

# Optimizing Nutrition and Dietetics: Sustainable Approaches for Health and Environmental Impact

Amani Tahsin\*<sup>1</sup> , and Pary Hadi<sup>1</sup> 

<sup>1</sup> Nutrition and Dietetics Department, Faculty of Applied Science, Tishk International University, Kurdistan Region, Iraq.

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\*Email address:

[amani.tahsin@tiu.edu.iq](mailto:amani.tahsin@tiu.edu.iq)

\*Corresponding Author



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**Abstract:** The interplay between dietary choices and their ramifications for individual health and environmental sustainability is increasingly recognized as pivotal in contemporary discourse. This review encapsulates the essential components influencing consumer behavior in food selection, emphasizing the necessity for informed decision-making approaches. A critical examination of the educational frameworks required to equip food and nutrition professionals, alongside healthcare practitioners, to navigate this complexity adeptly is warranted. Relevant studies were retrieved from Web of Science, Scopus, and Google Scholar using keywords such as “sustainable diets,” “nutrition education,” “consumer behavior,” “environmental impact,” “health promotion,” and “curriculum development.” Articles published between 2010 and 2024 were screened and included based on their relevance to sustainability, dietary patterns, and professional training frameworks. Emphasis is placed on the imperative for organizations dedicated to the training of these professionals to spearhead the creation and implementation of curricula that encompass principles of sustainable and health-promoting dietary practices. As the landscape of nutritional science evolves, driven by ongoing research, the discourse surrounding sustainable diets will remain dynamic, reflecting the shifting paradigms of knowledge. Consequently, the interconnections among education, policy formulation, and practical applications will perpetually require reassessment until a global food system emerges that concurrently fosters ecological integrity and optimizes human health. In this transformative journey, it is paramount that the insights gleaned from emerging professionals are integrated as society confronts escalating environmental challenges. Overall, this review concludes that the forthcoming generation of innovators in sustainable nutrition will undoubtedly propel our understanding and practices forward through their pioneering research endeavors.

**Keywords:** Dietary Choices; Environmental Sustainability; Consumer Behavior; Sustainable Diets; Curricula Development; Health Promotion; Ecological Integrity; Nutritional Science.

## 1. Introduction

Nutrition can be thought of as the cornerstone of what constitutes life on Earth. Dietetics, a sub-specialty alongside nutrition, further examines how food and nutrients work in the body. A nutrition-based dietetics approach can maximize a patient’s therapeutic process. The broad area of sustainability, however, includes individual health and planetary health. Each nutritional and dietetic decision must consider the ‘triple prism’ of sustainability: the environmental impact on the planet, the social ideal underpinning a well-balanced and adequate diet, and the economic constraints as to the individual, community, and global area [1]. There is growing interest, therefore, to concentrate our attention on optimizing nutrition and dietetics from a sustainability perspective. Sustainability and sustainable diets have become part of the knowledge area. The possible role health professionals might play in promoting this agenda has yet to be determined. Climate change, loss of biodiversity, and high-water consumption are critical global issues. As the worldwide incidence of single and multi-morbidities continues its trajectory, urgently needing preventive lifestyle management, it is time to reconsider diet from a sustainable perspective. Strategies are required to help address this discordant dichotomy. Mitigation is

feasible collectively with the adoption of a plant-strong dietary pattern from nutrition and environmental perspectives to 'feed and save the world.' Therefore, a triple bottom-line approach for an intervention is optimal, considering all aspects as illustrated in the figure. Addressing not only health benefits and detriments, but taking the long view and also exploring the environmental impacts of our actions, will resonate not only with those who understand clinical outcomes but also with the potential this intervention has to create more sustainable actions for the benefit of the planet [2].

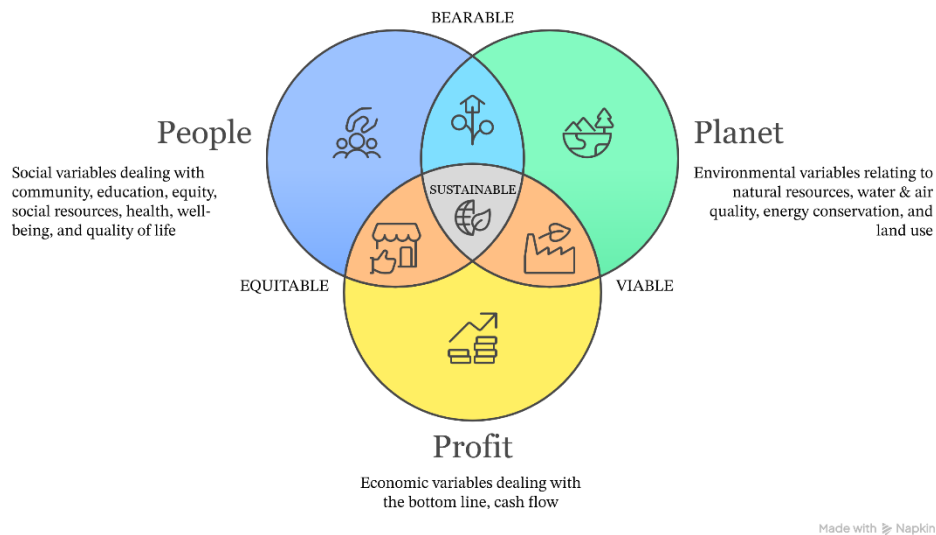


Figure 1: A conceptual diagram representing the three-dimensional prism of sustainability.

## 2. The Interplay Between Nutrition, Health, and the Environment

Nutrition, health, and the environment are three interlinked entities, with a single nutrition-related element holding the ability to influence either or both of the others. The importance of sustainability and its ties with the way we eat is a growing topic of interest, especially relevant to the current situation marked by ongoing world health-related problems. The interrelations providing ground and assumptions for this review thus become essential to any attempt at capacity-building optimization in future dietetic interventions [3].

Current food production and consumption practices undermine human health and damage the Earth's life-supporting systems. As yet, an adequate understanding of these complex relationships and interventions to mitigate the interconnected crises is not in place. Advice about food system optimization is also not always tuned to provide a combination of improved health and reduced environmental impact. Nourishing diets are relevant on a number of accounts, including the fact that they already focus on the promotion of concurrent individual and ecosystem health and introduce sustainability tools that can aid in capacity-building for dietitians. This review aims to offer a substantively enriched view of effective, desirable behavior and practice to inform further qualitative research both here and in the subsequent areas of this volume [4].

## 3. Review Strategy

This review followed a clear and thoughtful methodological approach designed to bring together the most relevant research on sustainable nutrition and environmental impact. To ensure broad coverage, we searched major academic databases—including PubMed/MEDLINE, Scopus, Web of Science, and Google Scholar—focusing on studies published between 2010 and 2024. A combination of keywords related to sustainable diets, environmental indicators, nutritional adequacy, and public health was used to identify research exploring the relationship between dietary choices, human health, and ecological outcomes. Only English-language studies that provided empirical evidence or systematic analysis were

considered, while opinion pieces, papers lacking methodological clarity, and studies unrelated to dietary patterns were excluded. This foundation allowed the review to be grounded in high-quality, up-to-date scientific evidence. A structured strategy was used to guide the selection and organization of the studies. After gathering all potentially relevant articles through the database search, we removed duplicates to create a clean set of materials for evaluation. Titles and abstracts were screened first to determine whether each study aligned with the focus of sustainable nutrition and its environmental or health implications. Articles that did not clearly address these themes were set aside. Full-text assessments were then conducted to confirm eligibility, ensuring that each study meaningfully incorporated both nutritional and environmental perspectives. Only those that met these criteria were included, forming the basis of the final synthesis. To deepen the quality of the review, we also paid close attention to the methodological diversity within the selected studies. Because sustainable nutrition is an interdisciplinary field, research often draws from nutrition science, public health, environmental modeling, and systems analysis. As part of our methodological evaluation, we considered how each study approached the topic—whether through life cycle assessment, epidemiological analysis, environmental impact modelling, or assessments of dietary patterns. This allowed us to appreciate the strengths and limitations of different analytical techniques and to understand how they contribute to the broader picture of sustainable food systems. Acknowledging these variations helped highlight areas where the evidence is strong, where findings are evolving, and where further investigation is needed. The final synthesis was conducted using a narrative approach, which allowed us to integrate diverse study designs and outcome measures while preserving the complexity and richness of the research. Rather than reducing the findings to a single quantitative estimate, the narrative method enabled us to explore patterns, themes, and connections across the literature. This approach supported a balanced interpretation of the evidence, shedding light on how sustainable dietary patterns influence both human well-being and environmental outcomes, and revealing the social, behavioral, and policy factors that shape dietary choices in real-world contexts. Through this comprehensive and human-centered methodology, the review provides a well-rounded understanding of how nutrition and sustainability intersect in contemporary scientific research.

Table 1: Key innovations and assessment tools.

Category	Innovation / Tool	Description / Purpose	Application / Impact
<b>Nutritional Assessment Tools</b>	Quantitative methods	Evaluate nutrient intake and adequacy using dietary recalls, food frequency questionnaires, or nutrient analysis software.	Ensures dietary sufficiency and monitors public health nutrition trends
	Qualitative methods	Uses interviews and observations to explore food habits, choices, and attitudes	Helps design culturally competent dietary interventions
	Digital health tools	Mobile apps, online databases, and diet-tracking systems	Enhance accessibility and personalized nutrition monitoring
	Ecological footprint calculators	Software linking nutrition data with environmental impact metrics	Assess the sustainability of dietary patterns

<b>Innovations in Sustainable Nutrition</b>	Plant-based alternatives and meat substitutes	Development of plant proteins and fermentation-based meat analogs	Reduces land, water, and greenhouse gas use
	Cellular agriculture	Cultivation of lab-grown meat and dairy substitutes	Addresses food security and environmental sustainability
	Biomass conversion technology	Uses agricultural waste to produce nutrient-rich snacks	Minimizes waste and improves resource efficiency
	Edible and biodegradable packaging	Derived from plant-based materials	Reduces plastic waste and supports the circular economy
	Low-water-use crops and regenerative farming	Crop systems designed for resource efficiency and soil restoration	Promotes environmental conservation and sustainable food systems
<b>Policy and Advocacy Tools</b>	Sustainable Development Goals alignment	Integrating dietary sustainability within SDGs and national guidelines	Strengthens policy coherence for health and environment
	Systems thinking in policy	Considers interconnected food, health, and environmental outcomes	Improves holistic dietary and environmental policymaking
<b>Educational Tools</b>	Curriculum integration frameworks	Embedding sustainability principles into nutrition and dietetics education	Builds future-ready professionals
	Experiential and participatory learning	Field trips, projects, and community engagement	Enhances practical sustainability competencies
<b>Research Assessment Tools</b>	Life cycle assessment (LCA)	Quantifies environmental impact across food production stages	Evaluates food system sustainability
	Mixed-methods research	Combines qualitative and quantitative approaches for deeper insight	Enhances the robustness of sustainability research

#### 4. Foundations of Sustainable Nutrition and Dietetics

Sustainable nutrition and dietetics require a paradigm shift. It is rooted in living on Earth as if we want to stay and ensuring the possibility of life for generations to come. In relation to food, it encompasses the shift from a short-term consumerist attitude to a long-term ecological citizen's perspective. This requires eating patterns that minimize environmental impact, plant-rich food, and balance with physical activity,

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together with the preservation of nature and biodiversity. Foundations for sustainable nutrition and dietetics address health and environmental considerations. These basic principles of sustainable nutrition have evolved and are based on theoretical perspectives and guidelines from sustainable food systems in relation to the ecological, economic, and social aspects of the food system [5].

The individual and population considerations strive to look at the big picture and involve nutrition in an environmental context that goes beyond the health consequences of food and its constituents. It recognizes that food and nutrient considerations go beyond environmental impact for obtaining nutritional adequacy and nutrient requirements. These foundations involve concepts that include eating seasonally, sourcing locally, reducing food waste, and the consumers' role in the food system. The incorporation of cultural and ethical considerations in the understanding, definitions, and discussion of sustainable diet adds to the growing rationale for a shift towards eating with lowered environmental impact. These foundations encompass not only ethical and environmental considerations but also include education as a fundamental principle [6].

A better understanding of the principles of the sustainable diet is crucial, as setting guidelines could hasten more rapid lifestyle change and further assist driven demand in the marketplace. This is a vital first step in being able to educate the public and other health professionals in this arena of nutrition expertise, but other complementary documents are required to more fully articulate the issues and describe implementation procedures that embrace the practical complexities of human nutrition and environmental impact [7].

#### **4.1 Principles of Sustainable Eating**

Sustainable eating implies a healthy, ethical, and environmentally friendly way of approaching our diet. Such principles can be translated into down-to-earth guidelines that can be applied in our daily choices. Many approaches coexist, but some common points can be summarized. A diet rich in plant-based foods is generally considered more sustainable, as it lowers the demand for animal products and is more respectful of natural resources and biodiversity. Eating less processed foods, favoring short food supply chains, and organic and seasonal sourcing are also considered more sustainable for contributing to reducing greenhouse gas emissions [8].

Eating more fruits, vegetables, legumes, and cereals supplies antioxidants and anti-inflammatory compounds, dietary fiber, and micro- and macrominerals that can also support the immune system. Combining cereals with legumes, such as pasta and beans, or rice and lentils, is an additional strategy to balance essential amino acids in the daily diet. A cardioprotective effect of in-season fruits and vegetables has been highlighted, as well as a greater contribution to the dietary intake of antioxidants and folate, and the improvement of serum levels of vitamins, folate, and minerals during these seasons. Some data have proven that the consumption of some seasonal fruits could decrease the prevalence of cardiovascular risk factors. Because of the intrinsic restrictive and relatively untrained approach of the sustainable diet in terms of nutrition know-how and food access, some national and international organizations are implementing measures aimed at people aware of the possible link between health and the environment [9].

The protocol promotes actions aimed at raising awareness among health workers, in particular dietitians, already in the education and training phase, but also among citizens. A first clinical and population intervention study is in progress to evaluate the level of adherence to the diet. It would be of great interest to understand the trend of healthy eating over a period of time, given that in Italy, there is currently no such permanent dietary pattern. It is currently known that foods are purchased without knowing their possible link with health, with the environment, and with a possible compromised farming method behind them that could affect their quality; in the future, will the Italian or European population buy products suitable for sustainability? [10].

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## 5. Assessing Nutritional Needs and Environmental Impact

Evaluating nutritional adequacy and sufficiency is a practical approach to evaluate nutritional and ecological performances within different settings, in the context of sustainable nutrition and dietetics practice. This section reports some methods targeted to evaluate nutritional and ecological performances of nutritional needs and diet plans. The main aim is to support health professionals in performing studies and evaluations in order to assess, in an integrated view, the nutritional adequacy of diet, in accordance with national guidelines, and the environmental footprint of selected diet plans that reflect human nutritional requirements. This can guarantee beneficial and realistic recommendations and interventions based on precise information, considering ecological needs. Furthermore, the section emphasizes the relevance of managing ecological sustainability in light of nutritional impact using specific tools, theoretical frameworks, and practical works that researchers and professionals in the fields may implement for broader comparison [11].

Nowadays, many software programs can bring about nutritional and ecological data using different calculations and approaches. This may better satisfy the need for using tools that calculate the ecological footprint and gather dietary data for specific countries or regions. The application of ecological footprint in nutrition science to show the environmentally unfriendly features of diet or food can be a useful idea, in line with the overarching concept. Diet assessment practiced through these tools should complement existing strategies known to public health and nutrition professionals [12].

### 5.1 Nutritional Assessment Tools

Dietetics professionals use a variety of tools and methodologies to assess diet. Some methods are quantitative, and some are qualitative. Quantitative measurements evaluate, in terms of both major content and minor food components, the dietary intake by individuals, groups, or populations. Such methods can be applied at a single point in time or as repeated measures, can provide a measure of adequacy, and/or guide dose-response relationships to outcomes. In addition to measuring portions consumed, some studies may also use assessments to obtain information about the availability, variety, or prices of foods within a community. Qualitative methods usually involve interviewing people to elicit a narrative description of what a typical meal or day in their life looks like. Additionally, new technologies continue to emerge as a means for health professionals to consult with clients, patients, or members of the public to provide best-practice solutions, whether through mobile applications, online diet and physical activity plans and support systems, or online databases of food information [13].

Qualitative methods, which may rely more on observation and structured interview techniques, are useful for capturing food habits, food choices, meal patterns, and attitudes about food and show promise for developing culturally competent interventions. Methods to evaluate dietary intake at the individual level or for groups, no matter how well conducted, will always be imperfect due to inherent limitations. To monitor the intake of the population at large, dietetics professionals require improved metrics for dietary quality. Practitioners need to know the range of tools and methodologies available to design and implement culturally competent assessments applicable to a variety of contexts. When designing new methodologies, researchers need to demonstrate, where possible, improvements over current survey methodologies in capturing nutrients, their food sources, and dietary patterns, including culturally attuned adaptations or catering for populations with food intolerances. Researchers need funds to evaluate existing methodologies and tools and to develop new ones. Dividends would include new or improved methods, applications, and tools for assessing nutritional intake that would have commercial potential [14].

## 6. Sustainable Food Systems and Agriculture

This publication recognizes the need to create a new relationship that resembles a new social contract between the public, producers, consumers, and regulatory authorities from a health-environment perspective. It is based on the idea that culture and context are the real frameworks that shape diet and

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food. Creating sustainable food systems means designing strategies and interventions from an environmental framework, reevaluating the different stages of food production, distribution, and consumption to generate ecological nutrition, a concept that approaches food from the prism of the agrifood system context [15].

The study of food origins today relies on agroecological and toxicological approaches, applied either independently or in combination. One advantage derived from agroecological farming is the recovery of the habit of consuming seasonal food, which reduces and optimizes nutritional transitions, with positive consequences for the planet by decreasing the consumption of resources. A worldwide trend is increasing food supply through the development of an intensive model of production to feed an ever-increasing global population. In fact, a model was presented to increase calorie supply as much as possible, and at the lowest possible price, creating an agricultural policy around this viewpoint, especially after World War II, and protecting this policy with a series of subsidies in favor of companies. However, academic literature reports that the impaired nutritional status and increased incidence of non-communicable diseases are not only associated with overweight and obesity but also with the agricultural practices adopted, data not frequently discussed [16].

Consequently, a new insight has begun to appear for developed countries, where improving diet and healthy eating programs to combat obesity are adopted, which take a new approach in reducing the ecological food footprint. Such dietary changes also aim to guarantee food security and to address the trend towards food self-sufficiency, taking into consideration the economic, social, and environmental dimensions that ensure human well-being and healthy lifestyles according to the context. This review examines the main drivers that currently influence the food reevaluation process in different territories and regions around the world, as new agri-food world models, analyzing recent and historical problems arising from governing them. We want to suggest that the most important and urgent task is to link all the different points of view in this common, transparent intention of producing a healthy product, with respect for man and nature [17].

### **6.1 Agroecology and Sustainable Farming Practices**

Agroecology is a scientific discipline and a framework for sustainable farming that is informed by the long-term management of natural resources. As such, these farming systems emphasize ecological balance and efficient allocation of resources while considering environmental integration. This can be manifested in several locations, and they should vary according to biocultural diversity. The present systems are based on empirical knowledge, also known as local knowledge [18].

This knowledge can identify wild and cultivated unrestricted and nutritious species to be helpful against micronutrient deficiencies. It can successfully face biotic and abiotic adversities with integrated approaches, reducing monocultures and using as many as possible local and marginal varieties; this can contribute to the long-term maintenance and enhancement of agrobiodiversity both among and within the species. In the end, matching natural resources and agroecological practices can make the system resource-conserving, fostering the possible reuse of organic and inorganic rejected materials within the system [19].

Agroecology permits healthy and diversified diets that respect different sociocultural and heritage choices—this means promoting local food chains. Such practices are acknowledged to have an important impact on the environment and enhance the whole sense of the community-based system, i.e., health settings. Initiatives on this topic are being developed in various field actions and are here reviewed. Some case studies of this approach will be analyzed and discussed in order to identify the bottlenecks and the best practices associated with this approach. Furthermore, having research on the pitfalls, possible solutions will also be illustrated in order to inspire future intervention [20].

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## 7. Food Security and Sustainability

Food security and sustainability are interlinked in many ways. In the quest to provide sufficient food for all, many modern food systems serve to reinforce the disparity in who does and does not have enough to eat. The global obesity epidemic, rather than the alleviation of hunger, is one such example. At the other end of the spectrum, food shortages and undernutrition can result from unsustainable use of agricultural land, at least in part. 811 million people were undernourished in 2020, and this was at least one of the reasons behind this issue; this equates to approximately 9.5–10.8% of the world's population. Growing cultivated crops monoculturally, making soil nutritionally depleted and infertile, drawing down finite resources, and increasing the carbon footprints of food products are noted as consequences of unsustainable practices and are leading to a reduction in the availability of diverse and nutritious foods [21].

Proposed solutions are the following: sustainable intensification of agriculture must be pursued as a way of increasing production in the short term while looking for alternatives for the long term, and there must be buy-in to the notion that ensuring food security involves a mix of global, national, and local policies. In addition, within these broad brushstrokes, elements of change in agriculture, such as enhancing crop biodiversity, which are now recognized as important tools that also provide gains for health and the environment, must be recommended [22].

Further compounding the problem is the interconnectedness of health and nutrition with environmentally sustainable access to food. Put simply, unsustainably produced food is associated with diets that are nutritionally poor, especially for populations with chronic disease [23].

### 7.1 Addressing Food Insecurity Through Sustainable Practices

Addressing food insecurity through sustainable practices. There are ample strategies and initiatives that are available and can be put into practice that focus on more sustainably producing healthy foods in order to bridge the gaps in both poor-quality diets and food insecurity. These initiatives typically focus on practical experiences such as community actions, physical solutions, and mechanisms that bridge access to food. Many examples of these can be found within agriculture in low- and middle-income countries, but can also be found in higher-income countries, such as community gardens, local farmers' markets, barn-to-door sales, and other local infrastructure. Practical recommendations and additional examples and case studies can also be found [24].

Overarching this work is the education on how to better understand and interact with their own food systems in order to provide for themselves in a sustainable and healthful manner. Extensive ongoing action within this is education for sustainable development. When dealing specifically with food-insecure individuals, these solutions are often singularly adopted and implemented. However, the literature shows that a comprehensive approach should be taken; one that helps poor and food-insecure people to develop their own food insecurity solutions by teaching or transferring knowledge and skills, but also supporting the necessary infrastructure to make sustainable food systems work, and the policy and governance that underpins it. These strategies require the involvement of very different groups, such as water usage associations, ministries of agriculture and environment, non-governmental organizations working on land rights, universities, and grassroots permaculture systems. There are several recognized food security indicators and methods available for evaluating solution efficacy [25].

## 8. Innovations in Sustainable Nutrition and Dietetics

As the face of food technology changes, the future of dietetics is optimizing individual nutrition while considering health, the environment, social, and economic resources at the same time. Many food technology innovations are on the verge of becoming more widespread, such as new sources of protein, egg-free and milk-free egg and meat analogs, seafood analogs, and fish raised on algal substrates, regenerative agricultural systems and meats, plant-based fats and oils, low-water-use crops, air-based water, biofertilizers, plant-based and edible packing materials, and more. Research and development in

plant-based proteins, fermentation-produced proteins, cellular agriculture, and microalgae have the potential to reduce land use, water use, greenhouse gases, and chemical use for an environmentally sustainable diet [26].

A biomass conversion process that uses cellulosic agricultural waste to create personal nutrition snacks has the potential to address multiple sustainability challenges. Innovations in dietary approaches are also emerging. Whole food-based dietary guides that address health and the environment are in development worldwide. Tech-savvy dietitians are creating new digital innovations that appraise dietary quality, impact, and environmental quality by leveraging contributions of new research in food, nutrition, greenhouse gases, and nutrient cycling. Changes are being made to the Sustainable Development Goals and may soon include new dietary measures in response to emerging planetary health concerns. Pioneering dietitians are helping develop new guidelines that will be critical for designing affordable, locally sustainable nutritional approaches for a future that is ever more likely to mirror current global rates of food insecurity, stratospheric food prices, large and hungry urban populations, mass migration, and regional famine, war, and climate change. If dietitians and dietetic educators wish to remain relevant in the years ahead, it is essential to keep pace with the daily and hourly changes to our food system and apply our core skills to mitigate and manage new challenges and set the agenda for positive change [27].

### **8.1 Plant-Based Alternatives and Meat Substitutes**

The rate of uptake of plant-based alternatives represents one of the most convincing changes in the contemporary landscape of diet and health.

Plant-based meat alternatives are often promoted for their potential to reduce the environmental intensity of the diet. Significantly, a plant-based meat substitute comprising portabella mushrooms was associated with a substantially lower carbon footprint than beef. A rudimentary analysis of key dietary traits shows that the low-impact characteristics of a hypothetical, nutritionally matched plant-based diet may shift consumer awareness of global benefit reduction. The sustainable aspect may also help to offset potential nutritional stigma. A plant-based substitution model was employed that replaced beef and other meat foods in the standard average diet with more sustainable, environmentally friendly alternatives. Central emphasis, however, is the alteration in environmental characteristics. The procurement of ingredients to accommodate a plant-based substitution altered key macronutrient and micronutrient characteristics in a number of cases, thus evidencing the potential for promotion through health perspectives, not just sustainability [28].

Efforts are underway to engage with consumer perspectives regarding the commercialized nature of food towards the identification of potentially successful pathways to mainstream transitions to more sustainable food. Survey data suggest that approximately two-thirds of people, including half of strictly non-vegetarians, indicated that they were interested in consuming less meat. Consumer trends further illustrate the growing consumer response and concern regarding the sustainability of the food system [29]. Plant-based alternatives are undergoing rapid evolution in the context of global reform of dietary patterns and food environments [30]. Despite the potential, acceptance and availability are not uniform, and, as yet, solutions to overcome these and other barriers are complex. A number of major challenge areas can be identified in the gap between consumer interest and actual transitions to plant-based diets [31].

In summary, plant-based alternatives are developing rapidly in a number of industrial and scientific arenas and offer significant advantages over current meat-based products in terms of environmental impact and diet quality. Evidence suggests substantial market interest and consumer potential for adoption [32].

## **9. Policy and Advocacy in Sustainable Nutrition**

A succession of policy levers will be required to support the shift to sustainable nutrition. Five guiding principles for policymakers, public health educators, and dietitians are outlined that relate to

transparency, partnership, ambition, representation, equity, and rejection, including the promotion of systems thinking in the development of dietary guidelines. This will require both governmental and non-governmental organizations to accept that the diet and health sector requires a broad coalition of stakeholders to fully understand the health, environmental, animal welfare, poverty, and social value of different business models, including agribusiness, traditional high street local food traders, and family-managed food processing companies. This sector will have an influential part to play in the development of sustainable food systems underpinned by ecological public health approaches. Current food policy tends to be dominated by the Euro-Atlantic worldview of 'health' and the promotion of food advertising, rather than increasing access and improving the nutrient content of food, while simultaneously working with producers, manufacturers, and retailers to make the food system more sustainable [33], [34].

Until recently, the development of national dietary policies and guidelines focused largely on nutrition, indicating nutrients of concern, rather than the adoption of a whole diet approach that takes into account the environmental and animal welfare impacts of production. The concept of 'Health at Every Size - HAES' could be extended into the whole diet and sustainability arena, and there will be a campaign for this. There are a number of existing international initiatives that could be further developed and strengthened to provide the foundation of good food systems. The centerpiece of the Food and Agriculture Organization is to increase access to food. This should not mean increasing access to 'empty calorie' processed food - there must be a healthy and sustainable balance. At the international level, countries are mindful of the Sustainable Development Goals (SDGs) [35].

### **9.1 National and International Policies for Sustainable Food Systems**

Current urbanized food systems need to significantly change in order to produce and provide food to growing urban populations in 2050 while at the same time avoiding short- and long-term negative impacts on the environment and human health. Sustainable food systems provide healthy diets for all, conserve biodiversity in nature and the environment, and do not contribute to climate change by reducing greenhouse gas emissions. A substantial proportion of citizens are concerned about the sustainability of food, mainly for health and environmental reasons. Nutrition and health professionals need to ensure that a system of preventing planetary boundaries is established, achievable, and agreed to at a global level through a binding international agreement or treaty, enforcement of policy nationally consistent with the international agreement, and effective delivery and monitoring at the local or community level through the work of health professionals [36].

There are national and international policies promoting sustainability that already exist. These tend to favor particular documented purposes, frequently discouraging the setting out of a coherent policy framework. There is a general critical view of food policies based on the observation that governmental support for traditional food production appears limited, and government action primarily aims at increasing global production and consequently the consumption of meat and dairy products, energy-dense foods, and sugar. Knowledge of how to construct a sustainable, healthy diet is limited. A further criticism of a healthy, sustainable diet is that sustainable food policymaking is still in an embryonic situation, considering food production and supply. Policymakers frequently tend to regard a sustainable diet as the diet of the future at the consumer level, and do not focus enough on the production level dietary habits. Policymaking should balance the production and consumption approaches. A healthy, sustainable diet is the diet of the future at the production level. There are several challenges for policy [37].

Nutrition and health professionals should advocate for a sustainable diet and food production value-based intergovernmental dialogues. These could be proposed as an advocacy action for local and national dietetic associations seeking tangible wins. For example, the large disease burden reduction from addressing the climate change, obesity, and underweight connections is a powerful argument to convince health portfolios to act. Evidence can be produced to show that currently equivalent gross event score reductions are larger if attention is simultaneously given to climate change and poverty. Policy can promote sustainability, may reduce vulnerability, and should contribute overall to improved equity.

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Intergovernmental institutions can facilitate national policy moves. Coordination will enable countries to maximize the triple health agendas. Since March 2008, a number of scientific, professional, and civil societies have signed declarations for climate action. Signed health ministers have a right to vote at relevant meetings and one additional vote if they pay the signup fee. Policy can be advanced with the support of scientific, government, and civil society against vested interests. Declarations can be used at high-level meetings and circulated to the negotiators [38].

## **10. Educational Strategies for Promoting Sustainable Nutrition**

Creating and sustaining awareness and practice of sustainability in dietetics will naturally require collaboration with various groups who serve as our primary and secondary educators, including school teachers, school systems, college and university faculty, and clinical and community preceptors. All educational levels are encouraged to include sustainability topics in their curriculum. Educational strategies include partnering with community organizations and food industry stakeholders that are already focused on sustainability in order to create a wider platform for sustainability education. Educators presenting on the topic in various settings should highlight ways that sustainability aligns with economic, social, and environmental justice [39].

Incorporating sustainability into educational programs is a process that is already happening in multiple geographic locations. Teaching tools and strategies may be of help to registered dietitian nutritionists, master's of science in nutrition programs, college instructors, public health departments, industry and trade groups, and food waste entrepreneurs. Including an instructional program evaluation component in an educational initiative will provide new knowledge and direction to others committed to advancing awareness and practice of sustainability in dietetics. For sustainability in dietetics and nutrition to become a societal norm, standards should be integrated into outcomes-based education. Continuous professional development to learn and improve instruction and practice related to sustainability is a nationwide priority for nutrition educators. Other professional educators, such as those in the medical and nursing professions, seem to have acknowledged the importance of continuous professional development in the learning and practice arenas of sustainability [40].

### **10.1 Integrating Sustainability into Nutrition Curricula**

Integrating sustainability concerns is academically focused, actionable, and can be targeted towards nutrition educators or educators of any discipline wishing to embed sustainability within their nutrition-related curriculum. There is a wealth of literature regarding different and innovative approaches to integrating these issues across the provision of dietetics and nutrition education. In terms of content, this might include discussions related to food, nutrition, and sustainability; systems thinking; sustainable dietary determinants and interventions; and critical global determinants of nutrition choice. It may also include a placement within local communities with students promoting nutrition education and sustainability to the local community [41].

Sustainability is a specialist area, and a change in curriculum direction can sometimes be met with resistance or defensiveness. Education pedagogies can encourage academic curiosity in students and cultivate new critical and problem-solving skills. Some of these involve empowering students to take risks and critique practice, taking a participatory approach, learning through inquiry, sharing and collaborating, providing experiences through local and international field trips, team/project-based learning, and reflective and experiential learning. Including these aspects of learning within a curriculum will ensure that students have the necessary skills to ensure that their learning in dietetics and nutrition has a sustainable impact. Clear graduate attributes and learning outcomes should be in place at the module, theme, and program levels to highlight the importance of curriculum content, which is also mapped across the course [42].

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## 11. Research Methods in Sustainable Nutrition and Dietetics

The field of sustainable nutrition and dietetics is an exciting and growing area of interest. There are a number of research methods relevant to a variety of research topics within this domain. Quantitative methods such as epidemiological studies, life cycle assessment, and food service waste audits can provide results that can be generalized to other groups and can increase the power and rigor of research conducted. Qualitative methods, including key informant interviews, Delphi polls, focus groups, and individual interviews, as well as historical and policy analysis, can help to flesh out the results of quantitative studies and add depth to research findings [43].

In order for any research to be conducted, a sound research design and operationalization of research questions are critical. Sufficient resources and expertise are also vital for these types of initiatives. The importance of partnering and collaborating with others, particularly researchers outside of nutrition, is also undervalued. Important research topics for this field may necessitate partnerships with individuals and groups educated in economics, psychology, and, more so, environmental and agricultural studies. Ethical treatment of human participants in research is important, and studies that cross disciplines necessitate additional planning and relations with multiple Institutional Review Boards [44].

Some areas that are highly related to sustainable food service that can benefit from additional investigation include waste assessments related to household and dining from home behavior, further study into the practice of restaurants that utilize local and sustainable procurement, and methodological papers that build upon life cycle analysis, particularly looking at organic ingredients in the face of impending legislation. Community partnership and involvement in sustainable nutrition research are not only highly favorable for conducting research with credibility and impact, but may also align with academic priorities of service to others. Publicizing research results can contribute to change within the community and be a public service that contributes to the improvement of public health and/or the environment. As a result, press releases, reports, publications, and presentations will be produced as part of this project [45].

### 11.1 Quantitative and Qualitative Approaches

Quantitative studies examining close-to-practice dietary data have been the main approach in the field of sustainable nutrition. The use of different dietary assessment methods in combination with food emission values provides new insights into free-living populations. Qualitative studies, on the other hand, aim to explore the reasons behind dietary behavior by means of semi-structured interviews or open questions in surveys. This allows for the collection of richer and more in-depth information on sustainable nutrition, but these populations are generally smaller, and therefore, results cannot be generalized. Combining qualitative and quantitative research methods may complement one approach's lapses with the benefits of the other. A qualitative approach, for example, can help to explore the context and behavior of interest and design survey items accordingly, and a quantitative approach can help to determine the extent of or establish behavior within a population [46].

To assess the food consumption patterns, preferences, and motives of free-living people, large surveys that include questions on sustainability or do not exclusively focus on it can be used. Semi-structured interviews or focus groups allow for exploring motivations and behaviors in more detail. Additionally, scales have been developed to measure consumers' motivation towards their diet and the environment, or to assess willingness to change dietary habits according to different reasons. This requires robust statistical analysis, with thorough validation and reliability studies. Independent of the approach taken, the ethical considerations are largely the same. By using tools in research, the validity and reliability of the results may dictate the implementation and use of the measure [47].

The use of scales for dietary assessment can be difficult as they tend not to be comprehensive of all facets of the diet in question and may be hypothetical in nature. This hypothetical sterility should be one of the leading points in any discussion provided. Potential data sharing with healthcare professionals should

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also be disclosed as part of the consent process; this will outline the usage of participant information and ensure the confidentiality of the data. Data interpretation of food frequency questionnaires should emphasize limitations regarding total energy intake and other assumptions. In this manner, an equitable presentation of the research should provide both the pros and cons of the results, providing a frame of reference for discussion. Examples of the use of these approaches and outcomes can be obtained in research [48].

## 12. Case Studies in Sustainable Nutrition and Dietetics

The evidence-based case studies in sustainable nutrition and dietetics presented address unique initiatives taking place in diverse locations. The critical societal and environmental health outcomes of each program are summarized, in addition to mentioning the key factors contributing to their success, such as the adaptability and scalability of services and the priority placed on reducing disparities for vulnerable members of their respective communities. Finally, the challenges encountered are examined [49].

Community-level demonstrations of effective practical changes and supportive policies can serve as guides for broad and effective action. In describing their work, the authors offer inspiration and practical details that can help others successfully replicate and/or build upon their initial efforts. To provide examples that encourage the work of dietetic program directors, educators, preceptors, and mentors to develop, promote, and adopt practices of sustainable food philosophies for monitoring and mentoring future nutrition and dietetic professionals [50].

The case studies cover a broad swath of practice, including issues related to women's health, food pantries, campus dining services, health care systems, occupational health, and international philanthropy. The case studies demonstrate the successful integration of sustainable practices into existing systems. The critical outcome, which indicates the level of success, is the slow cultural change that happens as a result of integrating sustainable nutrition counseling, projects, or practices into an organization's workflow or culture [51].

Additionally, the demographics, individual attitudes, and interests of faculty, students, and their families are evolving in the direction of local and organic consumption. The following article describes some community-based and clinically oriented academic programs or training clinics in dietetics and nutrition that offer an integrated focus on various aspects of sustainable food practice. Each practice-based academic article begins with the name of the institution, location of the program, a summary of the program, and an overview of the case study [52].

### 12.1 Successful Implementation of Sustainable Food Programs

Through the previous sections, educational and research information on reMIX, a sustainable food program, has been provided, but what actually makes it work? The three case studies of the reMIX program and the Oregon Farm to School program provide an idea of how cooperative extension agents in the United States have successfully promoted sustainable food programs. Program length, budget, and staffing varied for the three programs, but they are similar in that they involved partnerships between the research institutions and other groups of thought leaders. Often, this coalition included representation from environmental and sustainable agriculture organizations, local food producers, processors or distributors, health organizations, education administrators, and local K-12 educators. One thing that varied greatly was the extent to which informal stakeholders were invited to contribute input to program development [53].

In the case of the Derry Township reMIX program, the informal stakeholder, the borough parks and recreation department, provided the funding for the inaugural year of reMIXd, the community education site. In the case of the Virginia reMIX program, a business member of the external advisory board offered to host the first community education site. The business person also donated to the program. The Alabama reMIX program used informal networks of community support, which included the DHR

director, the Alabama primary care professional advisory council, and participants in the previous Wellness for Yourself diabetes self-management program. One of the greatest concerns of reMIX educators is the sustainability of the community sites beyond the expiration of grant awards. This has been part of the training of all actual and potential community site hosts [54].

Communities are encouraged to create volunteer teams who will run the sites. Funds to support the sites are being raised from community members, community organizations, and local businesses. Any policies that need to be created for sustainability are the result of a consensus-building discussion among each of the volunteer teams and their site hosts, who had hosted a site for one year. Each of the Alabama reMIX community nutrition programs' community team captains reported that their program was "extremely needed." Of the programs, reported that activities were in place to help maintain the community program [55].

### **13. Future Directions and Emerging Trends in Sustainable Nutrition and Dietetics**

In this new age of rapid technological advances and consumer preferences, various roles within nutrition, dietetics, and health practitioners are being adapted. Sustainability is no longer out of people's minds. Recent advancements have encouraged personalized nutrition and an increased purchasing power in developing countries. Four mega-trends were examined: preference for healthy food, growing interest in nutrition and 'beyond dieting', access to technology, and people craving unconventional eating experiences. These technological and consumer factors are expected to influence ongoing and potential future directions and emerging trends [56].

The impact of climate change is an obvious area where several of the above fields are expected to be intertwined. A projection of 7.9 billion people by 2030 is expected to increase the demand for food, and many of these common crops are being affected. Nutritional and health practices are required to adapt to these changes and new modifications through genetics and farming practices. This alludes to more research in nutrient capitalization and 'new foods' immune to disease. There are many new fields of inquiry emerging over time, particularly through the global crises currently present. Emerging areas in food and nutrition research at the time of publishing included: nutrigenomics and nutrigenetics, functional foods, nutrition policy, tailored nutrition, dietary adherence, and nutrition and the aging brain [57].

Research arising in recent years includes sustainable nutrition in this list, followed by climate-smart agriculture in the circular economy, indigenous food systems, and resilience. Given a long career in nutrition, health, and research, two skills are pivotal, considering the likelihood of new currents, whether in health or the environment. The ability to draw parallels between sciences may ensure that the knowledge in nutrition is retained, even if the overall background remains altered. The possibility of distinctly merging this knowledge is also present. Consultations where higher knowledge of the environment is integrated may be more useful. Furthermore, the literature features increasing amounts of research by environmental and agricultural academics with an interest in nutrition. Collaborations across disciplines are likely to increase and could encourage new, expanded public health measures and guidelines, even closer to policymakers. A proactive inclusion of the social and environmental determinants of nutrition-related health can be suggested and led by united guidance from researchers and practitioners in diverse fields that access traditional and modern scientific theory and measures [20].

### **14. Conclusion**

The points presented in this review draw attention to the complex and interconnected relationships between nutrition, good health, and environmental sustainability. Research shows that the choice of food can have a significant impact on environmental health through a diet's carbon footprint. Further, consumers will make choices about their food based on their perceptions of the impact on their health and that of their families. It is a complete circle that must be considered when food, nutrition, and the environmental impact of these disciplines are discussed and taught. The world we live in today

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necessitates that the next generation of professionals be prepared to address the complete food system in the near-term future, including cultural and economic influences, education, policy, and the science, technology, engineering, and math principles that will carry us forward into the future. With that in mind, the mentioned points provide a brief overview of topics related to education, philosophy, policy, and practice that have been highlighted in this probe. Evidence shows that modern food production and consumption practices simultaneously harm human health and destabilize the planet's life-support systems, yet a comprehensive understanding of these interdependencies remains limited. Existing efforts to optimize food systems often fall short because they fail to integrate both health and environmental perspectives. Taken together, the evidence highlights that sustainable nutrition is not only a dietary objective but a comprehensive framework requiring shifts in behavior, education, and professional practice. As the following section will explore, achieving these goals depends heavily on the capacity of food and nutrition professionals to translate sustainability principles into practical guidance for consumers and communities. Strengthening educational systems, integrating sustainability into curricula, and preparing the next generation of practitioners are therefore essential steps in ensuring that future dietetic interventions promote both human health and environmental integrity. This transition underscores the need for continuous learning, adaptive policy development, and collaborative engagement, setting the stage for a deeper examination of how nutrition education and professional training must evolve to meet emerging global challenges.

The concept of nourishing, sustainable diets emerges as a key strategy, as it promotes the dual goals of supporting individual health and protecting ecosystem integrity. These diets also introduce practical sustainability tools that can strengthen the professional capacity of dietitians. Collectively, the findings underscore the need for enhanced educational and behavioral frameworks that prepare future dietetic practitioners to address the multidimensional challenges of the food system. Overall, the body of evidence calls for more holistic, informed, and sustainability-driven approaches in dietetics, supported by ongoing qualitative research to refine professional practices and guide effective interventions.

In conclusion, as dietary intake can affect the health of bodies and the environment, it is important that consumers make informed choices about the foods they eat. This approach will necessitate that appropriately trained food and nutrition professionals and other healthcare personnel are prepared to help guide consumers in this process. Organizations involved in training food and healthcare professionals will need to lead the way as designers and implementers of curricula that include information about educated and sustainable dietary practices for healthy people on a healthy planet. As with any knowledge base, the information on the topic of sustainable diets and dietetics will change over time, with attention given to what research regarding these topics identifies. Hence, the topic of education, policy, and practice will always be an ongoing discussion until all countries achieve a food system that supports a sustainable planet and benefits human health. As future professionals are being trained, it is equally important to recognize the value of learning from them, especially as society confronts growing environmental challenges. The next generation of leaders in the field of sustainable nutrition will continue to evolve our thinking with their research.

#### **Author's Contribution**

It is hereby confirmed that all listed authors have read and approved the manuscript. Each author has contributed equally to the work, and the order of authorship has been reviewed and approved by all contributors.

#### **Conflict of Interest**

The authors declare that they have no conflicts of interest related to this paper.

#### **Acknowledgment**

No acknowledgments to declare.

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## Use of AI tool Declaration

The authors declare that any AI tools used in the preparation of this manuscript were limited to language and readability improvement only, and were not used to generate scientific content, data, analyses, or conclusions, with full responsibility retained by the authors.

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