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Review

The Food Systems, One Health, and Resilience (FOR) Approach—Led by the FOR-Runners

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Abstract: The COVID-19 pandemic, adverse effects of climate change, the ongoing war in Ukraine, and other threats have been calling on all relevant stakeholders from varied disciplines to collaborate via the One Health approach, addressing the health of people, animals, plants, and their shared environment. This narrative review examines the need to add two more dimensions to the One Health approach: food systems and resilience, thus laying down the foundation of the Food System, One Health, and Resilience (FOR) approach. By doing so, all FOR approach elements would benefit from collaborative, multisectoral, transdisciplinary, planet-based, and system-focused efforts. Addressing more comprehensive determinants that positively impact resilience and sustainability would upgrade the One Health approach. We share some examples of academic institutions and innovation hubs that use this approach to improve access to adequate, safe, nutritious, and sustainable diets for all on our planet. We call on other FOR stakeholders, including governing institutions, to embrace the FOR approach and join the "FOR-runners". It is suggested to widen the FOR community by including the doers, the food system's workers, and consumers and to create the needed common grounds to drive for solutions rooted in equitable, just, locally tailored, inclusive, and sustainable solutions that withstand emergencies.

Keywords: one health; food systems; food security; sustainability; resilience; climate change

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1. Introduction

Planetary challenges, such as climate change, pandemics, neglected and novel diseases, and food insecurity, have redirected the mindset of community interventions and policymakers at local, national, and global levels toward adopting the One Health (OH) approach [1–3]. Recently, the OH concept has moved from a human-centric to a planet-centric approach.

Even before the pandemic, different global and organizations formed alliances in the spirit of the OH approach. In 2001, the World Health Organization (WHO) Member States agreed to work together on preparedness and response to pandemics. Building on the International Health Regulations (IHR) (1995), all the WHO State Parties accepted an updated version of the IHR in 2005, which came into force in 2007. These regulations are based on cross- and trans-sector collaboration, using the "whole-of-government" and "whole-of-society" approaches and actions at local, national, and global levels. The IHR (2005) delineates the required core capacities for preparedness and response. Building on these regulations, in 2010, the Food and Agriculture Organization (FAO), the World Organization for Animal Health (WOAH, founded as OIE), and the WHO signed the Tripartite Concept Note, bringing agriculture and the health of animals and humans onto

the same platform [4]. Furthermore, the WHO and the WOAH created in 2014 the WHO-OIE Framework for good governance at the human–animal interface [5]. They also joined in bridging their assessment tools, the OIE Performance of Veterinary Services (PVS) [6] and the IHR (2005) Monitoring and Evaluation Framework [7], helping countries improve their preparedness for and response to health emergencies.

During the COVID-19 pandemic, in November 2020, at the Paris Peace Forum, the FAO, the United Nations Environment Programme (UNEP), WHO, and the WOAH agreed to enhance their collaboration by creating a multidisciplinary, independent One Health High-Level Expert Panel (OHHLEP) with the support of the governments of France and Germany. The Panel agreed that "One Health stands for an integrative and systemic approach to health, grounded on the understanding that human health is closely linked to the healthiness of food, animals and the environment, and the healthy balance of their impact on the ecosystems they share, everywhere in the world" [8,9].

In recent months, WHO Member States have started negotiating a global accord on pandemic prevention, preparedness, and response. The "zero draft" is anchored in the WHO Constitution, uses its definition of health, and recalls the preamble to the Constitution that states that "the enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition, and that unequal development in different countries in the promotion of health and the control of disease, especially communicable disease, is a common threat". It also reaffirms the State Parties' sovereignty principle in addressing public health issues, including pandemic prevention, preparedness, response, and health system recovery. It serves as a basis for the agreement, recognizes the One Health approach, and has an article dedicated to it. Yet, it remains "disease-centered" and does not include food systems as a distinct entity [10].

This article examines the need to bundle the food systems and resilience dimension into the OH approach, creating the Food System, One Health, and Resilience (FOR) approach. We present a literature review covering the three aspects of the FOR approach. In this regard, 904 scientific articles were identified through PubMed and the artificial intelligence-powered Semantic Scholar. They were sorted by their research focus and highlighted here.

2. The One Health, Food Systems, and Resilience—The FOR Platform

Humans and other living organisms coexist through mutual interdependence. They share food chains and food webs, hosting many of the same microorganisms, and residing in the same environment. The most recent opportunity for a wake-up call to re-calculate our route from a human-centric to a planet-centric approach was provided by the COVID-19 pandemic, which has widened inequalities, undermined progress on global poverty, and caused a widespread economic and humanitarian crisis [11,12]. The pandemic has revealed the threats and impacts of climate change and other imminent hazards, including antimicrobial resistance (AMR), conflicts, and food insecurity [13–17]. In 2022–2023, Ukraine was the fifth-largest wheat exporter worldwide. Due to the ongoing Ukraine-Russia conflict, Ukraine could not meet the export demands, resulting in food insecurity, particularly in Middle Eastern and African countries, and soaring global food prices [18]. Africa has been struggling with drought and, due to food insecurity, has pushed the region towards famine.

These events have shaken off the dust from the 30-year-old notion of the One Health concept [19]. This notion was practiced even earlier, for example, by Lady Eve Balfour, who stated that "the health of soil, plant, animal, and man is one and indivisible". The organic agricultural movement has further put it into practice [20]. The integrated One Health approach aims to sustainably balance and optimize the health of people, animals, and ecosystems. It relies on shared, respected, and influential governance and policymaking, community engagement and communication with shared responsibility and accountability, capacity development, education, forward-thinking, and innovation. It invests in peace among humans and their shared environment. The notion of One Health is still evolv-

ing, building on the work carried out by pioneers in clinical care and public health [21]. Nevertheless, we have yet to act in the entire span of the OH approach and amalgamate two separate groups: the first focuses on infectious disease agents, antimicrobial resistance (AMR), and food safety, originating at the animal–human-environment interface; the other is centered on eco- and socio-systems that promote human, animal, plant, and environmental health and sustainability. Each is led by different actors, such as researchers and doers, farmers, communities, industries, transportation and trade, and governing bodies. The OH approach promotes trans- and inter-disciplinary dialogues and collaboration among human, veterinary, plant, and environmental health and science experts. Merging these groups is essential for the resilience of our planet, its residents, and its resources, as well as bridging researchers with policy makers [22].

The critical stimulus for the first group was the "Hazards Approach". For example, zoonotic diseases constitute about 60 percent of all known infectious diseases in humans and 75 percent of all emerging infectious diseases [23]. The spread of these diseases is associated with environmental factors, climate change, animal health, human lifestyle, behaviors, and activities, including globalization, urbanization, migration, marginalization, and poverty. The incidence rate of emerging and re-emerging zoonotic diseases has been increasing globally, especially in settings with a high density of contact between people and animals [24]. Food-producing animals, wet market settings, infected and contaminated food ingredients and items, and climate change are leading to warmer temperatures conducive to the growth of Gram-negative bacteria and transboundary animal diseases that may serve as contaminating vehicles [25]. Many zoonotic diseases are associated with food because it is contaminated with pathogens or has been in contact with infected animals. For example, foodborne illnesses such as salmonellosis and campylobacteriosis can be transmitted to humans by consuming contaminated food [26]. Another aspect is the impact of industrial activities and waste collection around the globe on the accumulation of heavy metals in the environment, affecting the health of humans, animals, and plants [27]. Plants are an essential component of the One Health Approach as they provide over 80% of the food consumed by humans and are the primary source of nutrition for livestock. The FAO estimates that up to 40% of food crops are lost annually due to plant pests and diseases [28]. When their health is jeopardized due to the overuse of input materials, infections, toxins, improper post-harvest storage, and climate-change-induced warmer winters, the food security and health of the entire food chain and food webs become at risk. Food production's environmental impact includes the depletion of resources, such as water and soil, and exposure of humans, animals, and plants to environmental contaminants. Moreover, food systems, including food production, processing, transportation, and consumption, can contribute to climate change.

Another complex hazard that requires a better understanding is antimicrobial resistance (AMR). Driven by the inappropriate use of antimicrobial drugs in human and animal health settings, the food chain, and our day-to-day activities, AMR can lead to the emergence and spread of antimicrobial-resistant microorganisms and impact human and animal health [13]. To combat AMR, antibiotics should be prescribed only when needed for treatment, rarely for prophylaxis, and never as growth promotors across the One Health players. Moving forward, safer tools, alternative solutions to AMR, and improved control measures are needed.

The second group goes above and beyond the "hazards lens" (e.g., zoonotic diseases, food safety, and AMR). Agriculture, including crop and livestock production, is a significant source of greenhouse gas (GHG) emissions, including carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Agricultural GHG emissions can come from various sources, including using fossil fuels for irrigation, stubble burning, fertilization, transportation, enteric fermentation in livestock, stored manure, and synthetic fertilizers. Farming styles and modalities, such as family- or industrial-based agriculture, have different impacts on climate change, food and nutrition insecurity, sovereignty, and resilience [29,30]. Food processing and transportation can also contribute to GHG emissions due to the use of

fossil fuels and waste generation [31]. The food industry is also a significant contributor to GHG emissions, and efforts to reduce these emissions can help mitigate climate change. Researching different ways to implement a real circular economy approach can help reduce the negative impacts of food production on human, animal, plant, and environmental health. It can contribute to the overall sustainability of the food system. Environmental, Social, and Governance (ESG) guidelines will be important in identifying and measuring an organization's sustainability and ethical impact [32].

In addition to the direct impacts on human, animal, and plant health, microorganisms shape ecosystem dynamics and processes and play essential roles in nitrogen cycling and soil health. To add to it, organisms and their associated microbiota, the holobionts, form complex ecological units that influence the health of humans, animals, plants and the environment [33,34]. Viruses can affect the population dynamics of aquatic organisms [35], As a group, fungi have complex relations with nature, having essential roles in ecological processes. They communicate in ecosystems through their interactions with other organisms and plants. They can form symbiotic relationships with plants, animals, and other microorganisms to benefit both parties. On the other hand, some fungi can cause infections in humans, animals, and plants. Healthy soils are important for the health of humans, animals, plants, and the environment as they are reservoirs of beneficial microorganisms and pathogens that may counteract dysbiosis [36]. Therefore, microorganisms deserve a particular entry point to intradisciplinary research in the FOR scientific approach, providing a dedicated space to integrate a modern and holistic vision that builds on the recent scientific knowledge, including testing the holobiont hypothesis.

Access to healthy, safe, and nutritious food is costly. In 2020, according to the UN Food and Agriculture Organization (FAO), over 3 billion people could not afford a healthy diet [30]. This deepening of inequalities across- and within nations has impacted the entire One Health spectrum. The existing OH platforms are mainly centered on and revolve around rich countries and groups worldwide. Safe environments are associated with luxurious settings and access to people-centered, good-quality, safe, and life-long health services, including public health. This so far has been the privilege of people living in countries that provide universal health coverage (UHC) or those that can fund it. Prevention of diseases among animals and plants is expensive and not provided under UHC almost anywhere in the world. Technical experts, as seen during the COVID-19 pandemic, are rarely consulted with or listened to. Technologies, including diagnostics, vaccines, and medicine, have yet to be shared fairly with all countries. A disease such as COVID-19, as well as toxic exposures, knows no borders and harms humans, animals, and, in some instances, plants and the environment. Equity is, therefore, one of the key principles that the Food System, One Health and Resilience (FOR) approach should be based on. The COVID-19 pandemic has also exposed the dysfunctionalities of food, social, health, education, and economic systems, to name a few. The marked increase in food and nutrition insecurity [37], the deepening of poverty [38], and the negative impact of malnutrition on health conditions that cause more severe symptoms of COVID-19 have shown that food systems' resilience both reflects and reinforces food systems' inequities. It highlights the fact that food workers are essential, together with those from the health, social, and education workforce [39].

Different views exist on the needed actions to transform the current food systems and make them equitable, resilient, and sustainable. Juskaite and Haung summarize four such approaches: the first advocates for the increased production of food; the second emphasizes redistribution of current wealth and authority; the third group focuses on demolishing capitalism; and the fourth focuses on financial and food aid [40]. They argue that democracy is a prerequisite to bridging the power divide that is standing in the way of transforming the food system and making it equitable. With democracy, the voice and power of the consumers and workers will overcome corporate power, wealth, and influence. The availability of technologies has not paved the way for more resilient food systems during the COVID-19 pandemic [40].

The COVID-19 pandemic has enhanced the debates on the ethical considerations of the research base for policies at the interface of the health of humans, animals, and the environment. Decisions to halt international travel, enforce isolation and quarantine, restrict the free movement of people and goods, school closures, forced vaccination, and culling of animals are just a few ethical issues that brought the need to agree on the ethical considerations. "Planetary health ethics" or "One Health ethics" provide a set of principles that guide actions to protect and promote the health of humans, animals, and the environment [41], aiming at health equity for all worldwide, sharing the EchoHealth's view that sustainability is required for human wellbeing [42]. Morand and Lajaunie suggest using the term, "Global health ethics", which emphasizes that crises are complex and systemic and must lead to systemic actions for better health and well-being. They conclude that "to meet this goal, scientific research will need to embrace pluralism, avoid the hierarchy of sciences, and be better integrated with ethical and other normative values" [43].

3. Food System, One Health and Resilience (FOR) Research

Based on the reviewed literature, the essential components for successful research that is anchored in the FOR approach may be based on the following principles:

1. **Interdisciplinary and intersectoral collaborations,** sharing of data on a real-time basis, and enhanced coordination among the FOR sectors and disciplines,
2. **Systems thinking** that recognizes and identifies the complex interactions and finds ways to address them over time within the context of larger systems when addressing health issues.
3. **Preventive approaches that** are aimed at environmental protection, vaccinations to prevent the spread of human and animal diseases, promotion of hygiene, and infection control measures to address challenges linked to food and water safety and security, agri/food supply management, and antimicrobial resistance (AMR).
4. **Social-ecological lens** that directs research on governance, macroeconomic and social policies, culture and societal values, social equity, community engagement, cultures, diversity, and active support across and inside nations. The weakest link on our planet determines our resilience, health security, sustainability and future risks.
5. **Surveillance and transparency** through the continuous monitoring and evaluation of health risks and the effectiveness of interventions to identify, predict, and address potential health threats.
6. **Sustainability** and the need to consider the long-term sustainability of human, animal, and environmental health and adopt practices promoting sustainable solutions.
7. **Biosecurity** and health security aspects through implementing evidence-based known and innovative tools, including rapid detection, remote sensing, augmented reality, artificial intelligence, preventive measures, quarantine procedures, hygiene, and laboratory biosecurity protocols.
8. **Ethical considerations** to be included in research and activities, ensuring that the interdependencies and the trade-offs are considered, aiming for "first do no harm".

Unfortunately, the current OH approach suffers from a strong human bias. With more data becoming available, it has become apparent that humans are primarily responsible for the negative environmental impact, climate change, increased occurrence of transboundary animal diseases, and food security. With the FOR approach, we recommend the inclusion of all relevant stakeholders and to consider a planet-centric and sustainable approach to solve global challenges in the following research areas:

1. Studies on the transmission and control of zoonotic diseases. These studies may involve identifying risk factors for zoonotic disease transmission, early surveillance and detection, development of prevention and control measures, and evaluating the effectiveness of these measures.
2. Research on the impacts of environmental factors on health, including the effects of pollution, climate change, and land use on human, animal, plant, and environmental health.

3. Studies on the interactions between humans, animals, plants, and the environment, including research on the impacts of food systems on health, the role of antimicrobial resistance in the spread of diseases, behaviors, and culture, circular economy, and the effects of global trade on health.
4. Studies on the transmission and control of foodborne diseases. These studies may involve identifying risk factors for foodborne disease transmission, developing prevention and control measures, and evaluating the effectiveness of these measures.
5. Research on the impacts of food production practices on human, animal, plant, and environmental health, including studies on using pesticides, fertilizers, and antimicrobial drugs in food production.
6. Research on agroecology, organic farming, and high-input, resource-intensive farming systems, searching for innovative approaches to protect and enhance the natural source base while increasing productivity.
7. Build on holistic, transformative processes, such as agroecology, agroforestry, climate-smart agriculture, and conservation agriculture, which are rooted in indigenous and traditional practices and knowledge.
8. Studies on the impacts of food systems on climate change, including research on the GHG emissions associated with food production, processing, storage, and transportation, and the potential for sustainable food systems to mitigate climate change.
9. Research on the links between food systems and antimicrobial resistance (AMR), including studies on the use of antimicrobial drugs in food animal production and the potential impacts on human health.
10. Search for alternative solutions to AMR based on the holistic, integrated, multisectoral FOR approach. For example, the development of methods to improve animal welfare, preventing the spread and leakage of microbes and AMR from wildlife to other animals, plants, and soil, and from one agricultural sector into another. It may include research and innovation on combating AMR, such as phage and immune therapies, and beyond.
11. Studies on the impacts of food systems on the environment, including research on land use, water use, and pollution associated with food production, and the potential for sustainable food systems to reduce these impacts.
12. Anthropological research can help to provide insights on healthier planetary health outcomes, understand how food systems are shaped by cultural, social, and economic factors, and how these systems can impact human, animal, plant, and environmental health.
13. Geography research can help to understand how food systems are shaped by social and economic factors, such as access to markets and resources, and how these factors can impact the sustainability of food systems.
14. Literature research can be an important tool for synthesizing, shaping, and advancing the attention and knowledge of the food systems and the One Health approach.

4. FOR Innovation

Innovations are and will continue to be an important aspect of the success of the FOR platform, as they can result in the identification of new tools and technologies and the repurposing of existing technologies to address the complex issues involved in the interactions between humans, animals, plants, and the environment. Global and local consumers should be integral to the FOR approach. The review highlights some examples of current innovation gaps in the FOR approach, including:

1. The development of new technologies to identify and prevent adverse outcomes associated with health insecurity. Innovations using artificial intelligence and/or machine learning for medical imaging enable quicker care delivery with increased accuracy by building patient-centric workflows that empower doctors, veterinarians, and plant health specialists to understand the disease comprehensively and provide faster and more accurate diagnosis and treatment options across the full FOR platforms.

2. Repurposing existing and identifying new technologies aimed at prevention, early detection, surveillance, preparedness, and response to planetary health emergencies and control of infectious diseases. These may include the development of immunity accelerators, protection tools such as PPE's, rapid and accurate diagnostic tests, data analytics to identify disease trends and patterns, epi-centers, and footprint of infections inclusive for neglected, reemerging, and novel diseases.
3. The development of new medical countermeasures, including personal protective equipment (PPE), diagnostics, therapeutics and vaccines, and other preventive measures to reduce the transmission of infectious diseases. This may include the development of vaccines for emerging infectious diseases or the use of innovative delivery methods such as patch and nasal vaccines. It will also focus on ways to share these public health goods across the One Health platform globally.
4. The development of new approaches to improve antimicrobial adherence and stewardship, including using precision medicine to improve the selection of antimicrobial drugs, reduce the risk of antimicrobial resistance, and use phages as alternatives to treat patients with AMR.
5. The development of new approaches to sustainable food systems and climate-resilient agriculture, including new food products that utilize resilient and sustainable crops and wild edible plants, precision agriculture, effective, non-toxic biomolecules, safe agroecological practices, and alternative smart and enhanced protein sources to reduce the environmental pollution of food production. Such actions can improve food quality and consumers' health and well-being, increase farmers' income, food, nutrition, and health security, enhance on-farm educational and agricultural tourism, and promote traditional cultures.
6. Including food as an important health promoter and considering the biological interactions of plants, animals, microorganisms, and the environment. The development of new approaches to improving humans', animals', plants', and environmental health and well-being, using innovative technologies and approaches, including telemedicine and telehealth, to deliver services remotely and for human–animal-plant-environment assisted therapy.
7. The identification of global and local solutions to reduce the emission of GHGs, stubble burning, agri-waste management to treat industrial water, transition to renewable energy sources, and waste management, including food wastage by consumers.

The FOR innovation aims at finding diverse solutions that respect cultures and health concepts and use out-of-the-box thinking. It seeks to address complex health issues involving human, animal, and environmental interactions, guided by global health ethics and rooted in democratic governance. The deployment of these solutions requires policymakers and regulatory bodies to come together and include the consumers, workers, and doers in evaluating and monitoring compliance and the overall success of the FOR approach.

5. The One Health Approach—The Pandemic "Push"

To assess the focus of researchers around the globe on One Health and One Health and Food Systems before and during the COVID-19 pandemic, a review of the number of scientific publications centered on these issues was conducted using two databases: the artificial-intelligence-powered Semantic Scholar [44] (Table 1) and PubMed [45] (Table 2).

Table 1. The number of scientific publications in different areas, before and during the COVID-19 pandemic, using Semantic Scholar.

	One Health	One Health and Food Systems	Total
2017–2019	6264	42	6306
2020–2022	8586	90	8676

Data indicates an increase of 27.3% in the number of scientific publications.

Table 2. The number of scientific publications in different areas, before and during the COVID-19 pandemic, using PubMed.

	One Health	One Health and Food Systems	Total
2017–2019	2134	7	2141
2020–2022	5892	26	5918

Data indicates an increase of 63.8% in the number of scientific publications.

Data obtained suggest a significant increase in interest in research on the One Health perspective, with and without the food system approach. This indicates a clear need to establish FOR-networking platforms in academic and research institutes to stimulate partnerships, collaboration models, and effectiveness.

Additionally, due to the COVID-19 pandemic, more and more Universities worldwide have established "One Health" Platforms (Table 3):

Table 3. Examples of One Health structures within academic institutions.

University	Name of Program	Link
The University of Edinburgh, UK	MSc One Health, School of Veterinary Studies	https://www.ed.ac.uk/vet/studying/postgraduate/taught-programmes/one-health, accessed on 15 September 2023.
University of Glasgow, UK	MSc/PgDip/PgCert	https://www.gla.ac.uk/postgraduate/taught/onehealth/, accessed on 15 September 2023.
London School of Hygiene and Tropical Medicine, UK	MSc One Health: ecosystems, humans, and animals	https://www.lshtm.ac.uk/study/courses/masters-degrees/one-health, accessed on 15 September 2023.
University of Guelph, Canada	One Health Institute	https://onehealth.uoguelph.ca/, accessed on 15 September 2023.
The University of Alaska, Fairbanks, USA	Center for One Health Research	https://www.uaf.edu/onehealth/, accessed on 15 September 2023.
Colorado State University, USA	One Health Institute	https://onehealth.colostate.edu/, accessed on 15 September 2023.
University of Tennessee, USA	One Health Initiative	https://onehealth.tennessee.edu/, accessed on 15 September 2023.
Utrecht University, The Netherlands	The Netherlands Centre for One Health (NCOH)	https://ncoh.nl/, accessed on 15 September 2023.
University of Florida, USA	One Health Center of Excellence	https://onehealth.ifas.ufl.edu/, accessed on 15 September 2023.
Ben Gurion University of the Negev, Israel	The BGU Food Systems, One Health, and Resilience (BGU-FOR) Center	https://in.bgu.ac.il/en/vpdrd/Pages/FOR.aspx, accessed on 15 September 2023.

Additional institutions are planning to establish One Health platforms. For some, the entry point is through their veterinary schools or schools of public health. However, as with the area of sustainability, it is worth considering placing the One Health platforms under the Presidents of the universities to ensure cross-cutting, intra and inter-disciplinary collaborations, and high-level support. The BGU-FOR comprises six think tanks: 1. BGU-FOR peace; 2. BGU-FOR innovation; 3. BGU-FOR capacity development and education; 4. BGU-FOR communities; 5. BGU-FOR policy; and 6. BGU for prevention, preparedness, response, and recovery. Researchers and students from all disciplines are encouraged to join at least one think-tank. Each think-tank is working to identify the gaps in knowledge, data, tools, and actions and prepare research and innovation proposals for submission. The

BGU-FOR teams provide academic guidance, support, and the needed linkages with the public, policymakers, entrepreneurs, and private industry.

The BGU-FOR has recently joined hands with the International One Health Incubator at the Sustainability Innovation Centre (SINC), IKP Knowledge Park [46] to build on each of the institution's capacities and for identification of new technologies, scaling up solutions, launching joint Grand Challenges, deployments and technology transfer for concrete answers, tools, and systems that would drive the global change that is so needed for our planetary health.

6. Discussion

With the global population expected to reach ~10 billion by 2050, relentless efforts would have to be made at local, regional, national, and global levels to safeguard our planet for future generations. With mankind breaching the temperature benchmark of 1.5 degrees Celsius, the COVID-19 pandemic, and the Ukraine–Russia war pushing socio-economic crisis, poverty, and famine, the situation is grim, and mitigation and resilience strategies should be planned with a sense of urgency.

Resilience is the ability to live with change and develop, improve, and innovate with it [47]. There are currently two approaches to solving food system and OH and resilience challenges; the first focuses on localized systems while the other on global agreements and coordination [48]. Biggs and Schluter propose seven principles for enhancing capacities that are required to achieve resilience: maintain diversity and redundancy; manage connectivity; manage slow variables and feedbacks; foster an understanding of social-ecological systems as complex adaptive systems; encourage learning and experimentation; broaden participation; and promote polycentric governance systems [49]. Many of these principles are anchored in local norms, values, politics, and actions and thus feed the debate on whether it is at all possible to achieve global agreements on and coordination of the food systems in the framework of OH and resilience. One can argue that global health agreements, such as the International Health Regulations (IHR) (2005) [50], have shown that countries can agree on a common legal tool. This law legally binds 196 state parties, including the 194 WHO Member States. The IHR is set to improve national capacities for the prevention and detection of, preparation for, and response to health risks and threats. They introduce safeguards to protect the rights of travelers and others. However, the COVID-19 pandemic revealed the weaknesses of this legal instrument, especially regarding the accountability of the countries and their readiness to collaborate globally. Many countries only applied it partially, others were not sufficiently aware of it, and some ignored it [51].

The universality and severity of the food systems' and OH threats and vulnerabilities call for the urgent construction and implementation of a global FOR agreement and an accountability assurance tool, actions that depend on political will. In the past decades, global politics has resulted in increased divisions, tensions, and contentions that are personal, interest-, and value-driven [52]. However, there is hope and optimism that other global agreements are currently being crafted, among them an updated version of the IHR and the Global Pandemic Prevention, Preparedness, and Response accord [53].

Another challenge for constructing FOR plans at national and global levels is the involvement of many partners and stakeholders. They are needed since no single sector has all the required capacities, responsibilities, and accountabilities along the full FOR spectrum. However, each partner might have their own expectations, interests, and agendas, which are the ingredients of politics [54]. Anchoring plans and actions in ethics, culture, and evidence could assist in overcoming the hurdles to democratizing science and policy. To ensure effective and sustainable FOR partnerships, it is important to include those whose voices are rarely listened to, such as food systems workers and consumers, and to accommodate the competing political vectors. Real-time sharing of information, data, and protocols and the tailoring of community-specific actions could lead to collaborations among communities, which may drive actions at the national level.

On the other hand, global efforts by inter-governmental organizations, such as the WHO and FAO, may further shape the global common grounds. In this way, horizontal, bottom-up, and top-down initiatives will hopefully result in a global comprehensive FOR agreement [55].

The COVID-19 pandemic has revealed the weakest links in our local and global preparedness and response capacities. Well-defined FOR plans could include checks and balances for emergency prevention, preparedness, response, and recovery. Public health ethics deserve special attention, as well as community engagement and risk communication. Authorities have often directed sets of public health and social measures, aiming for health security, solidarity, and protecting the most vulnerable. However, disadvantaged groups have suffered the negative consequences of such universal measures in a disproportional manner. This again highlights the need to include public health ethics in pandemic preparedness and response and in all aspects of the FOR plans [56].

The term, "FOR-runners", in this article refers to partnerships of experts and doers in the areas and interfaces of food systems, One Health, and resilience. Their research and innovation work is based on the modern principles of agroecology that stem from the rich collective knowledge, behaviors, and practices carried out by indigenous and local agricultural practitioners, as well as governance, ethics, and community engagement. These "FOR-runners" may serve as role models for other partnerships. Another example of "FOR-runners" can be illustrated by partnerships that promote using a circular economy, which is interwoven in the FOR approach. They aim to minimize food waste and maximize resource sustainability by using closed-loop systems that reduce the extraction of new resources and promote the reuse and recycling of materials [57].

In summary, transitioning to the FOR approach at all levels, individual, community, national, and global, is a complex process. All stakeholders, including people and communities, must partner in shifting towards green, resilient, and sustainable systems. Short- and long-term investments in mitigation through zero-emissions, setting up climate-resilient health infrastructure, and supply chains are a few issues to be included [29].

7. Conclusions

To implement the holistic FOR Approach, academic and research institutions, science parks, and incubators may consider the setting up of interdisciplinary research and capacity development platforms to generate awareness and knowledge. They can be lead examples of partnership models to further the FOR approach. These platforms can enhance transdisciplinary collaboration with many stakeholders, including policymakers, civil society organizations, and communities. Their comprehensive focus, above and beyond zoonotic diseases, for instance, could bring prevention forward across sectors and hazards while ensuring the "Planet First" and balanced approaches.

Advancing research, developing capacities, and bringing solutions forward would benefit from addressing the entire Emergency Management Cycle [58], from prevention of, preparedness for, response to, and recovery from planetary emergencies. They should encompass the complete FOR aspect, including food systems and resilience. Moreover, the work should look for planet-friendly solutions, including those for the food systems, such as using locally produced food that will be affordable, fresher, and greener for the planet. Planetary health security and resilience call for more evidence, advocacy, policy, and regulatory frameworks and tools to strengthen the One Health universal health coverage concept. A few academic communities around the globe have already joined this movement and are now adjusting their working modalities across sectors and disciplines. Such endeavors will provide scientific evidence and breakthroughs, new tools, and methodologies, focus on prevention and resilience, and stimulate innovation for sustainable development.

There are two different perspectives on the way to transform the food systems. One is anchored in capitalism, promoting free-market forces, increased production, and using unsustainable approaches and tools. Big corporations and technocratic and funding institutions are the usual members of this strong and vocal group. The other is centered around

agroecology and food sovereignty and focuses on people, cultures, and the planet, basing it on democratic values. "Direct" democracy will make them heard and able to take part in decision making [59].

As a first step and until global agreements are reached and implemented, local communities play a key role in democratically deciding on how to tailor their FOR plan. They can fit it to their culture, circumstances, and priorities while ensuring their food and nutrition security, protection, resilience, sovereignty, and sustainability within planetary boundaries. Exercising ethics, democracy, justice, and equity norms are prerequisites to achieving these societal actions.

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References

1. Zinsstag, J.; Schelling, E.; Waltner-Toews, D.; Tanner, M. From "one medicine" to "one health" and systemic approaches to health and well-being. *Prev. Vet. Med.* **2011**, *101*, 148–156. [CrossRef]
2. Sinclair, J.R. Importance of a One Health approach in advancing global health security and the Sustainable Development Goals. *Rev. Sci. Technol.* **2019**, *38*, 145–154. [CrossRef]
3. Zinsstag, J.; Crump, L.; Schelling, E.; Hattendorf, J.; Maidane, Y.O.; Ali, K.O.; Muhummed, A.; Umer, A.A.; Aliyi, F.; Nooh, F.; et al. Climate change and One Health. *FEMS Microbiol. Lett.* **2018**, *365*, fny085. [CrossRef]
4. The FAO-OIE-WHO Collaboration Sharing Responsibilities and Coordinating Global Activities to Address Health Risks at the Animal-Human-Ecosystems Interfaces. 2010. Available online: https://cdn.who.int/media/docs/default-source/ntds/neglected-tropical-diseases-non-disease-specific/tripartite_concept_note_hanoi_042011_en.pdf?sfvrsn=8042da0c_1&download=true (accessed on 5 August 2023).
5. WHO-OIE Operational Framework for Good Governance at the Human-Animal Interface. 2014. Available online: https://www.who.int/publications-detail-redirect/who-oie-operational-framework-for-good-governance-at-the-human-animal-interface (accessed on 5 August 2023).
6. OIE Tool for the Evaluation of Performance of Veterinary Services. 2008. Available online: https://web.oie.int/downld/SC/EN_OIE%20PVS%20Tool_2008.pdf (accessed on 5 August 2023).
7. World Health Organization. Monitoring and Evaluation Framework. 2020. Available online: https://www.who.int/publications-detail-redirect/monitoring-and-evaluation-framework (accessed on 5 August 2023).
8. World Health Organization. One Health High-Level Expert Panel (OHHLEP). 2021. Available online: https://www.who.int/groups/one-health-high-level-expert-panel (accessed on 5 August 2023).
9. Dar, O.; Machalaba, C.; Adisasmito, W.B.; Almuhairi, S.; Behravesh, C.B.; Bilivogui, P.; Bukachi, S.A.; Casas, N.; Becerra, N.C.; Charron, D.F.; et al. One Health Theory of Changes. One Health High-Level Expert Panel (OHHLEP). 2021. Available online: https://www.who.int/publications/m/item/one-health-theory-of-change (accessed on 5 August 2023).
10. Countries Begin Negotiations on Global Agreement to Protect World from Future Pandemic Emergencies [Internet]. Available online: https://www.who.int/news/item/03-03-2023-countries-begin-negotiations-on-global-agreement-to-protect-world-from-future-pandemic-emergencies (accessed on 17 April 2023).
11. Bambra, C.; Riordan, R.; Ford, J.; Matthews, F. The COVID-19 pandemic and health inequalities. *J. Epidemiol. Community Health* **2020**, *74*, 964–968. [CrossRef]
12. Pereira, M.; Oliveira, A.M. Poverty and food insecurity may increase as the threat of COVID-19 spreads. *Public Health Nutr.* **2020**, *23*, 3236–3240. [CrossRef]
13. Velazquez-Meza, M.E.; Galarde-López, M.; Carrillo-Quiróz, B.; Alpuche-Aranda, C.M. *Antimicrobial Resistance: One Health Approach*; Veterinary World: Gujarat, India, 2022; Volume 15, pp. 743–749.
14. Kumareswaran, K.; Jayasinghe, G.Y. Systematic review on ensuring the global food security and COVID-19 pandemic resilient food systems: Towards accomplishing sustainable development goals targets. *Discov. Sustain.* **2022**, *3*, 29. [CrossRef]
15. Rizzo, D.M.; Lichtveld, M.; Mazet, J.A.K.; Togami, E.; Miller, S.A. Plant health and its effects on food safety and security in a One Health framework: Four case studies. *One Health Outlook* **2021**, *3*, 6. [CrossRef]
16. Boliko, M.C. FAO and the Situation of Food Security and Nutrition in the World. *J. Nutr. Sci. Vitaminol.* **2019**, *65*, S4–S8. [CrossRef]

17. Jackson, P. Food, health and sustainability. *Proc. Nutr. Soc.* **2022**, *82*, 227–233. [CrossRef]
18. Yazbeck, N.; Mansour, R.; Salame, H.; Chahine, N.B.; Hoteit, M. The Ukraine-Russia War Is Deepening Food Insecurity, Unhealthy Dietary Patterns and the Lack of Dietary Diversity in Lebanon: Prevalence, Correlates and Findings from a National Cross-Sectional Study. *Nutrients* **2022**, *14*, 3504. [CrossRef]
19. Di Paolo, T. Considerations on the sidelines of the second principle of the Rome Declaration: The challenge of the One Health concept on the health of the future. *Int. J. Risk Saf. Med.* **2022**, *33*, 117–124. [CrossRef]
20. Vieweger, A.; Döring, T.F. Assessing health in agriculture—Towards a common research framework for soils, plants, animals, humans and ecosystems. *J. Sci. Food Agric.* **2015**, *95*, 438–446. [CrossRef]
21. Bresalier, M.; Cassidy, A.; Woods, A. One Health in History. In *One Health: The Theory and Practice of Integrated Health Approaches*, 2nd ed.; Zinsstage, J., Ed.; CAB International: Wallingford, UK, 2021. Available online: https://www.cabi.org/wp-content/uploads/Chap1-9781789242577.pdf (accessed on 5 August 2023).
22. Mumford, E.L.; Martinez, D.J.; Tyance-Hassell, K.; Cook, A.; Hansen, G.R.; Labonté, R.; Mazet, J.A.; Mumford, E.C.; Rizzo, D.M.; Togami, E.; et al. Evolution and expansion of the One Health approach to promote sustainable and resilient health and well-being: A call to action. *Front. Public Health* **2023**, *10*, 1056459.
23. Rahman, M.T.; Sobur, M.A.; Islam, M.S.; Ievy, S.; Hossain, M.J.; Zowalaty, M.E.E.; Rahman, A.M.T.; Ashour, H.M. Zoonotic diseases: Etiology, impact, and control. *Microorganisms* **2020**, *8*, 1405. [CrossRef]
24. Allen, T.; Murray, K.A.; Zambrana-Torrelio, C.; Morse, S.S.; Rondinini, C.; Di Marco, M.; Breit, N.; Olival, K.J.; Daszak, P. Global Hotspots and Correlates of Emerging Zoonotic Diseases. Available online: www.nature.com/naturecommunications (accessed on 31 December 2022).
25. Humblet, M.F.; Vandeputte, S.; Albert, A.; Gosset, C.; Kirschvink, N.; Haubruge, E.; Fecher-Bourgeois, F.; Pastoret, P.-P.; Saegerman, C. Multidisciplinary and Evidence-based Method for Prioritizing Diseases of Food-producing Animals and Zoonoses—Volume 18, Number 4—April 2012—Emerging Infectious Diseases journal—CDC. *Emerg. Infect. Dis.* **2012**, *18*, e1. [PubMed]
26. Chlebicz, A.; Śliżewska, K. Campylobacteriosis, Salmonellosis, Yersiniosis, and Listeriosis as Zoonotic Foodborne Diseases: A Review. *Int. J. Environ. Res. Public Health* **2018**, *15*, 863. [CrossRef]
27. Aloud, S.S.; Alotaibi, K.D.; Almutairi, K.F.; Albarakah, F.N. Assessment of Heavy Metals Accumulation in Soil and Native Plants in an Industrial Environment, Saudi Arabia. *Sustainability* **2022**, *14*, 5993. [CrossRef]
28. International Year of Plant Health 2020 FAO | Food and Agriculture Organization of the United Nations [Internet]. Available online: https://www.fao.org/plant-health-2020/about/en/ (accessed on 21 January 2023).
29. Lloyd, S.J.; Chalabi, Z. Climate change, hunger and rural health through the lens of farming styles: An agent-based model to assess the potential role of peasant farming. *PLoS ONE* **2021**, *16*, e0246788. [CrossRef]
30. Food and Agriculture Organization of the United Nations. *The State of Food Security and Nutrition in the World 2022*; Food and Agriculture Organization of the United Nations: Rome, Italy, 2022.
31. Crippa, M.; Solazzo, E.; Guizzardi, D.; Monforti-Ferrario, F.; Tubiello, F.N.; Leip, A. Food systems are responsible for a third of global anthropogenic GHG emissions. *Nat. Food* **2021**, *2*, 198–209. [CrossRef]
32. José, C.; De Oliveira, B.; Gebreyes, W.A. One Health: Connecting environmental, social and corporate governance (ESG) practices for a better world. *One Health* **2022**, *15*, 100435.
33. Simon, J.C.; Marchesi, J.R.; Mougel, C.; Selosse, M.-A. Host-microbiota interactions: From holobiont theory to analysis. *Microbiome* **2019**, *7*, 5. [CrossRef]
34. Ouyang, Y.; Reeve, J.R.; Norton, J.M. The quality of organic amendments affects soil microbiome and nitrogen-cycling bacteria in an organic farming system. *Front. Soil Sci.* **2022**, *2*, 869136. [CrossRef]
35. Vincent, F.; Vardi, A. Viral infection in the ocean—A journey across scales. *PLoS Biol.* **2023**, *21*, e3001966. [CrossRef]
36. Banerjee, S.; A Heijden, M.G. Soil Microbiomes and One Health. Available online: www.nature.com/nrmicro (accessed on 30 April 2023).
37. Kakaei, H.; Nourmoradi, H.; Bakhtiyari, S.; Jalilian, M.; Mirzaei, A. Effect of COVID-19 on food security, hunger, and food crisis. In *COVID-19 and the Sustainable Development Goals*; Elsevier: Amsterdam, The Netherlands, 2022; pp. 3–29.
38. Moyer, J.D.; Verhagen, W.; Mapes, B.; Bohl, D.K.; Xiong, Y.; Yang, V.; McNeil, K.; Solórzano, J.; Irfan, M.; Carter, C.; et al. How many people is the COVID-19 pandemic pushing into poverty? A long-term forecast to 2050 with alternative scenarios. *PLoS ONE* **2022**, *17*, e0270846. [CrossRef]
39. Klassen, S.; Murphy, S. *Equity as Both a Means and an End: Lessons for Resilient Food Systems from COVID-19*; World Development: Hong Kong, China, 2020.
40. Juskaite, G.; Haug, R. Multiple meanings of "equitable food systems": Food systems and discursive politics of change. *Front. Sustain. Food Syst.* **2023**, *7*, 1127562. [CrossRef]
41. Foster, A.; Cole, J.; Farlow, A.; Petrikova, I. Planetary Health Ethics: Beyond First Principles. *Challenges* **2019**, *10*, 14. [CrossRef]
42. Wilcox, B.; Kueffer, C. Transdisciplinarity in EcoHealth: Status and Future Prospects. *EcoHealth* **2008**, *5*, 1–3. [CrossRef]
43. Morand, S.; Lajaunie, C. Linking Biodiversity with Health and Well-being: Consequences of Scientific Pluralism for Ethics, Values and Responsibilities. *Asian Bioeth. Rev.* **2019**, *11*, 153–168. [CrossRef]
44. Fricke, S. Semantic scholar. *J. Med. Libr. Assoc. Med. Libr. Assoc.* **2018**, *106*, 145–147. [CrossRef]
45. Lindberg, D.A.B. Policy matters. Internet Access to the National Library of Medicine. *Eff. Clin. Pract.* **2000**, *4*. Available online: www.pubmedcentral (accessed on 5 August 2023).

46. IKP Knowledge Park [Internet]. Available online: https://ikpknowledgepark.com/ (accessed on 21 January 2023).
47. Biggs, R.; Schluter, M.; School, M.L. *Principles for Building Resilience Sustaining Ecosystem Services in Social–Ecological Systems*; Cambridge University Press: Cambridge, UK, 2015; ISBN 978-1-107-08265-6.
48. Wood, A.; Queiroz, C.; Deutsch, L.; González-Mon, B.; Jonell, M.; Pereira, L.; Sinare, H.; Svedin, U.; Wassénius, E. Reframing the local–global food systems debate through a resilience lens. *Nat. Food* **2023**, *4*, 22–29. [CrossRef]
49. Biggs, R.; Schlüter, M.; Biggs, D.; Bohensky, E.L.; BurnSilver, S.; Cundill, G.; Dakos, V.; Daw, T.M.; Evans, L.S.; Kotschy, K.; et al. Toward Principles for Enhancing the Resilience of Ecosystem Services. *Annu. Rev. Environ. Resour.* **2012**, *37*, 421–448. [CrossRef]
50. International Health Regulations (2005)—Third Edition. Available online: https://apps.who.int/iris/rest/bitstreams/1031116/retrieve (accessed on 5 August 2023).
51. Aavitsland, P.; Aquilera, X.; Al-Abri, S.; Amani, V.; Aramburu, C.; Attia, T.; Blumberg, L.; Chittaganpitch, M.; Le Duc, J.W.; Li, D.; et al. Functioning of the International Health Regulations during the COVID-19 pandemic. *Lancet* **2021**, *398*, P1283–P1287. [CrossRef] [PubMed]
52. Lacy, W. Local food systems, citizen and public science, empowered communities, and democracy: Hopes deserving to live. *Agric. Hum. Values* **2023**, *40*, 1–17. [CrossRef]
53. Hannon, E.; Hanbali, L.; Lehtimaki, S.; Schwalbe, N. Why we still need a pandemic treaty. *Lancet* **2022**, *10*, E1232–E1233, [WHO. 2023. Pandemic prevention, preparedness and response accord (who.int)]. [CrossRef]
54. Abbas, S.S.; Shorten, T.; Rushton, J. Meanings and mechanisms of One Health partnerships: Insights from a critical review of literature on cross-government collaborations. *Health Policy Plan.* **2022**, *37*, 385–399. [CrossRef]
55. Canfield, M.; Anderson, M.D.; McMichael, P. UN Food Systems Summit 2021: Dismantling Democracy and Resetting Corporate Control of Food Systems. *Front. Sustain. Food Syst.* **2021**, *5*, 661552. [CrossRef]
56. Verweij, M.; Dawson, A. Public Health Ethics in a Pandemic. *Public Health Ethics* **2020**, *13*, 125–126. [CrossRef]
57. Fassio, F.; Chirilli, C. The Circular Economy and the Food System: A Review of Principal Measuring Tools. *Sustainability* **2023**, *15*, 10179. [CrossRef]
58. Smallwood, C.A.H.; Perehinets, I.; Meyer, J.S.; Nitzan, D. WHO'S Emergency Response Framework: A case study for health emergency governance architecture. *Eurohealth* **2021**, *27*, 20–25.
59. Pimbert, M. Transforming food and agriculture: Competing visions and major controversies. *Mondes Dév.* **2022**, *199–200*, 361–384. [CrossRef]