Review

Sustainable, Ethical and Secure Food Systems and Ecosystems Based on One Health and Plant-Based Diets Consumer Protection and Sustainability in Africa

Elahesadat Hosseini , Zenebe Tadesse Tsegay , Slim Smaoui , Walid Elfalleh , Maria Antoniadou , Theodoros Varzakas *

Posted Date: 29 October 2025

doi: 10.20944/preprints202510.2244.v1

Keywords: sustainability; ethical food systems; One Health approach; plant-based diets; Africa

Review

Sustainable, Ethical and Secure Food Systems and Ecosystems Based on One Health and Plant-Based Diets Consumer Protection and Sustainability in Africa

Elahesadat Hosseini [1], Zenebe Tadesse Tsegay [2], Slim Smaoui [3], Walid Elfalleh [4], Maria Antoniadou [5] and Theodoros Varzakas [6,*]

[1] Department of Chemical Engineering, Payame Noor University, Tehran, Iran
[2] College of Dryland Agriculture and Natural Resources, Department of Food Science and Post-Harvest Technology, Mekelle University, Mekelle, 231, Ethiopia
[3] Laboratory of Microbial and Enzymes Biotechnology and Biomolecules (LMEBB), Centre of Biotechnology of Sfax (CBS), University of Sfax-Tunisia, Road of Sidi Mansour Km 6, P. O. Box 1177, 3018, Sfax, Tunisia
[4] Department of Biology, College of Science, Imam Mohammad Ibn Saud Islamic University (IMSIU), Riyadh, 11623, Saudi Arabia
[5] Dental School, National and Kapodistrian University of Athens, Greece
[6] Department of Food Science and Technology, University of the Peloponnese, Antikalamos, 24100 Kalamata, Greece
* Correspondence: t.varzakas@uop.gr

Abstract

The contribution of members of the agri-food system to achieving the Sustainable Development Goals is a key element of the transition to sustainable development. Here, we show that many issues related to governance, social benefits, environmental impacts, animal welfare, general and oral health, and nutrition dimensions can be integrated into a One Health global approach to the food chain. The use of sustainable management systems allows the development of an integrated approach with a spirit of continuous improvement. Such an organization is based on risk management tools that are applied to multiple stakeholders, viz. product quality, occupational health and safety, environmental impact, etc., thus enabling better global performance. Addressing food systems complexities involves analyzing the involved different tools, ethical food consumption, and exploring ways to tackle nutritional insecurity. The need for food systems to be both sustainable and ethical can be achieved through the One Health approach, incorporating plant-based diets. Key suggested interventions to foster a responsible food system include: (i) raising awareness of animal rights and one Health approach, (ii) disseminating nutritional and environmental knowledge, (iii) promoting plant-based food research, commercialization and consumption, and (iv) fostering social inclusion and positive recognition of vegan identity. A case study from Africa shows the implementation of a sustainable and healthy future through the One Health approach.

Keywords: sustainability; ethical food systems; One Health approach; plant-based diets; Africa

1. Introduction

Different definitions of sustainable food systems include different pillars, such as food security and nutrition, i.e., the achievement of food security and nutrition security through sustainable and secure food systems [1]. Sustainable diets are another significant pillar targeting low environmental impacts, contributing to food and nutrition security, biodiversity and ecosystems, culturally

 doi:10.20944/preprints202510.2244.v1

acceptable, accessible, economically fair, and affordable[2]. Healthy diets are linked to planetary boundaries.

Another direction emphasizes sustainable development, with a focus on Sustainable Agriculture and Rural Development (SARD) in the agriculture, forestry, and fisheries sectors. This approach conserves land, water, plant, and animal genetic resources, ensuring environmental non-degradation, technical appropriateness, economic viability, and social acceptability.

Core dimensions of Sustainable development (Economic, Environmental, and Social) are complemented by other dimensions, such as Food, Health, Nutrition, and Cultural. The emphasis is placed on environmental processes and outcomes through sustainable food systems, which will achieve good nutrition and socioeconomic outcomes while keeping environmental impacts low enough. The aim is not to destabilize the planetary boundaries of biophysical processes and hence environmental systems, but to conserve "natural resources and protect global ecosystems for human and planetary health and wellbeing"[3].

Economic security is another essential pillar of food systems, since they need to achieve economic security of all stakeholders and combat existing malnutrition/obesity-related health problems[4]. The social parameter is also involved, taking into account resilient and equitable food systems, or sociocultural wellbeing, or social system integrity, or right to food & poverty and inequality, or inclusion, or common good, just & ethical & equitable food systems[5].

Cultured (laboratory-grown) muscle cell (CMC) food has emerged due to pressure on traditional food systems and negative aspects of livestock production[6]. The CMC industry claims a reduced demand for natural resources, minimal impact on the environment, and better outcomes for animal welfare[7–9]. Moreover, livestock production systems should be discussed and considered within the framework of One Health (https://commission.europa.eu/publications/sustainable-europe-2030_en). One Health encompasses healthy animals, healthy ecosystems, and healthy people [10]. Adoption of agroecology is another transformational change in the livestock industries[11]. This necessitates the combination of livestock production with ecosystem components, including water filtration, nutrient cycling, soil carbon, and increased biodiversity. Scalability of agroecology and equal applicability at the level of smallholder farmers and large livestock enterprises are attained[12,13] (https://www.ilri.org/news/one-health-key-sustainable-livestock-and-human-and-environment-health). Healthy ecosystems with ethical and sustainable production of natural animal protein depend on the complementarity of One Health and agroecology [2,14,15].

Moreover, animal welfare is recognized as a critical concern by the UN's One Health Expert Panel and other global stakeholders[16]. However, it is not discussed in climate discussions, including the Intergovernmental Panel on Climate Change's (IPCC) Sixth Assessment Report. The latter fails to address the One Health framework or the welfare implications of mitigation strategies with priority on the reduction of emissions from animal agriculture[17].

Despite the increasing recognition of these sustainability pillars, ethical consumption, and the One Health perspective, there remains limited integration of these dimensions into a unified framework guiding food system transformation. In particular, the intersection of plant-based dietary shifts, governance tools, and regional case studies (such as Africa) has not been sufficiently explored. The aim of this article is therefore to examine how food systems can be made both sustainable and ethical by incorporating the One Health approach, addressing psychological, social, and structural barriers to dietary change, and presenting strategies and examples that can inform global practice. As shown in **Figure 1**, there are many components and drives in the sustainable food system framework. It also displays that the food supply chain and food environments are integrated to assure sustainable development goals.

A conceptual framework is not only descriptive but also strategic. It underlines the systemic nature of food challenges while mapping the linkages across economic, social, environmental, and ethical domains. This integrative perspective provides the basis for identifying governance tools, consumer-oriented interventions, and dietary shifts, elements that will be further elaborated in the following sections.

 doi:10.20944/preprints202510.2244.v1

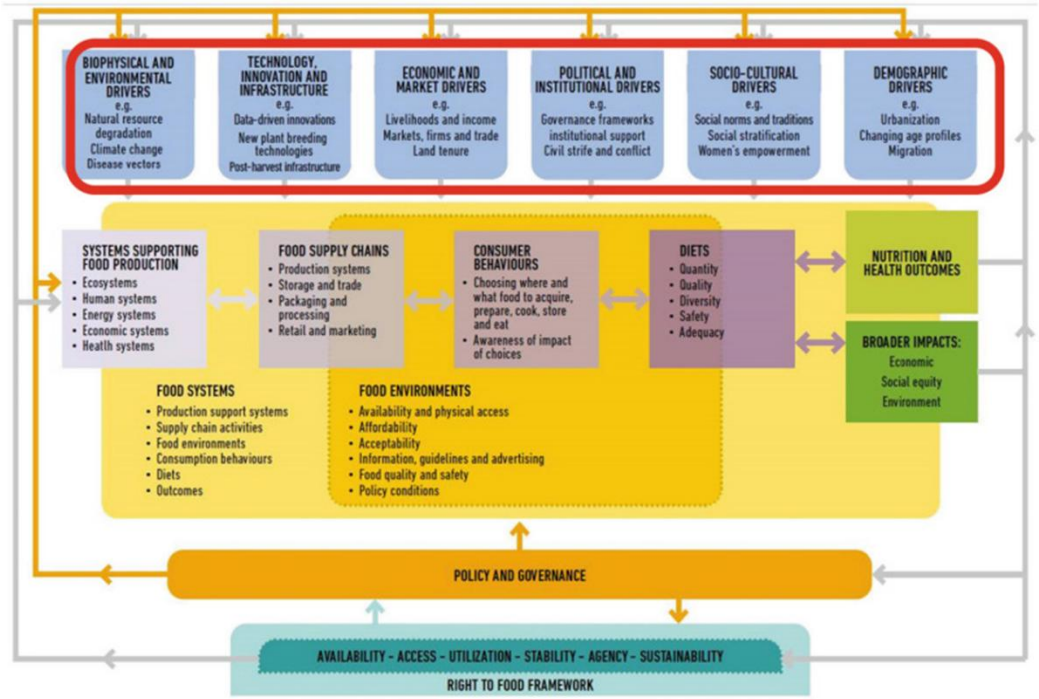

Figure 1. Sustainable food systems conceptual framework [18].

2. Methodology

This article follows a narrative review approach, synthesizing peer-reviewed publications, policy documents, and international reports published between 2015 and 2025. Literature was retrieved from major databases, including Scopus, Web of Science, and PubMed, complemented by official sources such as the FAO, WHO, IPCC, and the European Commission. Keywords included sustainable food systems, One Health, ethical consumption, plant-based diets, agroecology, and the Africa case study. Selection criteria prioritized studies offering conceptual models, empirical evidence, or policy analyses relevant to sustainability and ethics in food systems. Articles not directly addressing these intersections were excluded. References were critically examined and cross-checked to ensure accuracy and consistency, while emphasis was placed on recent evidence (2020–2025) to capture emerging trends.

To ensure reliability, all included studies and reports were subjected to a critical appraisal process. Publications were evaluated based on clarity of objectives, methodological soundness, transparency of data sources, and relevance to sustainability and ethical dimensions of food systems. Particular attention was given to identifying potential biases, such as industry influence in nutrition guidelines or limited geographic representation in empirical studies. The reviewing process followed an iterative approach: each co-author independently screened and appraised selected article, followed by cross-checking to resolve discrepancies. Priority was given to peer-reviewed journals and authoritative institutional reports, while grey literature was only included when it added unique contextual insights. This process allowed for a balanced synthesis of evidence across environmental, economic, social, and ethical domains.

3. Addressing Food Systems Complexities and Ethical Food Consumption

Different tools could address food systems complexities. Traditionally the impact of refrigerated chains on food conservation and environmental costs [19], the implications of emerging food technologies, such as plant-based and cultured meat[20], and the effects of alternative diets on systemic outcomes[21,22] could affect these complexities[23]. However, there is concern that national-scale tools might reduce their effectiveness in capturing on-the-ground barriers to food

 doi:10.20944/preprints202510.2244.v1

access and consumption, and fail to correlate these local dynamics to environmental, social, economic, and health dimensions. In addition, even though supply chains are affected by consumer demand for fair, healthy, and sustainable food production, local tools frequently overlook diets and consumer behavior[24].

The intersection of food security and nutrition with ecological, health, economic, political, and sociocultural systems, and the demand for healthy interrelationships for long-term food system viability is reported clearly by Clapp, et al. [25]. Sustainable diets are also associated with the right to adequate food, as indicated in in many studies [26,27]. The transformation of the entire food system will affect diet improvement, hence affecting the global burden of disease, also known as the diet-focused perspective [28].

Sustainable development in terms of its core dimensions is often associated with cultural aspects, food quality, health and nutrition, and governance[29]. The privatization of carbon markets, corporate-driven regenerative agriculture, and technological fixes are all responses to the challenges posed by unsustainable food systems. In this context, structural inequalities are avoided, resulting in 'greenwashing' and 'social washing' practices [30]. However, it is questioned whether these inequalities are avoided or reinforced. Carbon footprints or yield efficiency are examples of an oversimplification of sustainability. Otherwise, promotion of poverty, inequality, hunger, and violations of community livelihoods will occur.

Different systems such as Global Positioning System(s) (GPS) have been employed to define exposure to the food environment. Exposure to food outlets and the assessed associations with either diet-related or cardiometabolic health outcomes have been tested by Siddiqui, et al. [31], but no consistent associations were found.

Ethical decision-making in food consumption is essential, as reported by Varzakas and Antoniadou [32] and this will be enhanced by new tools such as digitalization, which will enhance consumers' decision-making and affect food systems, as reported by Jose, et al. [33]. Digitalization of livestock farming will aid in the monitoring of the health, welfare, reproduction, and environmental impact of individual animals in real-time [34]. New and traditional technologies such as Radio Frequency Identification (RFID), infrared thermal imaging[35], audio surveillance systems[36], deep learning and image analysis[37], two- and three-dimensional cameras[38], and accelerometers will be employed to monitor and manage animal welfare. Food systems face food and nutritional insecurity, along with climate change-related challenges and unsustainable farming practices[39]. Emerging digital technologies such as artificial intelligence (AI) and its subset, machine learning (ML), have been found to mitigate these challenges[40].

Prioritization of attributes such as animal diets, stress-free environments, humane processing practices, and health conditions, linking these to both ethical and hedonic values, has been indicated by consumers. Some studies also describe the solution to global food insecurity with GMOs as a modern, efficient solution, overshadowing its socio-economic and environmental risks [41]. Are GMOs a symbol of progress, marginalizing alternative models like agroecology by labelling them as inefficient or unscientific[42]?

This might displace small farmers, and lead to disruption of local food systems and consolidation of land ownership among corporations[43]. Emphasis on the preservation of traditional seeds, biodiversity, and agroecological practices to restore autonomy over food systems has been discussed by community-led resistance movements, such as those in Ghana and Argentina[44]. Raimi and Masri [45] applied critical discourse analysis (CDA) to analyze how GMO agripreneurship impacts the global food supply chain. They proposed agroecological sovereignty as a hybrid approach that balances decolonization.

In sum, ethical food consumption is increasingly shaped by digital technologies, consumer values, and contested innovations such as GMOs. These dynamics reveal both opportunities for more transparent and welfare-oriented food systems and risks of reinforcing inequalities or displacing traditional practices. Recognizing these tensions provides the foundation for the following sections,

 doi:10.20944/preprints202510.2244.v1

where the focus shifts from individual consumption choices to broader governance mechanisms and systemic transformations needed to ensure sustainability and equity across food systems.

4. Advancing Nutritional and Environmental Awareness

Nutrition affects both health and the environment, influencing climate change, biodiversity loss, and food security [46]. Despite available information, mixed messages lead many to consume high amounts of animal products, primarily from cows and sheep, and processed foods, which harm ecosystems [47,48]. In 2015, the Dietary Guidelines Advisory Committee (DGAC) recommended more plant-based and fewer animal-based foods for health and environmental benefits, but this was excluded from the final USDA guidelines [49,50]. Sharing knowledge through trusted experts can link health benefits to environmental care, motivating sustainable choices[48]. Public awareness, supported by education, media, and policy, is essential for advancing sustainable food systems[51].

4.1. Key Methods of Knowledge Dissemination in Nutrition and Sustainability

Spreading knowledge about healthy eating and its environmental impact requires varied approaches, reaching all ages via education, media, policies, and clear science communication to encourage better choices and sustainable food systems. Integrating sustainability and nutrition into school curricula effectively raises awareness [52]. Nutrition educators should promote healthy diets and ecological awareness[48]. Schools can foster this by combining biology, environmental science, and health education with hands-on activities like gardens, plant-based cooking, and sustainable lunch programs. Given the link between animal-based diets and environmental harm, addressing ecological impacts in curricula is vital[50].

4.2. Media and Digital Platforms: Social Media, Documentaries, and Awareness Campaigns

Social media platforms like Instagram, YouTube, TikTok, and X have become influential in linking eating habits with personal and environmental health, with plant-based chefs, health professionals, and science communicators promoting critical thinking about food choices[53]. Documentaries such as *Cowspiracy*, *What the Health*, and *The Game Changers* show that storytelling can make scientific information more accessible[54]. Digital tools like carbon footprint calculators, sustainability labels, and green recipe apps further help individuals assess the environmental impact of their diets[55]. With over half of Americans concerned about climate change[48], interest in diet advice that supports the environment is growing. Digital platforms thus play a key role in promoting healthier, more sustainable eating, a point highlighted in the 2015 DGAD report[49]. Industry 4.0 technologies like AI, big data, IoT, and blockchain are transforming agriculture and food systems toward sustainability[47]. Figure 2 shows key components of this digital transformation.

 doi:10.20944/preprints202510.2244.v1

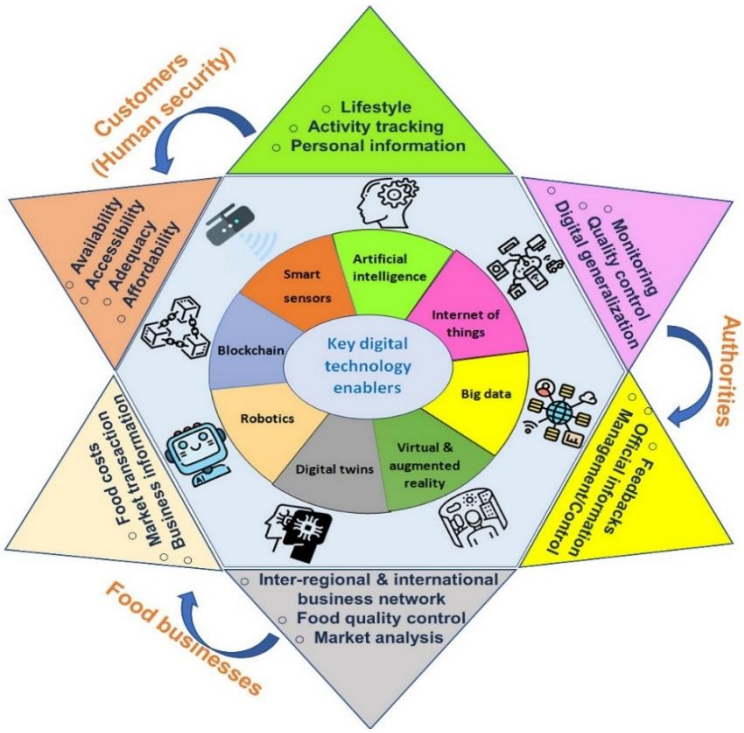

Figure 2. Food system and digital transformation [56].

4.3. Public Policies and Food Labels: Helping People Make Greener Choices

Public policies and clear food labeling are essential for promoting sustainable habits. Labels that show resource use or product origin help consumers make eco-friendly choices, recognized labels like EU Organic, Rainforest Alliance, and Carbon Trust guide buyers. The EU plans a unified sustainability label covering the full product lifecycle, complementing existing ones[57]. Studies on olive oil show that combining EU Organic and Sustainable Irrigation labels improves consumer perception and purchase intent[58]. The Rainforest Alliance label supports sustainable farming and social aspects, but faces communication challenges[59]. The Carbon Trust label reveals products' greenhouse gas emissions, aiding carbon footprint comparisons and raising awareness[60,61]. The SNEB supports including sustainability in national dietary guidelines (3). Countries like Brazil already do this, influencing public and institutional purchasing[49,62]. Clear, standardized, science-based labeling with strong regulation is needed for practical impact.

4.4. Scientific Research and Public Engagement: Bridging the Gap Between Academia and the Public

Scientific research is the basis for reliable advice on nutrition and environmental sustainability. Studies consistently show that animal-based foods (especially from ruminant animals) produce more greenhouse gases and use more land and water than plant-based alternatives. In this regard, Tools like Life-Cycle Assessment (LCA) confirm these impacts [48,63]. Experts thus recommend increasing consumption of whole grains, legumes, fruits, and vegetables [64]. However, research must be communicated clearly and accessibly. Researchers are encouraged to engage beyond academia, collaborating with media, educators, policymakers, and communities through methods like citizen science, public talks, open data, and partnerships with digital creators[49]. These approaches align with community-based social marketing, emphasizing clear messaging, local engagement, and behavioral insights to foster sustainable food choices[65]. Table 1 summarizes the key knowledge dissemination strategies discussed in this section, outlining their strengths, intended audiences, and examples from real-world application.

 doi:10.20944/preprints202510.2244.v1

Table 1. Overview of knowledge dissemination channels in nutrition and sustainability.

Method	Key Strengths	Target Audience	Example Tools/Initiatives
Education Systems	Builds lifelong habits and awareness	Students, educators	School gardens, integrated sustainability curricula
Media & Digital Platforms	Fast, broad reach, and cultural influence	General public, youth	Social media campaigns, documentaries
Public Policy & Labeling	Structural change informs purchasing	Consumers, institutions	Eco-labels, national dietary guidelines
Scientific Engagement	Credibility, evidence-based advocacy	Researchers, policymakers	LCA models, citizen science, public lectures

5. Challenges in Spreading Nutritional and Environmental Knowledge

Even though the significance of sustainability and nutrition is becoming widely recognized, several challenges hinder the effective dissemination of knowledge in this field. These challenges span from conflicting information to deeply rooted psychological and structural barriers. Understanding and addressing these challenges is essential for promoting general behavioral change and policy reform.

5.1. The Conflict Between Industry Narratives and Scientific Facts

A key challenge in sharing reliable nutrition and sustainability knowledge is conflicting media messages, with industry often altering or obscuring scientific findings, creating public confusion and distrust. Many commercial websites mix accurate and false information, while government and academic sources are generally more reliable[66]. This confusion undermines confidence and makes it harder to identify truly healthy and sustainable foods. Building a society that values health and trustworthy information, supported by clear public understanding, is essential for guiding better dietary choices.

5.2. Psychological Obstacles to Dietary Change

Despite expert support for healthier, more sustainable diets, many struggle to change due to cultural, emotional, and habitual factors. Even when aware of plant-based benefits, people often resist change. Habit is key; many enjoy meat, are used to it, and lack knowledge about plant-based alternatives, making shifts difficult[67]. Emotions and culture, including comfort and tradition, also play roles. Attachment to familiar foods, distrust of new advice, and limited professional support cause people to ignore facts and maintain their usual diets [68]. Perceived costs, complexity, and restricted access to sustainable foods add barriers. Mixed online messages reduce trust in science-based guidance[66]. Overcoming these challenges requires simple, supportive, and relatable messages that show plant-based eating as affordable and easy.

6. Economic and Political Influences on Food Systems

Economic and political factors strongly influence food systems. In many countries, meat and processed food production receive more government support than fruits and vegetables, which are classified as “specialty crops” and receive minimal funding [69]. Corporate lobbying can also shape nutrition advice, as seen in the U.S. in 2015 when the DGAC’s recommendation to reduce red and

 doi:10.20944/preprints202510.2244.v1

processed meat for environmental reasons was omitted from final guidelines under industry pressure [49]. Support for sustainable farming remains inconsistent, with large industrial farms often receiving substantial subsidies despite environmental harm, while eco-friendly farmers get less assistance[48]. For instance, in 2020, the U.S. canceled a $3 billion climate-smart agriculture program, showing how political decisions can hinder sustainability progress[70]. Disseminating nutritional and environmental knowledge can transform food systems to be more sustainable and ethically grounded by fostering critical reflection among consumers, health professionals, and policymakers on the ethical dimensions of food production, consumption, and policy.

7. Raising Awareness About Animal Rights and Welfare

Animals in large-scale farming often face poor living conditions, raising serious ethical concerns [48]. Research shows that when people learn about animal suffering and their capacity to feel pain and emotions, they tend to care more about animal welfare [71]. This awareness can lead to negative attitudes toward eating meat and increased interest in plant-based diets. Visual media, such as documentaries and online campaigns, have played a key role in exposing issues like factory farming and slaughterhouse practices, increasing public demand for more humane food systems [48,72]. However, emotional reactions alone may not create lasting change. Studies suggest that effective media should combine emotional impact with clear guidance for action while considering social norms and possible barriers to change [73].

8. Encouraging Plant-Based Diets Through Education and Commercial Promotion

Plant-based diets are gaining attention not only for health and environmental benefits but also for ethical reasons. Learning that plant-based foods generally require less land and water and produce fewer carbon emissions helps people understand the ethics behind their food choices. Rose et al. emphasize that eating fewer animal products and more vegetables, legumes, and whole grains benefits both health and the planet[48]. Animal foods, especially beef, emit far more greenhouse gases than plant-based foods, with meat producing over 30 kg CO_2-eq/kg compared to under 1 kg of most plant foods [64]. Promotional tools such as “climate-friendly” labels and positive environmental marketing can reduce meat consumption and promote plant-based diets[74]. Tailored strategies with cooking guides, shopping tips, and meal plans, particularly for younger consumers, are more effective when linked to ethical or ecological values [75]. Companies increasingly invest in plant-based products, using in-store campaigns, restaurant partnerships, school collaborations, and product sampling to encourage sustainable eating [76].

9. Supporting Agri-Food Reform by Informing Policymakers and Consumers

Scientific research increasingly shapes food policies as environmental concerns grow. Awareness of the high emissions from livestock encourages support for eco-friendly farming and climate-focused dietary guidelines [48,64]. The European Commission recommends making sustainable food options more accessible and appealing [77]. Consumers, equipped with clear information and tools, influence the market toward ethical choices. However, Reisch notes that effective communication must incorporate behavioral science to truly drive change, empowering individuals and institutions to foster healthier, more resilient food systems [78].

In conclusion, the effective transfer and communication of nutritional and environmental knowledge play a pivotal role in aligning individual behaviors, institutional practices, and policy frameworks with the principles of sustainability and ethics. While education, digital platforms, public policies, and scientific engagement provide powerful vehicles for change, their impact depends on overcoming misinformation, psychological resistance, and structural inequalities. Promoting informed choices and embedding ethical awareness into food systems establishes the foundation for

 doi:10.20944/preprints202510.2244.v1

more profound transformations, enabling a shift from awareness-raising toward systemic reforms that will be examined in the following sections.

10. Promotion of Plant-Based Food Research, Commercialization, and Consumption

The plant-based foods commercialization tracks a flexible innovation process that converts scientific findings into fully developed products. The initial phase concentrates on generating ideas, led by consumer trends, sustainable development goals, and perceptions from nutritional studies [79]. To design formulations that simulate the organoleptic characteristics and nutrient profiles of traditional animal-based products, scientists are progressively investigating innovative ingredients such as pea protein and algae.

As an illustration, pea protein shows a rational amino acid profile. It presents similar emulsifying properties that allow it to satisfy current consumer demands for alternative plant-based protein bases. Previous research showed that in liquid emulsions, pea protein has been used for oil microencapsulation as an emulsifier [80]. However, the variability of pea protein is due to its limited molecular flexibility, which prevents it from forming a stable interfacial film in the presence of oil. Additionally, because of its beneficial health impacts, hypoallergenic features, and non-genetically modified aspects, pea protein has been employed as an encapsulation material [80]. Furthermore, pea protein, as a biocompatible and biodegradable natural polymer, has been extensively investigated for the development of edible/biodegradable films. It suggests a promising option for using pea protein-based films in the food industry[81]. Consequently, pea proteins are appreciated as functional ingredients and are commonly integrated into cereals, baked goods, meat products, and dairy alternatives for human consumption.

On the other hand, algae have been gaining popularity as 'superfoods' across the food and beverage sectors, serving as key ingredients, flavoring agents, or natural colorants in an increasing number of premium product launches[82]. In 2023, the global market for algal products was valued at USD 5.3 billion, with expectations for continued expansion, a compound annual growth rate (CAGR) of 6.4% to reach USD 7.3 billion by 2028[83]. Moreover, the worldwide algal protein market touched USD 3.2 billion in 2021, with a CAGR of 8.4% from 2022 to 2030[84]. Although microalgal protein extracts typically display low solubility close to their isoelectric points, they show high solubility in neutral to basic environments[85]. Particularly, high-pressure homogenization allowed *Chlorella protothecoides* proteins to attain above 90% solubility between pH 2 - 6[86], and *Nannochloropsis oceanica* proteins also presented high solubility, making them adequate for acidic and low viscosity foods[87]. Abundant in phospholipids and polysaccharides, algal proteins demonstrate strong emulsifying abilities, outstanding gelling and foaming properties, which could support their use in food products like snacks, sauces, baked goods, meat alternatives, and desserts[88]. Michel, et al. [89] specified that consumers had favorable thoughts on algal meat analogs because of the environmental and nutritional advantages. Van der Stricht, et al. [90] reported that E.U. consumers were unfamiliar with food products containing microalgal proteins. Likewise, Mellor, et al. [91] reported that British consumers had limited knowledge of algae as a food source but showed interest in trying them, and the acceptance of algae was determined by the supposed innovation, savor, well-being, sustainability, and cheapness. Lafarga, et al. [92] pointed out that Spanish consumers viewed microalgae as sustainable, nutritious, and safe; however, low consumption was mainly attributed to a lack of awareness and unfamiliarity. Generally, improving consumer familiarity with algae and algal proteins could drive greater adoption and boost market share. However, flavor-including aromatic and basic taste profiles remain a critical barrier to broader acceptance. Vanquishing these flavor challenges across advanced processing methods, formulation adaptations, and flavor covering strategies is indispensable to increasing consumer appeal and boosting market development.

Once a feasible model is developed, the subsequent phase includes prototyping. At this stage, preparations are sophisticated and assessed for organoleptic qualities such as taste, texture, appearance, and storage stability. To enhance product functionality and manufacturability in plant-

 doi:10.20944/preprints202510.2244.v1

based food development, cross-disciplinary collaboration among food technologists, flavor experts, and process engineers is required. In this regard, to fine-tune the prototypes, food scientists and product developers use a wide range of tools such as emulsification, extrusion, fermentation, and flavor masking. Continuous experimentation leads to the evaluation of sensory responses, shelf-life stability, and compatibility with food processing engineering.

Every feasible model is developed; the subsequent phase includes prototyping. At this stage, preparations are sophisticated and assessed for organoleptic qualities like taste, texture, appearance, and storage stability. Here, to enhance product functionality and manufacturability in plant-based food development, cross-practice collaboration amongst food technologists, savor experts, and resources engineers was required. In this regard, to fine-tune the prototypes, food scientists and product developers worked on an extensive range of tools comprising emulsification, extrusion, fermentation, and flavor masking. Continuous experimentation leads to weighing consumer sensory responses, shelf-life stability, and correspondence with food processing engineering. Once the prototype encounters standard measurements, the product moved into the pilot testing phase to mimic profitable production conditions. This step is important for classifying mechanical challenges, *viz.,* ingredient distribution, yield rate, processing blocks, packaging requirements, controlling labeling, allergen statements, and endorsements from food safety establishments. The next stage is market authentication, where early adopters offer essential feedback on the quality of the product, usability, and alignment with consumer standards. This feedback loop enables companies to refine their branding and build confidence in their go-to-market approach. If market indications are robust, the product is forwarded to commercial promotion. The focus shifts to increasing production to meet demand, forming distribution partnerships, and implementing targeted marketing strategies. Through this pipeline, rapidity and flexibility are essential, reasonable advantages, as consumer preferences and technological novelties in the plant-based space multiply.

To promote regular plant-based consumption, integrating plant-based options into public institutions and commercial settings is a strategic approach. For instance, New York City has adopted plant-based meals as the primary offering in all public hospitals, resulting in a 36% decrease in food-related greenhouse gas emissions and cost investments of $318,000 in 2023[93]. The platform attained over 90% patient fulfillment, representing the viability and welfare of plant-based blackboards in healthcare settings [94]. Columbia University has dedicated to driving its food-related carbon emissions by 25% by 2030 as part of New York City's Plant-Powered Carbon Challenge[94]. This initiative stimulates organizations to drop their carbon footprints by growing plant-based meal aids and reducing emissions from food procurement[95]. In the first year of contribution, Columbia Dining realized a reduction of 1.6% in emissions strength, notwithstanding a 10% increase in meal quantity. Other NYC institutions have also combined the challenge. The NYC Health + Hospitals is distinguished for serving over 1.2 million plant-based meals, resulting in a 36% decrease in carbon emissions and a 60% cost savings per meal [94] . In the UK, the "Plants First Healthcare" campaign supports making plant-based meals the default option in National Health Service (NHS) hospitals. Supported by signatories, the campaign underlines that such a change could yearly protect the NHS £74 million and decrease food-related emissions by up to 50% [96].

Table 2 provides a comparative overview of the most established and emerging plant-based food sources, highlighting their primary processing methods, functional applications, commercialization, and consumer acceptance trends. It includes widely used ingredients such as soy, oats, and pea protein, as well as novel and underutilized sources like algae, jackfruit, mycelium, and duckweed. Each source is assessed for its technological readiness and market integration, offering insight into its role in current and future plant-based food innovation. In summary, the commercialization of plant-based foods reflects a dynamic innovation pathway that moves from scientific discovery to large-scale adoption. While ingredients such as pea protein and algae illustrate the technological promise and the sensory challenges of alternative proteins, their integration into institutional and commercial contexts demonstrates tangible environmental and economic benefits. As public and private sectors increasingly invest in scaling plant-based solutions, the combination of scientific

 doi:10.20944/preprints202510.2244.v1

advances, consumer acceptance, and supportive policy frameworks will determine the long-term role of these products in sustainable and ethical food systems.

Table 2. Processing technologies, commercialization status, and consumption trends for established and emerging plant-based protein sources.

Plant Source	Main Processing Methods	Functional Applications	Commercialization Level	Consumer Acceptance/Trends	Reference
Soy	Soaking, milling, extrusion, fermentation	Meat/dairy analogs, protein isolate	Widely commercialized	High in Asia and Western countries	[97]
Pea	Protein extraction, emulsification, film formation	Protein drinks, meat analogs, emulsifiers	Rapid growth, global brands use it	Growing due to hypoallergenic nature	[98]
Algae (e.g., Spirulina, Chlorella)	Drying, homogenization, protein extraction	Functional foods, supplements, meat analogs	Niche but growing	Moderate; increasing interest as "superfoods"	[99]
Lentils/Legumes	Milling, fermentation, extrusion	Plant protein blends, textured proteins	Well-established	Stable consumption; eco-conscious markets	[100]
Chickpeas	Roasting, fermentation, drying	Hummus, dairy alternatives, baked goods	Expanding	Popular in Middle East and now globally	[101]
Oats	Milling, enzymatic hydrolysis	Oat milk, cereal bars, dairy alternatives	Very high	Very high, especially in oat milk	[102]
Rice protein	Alkaline extraction, filtration	Beverages, protein blends	Mid-stage commercialization	Growing in sports and allergen-free markets	[103]
Hemp	Cold pressing, decortication, protein extraction	Beverages, protein powders, bakery products	Niche, expanding post-legalization	Growing among health-conscious consumers	[104]

 doi:10.20944/preprints202510.2244.v1

Fava Beans	Dehulling, air classification, dry fractionation	Snacks, meat alternatives	Rising	Good acceptance in EU	[105]
Quinoa/Amaranth	Milling, extrusion, puffing	Cereal mixes, meat/dairy alternatives	Early stage	Trendy in functional food segments	[106]
Jackfruit	Minimal	Whole-food meat alternative	Small-scale commercialization	Positive trend in vegan cuisines	[107]
Mushroom/Mycelium	Fermentation, mycelium cultivation	Meat substitutes, umami enhancers	Experimental to emerging	High for health and sustainability appeal	[108]
Duckweed (Lemna)	Wet biomass processing, centrifugation	Protein isolate, smoothies	R&D/Start-up stage	Low; education needed	[109]

11. Fostering Social Inclusion and Positive Recognition of Vegan Identity

Goal 2, aiming at ensuring universal access to safe and nutritious food, is in resonance with veganism. Goal 3 focuses on good health and well-being, while Goal 15 is centered around life on land and the connection to vegan diets (Lang, 2020; Wang & Scrimgeour, 2021). Vegan adoption behavior is interlinked with human health, animal welfare, and environmental sustainability, as reported by many authors (Bolderdijk & Cornelissen, 2022; Gregson et al., 2022; Habib et al., 2024; Khara et al., 2021).

In the context of vegan diet adoption, different factors have been considered, such as taste, religious beliefs, and social and familial environments (Kessler et al., 2016; McKeown & Dunn, 2021; Miller & Dickstein, 2021; Fresán et al., 2020).

Vegan adoption behavior in relation to consumer behavior considers different models such as the stage model of self-regulated behavior change (Siebertz et al., 2022), transtheoretical models (Bryant et al., 2022), value attitude behaviors (Brouwer et al., 2022), the theory of planned behavior (D'Souza et al., 2022), and health belief models (Urbanovich & Bevan, 2020).

Shah and Joshi (2024) showed that environmental beliefs, health beliefs, and anti-speciesism values exerted a positive influence on individuals' attitudes toward adopting a vegan diet.

Moreover, the appearance of attitude has been reported as a pivotal mediator, connecting the social stigma to the vegan diet adoption behavior. Figure 3 shows plant-based food groups and their daily recommended servings. The recommended daily servings illustrated in Figure 3 emphasize not only the nutritional adequacy of plant-based diets but also their alignment with broader sustainability and health goals. A balanced inclusion of fruits, leafy greens, legumes, and whole grains ensures essential nutrient intake while reducing environmental impact. The recommendation for daily servings are as follows: Fruits:1 serving size = 1 piece or ½ cup; Leaf green:1 serving size = 1 cup raw or ½ cup cooked; legumes:1 serving size = ½ cooked legumes or 1 tablespoon seeds; grains: 6-11 serving size = ½ cup cooked or 1 slice whole-grain bread [110].

These guidelines therefore serve as a practical framework for individuals, institutions, and policymakers seeking to promote diets that are simultaneously health-promoting, ethically grounded, and ecologically responsible.

 doi:10.20944/preprints202510.2244.v1

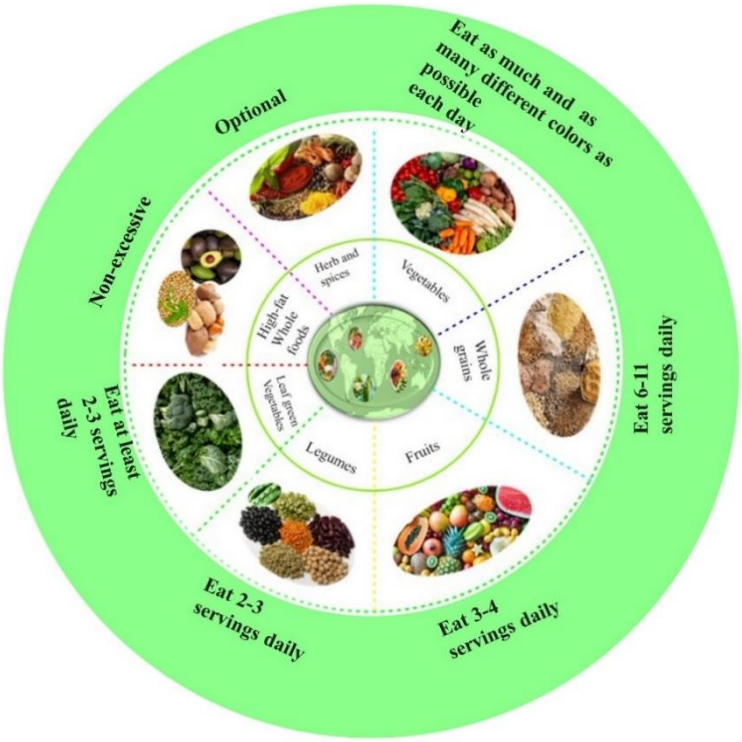

Figure 3. Plant-based food groups and their daily recommended servings.

12. A Paradigm for a Sustainable and Healthy Future in Africa Through the One Health Approach

The One Health framework is designed to create a desired impact on preventing, predicting, detecting, and responding to health threats and enhance the health of human beings, animals, plants, and the environment, as well as contribute to sustainable development concurrently. Hence, the One Health joint plan of action (OH-JPA, 2022–2026) developed a guide containing six interdependent action tracks (as shown in Table 3) on how the One Health principles could be applied to strengthen collaboration, communication, capacity building and coordination mutually throughout all sectors and to interface the health concerns at the human– animal–plant–environment lines [111]. Traore, et al. [112] discussed that the existing health security assessment frameworks show limited scope as well as have limitations to sufficiently consider complex social, political, economic, regulatory, and ecological factors. Therefore, approaches like One Health could develop frameworks that interface among humans, animals, and ecosystems to develop global health security. They concluded that such frameworks should ensure the process of prioritization and building capacity following the core One Health principles. Besides, any added values, trade-offs, and benefits across human, animal, and environmental health systems should be the core interventions and outcomes during assessments. For instance, Zinsstag, et al. [113] summarized that the advancement and application of One human–animal–environment health for global health security. They recommended that such approaches appear to be crucial and sustainable to prevent, create preparedness, early detection, and investigation of growing risks and hazards. It creates an evidence base to monitor endemic and neglected tropical diseases. Figure 4 depicts the integrated components of the One Health approach.National One Health platforms have been developed as a setup by many sub-Saharan African countries to integrate surveillance and control of zoonotic diseases, food safety and security, antimicrobial resistance, poverty, as well as other health and socio-economic problems [114]. In Africa, National One Health platforms gained momentum

 doi:10.20944/preprints202510.2244.v1

which provide a capacity to identify prioritization, strengths, weaknesses, opportunities, and gaps during implementation yet it need improvement [114]. Applying the One Health approach helps to tackle parasitic and vector-borne infections, of humans, animals, or both, of topical relevance to the African continent for better food security, livelihood, and public health [115]. Zhao, et al. [116] conducted zoonoses assessment of performance at Sub-Saharan African countries employing the global One Health index. They reported that this region had high performance for sub-indicators in zoonoses surveillance and response, vector and reservoir interventions, and natural protected areas, indicating that the countries in this region have a specific capability to monitor and prevent or respond to any zoonotic cases.

Today many challenges such as understaffing, underfunding of institutions, limitation of interdisciplinary cooperation, collaboration, and coordination [117]; increasing risks of zoonotic infections [118]; raising awareness, commitments, and creating policy influence [119]; demand for integrated set of policy approaches, farmers' food safety education, incorporate regulations, organizations, and multidisciplinary research during the introduction of emerging technologies (genetically modified organisms, nanotechnology, and vertical farming) on food safety [120], etc. have been continued as obstacles to assure the One health goals in Africa. Table 3 shows summaries of some case studies conducted in the African continent, focusing on the One Health joint plan of action (OH-JPA, 2022–2026) tracks.

The recognition of vegan identity and the principles of social inclusion highlight how individual choices and values intersect with systemic transformations in food systems. At the same time, the One Health approach in Africa illustrates how integrated frameworks can address health, environmental, and food security challenges at regional and global scales. Together, these perspectives demonstrate that sustainable food system transitions require both cultural and behavioral shifts, as well as coordinated institutional and policy responses. The article, therefore, concludes by emphasizing the importance of uniting ethical consumption, technological innovation, governance, and multi-sectoral collaboration to advance resilient, equitable, and sustainable food systems worldwide.

Table 3. Six interdependent action tracks by the One Health Joint Plan of action (OH-JPA, 2022–2026)[111] and some related case studies in Africa.

OH-JPA (2022–2026) Action track		**Name of the African Country**	**Main focus/s**	**Research outcome/s**	**Reference**
1	Improving the One Health approach to build stronger health systems	Uganda	One Health approach to health security	Investing in the funding gaps reinforces Uganda's health security	[121]
		Ethiopia	Implementation of the OH approach	Understaffing, underfunding of institutions, limitation of interdisciplinary cooperation,	[117]

 doi:10.20944/preprints202510.2244.v1

				collaboration, and coordination among animal and human health practitioners are obstacles	
2	Minimizing the widespread threats posed by new and recurring animal-borne diseases	All Africa	Urbanization, armed conflict, and deforestation	Increased risks of zoonotic infections on the environment, animal health, and human health	[118]
			Limitations in detection of new infectious disease outbreaks in the community, in rapid pathogen identification, and in proactive surveillance systems	Main gaps in public health readiness, detection, and response systems Main paradigm shift is required to develop an effective infrastructure and common frameworks	[122]
3	Manage and eradicate endemic zoonotic, neglected tropical, and vector-borne diseases	African Union member states	Controlling the continental strategy for zoonotic disease	Raising awareness, commitments, and creating policy influence	[119]
			Sustainable and effective strategies for post-elimination control of neglected tropical diseases	Post-elimination control of NTDs remained as challenging	[123]

 doi:10.20944/preprints202510.2244.v1

		Sub-Saharan Africa	Urbanization, fast population growth, increased demand for animal food, and natural habitats invasions	Infectious disease outbreaks are caused by zoonotic pathogens	[124]
			Interventions against neglected tropical diseases	Insecticide resistance, multiplicity of vector species, changes in vector behavior, and cost	[125]
			Vector-borne helminthiases: onchocerciasis, lymphatic filariasis, loiasis, and mansonellosis	Onchocerciasis and lymphatic filariasis have established global elimination programs Loiasis and Mansonellosis have largely been neglected and do not have large-scale control programmes.	[126]
		Zambia	Zoonotic transmission of vector-borne pathogens in humans	The occurrence of many vector-borne zoonotic pathogens circulating in vectors and animals	[127]
4	Enhancing food safety risk analysis, management,	Sub-Saharan Africa	Food fraud threatens food safety and security	High production costs, weak regulatory systems, cultural practices, and	[128]

 doi:10.20944/preprints202510.2244.v1

	and communication			technological limitations	
			Waste management practices by street vendors and factors influencing their mismanagement	A lack of recognition and comprehensive laws and regulations to monitor waste management	[129]
			Effects of emerging technologies (genetically modified organisms, nanotechnology, and vertical farming) on food safety	Requirements of an integrated set of policy approaches, farmers' food safety education, incorporate regulations, organizations, and multidisciplinary research	[120]
			Meat value chains and prevalent risks	Limitations in policy actors and the incorporation of a participatory approach in the street-vending sector	[130]
		Nigeria and Ghana	Harnessing food safety	Weak enforcement of food safety laws is contributing to complications in the food production chain	[131]
5	Combating the quiet crisis of	Developing countries in Africa	Fundamental conflicts that complicate efforts to	Antimicrobial resistance policies and actions require balancing the	[132]

 doi:10.20944/preprints202510.2244.v1

	antimicrobial resistance		control the proliferation of antimicrobial resistance	interests of all relevant stakeholders, considering the interests and well-being of future generations	
		Sub-Saharan Africa	Antimicrobial resistance's causes and challenges in implementing prevention measures	Weak antimicrobial resistance surveillance and absence of collaboration, irrational use of antibiotics, poor medicine regulatory systems, lack of infrastructural and institutional capacities, deficiency of human resources, and inefficient infection prevention and control (IPC) practices	[133]
6	Ensuring One Health and environmental integration	Sub-Saharan Africa	Integrated One Health on preventing and managing zoonotic and environmental health threats	Integrating One Health in national agendas and a unified continental framework is required	[134]
			Push-pull technology to sustain vegetable production and maintain soil health	The cropping system could contribute to eradicating zoonotic diseases by	[135]

 doi:10.20944/preprints202510.2244.v1

			and fertility, human and animal nutrition, and food safety	incorporating companion plants that fend off disease vectors	
		Nigeria	One Health framework to mitigate cholera outbreak through integration of human, animal, and environmental health	The One Health framework enables understanding of cholera dynamics and promotes sustainable solutions to deter future outbreaks	[136]

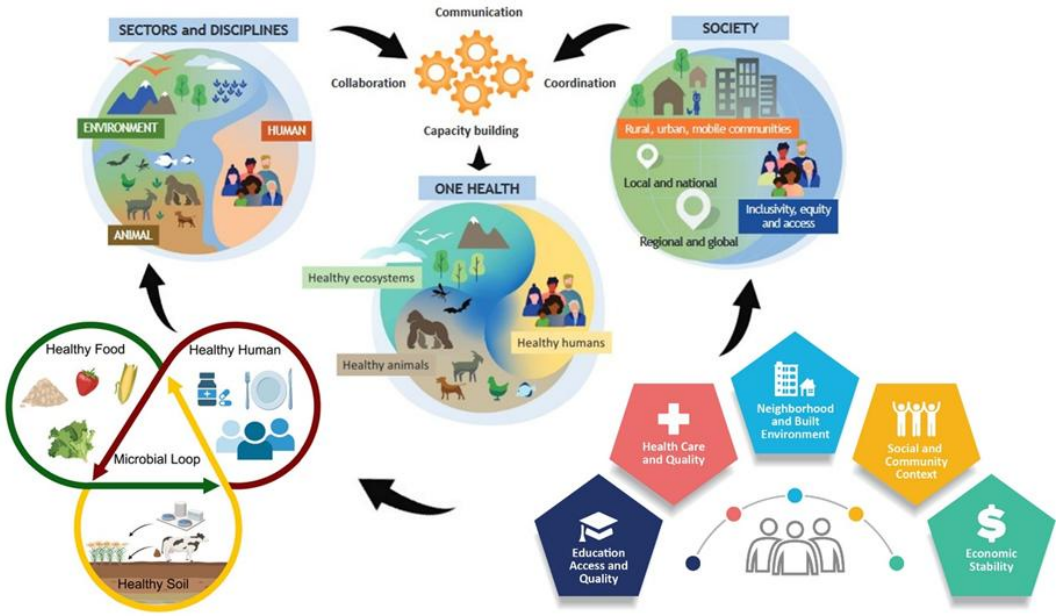

Figure 4. Integrated one health approach [16,137]6. Conclusion and Future Directions.

Sharing of nutrition- and environment-related knowledge is increasingly regarded as a strategic component in promoting ethical and sustainable food systems. Rather than being a solely educational activity, it contributes to the transformation of food culture, policy frameworks, and consumer behavior. Although progress has been made, particularly in the integration of environmental goals into dietary guidelines, greater cooperation between academic institutions, governmental bodies, media channels, and civil society remains essential for further advancement. These collaborations are necessary to ensure that science-based messages reach the public in a reliable and comprehensible manner.

In addition, transparency across all stages of food production and distribution should be improved. The implementation of mandatory environmental labeling and disclosure of sourcing practices by companies can support more informed and responsible consumer choices. This can contribute to both individual awareness and market-level change. Moreover, promoting critical engagement with food systems, through food literacy programs and public dialogue, can enable

 doi:10.20944/preprints202510.2244.v1

consumers better to understand the broader implications of their dietary decisions. Such awareness may lead to more deliberate choices, reductions in environmental impact, and improvements in long-term public health outcomes.

With the growing availability of digital tools and open-access data, the potential to influence food systems at scale is increasing. The intersection of education, transparent policy, and citizen participation can be viewed as a foundation for achieving food systems that are not only sustainable but also socially just and resilient.

Overall, the evidence indicates that the transformation of food systems cannot be achieved through fragmented or isolated measures. An integrated approach is required, one that brings together ethical consumption, technological innovation, scientific communication, and multi-sectoral governance. Situating sustainability and ethics at the center of food production, policymaking, and everyday practice will enable the development of systems that are resilient and nutritionally adequate, while also equitable and just, ensuring that future food pathways serve both humanity and the planet. Beyond individual components, the article suggests viewing the food system as an interconnected ecosystem in which health, environment, culture, and economics are mutually reinforcing, underlining that meaningful change depends on systemic integration rather than incremental adjustments.

Author Contributions: Elahesadat Hosseini, Zenebe Tadesse, Slim Smaoui, Walid Elfalleh, Maria Antoniadou, and Theodoros Varzakas: Conceptualisation, Data curation, Formal analysis, Investigation, Methodology, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

Funding: None.

Conflicts of Interest: The authors do not have a conflict of interest. Data availability No data was used for the research described in the article.

References

1. Acharya, T., J.C. Fanzo, D. Gustafson, J. Ingram, and B. Schneeman, *Assessing sustainable nutrition security: the role of food systems.* 2014.
2. FAO, One Health and agroecology workshop, FAO, Editor.(2023) DOI:Ã◉Â www.fao.org/one-health/resource s/events/events-detail/one-health-and-agroecology-workshop/en.
3. Gormaz, T., S. Cortés, O. Tiboni-Oschilewski, and G. Weisstaub *The Chilean Diet: Is It Sustainable?* Nutrients. **14**, (2022), DOI: 10.3390/nu14153103.
4. Chaudhary, A., D. Gustafson, and A. Mathys, *Multi-indicator sustainability assessment of global food systems.* Nature Communications. 2018. **9**(1): p. 848 DOI: 10.1038/s41467-018-03308-7.
5. Shariatmadary, H., S. O'Hara, R. Graham, and M. Stuiver *Are Food Hubs Sustainable? An Analysis of Social and Environmental Objectives of U.S. Food Hubs*. Sustainability. **15**, (2023), DOI: 10.3390/su15032308.
6. Deliza, R., B. Rodríguez, F. Reinoso-Carvalho, and T. Lucchese-Cheung, *Cultured meat: a review on accepting challenges and upcoming possibilities.* Current Opinion in Food Science. 2023. **52**: p. 101050 DOI: https://doi.org/10.1016/j.cofs.2023.101050.
7. Hocquette, J.-F., S. Chriki, D. Fournier, and M.-P. Ellies-Oury, *Review: Will "cultured meat" transform our food system towards more sustainability?* animal. 2025. **19**: p. 101145 DOI: https://doi.org/10.1016/j.animal.2024.101145.
8. Tavan, M., N.W. Smith, W.C. McNabb, and P. Wood, *Reassessing the sustainability promise of cultured meat: a critical review with new data perspectives.* Critical Reviews in Food Science and Nutrition. p. 1-9 DOI: 10.1080/10408398.2025.2461262.
9. Tuomisto, H.L., *Challenges of assessing the environmental sustainability of cellular agriculture.* Nature Food. 2022. **3**(10): p. 801-803 DOI: 10.1038/s43016-022-00616-6.
10. Qian, J., Z. Wu, Y. Zhu, and C. Liu, *One Health: a holistic approach for food safety in livestock.* Science in One Health. 2022. **1**: p. 100015 DOI: https://doi.org/10.1016/j.soh.2023.100015.

 doi:10.20944/preprints202510.2244.v1

11. Montgomery, D.R., P. Rabinowitz, Y. Sipos, and E.E. Wheat, *Soil health: A common focus for one health and planetary health interventions.* One Health. 2024. **18**: p. 100673 DOI: https://doi.org/10.1016/j.onehlt.2023.100673.
12. Heerden, N.v., S.S. Grobbelaar, I. Meyer, and E. Vermeulen, *Emerging smallholder cattle farming from a One Health perspective: A system dynamics model of the highveld region of South Africa.* Environmental Science & Policy. 2024. **152**: p. 103646 DOI: https://doi.org/10.1016/j.envsci.2023.103646.
13. Voisin, R., P. Horwitz, S. Godrich, R. Sambell, K. Cullerton, and A. Devine, *What goes in and what comes out: a scoping review of regenerative agricultural practices.* Agroecology and Sustainable Food Systems. 2024. **48**(1): p. 124-158 DOI: 10.1080/21683565.2023.2270441.
14. Burke, D.T., P. Hynds, and A. Priyadarshini, *Assessing the One Health (ecosystem, animal and human health) impacts of current dietary patterns based on farm-to-fork life cycle assessment in the Republic of Ireland.* Science of The Total Environment. 2025. **975**: p. 179313 DOI: https://doi.org/10.1016/j.scitotenv.2025.179313.
15. Jonas, T. and B. Trethewey, *Agroecology for Structural One Health.* Development. 2023. **66**(3): p. 238-244 DOI: 10.1057/s41301-023-00385-0.
16. One Health High-Level Expert, P., W.B. Adisasmito, S. Almuhairi, C.B. Behravesh, P. Bilivogui, S.A. Bukachi, N. Casas, et al., *One Health: A new definition for a sustainable and healthy future.* PLOS Pathogens. 2022. **18**(6): p. e1010537 DOI: 10.1371/journal.ppat.1010537.
17. Maci, S.M., *From Climate Change to Global Crises. The Perspective of UNO*, in *Critical Approaches to Polycrisis: Discourses of Conflict, Migration, Risk, and Climate*, T. Parnell, T. Van Hout, and D. Del Fante, Editors(2024), Springer Nature Switzerland: Cham. p. 209-251 DOI:Â 10.1007/978-3-031-76966-5_9.
18. Neufeld, L.M., J. Huang, O. Badiane, P. Caron, and L.S. Forsse, *Advance Equitable Livelihoods*, in *Science and Innovations for Food Systems Transformation*, J. von Braun, K. Afsana, L.O. Fresco, and M.H.A. Hassan, Editors(2023), Springer International Publishing: Cham. p. 135-163 DOI:Â 10.1007/978-3-031-15703-5_8.
19. Chaboud, G. and B. Daviron, *Food losses and waste: Navigating the inconsistencies.* Global Food Security. 2017. **12**: p. 1-7 DOI: https://doi.org/10.1016/j.gfs.2016.11.004.
20. Salzano, A., M.J. D'Occhio, A. Balestrieri, G. Bifulco, A. Limone, and G. Campanile, *Nutritional, environmental and social profiles of natural meat and food derived from cultured muscle cells: An overview.* Meat Science. 2025. **228**: p. 109868 DOI: https://doi.org/10.1016/j.meatsci.2025.109868.
21. Semba, R.D., S. de Pee, B. Kim, S. McKenzie, K. Nachman, and M.W. Bloem, *Adoption of the 'planetary health diet' has different impacts on countries' greenhouse gas emissions.* Nature Food. 2020. **1**(8): p. 481-484 DOI: 10.1038/s43016-020-0128-4.
22. Li, Y., P. He, Y. Shan, Y. Li, Y. Hang, S. Shao, F. Ruzzenenti, et al., *Reducing climate change impacts from the global food system through diet shifts.* Nature Climate Change. 2024. **14**(9): p. 943-953 DOI: 10.1038/s41558-024-02084-1.
23. Springer, N.P., A.D. Hollander, P.R. Huber, C. Riggle, and T.P. Tomich, *A malleable workflow for identifying the issues and indicators that define and measure sustainability in food systems.* Frontiers in Sustainable Food Systems. 2022. **Volume 6 - 2022** DOI: 10.3389/fsufs.2022.684831.
24. Röös, E., A. Mayer, A. Muller, G. Kalt, S. Ferguson, K.-H. Erb, R. Hart, et al., *Agroecological practices in combination with healthy diets can help meet EU food system policy targets.* Science of The Total Environment. 2022. **847**: p. 157612 DOI: https://doi.org/10.1016/j.scitotenv.2022.157612.
25. Clapp, J., W.G. Moseley, B. Burlingame, and P. Termine, *Viewpoint: The case for a six-dimensional food security framework.* Food Policy. 2022. **106**: p. 102164 DOI: https://doi.org/10.1016/j.foodpol.2021.102164.
26. Gaupp, F., C. Ruggeri Laderchi, H. Lotze-Campen, F. DeClerck, B.L. Bodirsky, S. Lowder, A. Popp, et al., *Food system development pathways for healthy, nature-positive and inclusive food systems.* Nature Food. 2021. **2**(12): p. 928-934 DOI: 10.1038/s43016-021-00421-7.
27. Mayton, H., T. Beal, J. Rubin, A. Sanchez, M. Heller, L. Hoey, S. de Haan, et al., *Conceptualizing sustainable diets in Vietnam: Minimum metrics and potential leverage points.* Food Policy. 2020. **91**: p. 101836 DOI: https://doi.org/10.1016/j.foodpol.2020.101836.
28. FAO, W., Sustainable healthy diets - Guiding principles, FAO and WHO, Rome, 2019. https://doi.org/10.4060/ca6640en., Sustainable healthy diets - Guiding principles.(2019), FAO and WHO: Rome DOI:Ã®Â https://doi.org/10.4060/ca6640en.

 doi:10.20944/preprints202510.2244.v1

29. Reina-Usuga, L., C. Parra-López, T. de Haro-Giménez, and C. Carmona-Torres, *Sustainability assessment of Territorial Short Food Supply Chains versus Large - Scale Food Distribution: The case of Colombia and Spain*. Land Use Policy. 2023. **126**: p. 106529 DOI: https://doi.org/10.1016/j.landusepol.2022.106529.
30. Tittonell, P., V. El Mujtar, G. Felix, Y. Kebede, L. Laborda, R. Luján Soto, and J. de Vente, *Regenerative agriculture—agroecology without politics?* Frontiers in Sustainable Food Systems. 2022. **Volume 6 - 2022**.
31. Siddiqui, N.Z., L. Wei, J.D. Mackenbach, M.G.M. Pinho, M. Helbich, L.J. Schoonmade, and J.W.J. Beulens, *Global positioning system-based food environment exposures, diet-related, and cardiometabolic health outcomes: a systematic review and research agenda.* International Journal of Health Geographics. 2024. **23**(1): p. 3 DOI: 10.1186/s12942-024-00362-x.
32. Varzakas, T. and M. Antoniadou *A Holistic Approach for Ethics and Sustainability in the Food Chain: The Gateway to Oral and Systemic Health*. Foods. **13**, (2024), DOI: 10.3390/foods13081224.
33. Jose, H., E.L. Jackson, C. Duong, and B. Sung, *Ethical food consumption in the digital age: Consumer attitudes towards digitally monitored animal welfare in pork products.* Appetite. 2025. **207**: p. 107853 DOI: https://doi.org/10.1016/j.appet.2025.107853.
34. Giersberg, M.F. and F.L.B. Meijboom, *As if you were hiring a new employee: on pig veterinarians' perceptions of professional roles and relationships in the context of smart sensing technologies in pig husbandry in the Netherlands and Germany*. Agriculture and Human Values. 2023. **40**(4): p. 1513-1526 DOI: 10.1007/s10460-023-10450-6.
35. Wang, X., F. Hu, R. Yang, and K. Wang *An Infrared Temperature Correction Method for the Skin Temperature of Pigs in Infrared Images*. Agriculture. **13**, (2023), DOI: 10.3390/agriculture13030520.
36. Chung, Y., S. Oh, J. Lee, D. Park, H.-H. Chang, and S. Kim *Automatic Detection and Recognition of Pig Wasting Diseases Using Sound Data in Audio Surveillance Systems*. Sensors. **13**, (2013), 12929-12942 DOI: 10.3390/s131012929.
37. Alameer, A., I. Kyriazakis, H.A. Dalton, A.L. Miller, and J. Bacardit, *Automatic recognition of feeding and foraging behaviour in pigs using deep learning.* Biosystems Engineering. 2020. **197**: p. 91-104 DOI: https://doi.org/10.1016/j.biosystemseng.2020.06.013.
38. Riekert, M., A. Klein, F. Adrion, C. Hoffmann, and E. Gallmann, *Automatically detecting pig position and posture by 2D camera imaging and deep learning.* Computers and Electronics in Agriculture. 2020. **174**: p. 105391 DOI: https://doi.org/10.1016/j.compag.2020.105391.
39. Ghasemlou, M., G.A. Khan, B. Adhikari, C.J. Barrow, and R. Finger, *Sustainability and Environmental Footprints of AI-Supported Agrifood Systems.* Journal of Agricultural and Food Chemistry. 2025. **73**(15): p. 8675-8677 DOI: 10.1021/acs.jafc.5c03514.
40. Ektefaie, Y., A. Shen, D. Bykova, M.G. Marin, M. Zitnik, and M. Farhat, *Evaluating generalizability of artificial intelligence models for molecular datasets.* Nature Machine Intelligence. 2024. **6**(12): p. 1512-1524 DOI: 10.1038/s42256-024-00931-6.
41. Knudsen, E.R. and U. Rahbek, *8 Postcolonial Theory.* The Year's Work in Critical and Cultural Theory. 2021. **29**(1): p. 118-137.
42. Rashid, A. and C. Whitehead, *Applying postcolonial theory in academic medicine.* Journal of the Royal Society of Medicine. 2022. **115**(5): p. 193-194.
43. Naylor, L., *GMOs, the land grab, and epistemological enclosures*, in *Routledge Handbook of Global Land and Resource Grabbing*2023), Routledge. p. 143-155.
44. Pimbert, M.P. and P. Claeys, *Food sovereignty*, in *Oxford Research Encyclopedia of Anthropology*2024).
45. Raimi, L. and M. Masri, *Critical discourse on GMO agripreneurship for global food security: bridging agricultural colonialism and food sovereignty perspectives.* International Journal of Ethics and Systems. 2025.
46. Broome, J., *Climate change 2014: synthesis report.* 2015.
47. Solaw, F.A.O., *The state of the world's land and water resources for food and agriculture.* Rome, Italy. 2011.
48. Rose, D., M.C. Heller, and C.A. Roberto, *Position of the Society for Nutrition Education and Behavior: The Importance of Including Environmental Sustainability in Dietary Guidance.* Journal of Nutrition Education and Behavior. 2019. **51**(1): p. 3-15.e1 DOI: https://doi.org/10.1016/j.jneb.2018.07.006.
49. Committee, D.G.A., Scientific report of the 2015 Dietary Guidelines Advisory Committee: advisory report to the Secretary of Health and Human Services and the Secretary of Agriculture.(2015) DOI:Ã◉Â https://health.gov/dietaryguidelines/.

 doi:10.20944/preprints202510.2244.v1

50. USDA, U.D.o.H.a.H.S.a., Dietary Guidelines for Americans, 2015_2020.(2015), US Dept of Health and Human Services and USDA: Washington, DC.
51. Hallström, E., A. Carlsson-Kanyama, and P. Börjesson, *Environmental impact of dietary change: a systematic review.* Journal of Cleaner Production. 2015. **91**: p. 1-11 DOI: https://doi.org/10.1016/j.jclepro.2014.12.008.
52. Dye Gussow, J., *Dietary Guidelines for Sustainability: Twelve Years Later.* Journal of Nutrition Education. 1999. **31**(4): p. 194-200 DOI: https://doi.org/10.1016/S0022-3182(99)70441-3.
53. Liu, H., W. Liu, V. Yoganathan, and V.-S. Osburg, *COVID-19 information overload and generation Z's social media discontinuance intention during the pandemic lockdown.* Technological Forecasting and Social Change. 2021. **166**: p. 120600 DOI: https://doi.org/10.1016/j.techfore.2021.120600.
54. Hartwell, M., T. Torgerson, R. Essex, B. Campbell, D. Belardo, and M. Vassar, *Public awareness of a plant-based diet following the release of "Game Changers" and "What the Health" documentaries.* American Journal of Lifestyle Medicine. 2022. **16**(2): p. 190-196.
55. Brazier, J.C., *Mobile Carbon Footprinting: Sensing and Shaping the Carbon Emissions of Daily Activities Using Digital Technologies.* 2021.
56. Hassoun, A., H.J.P. Marvin, Y. Bouzembrak, F.J. Barba, J.M. Castagnini, N. Pallarés, R. Rabail, et al., *Digital transformation in the agri-food industry: recent applications and the role of the COVID-19 pandemic.* Frontiers in Sustainable Food Systems. 2023. **Volume 7 - 2023**.
57. Commission, E., *Towards an EU-wide sustainability food label: Challenges and proposals.* 2024.
58. Delpozo, B., A. Pons-Gómez, and C. Besada, *Eye-tracking study on the impact of 'EU organic' and 'sustainable irrigation' logos on consumer acceptance of olive oil.* Journal of the Science of Food and Agriculture. 2025. **105**(3): p. 1864-1874 DOI: https://doi.org/10.1002/jsfa.13963.
59. Alliance, R., Case Study: Communicating Food Sustainability Information to Consumers, in *One Planet Network.*(2023) DOI:Ã⊚Â https://www.oneplanetnetwork.org/news-and-events/news/rainforest-alliance-case-study-communicating-food-sustainability-information.
60. Trust, C., Product Carbon Footprint Label – What it means and why it matters.
.(2023) DOI:Ã⊚Â https://www.carbontrust.com/what-we-do/carbon-footprint-labelling/product-carbon-footprint-label.
61. Trust, C., Research reveals consumer demand for climate change labelling.
.(2020) DOI:Ã⊚Â
https://www.carbontrust.com/news-and-insights/news/research-reveals-consumer-demand-for-climate-change-labelling.
62. Brazil, M.o.H.o., Dietary Guidelines for the Brazilian Population.(2014), Ministry of Health of Brazil: Brazil.
63. Curran, M.A., *Life Cycle Assessment: a review of the methodology and its application to sustainability.* Current Opinion in Chemical Engineering. 2013. **2**(3): p. 273-277 DOI: https://doi.org/10.1016/j.coche.2013.02.002.
64. Opio, C., P. Gerber, A. Mottet, A. Falcucci, G. Tempio, M. MacLeod, T. Vellinga, et al., *Greenhouse gas emissions from ruminant supply chains–A global life cycle assessment.* 2013.
65. McKenzie-Mohr, D., *Fostering sustainable behavior: An introduction to community-based social marketing*. 2011: New society publishers.
66. Lee, J., J. Nguyen, and F. O'Leary *Content, Quality and Accuracy of Online Nutrition Resources for the Prevention and Treatment of Dementia: A Review of Online Content*. Dietetics. **1**, (2022), 148-163 DOI: 10.3390/dietetics1030015.
67. Lourenco, C.E., N.M. Nunes-Galbes, R. Borgheresi, L.O. Cezarino, F.P. Martins, and L.B. Liboni *Psychological Barriers to Sustainable Dietary Patterns: Findings from Meat Intake Behaviour*. Sustainability. **14**, (2022), DOI: 10.3390/su14042199.
68. Reipurth, M.F.S., L. Hørby, C.G. Gregersen, A. Bonke, and F.J.A. Perez Cueto, *Barriers and facilitators towards adopting a more plant-based diet in a sample of Danish consumers.* Food Quality and Preference. 2019. **73**: p. 288-292 DOI: https://doi.org/10.1016/j.foodqual.2018.10.012.
69. Forum, A.A., Agricultural Subsidies and Their Influence on the Composition of U.S. Food Supply.(2020) DOI:Ã⊚Â https://www.americanactionforum.org.
70. Reuters, Trump Administration Cancels $3 Billion Climate-Friendly Farming Program.(2020) DOI:Ã⊚Â https://www.reuters.com.

 doi:10.20944/preprints202510.2244.v1

71. Graça, J., C.A. Godinho, and M. Truninger, *Reducing meat consumption and following plant-based diets: Current evidence and future directions to inform integrated transitions.* Trends in Food Science & Technology. 2019. **91**: p. 380-390 DOI: https://doi.org/10.1016/j.tifs.2019.07.046.
72. Machine, T.G.i.O., D.b.L. Marshall., Editor.(2013).
73. Wired, Can Netflix's Seaspiracy really shock people into not eating fish? .(2021).
74. Bianchi, F., C. Dorsel, E. Garnett, P. Aveyard, and S.A. Jebb, *Interventions targeting conscious determinants of human behaviour to reduce the demand for meat: a systematic review with qualitative comparative analysis.* International Journal of Behavioral Nutrition and Physical Activity. 2018. **15**(1): p. 102 DOI: 10.1186/s12966-018-0729-6.
75. Apostolidis, C. and F. McLeay, *Should we stop meating like this? Reducing meat consumption through substitution.* Food Policy. 2016. **65**: p. 74-89 DOI: https://doi.org/10.1016/j.foodpol.2016.11.002.
76. (GFI), G.F.I., Plant-based market overview: Retail sales and consumer insights.(2023).
77. Mechanism, E.C.s.S.A., Make sustainable and healthy food the easy choice.(2023).
78. Reisch, L.A., *Shaping healthy and sustainable food systems with behavioural food policy.* European Review of Agricultural Economics. 2021. **48**(4): p. 665-693.
79. Andreani, G., G. Sogari, A. Marti, F. Froldi, H. Dagevos, and D. Martini *Plant-Based Meat Alternatives: Technological, Nutritional, Environmental, Market, and Social Challenges and Opportunities*. Nutrients. **15**, (2023), DOI: 10.3390/nu15020452.
80. McClements, D.J. and S.M. Jafari, *Improving emulsion formation, stability and performance using mixed emulsifiers: A review.* Advances in Colloid and Interface Science. 2018. **251**: p. 55-79 DOI: https://doi.org/10.1016/j.cis.2017.12.001.
81. Ge, J., C.-X. Sun, H. Corke, K. Gul, R.-Y. Gan, and Y. Fang, *The health benefits, functional properties, modifications, and applications of pea (Pisum sativum L.) protein: Current status, challenges, and perspectives.* Comprehensive Reviews in Food Science and Food Safety. 2020. **19**(4): p. 1835-1876 DOI: https://doi.org/10.1111/1541-4337.12573.
82. Ścieszka, S. and E. Klewicka, *Algae in food: a general review.* Critical Reviews in Food Science and Nutrition. 2019. **59**(21): p. 3538-3547 DOI: 10.1080/10408398.2018.1496319.
83. Market, B., *Available online: https://www. marketsandmarkets. com.* Market-Reports/near-field-communication-nfc-market-520. html (accessed on 1 October 2021). 2023.
84. Hd, A. and H. Vijayan P. U, *Bio-green Evolution: The Journey of Microalgae Products from Lab to Market—An Overview of Microalgae-Based Processes and Products—Part I.* Microalgae Horizons: Fundamentals, Innovations, and Industrial Applications. 2025: p. 185-275.
85. Geada, P., C. Moreira, M. Silva, R. Nunes, L. Madureira, C.M.R. Rocha, R.N. Pereira, et al., *Algal proteins: Production strategies and nutritional and functional properties.* Bioresource Technology. 2021. **332**: p. 125125 DOI: https://doi.org/10.1016/j.biortech.2021.125125.
86. Grossmann, L., S. Ebert, J. Hinrichs, and J. Weiss, *Effect of precipitation, lyophilization, and organic solvent extraction on preparation of protein-rich powders from the microalgae Chlorella protothecoides.* Algal Research. 2018. **29**: p. 266-276 DOI: https://doi.org/10.1016/j.algal.2017.11.019.
87. Grossmann, L., J. Hinrichs, and J. Weiss, *Solubility of extracted proteins from Chlorella sorokiniana, Phaeodactylum tricornutum, and Nannochloropsis oceanica: Impact of pH-value.* LWT. 2019. **105**: p. 408-416 DOI: https://doi.org/10.1016/j.lwt.2019.01.040.
88. Liu, Y., W.R. Aimutis, and M. Drake *Dairy, Plant, and Novel Proteins: Scientific and Technological Aspects*. Foods. **13**, (2024), DOI: 10.3390/foods13071010.
89. Michel, F., A. Knaapila, C. Hartmann, and M. Siegrist, *A multi-national comparison of meat eaters' attitudes and expectations for burgers containing beef, pea or algae protein.* Food Quality and Preference. 2021. **91**: p. 104195 DOI: https://doi.org/10.1016/j.foodqual.2021.104195.
90. Van der Stricht, H., Y. Hung, A.R.H. Fischer, and W. Verbeke, *Consumer segments less or more willing to adopt foods with microalgae proteins.* Food Quality and Preference. 2024. **113**: p. 105047 DOI: https://doi.org/10.1016/j.foodqual.2023.105047.

 doi:10.20944/preprints202510.2244.v1

91. Mellor, C., R. Embling, L. Neilson, T. Randall, C. Wakeham, M.D. Lee, and L.L. Wilkinson *Consumer Knowledge and Acceptance of "Algae" as a Protein Alternative: A UK-Based Qualitative Study*. Foods. **11**, (2022), DOI: 10.3390/foods11121703.
92. Lafarga, T., R. Rodríguez-Bermúdez, A. Morillas-España, S. Villaró, M. García-Vaquero, L. Morán, A. Sánchez-Zurano, et al., *Consumer knowledge and attitudes towards microalgae as food: The case of Spain.* Algal Research. 2021. **54**: p. 102174 DOI: https://doi.org/10.1016/j.algal.2020.102174.
93. Morgenstern, S., M. Redwood, and A. Herby, *An innovative program for hospital nutrition.* American Journal of Lifestyle Medicine. 2025. **19**(2): p. 320-323.
94. Babich, J.S., M. McMacken, L. Correa, K. Polito-Moller, K. Chen, E. Adams, S. Morgenstern, et al., *Advancing Lifestyle Medicine in New York City's Public Health Care System.* Mayo Clinic Proceedings: Innovations, Quality & Outcomes. 2024. **8**(3): p. 279-292 DOI: https://doi.org/10.1016/j.mayocpiqo.2024.01.005.
95. Breggin, L., B. Myers, S. Backer, and T. RaoShah, *More than a Hill O'Beans: A Typology for Incorporating Plant-Based Protein Measures into Municipal Climate Action Plans.* Geo. Env't L. Rev. 2024. **37**: p. 61.
96. Sadler, I., A. Bauer, and S. Kassam, *How Sustainable Are Hospital Menus in the United Kingdom? Identifying Untapped Potential Based on a Novel Scoring System for Plant-Based Provisions.* Journal of Human Nutrition and Dietetics. 2025. **38**(1): p. e70019 DOI: https://doi.org/10.1111/jhn.70019.
97. Baig, M.A., F.F. Ajayi, M. Hamdi, W. Baba, F.H. Brishti, N. Khalid, W. Zhou, et al., *Recent Research Advances in Meat Analogues: A Comprehensive Review on Production, Protein Sources, Quality Attributes, Analytical Techniques Used, and Consumer Perception.* Food Reviews International. 2025. **41**(1): p. 236-267 DOI: 10.1080/87559129.2024.2396855.
98. Shanthakumar, P., J. Klepacka, A. Bains, P. Chawla, S.B. Dhull, and A. Najda *The Current Situation of Pea Protein and Its Application in the Food Industry*. Molecules. **27**, (2022), DOI: 10.3390/molecules27165354.
99. Gohara-Beirigo, A.K., M.C. Matsudo, E.A. Cezare-Gomes, J.C.M.d. Carvalho, and E.D.G. Danesi, *Microalgae trends toward functional staple food incorporation: Sustainable alternative for human health improvement.* Trends in Food Science & Technology. 2022. **125**: p. 185-199 DOI: https://doi.org/10.1016/j.tifs.2022.04.030.
100. Dhiman, S., S. Kaur, B. Thakur, P. Singh, and M. Tripathi *Nutritional Enhancement of Plant-Based Fermented Foods: Microbial Innovations for a Sustainable Future*. Fermentation. **11**, (2025), DOI: 10.3390/fermentation11060346.
101. Sidhu, J.S., T. Zafar, P. Benyathiar, and M. Nasir, *Production, Processing, and Nutritional Profile of Chickpeas and Lentils*, in *Dry Beans and Pulses*2022). p. 383-407 DOI:Â https://doi.org/10.1002/9781119776802.ch15.
102. Yang, Z., C. Xie, Y. Bao, F. Liu, H. Wang, and Y. Wang, *Oat: Current state and challenges in plant-based food applications.* Trends in Food Science & Technology. 2023. **134**: p. 56-71 DOI: https://doi.org/10.1016/j.tifs.2023.02.017.
103. Wanasundara, J.P.D., H. Kumagai, A.P. Kasch, L. Van Gels, and S. Peirce, *Chapter 3 - Rice: A Source of Plant Protein with Many Valuable Processing Co-products*, in *Sustainable Protein Sources (Second Edition)*, S. Nadathur, J.P.D. Wanasundara, and L. Scanlin, Editors(2024), Academic Press. p. 55-75 DOI:Â https://doi.org/10.1016/B978-0-323-91652-3.00008-3.
104. Nissen, L., F. Casciano, E. Babini, and A. Gianotti, *Chapter 10 - Industrial hemp foods and beverages and product properties*, in *Industrial Hemp*, M. Pojić and B.K. Tiwari, Editors(2022), Academic Press. p. 219-246 DOI:Â https://doi.org/10.1016/B978-0-323-90910-5.00001-4.
105. Stone, A.K., D. Shi, C.P.F. Marinangeli, J. Carlin, and M.T. Nickerson, *Current review of faba bean protein fractionation and its value-added utilization in foods.* Sustainable Food Proteins. 2024. **2**(3): p. 101-124 DOI: https://doi.org/10.1002/sfp2.1028.
106. Balakrishnan, G. and R.G. Schneider *The Role of Amaranth, Quinoa, and Millets for the Development of Healthy, Sustainable Food Products—A Concise Review*. Foods. **11**, (2022), DOI: 10.3390/foods11162442.
107. Bedsaul-Fryer, J.R., J. Monroy-Gomez, K.G. van Zutphen-Küffer, and K. Kraemer, *An introduction to traditional and novel alternative proteins for low-and middle-income countries.* Current Developments in Nutrition. 2023. **8**(Suppl 1): p. 102014.
108. Maseko, K.H., T. Regnier, P. Bartels, and B. Meiring, *Mushroom mycelia as sustainable alternative proteins for the production of hybrid cell-cultured meat: A review.* Journal of Food Science. 2025. **90**(2): p. e70060 DOI: https://doi.org/10.1111/1750-3841.70060.

109. Takács, K., R. Végh, Z. Mednyánszky, J. Haddad, K. Allaf, M. Du, K. Chen, et al. *New Insights into Duckweed as an Alternative Source of Food and Feed: Key Components and Potential Technological Solutions to Increase Their Digestibility and Bioaccessibility*. Applied Sciences. **15**, (2025), DOI: 10.3390/app15020884.
110. Hever, J., *Plant-Based Diets: A Physician's Guide.* Perm J. 2016. **20**(3): p. 15-082 DOI: 10.7812/tpp/15-082.
111. FAO, U., WHO, and WOAH. *One Health Joint Plan of Action (2022-2026)*. Working together for the health of humans, animals, plants and the environment 2022.
112. Traore, T., S. Shanks, N. Haider, K. Ahmed, V. Jain, S.R. Rüegg, A. Razavi, et al., *How prepared is the world? Identifying weaknesses in existing assessment frameworks for global health security through a One Health approach.* The Lancet. 2023. **401**(10377): p. 673-687 DOI: 10.1016/S0140-6736(22)01589-6.
113. Zinsstag, J., A. Kaiser-Grolimund, K. Heitz-Tokpa, R. Sreedharan, J. Lubroth, F. Caya, M. Stone, et al., *Advancing One human–animal–environment Health for global health security: what does the evidence say?* The Lancet. 2023. **401**(10376): p. 591-604 DOI: 10.1016/S0140-6736(22)01595-1.
114. Fasina, F.O., B. Bett, M. Dione, F. Mutua, K. Roesel, L. Thomas, E. Kwoba, et al., *One Health gains momentum in Africa but room exists for improvement.* One Health. 2022. **15**: p. 100428 DOI: https://doi.org/10.1016/j.onehlt.2022.100428.
115. Lorusso, V. *Parasitology and One Health—Perspectives on Africa and Beyond*. Pathogens. **10**, (2021), DOI: 10.3390/pathogens10111437.
116. Zhao, H.-Q., S.-W. Fei, J.-X. Yin, Q. Li, T.-G. Jiang, Z.-Y. Guo, J.-B. Xue, et al., *Assessment of performance for a key indicator of One Health: evidence based on One Health index for zoonoses in Sub-Saharan Africa.* Infectious Diseases of Poverty. 2022. **11**(05): p. 74-86 DOI: 10.1186/s40249-022-01020-9.
117. Nyokabi, N.S., H. Moore, S. Berg, J. Lindahl, L. Phelan, G. Gimechu, A. Mihret, et al., *Implementing a one health approach to strengthen the management of zoonoses in Ethiopia.* One Health. 2023. **16**: p. 100521 DOI: https://doi.org/10.1016/j.onehlt.2023.100521.
118. Otu, A., E. Effa, C. Meseko, S. Cadmus, C. Ochu, R. Athingo, E. Namisango, et al., *Africa needs to prioritize One Health approaches that focus on the environment, animal health and human health.* Nature Medicine. 2021. **27**(6): p. 943-946 DOI: 10.1038/s41591-021-01375-w.
119. Alimi, Y. and J. Wabacha, *Strengthening coordination and collaboration of one health approach for zoonotic diseases in Africa.* One Health Outlook. 2023. **5**(1): p. 10 DOI: 10.1186/s42522-023-00082-5.
120. Chukwugozie, D.C., A.F. Victoria, U.G. Onawo, D.A. Kawino, I.M. Mazi, and H. Onyeaka, *Assessing the Impact of New Agricultural Technologies on Food Safety in Sub-Saharan Africa.* Modern Agriculture. 2025. **3**(1): p. e70011 DOI: https://doi.org/10.1002/moda.70011.
121. Bakiika, H., E.A. Obuku, J. Bukirwa, L. Nakiire, A. Robert, M. Nabatanzi, M. Robert, et al., *Contribution of the one health approach to strengthening health security in Uganda: a case study.* BMC Public Health. 2023. **23**(1): p. 1498 DOI: 10.1186/s12889-023-15670-3.
122. Nachega, J.B., S. Nsanzimana, A. Rawat, L.A. Wilson, P.J. Rosenthal, M.J. Siedner, J.K. Varma, et al., *Advancing detection and response capacities for emerging and re-emerging pathogens in Africa.* The Lancet Infectious Diseases. 2023. **23**(5): p. e185-e189 DOI: 10.1016/S1473-3099(22)00723-X.
123. Chotun, N., J. Eaton, I.A. Anagbogu, H.A. Tesfahunei, S. Shawa, C. Karutu, A. Bolarinwa, et al., *Sustaining success through strategies for post-elimination management of neglected tropical diseases in African Union Member States.* Frontiers in Tropical Diseases. 2024. **Volume 5 - 2024**.
124. Moyo, E., M. Mhango, P. Moyo, T. Dzinamarira, I. Chitungo, and G. Murewanhema, *Emerging infectious disease outbreaks in Sub-Saharan Africa: Learning from the past and present to be better prepared for future outbreaks.* Frontiers in Public Health. 2023. **Volume 11 - 2023**.
125. Boakye, D.A., D.K. de Souza, and M. Bockarie, *Alternative Interventions Against Neglected Tropical Diseases in SSA: Vector Control*, in *Neglected Tropical Diseases - Sub-Saharan Africa*, J.O. Gyapong and B.A. Boatin, Editors(2024), Springer International Publishing: Cham. p. 505-522 DOI:Â 10.1007/978-3-031-53901-5_19.
126. Kamgno, J., M. Adeleke, M.-G. Basáñez, Y. Coulibaly, D.K. de Souza, L.B. Debrah, A.Y. Debrah, et al., *Vector-borne helminthiases: a road map for current and future research to support control and elimination in sub-Saharan Africa.* The Lancet Infectious Diseases. DOI: 10.1016/S1473-3099(25)00084-2.
127. Mubemba, B., M.M. Mburu, K. Changula, W. Muleya, L.C. Moonga, H.M. Chambaro, M. Kajihara, et al., *Current knowledge of vector-borne zoonotic pathogens in Zambia: A clarion call to scaling-up "One Health" research*

 doi:10.20944/preprints202510.2244.v1

in the wake of emerging and re-emerging infectious diseases. PLOS Neglected Tropical Diseases. 2022. **16**(2): p. e0010193 DOI: 10.1371/journal.pntd.0010193.

128. Chukwugozie, D.C., E.I. Njoagwuani, K. David, B.A. Okonji, N. Milovanova, A.A. Akinsemolu, I.M. Mazi, et al., *Combatting food fraud IN SUB-SAHARAN Africa: Strategies for Strengthened safety and security.* Trends in Food Science & Technology. 2024. **150**: p. 104575 DOI: https://doi.org/10.1016/j.tifs.2024.104575.
129. Grangxabe, X.S., B.S. Madonsela, T. Maphanga, B. Gqomfa, T.T. Phungela, and K.C. Malakane, *An overview of waste management practices of street vendors in sub-saharan africa: A meta-analysis.* Journal of Environmental Management. 2024. **364**: p. 121464 DOI: https://doi.org/10.1016/j.jenvman.2024.121464.
130. Birgen, B.J., L.G. Njue, D.W.M. Kaindi, F.O. Ogutu, and J.O. Owade, *Quantitative versus qualitative risk assessment of meat and its products: what is feasible for Sub-Saharan African countries?* Critical Reviews in Food Science and Nutrition. 2022. **62**(1): p. 106-118 DOI: 10.1080/10408398.2020.1812505.
131. Christiana Cudjoe, D., G.I. Balali, O.O. Titus, R. Osafo, and M. Taufiq, *Food Safety in Sub-Sahara Africa, An insight into Ghana and Nigeria.* Environmental Health Insights. 2022. **16**: p. 11786302221142484 DOI: 10.1177/11786302221142484.
132. Sunil, P., A. Bipin, J. Tess, and C. Phaik Yeong, *Interventions to address antimicrobial resistance: an ethical analysis of key tensions and how they apply in low- income and middle-income countries.* BMJ Global Health. 2024. **9**(4): p. e012874 DOI: 10.1136/bmjgh-2023-012874.
133. Moyo, P., E. Moyo, D. Mangoya, M. Mhango, T. Mashe, M. Imran, and T. Dzinamarira, *Prevention of antimicrobial resistance in sub-Saharan Africa: What has worked? What still needs to be done?* Journal of Infection and Public Health. 2023. **16**(4): p. 632-639 DOI: https://doi.org/10.1016/j.jiph.2023.02.020.
134. Gashema, P., P. Sesonga, P.G. Iradukunda, R. Muvunyi, J.C. Mugisha, J. Ndayisenga, T. Musafiri, et al., *Enhancing Global Health Security in Sub-Saharan Africa: The case for integrated One Health surveillance against zoonotic diseases and environmental threats.* One Health. 2025. **21**: p. 101136 DOI: https://doi.org/10.1016/j.onehlt.2025.101136.
135. Chidawanyika, F., B. Muriithi, S. Niassy, F.O. Ouya, J.O. Pittchar, M. Kassie, and Z.R. Khan, *Sustainable intensification of vegetable production using the cereal 'push-pull technology': benefits and one health implications.* Environmental Sustainability. 2023. **6**(1): p. 25-34 DOI: 10.1007/s42398-023-00260-1.
136. Aborode, A.T., R.O. Adesola, I.A. Onifade, R. Adesiyan, V.A. Ibiam, N.A. Jinadu, and A.A. Bakre, *Outbreak of cholera in Nigeria: the role of One Health.* Discover Public Health. 2025. **22**(1): p. 125 DOI: 10.1186/s12982-025-00526-5.
137. Yan, Z., C. Xiong, H. Liu, and B.K. Singh, *Sustainable agricultural practices contribute significantly to One Health.* Journal of Sustainable Agriculture and Environment. 2022. **1**(3): p. 165-176 DOI: https://doi.org/10.1002/sae2.12019.