *Food Banks as a Green Solution to Hunger.*
9 EC-FAO Food Security Programme, *An Introduction to the Basic Concepts of Food Security* (EC-FAO Food Security Programme, 2008), https://www.fao.org/3/al936e/al936e.pdf.
10 Food and Agriculture Organization of the United Nations, *Climate change and food security: Risks and Responses* (Food and Agriculture Organization, 2015), https://www.fao.org/3/i5188e/I5188E.pdf.
11 Food and Agriculture Organization, International Fund for Agricultural Development, United Nations International Children's Emergency Fund, World Food Programme, and World Health Organization, *The State of Food Security and Nutrition in the World 2020: Transforming food systems for affordable healthy diets* (Rome: Food and Agriculture Organization of the United Nations, 2020), https://www.fao.org/3/ca9692en/online/ca9692en.html#.
12 Ricardo Fuentes-Nieva, "Growing hunger, high food prices in Africa don't have to become worse tragedy," *United Nations Africa Renewal*, May 20, 2022, https://www.un.org/africarenewal/magazine/may-2022/growing-hunger-high-food-prices-africa-dont-have-become-worse-tragedy.
13 "Malnutrition,"Action Against Hunger, accessed July 20, 2022, https://actionagainsthunger.ca/what-is-acute-malnutrition/.
14 "Hunger and food insecurity," Food and Agriculture Organization of the United Nations, accessed July 20, 2022, https://www.fao.org/hunger/en/.
15 Suzanne Goldenberg, "From field to fork: the six stages of wasting food," *The Guardian*, July 14, 2016, https://www.theguardian.com/environment/2016/jul/14/from-field-to-fork-the-six-stages-of-wasting-food.
16 Goldenberg, "From field to fork: the six stages of wasting food."

A box full of salvaged vegetables and fruits retrieved from the waste of a hypermarket

Credit: Foerster

The third stage is storage or conservation, which is the temporary storage of the food under preservation conditions indicated by the manufacturer-producer. The fourth stage is distribution. Here, the products must travel short or long distances to reach the places where the final consumer buys them. The fifth stage is sale. This is where the products are displayed and made available to the buyer in supermarkets, markets, or central supply centers. The final stage is consumption, which is the final destination of the products. It includes homes, markets, restaurants, and schools.[17]

Food waste occurs at all levels of the food supply chain. For fruits, vegetables, and grains to reach the table, they must first be grown. After harvesting, the crops must be sorted, placed in containers for transport, and then distributed.[18] Farms are the main actors in the first stage. Food loss on farms totals about 1.2 billion tons, a weight that is equivalent to 10 million blue whales. This figure represents 15.3 percent of all food produced globally.[19]

Supermarkets are responsible for the most significant food waste when food reaches distribution channels. According to the same report, supermarkets lost an estimated USD 15 billion in unsold fruits and vegetables.[20] Supermarket food waste is due to store policies (e.g., overstocking) and their power over other actors in food supply chains. Replenished shelves are the basis of the appeal of products in the food retail sector. Supermarkets' contracts with manufacturers often force them to generate excess production to ensure that they can fulfill last-minute orders. Farmers have similar contracts with supermarkets and often discard most of their produce due to aesthetic standards.[21] Some produce does not make it to shelves because it does not meet sales standards, such as a misshapen carrot or undersized apple. These items are almost always immediately thrown away since customers expect aesthetically perfect products. Distributors stock their products based on aesthetics, even if the shape, color, or size of the fruit has no relation to the quality. One farmer in the United States estimates that about a quarter of the potatoes they harvest is wasted for this reason.[22] Products can also

17 Goldenberg, "From field to fork: the six stages of wasting food."
18 Goldenberg, "From field to fork: the six stages of wasting food."
19 WWF-UK, *Driven to Waste: The Global Impact of Food Loss and Waste on Farms* (WWF, 2021), https://wwfint.awsassets.panda.org/downloads/wwf_uk__driven_to_waste___the_global_impact_of_food_loss_and_waste_on_farms.pdf.
20 Dana Gunders, Jonathan Bloom, JoAnne Berkenkamp, Darby Hoover, Andrea Spacht, and Marie Mourad, *Wasted: How America is losing up to 40 percent of it's food from farm to fork to landfill* (Natural Resources Defense Council, 2017), https://www.nrdc.org/sites/default/files/wasted-2017-report.pdf.
21 Dana Gunders et al., *Wasted: How America is losing up to 40 percent of it's food from farm to fork to landfill* (Natural Resources Defense Council, 2017), https://www.nrdc.org/sites/default/files/wasted-2017-report.pdf.
22 Goldenberg, "From field to fork: the six stages of wasting food."

be damaged during transportation, leading supermarkets to discard them.

Expiration Date Labeling

The other type of waste is related to canned goods, cereals, dairy products, and perishables that must be discarded when they expire. The shelf life of food is decided by its manufacturers. It indicates the time that elapses from its preparation to its deterioration. Different factors, such as temperature, light, humidity, or oxygen, can cause it to vary from days to months.[23] For the customer, the freshness of food generally depends on its "best-before" date on the food's label.[24] Many stocks have to be withdrawn or reduced in the last few days before this date because customers will not purchase them.

It is essential to differentiate between foods with an expiration date and foods with a best-before date. The expiration date is the date after which the product is not safe for consumption. Once this date has been exceeded, the product must be withdrawn from sale. Expiration dates are used in very perishable products for consumers' health and safety. The best-before date or minimum shelf life of food is the date until which the product maintains its specific properties as long as it is stored under adequate preservation conditions. After this date, the quality of the product may decrease, but in no case does it imply any health problems.[25]

The difference between these labels often causes confusion for consumers and leads to food waste. About 10 percent of all food waste is related to date labeling.[26] In the United States, this causes up to USD 29 billion in losses each year.[27] In Europe, 88 million tons of food are wasted each year. A survey by the European Union found that only about 40 percent of consumers correctly understood the difference between expiration and best-before labels. About half of Europeans believe that more clarity on the food labels would help them reduce their home food waste.[28]

To combat this extreme food waste, some stores have begun donating this type of product to food banks. Despite a

23 Food and Agriculture Organization, "Home | Food and Agriculture Organization of the United Nations," *The State of Food and Agriculture*, 2019, https://www.fao.org/3/ca6030en/ca6030en.pdf.
24 Food and Agriculture Organization, "Home | Food and Agriculture Organization of the United Nations."
25 Food and Agriculture Organization, "Home | Food and Agriculture Organization of the United Nations."
26 European Commission, *Know Your Dates* (2018), https://food.ec.europa.eu/system/files/2020-06/fw_eu-actions_date-marking_infographic_en.pdf.
27 The Consumer Goods Forum, "Companies Commit to Simplify Food Date Labels Worldwide by 2020, Reducing Food Waste," press release, September 20, 2017, https://www.theconsumergoodsforum.com/press_releases/companies-commit-to-simplify-food-date-labels-worldwide-by-2020-reducing-food-waste/.
28 European Commission, *Know Your Dates*.

Food with no expiration dates but which are past the "best by" dates scheduled to go to the trash

Credit: Colenyj

specified best-before date, these products remain in optimal conditions for human consumption for a more extended period. Food donation is a mutually beneficial alternative against massive food waste. It provides food to vulnerable populations while allowing shopping centers to prioritize their most marketable goods.[29] Although food donation is not widespread today, countries such as the United States have found incentives to encourage consumers to donate food. Some of these incentives are tax deductions for each donation and a reduction in dumpster fees.[30] These incentives have been a good start to preventing food waste in the US, but further solutions must be developed for international improvements.

In 2017, the Consumer Goods Forum (CGF) adopted a Call to Action to standardize food date labels globally by 2020. The CGF is a group of 400 of the largest consumer goods companies in the world. These companies span 70 countries and include Kellogg, Walmart, and Nestlé.[31] In 2021, FAO and the Turkish government held a conference on food waste in Azerbaijan, Central Asia, and Turkey. At the conference, speakers discussed date labeling improvements and food donations. These events mark a step in the right direction for international collaboration on food waste.[32]

Environmental Impact of Food Waste

An environmental impact is any environmental change often caused by human activity. Most production processes impact the environment. From harvesting to transportation and distribution, greenhouse gasses are released in every stage of the food supply chain. The emissions come from the machinery used in each process. Furthermore, both land and ocean systems are affected due to marine exploitation and deforestation that drive climate change and biodiversity loss.[33]

The first significant impact of food waste is greenhouse gas (GHG) emissions. It is estimated that approximately 3,300 metric tons of carbon dioxide equivalents are released into the atmosphere annually due to food waste. If food waste were a country, it would be third in the world in terms of emissions (following the US and China). Food waste releases not only carbon dioxide but also other harmful GHGs like methane and nitrous oxide. Meat and dairy products generate carbon from fertilizer production, nitrous oxide from soil turnover, and methane from livestock digestion.[34]

The primary products for food waste emissions are cereals, meat, and vegetables. Along with the type of food, emissions from food waste vary by region. For example, North America has higher carbon emissions from food waste than Europe because North America causes more meat waste. In industrialized Asia, carbon emissions are high because rice, a staple food, is often wasted.[35]

Greenhouse gases capture a portion of the Earth's outgoing energy, trapping heat in the atmosphere. Human and industrial activities have increased greenhouse gases such as water vapor, carbon dioxide, and methane. This has caused an increase of one degree Celsius in global air temperature over the past 115 years.[36] The effects of climate change include rising temperatures, variations in precipitation, deglaciation, rising sea levels, and increased occurrences of wildfires and hurricanes. To adequately address the climate crisis, emissions from food waste must be taken into account.

Another substantial impact of food loss and waste is the water footprint. This is the consumption of surface and groundwater resources. Water is necessary for every stage in the food supply chain, which results in significant usage of the planet's water supply. For example, it is estimated that the US uses 70 percent of the planet's freshwater for food production. Over 15,000 liters of water are used to produce one kilogram

29 Food and Agriculture Organization, "Home | Food and Agriculture Organization of the United Nations."
30 Jean Buzby, "Federal Incentives for Businesses to Donate Food," U.S Department of Agriculture, July 29, 2021, https://www.usda.gov/media/blog/2020/07/08/federal-incentives-businesses-donate-food.
31 The Consumer Goods Forum, "Companies Commit to Simplify Food Date Labels."
32 "Azerbaijan, Central Asia, and Turkey explore new solutions to food loss and waste," *FAO*, September 29, 2021, https://www.fao.org/save-food/news-and-multimedia/news/news-details/en/c/1441837/.
33 Hannah Ritchie, "Food Production Is Responsible for One-Quarter of the World's Greenhouse Gas Emissions," *Our World in Data*, November 6, 2019, https://ourworldindata.org/food-ghg-emissions.
34 Food Wastage Footprint, *Food wastage footprint: Impacts on natural resources.*
35 Food Wastage Footprint, *Food wastage footprint: Impacts on natural resources.*
36 "Highlights of the Findings of the U.S. Global Change Research Program Climate Science Special Report," U.S. Global Change Research Program, accessed July 21, 2022, https://science2017.globalchange.gov/chapter/executive-summary/.

of beef, and almost 2,500 liters for one kilogram of rice.[37] To produce food for human consumption, 1,300 cubic meters of water are required per person each year. This figure correlates to approximately 13.5 trillion cubic meters of water annually, which would fill the Atlantic ocean 10 times.[38]

In addition to water, the food produced and not consumed uses almost 1.4 billion hectares of land. This is almost 30 percent of the area covered by agricultural land in the world. It is equivalent to an area larger than China. Although it is difficult to estimate the impacts on biodiversity at the global level, agricultural expansion in wild areas has detrimental impacts on global ecosystems. Globally, food waste accounts for more than 20 percent of the pressure on biodiversity. [39]

Modifications to the food supply chain are necessary to reduce its environmental impacts. Currently, the food market separates the origin stage from the sale stage. Farmers at the origin have difficulty considering demand at the sale stage. This can lead to the overproduction of goods, resulting in increased food waste. Moreover, market strategies are often unfair because they favor supermarkets and corporations over farmers. This makes it difficult to break the cycles of poverty and invest in technology and training to reduce food waste.

National governments play a significant role in reducing the environmental harm of food supply chains. The Paris Agreement is a legally binding international treaty that aims to limit global warming to less than 2 degrees Celsius. It was adopted in Paris at COP21 and entered into effect on November 4, 2016. Less than six percent of Paris Agreement signatories have included loss and waste strategies in their national carbon plans. This issue needs to be higher on national political agendas. Governments should increase investments into infrastructure for waste management, including animal welfare and fishery laws, to reduce the volume of waste in production and its adverse environmental effects.[40]

Economies and Food Waste

Since 2007, the global economy has been undergoing a deepening economic crisis. This crisis has been called the most severe crisis of capitalism, including the Great Depression of the 1930s. The argument is that this crisis has also spread to the energy, ecological, and food spheres, making it much more complex to solve. The food crisis manifested in historic increases in international food. It thus threatened the livelihoods of millions of rural and urban households in countries with high food dependence. Already marginalized populations with limited access to sustainable and equitable food systems were harmed even more.

The Food Price Index reported that prices rose 23 percent above their value last year. In June of this year, the average price of wheat was 48.5 percent higher than it was a year earlier. On the other hand, the price of soybeans was 7.6 percent lower, and corn was 3.5 percent lower. Although grain and cereal prices have fallen somewhat, overall food prices remain high. As families experiencing poverty also face higher housing and fuel costs, they are unable to purchase enough food.[41]

The increase in food prices, especially for basic grains, had severe consequences for peripheral countries. Peripheral countries are those with a disproportionately low share of global wealth, low incomes, and high dependence on food imports. Millions of families spend up to 27 percent of their income on food. This figure reaches up to 80 percent within the poorest countries.[42] In these cases, rising prices have made food inaccessible to low-income populations who are already the most marginalized. If only a quarter of global food waste were saved, there would be enough food to feed 870 million people. In other words, there is enough food to feed the world's population. Food insecurity is a problem of distribution rather than quantity.

Food waste occurs in different places and for different

37 Institution of Mechanical Engineers, *Global Food: Waste not, Want not* (Institution of Mechanical Engineers), https://www.imeche.org/docs/default-source/reports/Global_Food_Report.pdf.
38 Food Wastage Footprint, *Food wastage footprint: Impacts on natural resources.*
39 Food Wastage Footprint, *Food wastage footprint: Impacts on natural resources.*
40 WWF-UK, *Driven to waste.*
41 "World Food Situation," FAO, accessed July 23, 2022, https://www.fao.org/worldfoodsituation/foodpricesindex/en/?_=1393604860.
42 Inter-Agency and Expert Group on Food Security, *Food Data Collection in Household Consumption and Expenditure Surveys* (New York: Inter-Agency and Expert Group on Food Security, 2018), http://documents.worldbank.org/curated/en/793601587034078451/pdf/Food-Data-Collection-in-Household-Consumption-and-Expenditure-Surveys-Guidelines-for-Low-and-Middle-Income-Countries.pdf.

reasons. A country's economic development impacts its food supply chain and waste habits. In general, developing countries often lack the transportation infrastructure to get all food to consumers in good condition. Therefore, most losses occur during the production, post-harvest, and processing stages. Without adequate refrigeration systems, dairy products spoil, and fish rots. Excess perishable products cannot be transformed into long-lasting, durable foodstuffs without the ability to pickle, can, cure or bottle. Poorly packaged fruit and vegetables rot in the market. Furthermore, inadequate roads and railways slow the journey of products from the field to the market. These issues all stem from insufficient investment in the sustainability of the food supply chain.

Within Africa, inadequate storage and transport systems cause between 10 and 20 percent of sub-Saharan cereals to succumb to mold, insects, and rodents. This loss is worth USD 3 billion of food, enough to feed 48 million mouths for an entire year.[43] Dagaa is a protein-rich fish commonly eaten in the regions surrounding Lake Victoria in Africa. Specific drying equipment must be used after dagaa are caught to prevent rotting. In Uganda and Tanzania, up to 40 percent of dagaa are wasted due to improper drying technology. This contributes to food and economic insecurity for the local people.[44]

In India, which faces similar problems, 21 tons of vegetables are wasted every year. This causes an annual loss of INR 580 billion.[45]

In contrast to developing economies, developed economies face different causes of food waste. Efficient farming practices, refrigeration, and the quality of transportation, storage, and communications ensure that most of the food produced makes it to the point of sale. However, from that point on, problems arise. Industrialized countries, such as the United States, Canada, and Australia, throw away 670 million tons of food a year. This amount is almost equal to the net food production of sub-Saharan Africa.[46] In the United States, supermarkets generate 8 million tons of waste annually, representing USD 18.2 billion.[47] In Europe, estimates show that since 2017, 88 million tons of food have been wasted annually. This breaks down to about 173 kilograms of food per person.

This does not mean that developed economies do not suffer from food insecurity. While 20 percent of the food produced in the EU goes to waste, 55 million people cannot afford quality food every other day. The costs associated with food waste for the EU in 2012 were around EUR 143 billion. Two-thirds of the costs are associated with household food waste.

Current Status

Food Crisis from the Russo-Ukrainian War

The Russian invasion of Ukraine is a humanitarian tragedy with serious international law violations. The disruption in the region and the sanctions placed upon Russia by other countries have created various issues for the global community. One of these issues is food security. The war in Ukraine is likely to increase the number of hungry people in the world by 13 million.[48]

Staple foods represent a dominant portion of a standard diet, representing around 90 percent of the world's food calorie intake. Russia and Ukraine play a vital role in the global production of barley, wheat, corn, and sunflower oil. For example, more than 40 percent of African wheat imports come from Ukraine and Russia. However, grain production in Ukraine is harmed by the effects of the armed conflict. The pressure for Black Sea wheat production is anticipated to shift to other countries such as Bulgaria, France, Germany, and Romania.[49] Because of this shift, wheat prices have risen

43 "Worldwide food waste," United Nations Environmental Programme, accessed July 23, 2022, https://www.unep.org/thinkeatsave/get-informed/worldwide-food-waste.
44 WWF-UK, *Driven to Waste.*
45 UN Environmental Programme, "Worldwide food waste."
46 Food and Agriculture Organization,"Cutting food waste to feed the world," *Food and Agriculture Organization*, May 11, 2011, https://www.fao.org/news/story/en/item/74192/icode/.
47 Rene Brinkley, "Zero-waste stores pop up in the US, targeting shoppers tired of all the waste," *CNBC*, October 28, 2018, https://www.cnbc.com/2018/10/19/zero-waste-markets-want-to-shake-up-grocery-shelves-and-your-shopping.html.
48 Declan Walsch and Valerie Hopkins, "Russia Seeks Buyers for Plundered Ukraine Grain, U.S. Warns," *New York Times* https://www.nytimes.com/2022/06/05/world/africa/ukraine-grain-russia-sales.html.
49 Sampad Nandy, Aditya Kondalamahanty, and Shikha Singh, "Analysis: Black Sea conflict may alter global trade patterns for grains,

Grocery shortages due to the Russia-Ukraine conflict in 2022

Credit: Denis Apel

50 percent in the last months to the highest levels in 14 years.

In addition, the conflict has disrupted the food trade. Economic sanctions imposed on Russian products due to the invasion of Ukraine are disrupting the trade of these essential agricultural products.[50] The sanctions have reduced flows of cereals and oilseeds from the Black Sea. Cereals are also the main feed used by the livestock sector to feed livestock. Thus, reduced trade of cereals is also causing the price of meat to rise. Sanctions are also straining the flow of agricultural fertilizers. Russia and Belarus make up 40 percent of the fertilizer's total global exports.

States that rely on food imports will inevitably be affected. Many states in Africa, the Middle East, and the Western Balkans import their food. Because of the conflict, they will experience an increase in their food prices and import fees.[51] Grain-importing countries such as Lebanon, Egypt, Tunisia, and Yemen are already severely affected. Likewise, countries that depend on fertilizer imports for their agricultural production are facing increasing costs, posing a serious threat to their food production. [52]

All these factors tend to increase production costs for farmers and food transporters. If it costs more to produce and transport food, the price of food will increase for consumers. Inflated prices particularly impact low-income people. Those of lower socioeconomic status are already the most vulnerable to food insecurity. If basic staple food costs increase, more people will go hungry. Additionally, when food prices rise, households tend to buy fewer fruits and vegetables. Instead, they opt for cheaper foods that are more calorie-dense and poor in nutrients.[53]

Although the Russo-Ukrainian War is not directly causing more food waste, it exacerbates world hunger. Therefore, it is becoming even more critical for the FAO and the international community to address the harms of food waste.

Case Study: Food Crisis in Venezuela

Venezuela is currently undergoing a complex humanitarian emergency. According to the Federation of Chambers and

veg oil," *S&P Global Commodity Insights,* March 11, 2022, https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/agriculture/031122-analysis-black-sea-conflict-may-alter-global-trade-patterns-for-grains-veg-oil.
50 Dirk Jan Kennes, "The Russia-Ukraine War's Impact on Global Fertilizer Markets," Rabobank, April 2022, https://research.rabobank.com/far/en/sectors/farm-inputs/the-russia-ukraine-war-impact-on-global-fertilizer-markets.html.
51 World Food Programme, *War in Ukraine Drives Global Food Crisis* (World Food Programme, 2022), https://www.wfp.org/publications/war-ukraine-drives-global-food-crisis.
52 FAO, "World Food Situation.".
53 Mayuree Rao et al., "Do healthier foods and diet patterns cost more than less healthy options? A systematic review and meta-analysis," *BMJ Journals* 3, no. 2 (December 2013): 4-6, https://bmjopen.bmj.com/content/3/12/e004277.

Associations of Commerce and Production of Venezuela, in 1999, there were approximately 13,000 active industries. 20 years later, 2,600 or fewer remain. The reasons for such drastic industry drops are a decrease in consumption, political uncertainty, lack of financing, and recurrent failures in public services, from lack of electricity to transportation.

More specifically, the food industry is operating at 20 percent of its installed capacity. Of 28.5 million people, 9.3 million do not have reliable access to adequate amounts of food. Seven million people are moderately food insecure, and 2.3 million are severely food insecure.[54] People who are moderately food insecure have reduced the quality and quantity of food due to a lack of money or resources. Severely food insecure people have almost no access to food. In the most extreme cases, they have gone days without eating.[55]

Venezuela's national food policy is mainly based on allocating CLAP boxes. The Venezuelan government delivers this box of food to people's homes monthly. They usually contain rice, pasta, sugar, corn flour, and sunflower oil. According to the National Survey of Living Conditions (ENCOVI), in 2018, 69 percent of households relied on purchasing a food ration at subsidized prices through the CLAP. Even then, the food ration costs approximately 6 Venezuelan minimum wages.[56]

The Venezuelan Society of Agricultural Engineers (SVIAA) has estimated food losses and food waste in Venezuela to be 2,280,000 tons per year. This was 21 percent of the total food available in 2018. Avoiding these losses would supply the nutritional needs of at least one-third of the vulnerable undernourished population. By December 2019, food losses and waste were estimated to be 78,000 tons per month.[57] This is around 18 percent of the total food available. Though this value is alarming, it is low compared to other Latin American and Caribbean countries.

The Venezuelan government has implemented strong policies against food waste. A large part of the food waste is used in animal production or feed industries. Additionally, 70 percent

54 Food and Agriculture Organization, International Fund for Agricultural Development, United Nations International Children's Emergency Fund, World Food Programme and World Health Organization., *The State of Food Security and Nutrition in the World 2022. Repurposing food and agricultural policies to make healthy diets more affordable.* (Rome: Food and Agriculture Organization of the United Nations, 2022), https://www.fao.org/3/cc0639en/online/cc0639en.html.
55 FAO, "Hunger and food insecurity."
56 Observatorio Venezolano de la salud, Reporte Nacional: Emergencia humanitaria compleja en Venezuela, derecho a la alimentación (Caracas, Observatorio Venezolano de la salud, 2018), https://www.ovsalud.org/wp-content/uploads/Reporte-Nacional-EHC-Derecho-a-la-Alimentacion-y-Nutricion-diciembre-2018-Ingles.pdf.
57 UN Office for the Coordination of Humanitarian Affairs, Venezuela Humanitarian Response Plan (OCHA, 2019), https://reliefweb.int/attachments/300b173f-3194-3bcf-a9ad-27a7da1a4f14/20190814_HRP_VEN_EN.pdf.

Empty fridges in a supermarket in Los Teques due to shortages in Venezuela

Credit: Wilfredor

of perishable food waste is collected and sold at a lower price.[58] The SVIAA presented the "Venezuela 2019 Humanitarian Response Plan." It is an initiative in the United Nations Office for the Coordination of Humanitarian Affairs (OCHA). The main objectives are establishing the first food bank in Venezuela and reducing waste losses in primary production, agro-industry, and trade. The food losses in these industries were estimated to be 1,260,000 tons per year by mid-2019. This represented 10 percent of the total food required monthly for the second half of 2019. The Humanitarian Response Plan would enable the government to feed at least one-third of the undernourished vulnerable population.[59] Solving Venezuela's humanitarian crisis requires a multi-faceted approach. We must look to the future with optimism to continue promoting sustainable food systems in Venezuela and on a global scale.

The Role of SDGs on Hunger and Food Waste

In 2018, The Committee of the United Nations for Development Policy (CDP) committed to creating a world that "leaves no one behind." As a result, the 2030 Agenda for Sustainable Development Goals was established. It included 17 interlinking international Sustainable Development Goals (SDGs) for peace and prosperity. Of these goals, the most pertinent to this committee, and especially this topic, is SDG 2: Zero Hunger. This goal includes ending all forms of malnutrition and ensuring access to safe, nutritious, and sufficient food.[60] Reducing food waste is a critical step in eradicating global hunger.

Following the adoption of the SDGs, the United Nations Decade of Action on Nutrition 2016-2025 formulated the goal of eliminating all forms of malnutrition by 2025.[61] That being said, very little measurable progress has occurred. The Mid Term Review provided an opportunity to identify gaps in the plan. Areas of opportunity were identified for the second half of the UN Decade of Action on Nutrition, from 2021 to 2025. The objectives were to integrate food education, increase the quality and number of nutrition professionals, and implement adequate nutrition labeling to inform consumers.[62]

Disparities in food security arise from inequitable systems that define the conditions of everyday life. Thus, SDG 1: No Poverty and SDG 10: Reduced Inequalities are intrinsically linked to this topic. People with less purchasing power tend to spend a higher percentage of their money on food than those with more. The lower your income, the more likely you will rely on cheaper, less nutritious foods.[63] Since the views and ideas of marginalized people are frequently ignored, their crucial nutrition needs are often neglected. For example, in the United States, families with incomes 100 percent below the poverty line, Hispanic or black residents, or single-family heads experience higher rates of food insecurity than other households.

In 2021, Secretary-General Antonio Guterres convened the "Food Systems Summit" to help implement the SDGs. This summit established and implemented bold new measures to advance the SDGs. These included awareness campaigns and a follow-up and review system to ensure successful outcomes.[64] Understanding nutritional inequities and the factors that drive them is essential to achieving the SDGs and other global nutrition targets.

58 Food and Agriculture Organization, International Fund for Agricultural Development, United Nations International Children's Emergency Fund, World Food Programme, and World Health Organization, *The State of Food Security and Nutrition in the World 2022. Repurposing food and agricultural policies to make healthy diets more affordable.* (Rome: Food and Agriculture Organization of the United Nations, 2022), https://www.fao.org/3/cc0639en/online/cc0639en.html.
59 UN Office for the Coordination of Humanitarian Affairs, *Venezuela Humanitarian Response Plan* (OCHA, 2019), https://reliefweb.int/attachments/300b173f-3194-3bcf-a9ad-27a7da1a4f14/20190814_HRP_VEN_EN.pdf.
60 United Nations Committee for Development Policy, *Leaving no one behind* (UNCDP, 2018), https://sustainabledevelopment.un.org/content/documents/2754713_July_PM_2._Leaving_no_one_behind_Summary_from_UN_Committee_for_Development_Policy.pdf.
61 "The UN Decade of Action on Nutrition 2016-2025," United Nations System Standing Committee on Nutrition, accessed July 21, 2022, https://www.unscn.org/en/topics/un-decade-of-action-on-nutrition?pages=2.
62 "Mid-term Review Foresight paper," United Nations Food and Agriculture Organization and World Health Organization, accessed August 22, 2022, https://www.un.org/nutrition/sites/www.un.org.nutrition/files/general/pdf/nutrition_decade_mtr_background_paper_en.pdf.
63 Simone A. French, et al., "Nutrition quality of food purchases varies by household income: the SHoPPER study," *BMC Public Health* 19, 231 (2019), https://doi.org/10.1186/s12889-019-6546-2.
64 "About the Summit," United Nations, accessed August 15, 2022, https://www.un.org/en/food-systems-summit/about.

Bloc Analysis

Points of Division

No country is immune to the threats and risks posed by food insecurity. Both high-income and less-developed countries have exorbitant amounts of food waste, affecting the quality of life beyond nutrition. Many national indicators can suggest the quality of food security in a country. They consider the availability of food, the ease with which people can obtain it, or the solutions implemented at the time. For this committee, countries can be divided into three blocks according to the level of wastage, food insecurity, and current policies.

Countries with High Food Waste

Countries in this bloc are the most food wasteful per capita. These countries account for 44 percent of global wastage. Both developing and developed countries can experience excessive levels of waste. Many countries in this bloc have high levels of food insecurity and hunger, which is undoubtedly correlated with their large amounts of food waste. This bloc typically has a large gap between high and low socioeconomic classes. A minority of the population can be overindulgent in food sending. At the same time, the lower classes struggle to sustain themselves. While countries in this bloc share common issues with the others, food waste is their greatest lost capacity. Some countries that would fall under this bloc are Australia, the United States, Turkey, Spain, Japan, Germany, Mexico, Italy, Morocco, and Portugal.

These countries should focus on the interventions of training and improving technology to reduce food waste. Developing countries mainly suffer from post-harvest losses due to a lack of infrastructure for the maintenance of crops. Developed countries experience the highest percentage of waste in the consumption stage. In these countries, 40 percent of wastage occurs in stores, such as restaurants or supermarkets.[65] As mentioned above, the problem with world hunger is a problem of distribution rather than quantity. Therefore, the countries in this bloc should develop strategies to improve their distribution processes, ranging from food banks to public awareness.

There have been several initiatives that are promising for countries within this bloc. For example, in 2015, the United States Department of Agriculture joined with the US Environmental Protection Agency to address, combat, and reduce food waste by 50 percent by 2030. Some states in the US have begun to implement tax incentives for food donations.[66]

Countries with High Food Insecurity

This bloc constitutes the countries most affected by food insecurity and hunger directly. While the 2021 Global Hunger Index (GHI) shows long-term progress, these countries still suffer from chronic hunger. The world regions struggling most with hunger are South Asia and sub-Saharan Africa. Their GHI scores fall into the severe category (27.1 and 26.1, respectively). Furthermore, according to projections from the SDGs and the GHI, climate change will push 78 million more people into hunger by 2030. More than half of this burden is expected in sub-Saharan Africa. The long-term effects caused by the COVID-19 pandemic may also place 30 million more undernourished people globally in 2030. Again, more than than half of those affected are expected to be in sub-Saharan Africa.a

The scores for East and Southeast Asia, Near East and North Africa, Latin America and the Caribbean, and Eastern Europe range from low to moderate hunger (between 7.8 and 12.8). These averages mask worrying results for each region, including severe hunger in Tajikistan, Guatemala, Haiti, Iraq, and Yemen. There is also severe hunger in half of all countries in East and Southeast Asia.[67]

One example is China, which achieved its Millenium Development Goal in 2015 by halving the number of hungry citizens. This resulted in a reduction of the global hunger rate by two-thirds. However, China's efforts should

65 Brian Lipinski et al., *Reducing Food Loss and Waste* (Washington DC: World Resources Institute, 2013), http://pdf.wri.org/reducing_food_loss_and_waste.pdf.
66 Jennifer Schultz, "Fighting food waste," *National Conference of State Legislatures* 25, no. 46 (December 2017):1, https://www.ncsl.org/research/agriculture-and-rural-development/fighting-food-waste.aspx.
67 Klaus von Grebmer et al., *2021 Global Hunger Index: Hunger and Food Systems in Conflict Settings* (Dublin: Welthungerhlife, December 2021) https://www.globalhungerindex.org/pdf/en/2021.pdf.

not stop here. Food inequity prevails in rural areas, making up to 150.8 million people malnourished. Due to China's size and population, figures such as 25 percent overweight, 19.6 percent anemia, and 9.4 percent stunting in children account for significant global burdens.[68]

Delegates representing this bloc will need to improve data collection on hunger to inform progress and to help policymakers target their efforts. They will also need to look at broader problems of imports and accessibility to food. Food insecurity within this bloc occurs because of a lack of food rather than mismanagement, as seen in the previous bloc.

Countries with Low Food Waste and Hunger

While no country is entirely food secure, a few have progressive policies limiting food waste and hunger. Countries such as Italy, France, South Korea, and Singapore have enacted legislation to meet ambitious targets to reduce food waste in the long term.

France has been a pioneer in the fight against food waste. Its policies have stood out as a model for food prevention, recovery, and recycling. In France, food losses and waste represent 10 million tons of products per year, with a commercial value of EUR 16 billion. In 2016, law 2016-138 was enacted. The law requires companies to hand over unsold food that would previously be discarded.[69] In just the first year of implementation, this law showed an increase of approximately 30 percent in donations. The percentage of unsold donated products from supermarkets rose from 66 percent before 2016 to more than 90 percent in 2018. [70]

In Italy, the country passed a similar regulation. Unlike the French law that penalizes supermarkets that do not comply with the regulations, the Italian law made it easier for companies to donate unsold food to food banks. The food would later be distributed to food-insecure regions. This initiative aims to help Italy recover one million tons of food annually.[71]

Another example is South Korea. In 2013, the government introduced mandatory food waste recycling through the "Volume Based Waste Collection Charging System." It is better known as "Pay As You Throw." The initiative is

68 FAO, "Hunger and food insecurity."
69 Pierre Condamine, "France's law for fighting food waste: Food Waste Prevention Legislation," Zero Waste Europe, accessed August 7, 2022, https://zerowasteeurope.eu/wp-content/uploads/2020/11/zwe_11_2020_factsheet_france_en.pdf.
70 "France's Ban on Food Waste Three Years Later," *Food Tank,* accessed August 15, 2022, https://foodtank.com/news/2019/06/opinion-frances-ban-on-food-waste-three-years-later/.
71 Pierre Condamine, "Italy's law for donation and distribution of food and pharmaceuticals to limit food waste: Food Waste Prevention Legislation," *Zero Waste Europe*, accessed August 7, 2022, https://zerowasteeurope.eu/wp-content/uploads/2020/11/zwe_11_2020_factsheet_italy_en.pdf.

Food waste smart dumpster processor in South Korea
Credit: revi

based on charging for biodegradable bags and the weight of organic waste. This fee covers the costs of running the initiative and encourages home composting. The program relies on automated garbage cans that weigh food waste as it is deposited and charge residents for its value via an ID card. With this initiative, South Korea went from recycling 2 percent of food in 1995 to 95 percent in 2019. In 2016, South Korea produced 13,000 tons of organic waste daily. 60 percent was recycled for animal feed, 30 percent for compost and fertilizer, and 10 percent for the generation of biofuels.[72]

Countries in this bloc should aim to reinforce their policies and promote these policies in other countries. While there is no single solution to food waste, delegates in this bloc can learn from their countries' successes. They should seek to integrate solutions based on the necessities of all the blocs on an international scale.

Committee Mission

The FAO's mission is to contribute to building a food-secure world for present and future generations. Primarily, it protects the right to human life by ensuring access to food, a dire necessity. The FAO's mandate focuses on four main functions. First is collecting and disseminating information to monitor progress and generate data. Second, providing technical advice to assist countries in implementing policies that improve food and agriculture. Lastly, the development of policy recommendations and assistance to governments working toward food security. These include forums for international negotiation.

Like many other environmental issues, food security is inherently intersectional. The issue interacts with broad populations, ecosystems, and communities. Reducing food loss and waste must be seen as a way to achieve other goals, such as improving food security and nutrition, lowering greenhouse gas emissions, reducing stresses on water and land resources, and increasing productivity and economic growth.

Effective policy formulation requires comprehensive data on the geographic location and part of the supply chain waste originates. The FAO's work on measuring food loss and waste is fundamental to tracking progress made by countries in this matter. While addressing food waste, delegates will also need to adjust current agricultural practices to make them more efficient in controlling food waste. As dangerous levels of carbon emissions, water wastage, deforestation, and climate change already threaten the world, it is becoming increasingly crucial for FAO to incorporate innovative approaches to waste management, infrastructure, and policies.

72 Douglas Broom, "South Korea once recycled 2% of its food waste. Now it recycles 95%," *World Economic Forum*, accessed August 7, 2022, https://www.weforum.org/agenda/2019/04/south-korea-recycling-food-waste/; Marissa Sheldon, "South Korea Recycles Food Waste in Effort to Become Zero-Waste Society," *Hunter College New York City Food Policy Center*, accessed August 7, 2022, https://www.nycfoodpolicy.org/food-policy-snapshot-south-korea-food-waste/.

Research and Preparation Questions

Your dais has prepared the following research and preparation questions as a means of providing guidance for your research process. These questions should be carefully considered, as they embody some of the main critical thought and learning objectives surrounding your topic.

Topic A

1. How was your country impacted by the COVID-19 pandemic, and what policies were implemented to adapt to supply chain issues?
2. Has your country experienced disease-related crop degradation or loss? What have been the economic ramifications of these losses?
3. Does your country use preventative health measures for livestock? If so, how effective are these measures, and what can be improved?
4. To what extent does your country rely on trade for imports and exports? Does your country produce food domestically?
5. How have FAO initiatives related to climate change, environmental health, and public health impacted your country's food security?

Topic B

1. In which stages of the food supply chain is food most commonly wasted in your country? Does your country have higher levels of food waste or food insecurity?
2. How can the FAO facilitate and promote cooperation among countries to implement practices to decrease food wastage at the international level? What laws or regulations does your country have to address hunger and food waste, especially for vulnerable populations?
3. What demographic groups are most affected by food waste in your country? How can the FAO strive to find a solution for these groups?
4. Has your country taken steps to reduce the environmental damage produced by food waste, such as carbon emissions, water waste, and deforestation? How can your country improve on its current policies?
5. How can the FAO help countries and consumers make environmentally conscious food choices?

Important Documents

Topic A

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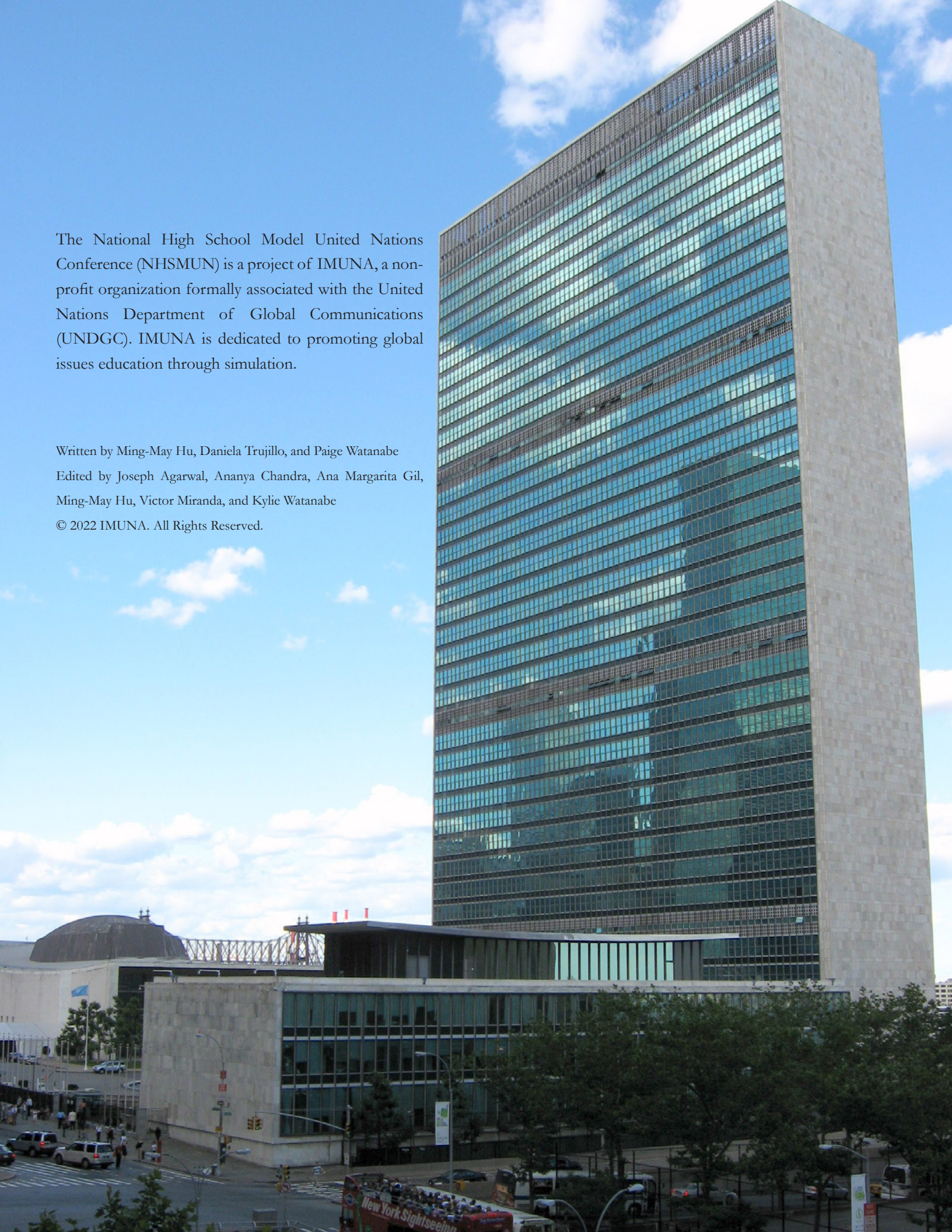

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