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Review

Promoting Sustainable Diets Through Food-System Transformation: Policy and Governance Across Distinct National Contexts

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Abstract

Background/Objectives: Translating policy commitments to sustainable diets into effective implementation and measurable outcomes remains challenging. This review examines policy approaches and governance arrangements relevant to sustainable diets, with particular attention to implementation conditions, available evidence, and differences across national contexts with Bangladesh and Poland examined as illustrative cases. Methods: A structured narrative review synthesised 110 publications identified through searches of Web of Science and Scopus and supplementary identification methods. Selected policy documents informed the country-specific analyses. The synthesis covered five analytical themes: governance and policy coherence; nutrition-sensitive and climate-resilient agriculture; healthy food environments and consumer-oriented policies; environmental sustainability and food-system resilience; and monitoring, evaluation, and adaptive learning. Results: Evidence indicates that in order to promote sustainable diets successfully, attention must be paid to implementation conditions. Further emphasized should be the effectiveness of recurring enabling conditions that include policy coherence, institutional capacity, financing, and stakeholder participation. Selected agricultural and food-environment interventions show potential benefits for nutrition and nutrition-related inequalities, while environmental and longer-term outcomes were less consistently assessed. Bangladesh has established explicit multisectoral planning mechanisms but faces constraints in financing, coordination, local implementation, and dietary affordability. Poland operates within an extensive EU–national regulatory and financing framework, yet sectoral fragmentation and documented gaps in implementation and monitoring persist. Conclusions: The reviewed evidence reveals uneven availability of policy evaluations, with reported benefits for selected interventions but limited evidence on broader food-system outcomes. The Bangladesh–Poland comparison illustrates that implementation gaps persist under contrasting governance arrangements, although the nature of institutional, financial, and local implementation constraints differs between the two contexts. These findings highlight the need for context-sensitive evaluation of existing policies, linking their implementation to nutritional, environmental, and distributional outcomes.

Keywords: sustainable diets; sustainable food systems; food-system transformation; food-system governance; nutrition-sensitive agriculture; climate resilience

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1. Introduction

Food systems have changed rapidly under the combined influence of globalisation, urbanisation, economic development, technological change, and increasingly concentrated food markets. These changes have expanded the availability and consumption of ultra-processed foods and contributed to nutrition transitions and diet-related non-communicable diseases [1,2]. At the same time, food systems face pressures from climate change, biodiversity loss, natural-resource depletion, demographic change, and persistent socioeconomic inequalities [3,4]. These interacting challenges have shifted policy attention beyond agricultural output towards the capacity of food systems to provide diets that are healthy, environmentally sustainable, affordable, safe, culturally acceptable, and socially equitable [4–7]. Food-system transformation therefore requires coordinated changes in production, value chains, food environments, consumption, and governance rather than reliance on individual behaviour alone [8,9].

Several international initiatives have framed food-system transformation and sustainable healthy diets as contributing to multiple Sustainable Development Goals [4,10,11]. These include the 2030 Agenda for Sustainable Development [10], the 2021 United Nations Food Systems Summit [11], the FAO and WHO guiding principles for sustainable healthy diets [7], and the 2025 EAT–Lancet Commission on healthy, sustainable, and just food systems [4]. Although these initiatives differ in legal status and evidentiary basis, they converge in calling for action beyond production-oriented agricultural policy, including changes in food environments, value chains, governance, access to nutritious foods, and environmental management. They should therefore be treated as strategic frameworks and scientific guidance rather than as evidence that national implementation has occurred [4,7,10,11].

Broad international agreement on the need for food-system transformation coexists with fragmented governance, weak institutional coordination, inconsistent implementation, and limited integration of agricultural, nutritional, environmental, and economic objectives [12–15]. Policy design must therefore reflect national socioeconomic conditions, institutional capacity, agricultural structures, climate vulnerability, and food cultures. Modelling also indicates that the transitional costs and benefits of healthier diets are unevenly distributed: emerging and developing economies may face greater short-term affordability and water-use pressures than advanced economies, even when longer-term outcomes improve [16]. Evidence from different national contexts is valuable for understanding how common sustainability goals are translated into policy under differing socioeconomic and institutional conditions and where tensions and trade-offs may emerge.

This review examines the policy experiences of Bangladesh and Poland as illustrative cases of how shared sustainability goals are addressed in different national settings. Bangladesh, a lower-middle-income country highly exposed to climate-related hazards, has progressively incorporated nutrition-sensitive agriculture, climate adaptation, and multisectoral coordination into its food policy agenda, while food security, access to affordable and nutritious diets, and rural livelihoods remain central priorities [17–19]. Poland, by contrast, is a high-income EU Member State whose agri-food system has followed a different historical trajectory [20] and whose current policy is shaped by the Common Agricultural Policy and broader EU sustainability frameworks [20–23]. The comparison considers policy priorities, governance arrangements, and implementation challenges documented in the reviewed sources; neither country is treated as representative of a wider economic or geographical group. Existing reviews frequently address individual dimensions of food-system transformation, while fewer studies integrate policy instruments, governance, implementation, and multidimensional monitoring [8,24,25].

Existing studies and reviews have examined nutritional, environmental, and institutional aspects of food-system transformation, including integrated conceptual frameworks and analyses of policy approaches [25–27]. However, these contributions differ in their analytical focus and the types of evidence they provide. A central challenge is therefore to examine how policy interventions, governance arrangements, implementation conditions, and monitoring can be considered together while distinguishing policy recommendations, governance processes, modelled projections, and observed outcomes.

Two considerations are particularly relevant to the present review. First, policy recommendations and analyses of policy design should not be interpreted as evidence of implementation or effectiveness, especially since evidence of policy effectiveness remains uneven for environmental outcomes and food-supply-chain interventions [28,29]. The available literature draws on heterogeneous methodological approaches and addresses different stages of the policy process. For example, analyses of policy commitments, indicator frameworks, and stakeholder perspectives provide valuable insights into policy design and implementation conditions but do not necessarily demonstrate improvements in dietary or environmental outcomes [27,30,31]. Second, the feasibility and implementation of food-system policies depend on national and local conditions, including institutional mandates, financing, cross-sectoral coordination, and market structures [14,32]. Global recommendations therefore require context-sensitive interpretation rather than direct application across settings with different socioeconomic and institutional characteristics [25,33]. Furthermore, research planning in South Asia has identified major blind spots in evaluating this process, particularly regarding family-level food decisions, adolescent diets, farmer-to-market connections, and long-term tracking [34].

Against this background, the present review synthesises evidence on policy instruments, governance mechanisms, implementation conditions, and approaches to monitoring food-system transformation. Particular attention is given to the relationships between agricultural production, food value chains, food environments, and the institutional arrangements supporting policy implementation. Bangladesh and Poland are examined as illustrative national contexts to explore how sustainability-related policy priorities and implementation constraints differ across socioeconomic and governance settings. The comparison is used to identify potentially transferable governance mechanisms and policy design principles while retaining explicit limits on cross-country generalisation.

To address these issues, this review is guided by the following research questions:

1. How are sustainable diets conceptualised within the broader literature on food-system transformation, and how are they linked to food-system policy objectives?
2. Which policy instruments, governance mechanisms, and implementation conditions are identified in the literature as relevant to promoting sustainable diets and food-system transformation, and what forms of evidence support their reported contributions?
3. How are sustainable diet and food-system transformation objectives reflected in the policy priorities and governance arrangements of Bangladesh and Poland, and what context-specific implementation constraints can be identified?

The remainder of the paper is organised as follows. Section 2 describes the review methods. Section 3 presents the conceptual foundations of sustainable diets and food-system transformation. Section 4 examines global policy approaches and governance mechanisms. Sections 5 and 6 analyse the policy landscapes of Bangladesh and Poland, and Section 7 considers them across selected policy and governance dimensions. Section 8 synthesises the findings, Section 9 presents policy recommendations and research priorities, and Section 10 concludes the review.

2. Methods

2.1. Review Design

This study synthesizes evidence on policy approaches for promoting sustainable diets and food-system transformation through a structured narrative review. Additionally, the policy experiences of Bangladesh and Poland are examined as illustrative national contexts. Two complementary pathways were followed for literature search. First, a general literature search was carried out to identify evidence related to sustainable diets, food-system transformation, policy, and governance. Second, a country-specific search was designed to capture additional literature relating to Bangladesh and Poland. This structured narrative review was considered appropriate because the pool of literature comprises heterogeneous evidence, such as conceptual papers, empirical studies, systematic and narrative reviews, policy analyses, official policy documents, and scholarly book chapters. Such heterogeneity in the literature precluded quantitative pooling. However, this heterogeneity allowed a thematic synthesis of policy instruments, governance arrangements, implementation mechanisms, and monitoring approaches [35–37].

2.2. Literature Search Strategy

The Web of Science Core Collection and Scopus were utilized for conducting the literature search because of their complementary journal coverage, which was suitable for identifying literature across food science, nutrition, agriculture, sustainability, environmental science, economics, and public health [38,39].

The following Boolean search expression was used for the general literature search in both databases: (“sustainable diet” OR “sustainable food system”) AND (“food policy*” OR governance* OR “policy instrument*”) AND (“food system transformation*” OR “sustainability transition*”). The search retrieved 80 records from Web of Science and 110 records from Scopus, yielding 190 records before the identification of duplicate records across the two databases. Second, a country-specific search pathway was used to identify additional literature relating to Bangladesh and Poland. The Boolean search expression was: (Bangladesh OR Poland) AND (“sustainable food system” OR “sustainable diet” OR “food system sustainability”) AND (policy* OR governance*). This search identified 14 records in Web of Science and 20 records in Scopus, yielding 34 country-specific records before duplicate checking between databases. The general search constituted the primary literature-search pathway, whereas the Bangladesh–Poland search served as a complementary country-specific pathway.

Finally, seventy-two duplicate records were removed from the 190 general-search records, leaving 118 unique general records. Twelve duplicate records were removed from the 34 country-specific records, leaving 22 unique country-specific records. Overall, 224 database records were retrieved, of which 84 duplicate copies were removed, resulting in 140 unique records. Only English-language publications were considered. No restriction was imposed on study design because conceptual studies, empirical research, systematic and narrative reviews, policy analyses, comparative studies, and relevant scholarly book chapters were considered appropriate for addressing the review objectives. The detailed literature search strategy, including the specific databases, Boolean search strings, and eligibility criteria, is outlined in Table 1.

Table 1. Literature Search Strategy, Keywords, and Eligibility Criteria.

Category	Description/Search Strings	Rationale & Yield
Databases Searched	Web of Science (Advanced Search), Scopus	Provides comprehensive, multidisciplinary coverage of high-impact food-system, policy, and environmental governance literature.
Search Pathway 1: General/Global Focus	("sustainable diet*" OR "sustainable food system*") AND ("food policy*" OR governance* OR "policy instrument*") AND ("food system transformation*" OR "sustainability transition*")	Rationale: Captures the broad intersection of systemic food sustainability, formal institutional action, and transformative transitions. Yield: 190 total records (WoS: 80; Scopus: 110).
Search Pathway 2: Country-Specific Focus	(Bangladesh OR Poland) AND ("sustainable food system*" OR "sustainable diet*" OR "food system sustainability") AND (policy* OR governance*)	Rationale: Captures targeted literature focusing on the specific institutional, environmental, and socio-economic realities of the illustrative case studies. Yield: 34 total records (WoS: 14; Scopus: 20).
Inclusion Criteria	Peer-reviewed research articles and comprehensive reviews; English language; published from 2015 onward; explicit focus on systemic food policy, governance, or multi-sectoral transformations.	Ensures high-quality, contemporary evidence aligned with the post-SDG (2015) policy era and the modern global governance landscape.
Exclusion Criteria	Editorials, letters, short notes, study protocols, and conference abstracts; studies with a narrow technical, clinical, agronomic, or localized behavioral focus lacking broader systemic policy scope.	Excludes publications lacking substantive analytical evidence or those disconnected from systemic policy and governance mechanisms.

2.3. Study Selection and Eligibility Criteria

The 140 unique records were screened based on their titles, abstracts, keywords, document type, full texts and relevance to the predefined review questions and thematic scope. These unique records were classified into three categories: core, supplementary, and excludable. Relevance screening identified 49 records as core evidence, 61 as supplementary evidence, and 30 as excludable. Following the exclusion of these 30 records, 110 records were retained in the evidence pool for potential use in the thematic synthesis. Core evidence comprised publications directly addressing the review's central questions concerning sustainable diets, food-system transformation, policy instruments, governance, implementation, or monitoring while supplementary evidence comprised eligible publications providing narrower thematic, contextual, country-specific, conceptual, or supporting evidence. Publications focused narrowly on technical production or engineering issues without a wider food-system or policy perspective were excluded. Moreover, conference papers or abstracts, letters, editorials, errata, news items, and other publication types lacking substantive analytical evidence relevant to the review questions were also excluded. Only perspective and conceptual policy articles were retained when they contributed directly to sustainable framework development or governance analysis.

Official policy documents were identified through targeted searches of government, European Union, United Nations, FAO, WHO, and institutional repositories and were used to verify policy content, dates, legal status, and formal governance arrangements. These official policy documents were treated as supplementary documentary sources and were not included in the database-record counts reported in Figure 1. Reference details and web addresses were checked against the issuing institution or the publication's DOI record where available.

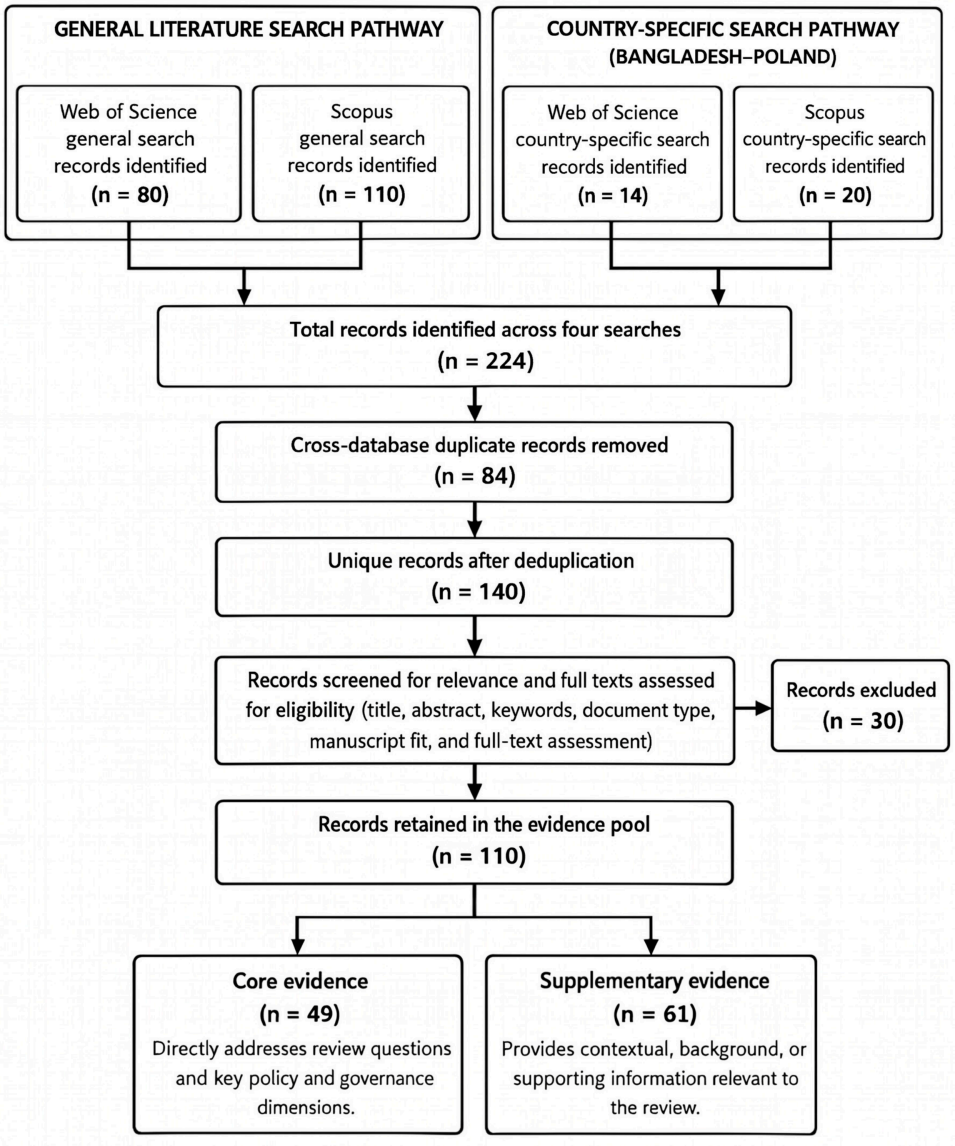


Figure 1. Literature Search, Deduplication, and Relevance-Screening Workflow.

2.4. Evidence Extraction and Data Synthesis

A literature-extraction and screening matrix was used to record bibliographic information, source database and search pathway, study design, geographical scope, document type, policy level, theoretical perspective, policy instrument or governance mechanism, sustainability dimension, principal findings, implementation conditions, reported trade-offs, evidence classification, and relevance to Bangladesh, Poland, or the cross-context framework. To ensure transparency and structural alignment with the five analytical themes, all 110 retained records were systematically compiled into a supplementary database (Supplementary Table S1). Each study was extracted and classified based on the following pre-defined criteria: (1) Document Type (e.g., conceptual framework, empirical evaluation, policy document); (2) Policy Instrument/Governance Mechanism, identifying the specific intervention evaluated (e.g., fiscal measure, procurement, multi-stakeholder platform); (3) Thematic Category, classifying studies according to their primary analytical focus; and (4) Principal Findings/Documented Trade-offs, summarizing the reported outcomes, implementation barriers, or socio-economic tensions. Evidence type was retained during synthesis so that conceptual recommendations, modelled scenarios, policy-content analyses,

implementation studies, and outcome evaluations were not treated as equivalent forms of evidence [37]. The evidence was organised into themes covering sustainable-diet concepts, food-system transformation, governance and policy coherence, policy instruments, nutrition-sensitive and climate-resilient agriculture, food environments, resilience, monitoring, and national policy experience. The synthesis compared policy content, implementation arrangements, contextual conditions, and reported evidence gaps. Particular attention was paid to whether a source documented a policy commitment, analysed implementation, modelled a possible outcome, or evaluated an observed outcome.

3. Results

3.1. Conceptual Foundations: Sustainable Diets and Food Systems

3.1.1. Sustainable Diets as a Multidimensional Concept

The sustainable-diet concept integrates health and nutrition with environmental, economic, social, and cultural considerations. Sustainable diets are expected to be nutritionally adequate, safe, affordable, culturally acceptable, protective of biodiversity and ecosystems, and compatible with the efficient use of natural and human resources [5–7]. Food-systems research further highlights the interdependence of environmental conditions, food-system activities, dietary quality, and nutrition outcomes [40]. Because diets are both outcomes and drivers of food systems, their promotion involves addressing food availability, affordability, marketing, production incentives, and institutional governance, rather than reliance on individual choice alone [6,8].

Environmental improvement does not automatically guarantee nutritional adequacy. Dietary scenarios can reduce selected environmental pressures while creating affordability and nutritional trade-offs, particularly in emerging and developing economies [16,41]. A case study of an intensive agricultural system supplying European markets highlights cross-scale trade-offs between expanding healthy diets and pressures on production regions, including resource, labour, and governance challenges [42]. Recent global evidence highlights the need to consider both the cost and the climate impact of healthy diets when designing policy [16,43]. The implications of reducing animal-source food consumption depend on baseline dietary patterns, the types of foods being reduced or replaced, and population-specific nutritional needs, particularly where micronutrient deficiencies and limited dietary diversity remain prevalent [4,16]. The 2025 EAT–Lancet Commission likewise presents its reference diet as adaptable to nutritional needs, food cultures, and local conditions rather than as a uniform prescription [4].

Economic accessibility is a major constraint on dietary transitions, particularly where recommended dietary changes increase household food expenditure relative to available resources [44,45]. Modelled evidence suggests that dietary transitions may generate long-term improvements but impose short-term affordability burdens in a number of emerging and developing economies [16]. These findings highlight the importance of considering food-environment interventions alongside income support, targeted subsidies, school feeding, or other social-protection measures, depending on the context.

Sustainable food-system transformation also raises questions of distributional, procedural, and recognitional justice [46]. Benefits, costs, risks, and participation opportunities may be distributed unevenly across consumers, farmers, workers, women, indigenous communities, and other groups. Cross-country analyses of food-system transitions indicate that improvements in dietary affordability have not necessarily been accompanied by comparable improvements in nutrition, environmental sustainability, inclusion, and equity [47]. A case study from Bolivia shows that formal participation does not necessarily eliminate hidden or structural power imbalances [48].

Overall, the multidimensional concept of sustainable diets combines health and nutrition with environmental sustainability, affordability, cultural acceptability, social equity, and justice. Ethical considerations, particularly those concerning equity and participation, are therefore relevant to assessing the trade-offs associated with food-system transformation [49].

3.1.2. Food Systems: Interactions, Trade-Offs, and Assessment

Food systems encompass activities and actors involved in production, processing, storage, distribution, retail, consumption, and waste management. Their trajectories are shaped by climate change, globalisation, demographic and technological change, governance, infrastructure, market concentration, and consumer demand [2,50,51]. Available food-system assessments remain constrained by uneven indicator coverage and data availability across sustainability dimensions and system activities [52,53].

Food systems are dynamic socio-ecological systems characterised by interactions, feedbacks, and trade-offs. Food-system interventions may generate trade-offs across nutritional, environmental, and socioeconomic objectives, so that assessments based on individual performance dimensions are insufficient [29]. True Cost Accounting (TCA) has emerged as an approach to assessing environmental, health, social, and economic externalities in agrifood systems, although its methodological application remains insufficiently standardised [54]. Cross-country analyses accordingly caution against interpreting progress in one dimension as evidence of overall sustainability [47,55]. Policy assessment should therefore consider the affected groups, anticipated synergies and trade-offs, and the indicators required to monitor unintended consequences [28,29].

Gustafson et al. proposed seven metrics of sustainable nutrition security: nutrient adequacy, ecosystem stability, food affordability and availability, sociocultural well-being, food safety, resilience, and food loss and waste [56]. Subsequent multidimensional assessments have applied related indicator-based approaches to compare food-system sustainability across countries [52,55]. Other indicator frameworks similarly combine environmental, social, nutrition, and economic dimensions but reveal trade-offs between conceptual coverage and data availability [52,53]. A recent scoping review proposes an integrated framework linking environmental, economic, social, and food-security-and-nutrition dimensions with FAO transformation pathways and SDG priorities [57]. Although these frameworks broaden the scope of food-system assessment, their practical utility depends on the availability, comparability, and policy relevance of indicators. Consequently, the selection and interpretation of food-system indicators need to reflect differences in data availability, institutional capacity, and national policy priorities. Global recommendations therefore require context-sensitive interpretation, particularly where upstream commercial and financial drivers, local research capacity, and implementation resources receive insufficient attention [25]. The following section examines governance and sustainability transition processes as cross-cutting considerations in food-system transformation.

3.2. Sustainability Transitions and Food-System Governance

3.2.1. Food-System Transitions: Systemic Change, Lock-In, and Contested Pathways

Sustainability-transition research conceptualises change as a long-term reconfiguration of production, technologies, institutions, markets, practices, and social values [58]. In food systems, however, nutrition objectives have not always received sufficient attention in transition research emphasising agricultural production or technological change [8]. Accordingly, a systemic transition requires coordinated changes across production and consumption, together with governance arrangements capable of addressing power, lock-in, and interacting barriers [9,15,59]. Combining foresight and transition theory, Lorenz et al. found that existing EU policies lack internal coherence, that incremental reform of

the Common Agricultural Policy is insufficient for transformation, and that just-transition governance remains underdeveloped [60].

Transition pathways are also contested: analysis of European agri-food research and innovation identifies competing sociotechnical imaginaries and calls for participatory technology assessment to prevent technology lock-in [61], while historical analysis shows that earlier innovation-driven transformations produced negative social and environmental outcomes [62]. Land tenure, access, and property relations have also been identified as structural factors that may enable or constrain food-system transformation [63]. Long-term progress depends on governance that can coordinate sectors, reconcile objectives, mobilise resources, and adapt interventions as evidence changes [12,32]. Halbe and Pahl-Wostl [64] propose a methodological framework that helps initiators of transition processes either facilitate and coordinate existing initiatives or set new impulses through purposeful intervention. In agroecosystems, adaptive governance also involves managing plural values and the allocation of landscape costs, rights, and benefits [65], and open questions remain about the roles of key actors, the formation of actor coalitions, and resistance to change in food-system regimes [66]. Such challenges are documented in several low- and middle-income contexts, where nutrition objectives may remain weakly integrated into agricultural and economic policy and where administrative and financial constraints affect implementation [14,25,67]; the Polish case (Section 6) shows that they are not confined to these settings.

3.2.2. Governance as the Foundation of Food-System Transformation

Governance provides the institutional arrangements through which broad sustainability objectives are translated into policy mixes and implementation. A scoping review of food-systems governance frameworks identifies contrasting governance, democracy, ideology, and transformation paradigms, providing a typology for analysing social-change pathways [68]. Policy coherence does not mean eliminating all tensions; it requires identifying interactions among agricultural, nutrition, health, environmental, trade, and social objectives and managing unavoidable trade-offs transparently. Practice-theoretical analysis of integrated food policymaking in two German cities shows that examining day-to-day policy practices can reveal early practical opportunities and barriers to policy integration [69]. Five recurring challenges are the construction of a shared policy frame, specification of goals, inclusion of relevant sectors and levels, selection of an appropriate degree of integration, and design of a consistent instrument mix [12]. Comparative analysis of food-policy agenda setting in Finland and Sweden suggests that policy processes may fall short of transformative potential when directionality and reflexivity are insufficiently addressed [70].

Food-system governance operates across global, regional, national, and local levels. Recent governance analysis argues that food-system partnerships must address incumbent power relationships if they are to enable transformative change [71]. Actor mapping in Dortmund indicates that local food-system transformation depends on relationships among civil-society and municipal actors, with coordination, financing, participation, visibility, and networking identified as key factors [72]. Local-policy research in Spain identifies tensions between municipal and regional powers, agricultural and food policies, and rural and urban territories as constraints on multilevel agro-food governance [73]. Agroecology living labs provide another example of science–policy–society collaboration in addressing local governance challenges [74]. Participatory scenario work in Berlin-Brandenburg shows how co-creation among academic and non-academic actors can link dietary choices with agricultural land-use capacity and generate policy-relevant knowledge [75]. A Tuscany case study examines how local food governance may be scaled through a regional participatory multi-stakeholder platform [76]. These studies highlight challenges in connecting policy objectives and governance arrangements across levels and actors, including linkages between

food production and consumption [77]. Multilevel governance therefore requires clear mandates, vertical coordination, information exchange, and mechanisms that connect national strategies with local delivery.

Participatory governance can improve problem definition, legitimacy, knowledge exchange, and implementation, but participation alone does not remove differences in power or incentives [46]. Practice-informed research on agroecological transitions further emphasizes the need to embed distributional, procedural, and recognitional justice into food and land-system governance [78]. A case study of the Fort Portal Food Change Lab suggests that local civil-society-led multi-stakeholder platforms can strengthen inclusiveness and horizontal linkages but have limited capacity to transform food systems alone [79]. Evidence from 89 multi-stakeholder platforms suggests that they can improve boundary spanning, adaptability, and learning, but may have limited capacity to shift system narratives or deliver transformation on their own [80]. Cross-sectoral policy action is more likely to progress when institutional mandates, incentives, shared framing, long-term engagement, and opportunities for policy learning are present [32]. Transparency and safeguards against conflicts of interest remain necessary, particularly where private actors possess substantial market and political power [1,48].

In some low- and middle-income settings, fragmented responsibilities, limited budgets, uneven local administrative capacity, and weak monitoring constrain implementation. Analysis of Indian food-policy budgets illustrates that sustainability objectives may be present in policy documents but concentrated in instruments with comparatively small budget allocations [14]. Formal inclusion of sustainability language should therefore not be equated with institutional priority or implementation capacity.

Research on food-system governance also highlights asymmetries in stakeholder influence and their implications for policy processes [81]. Large food companies and organised industry groups can influence food-policy agendas and decisions, raising questions about transparency, representation, and conflicts of interest [81,82]. Similar concerns arise in multi-stakeholder initiatives, where participation does not necessarily imply equal influence among corporations, local communities, civil-society organisations, and representatives from lower-income countries [83]. Critiques of the governance arrangements surrounding the 2021 UN Food Systems Summit have raised concerns about corporate influence, accountability, and the representation of different stakeholder interests [84].

Fragmentation also remains a challenge for policy integration and implementation. Studies identify constraints on translating broad food-policy objectives into action, including limited resources, weak communication, and competing economic, social, and environmental priorities [26,33]. Assessing food-system governance therefore requires attention not only to formal coordination and participatory arrangements, but also to power relations, accountability, policy coherence, and evidence of implementation.

4. Global Policy Approaches for Promoting Sustainable Diets and Food-System Transformation

4.1. International Policy Frameworks for Sustainable Diets and Food-System Transformation

Sustainable healthy diets are recognised in several international policy and scientific frameworks. The FAO and WHO guiding principles integrate health, environmental impact, affordability, accessibility, safety, and sociocultural acceptability [7], while the 2025 EAT–Lancet Commission places particular emphasis on justice and food-system transformation [4]. These frameworks provide normative and scientific guidance but do not prescribe an identical national policy package. The 2030 Agenda situates food-system objectives across multiple SDGs [10] and the 2021 UN Food Systems Summit promoted cross-sectoral national pathways and commitments [10,11]. Their relevance to policy review lies in framing

interdependence among food security, health, inequality, production, climate, biodiversity, and institutions. A review of African food security emphasises rights-based approaches, governance, accountability, land tenure, gender equality, nutrition, and sustainable agriculture as interconnected equity concerns [85]. Evidence on implementation must nevertheless be drawn from national policies and evaluations rather than inferred from participation in global initiatives. Resilience to climate-related disasters, health emergencies, conflict, price volatility, and supply-chain disruption has become a prominent policy objective. Relevant strategies discussed in the literature include diversification, redundancy, flexible logistics, social protection, local response capacity, and monitoring systems that detect emerging risks [86,87]. Resilience should not be reduced to the ability to restore previous system functioning when that system produced poor nutrition, inequity, or environmental harm [9,86,87]. International frameworks increasingly recognise that food insecurity is shaped not only by aggregate food availability but also by poverty, unequal access, gendered constraints, social exclusion, and power relations. Policy priorities in this context include affordable access to nutritious foods, protection of smallholder and worker livelihoods, women's agency, inclusive decision-making, and rights-based safeguards [47,48,88]. The way these objectives are prioritised and implemented varies with national institutions, vulnerabilities, and available resources [25].

4.2. Policy Instruments for Promoting Sustainable Diets

Governments use combinations of regulatory, fiscal, informational, procurement, agricultural, and social-protection instruments to influence food supply chains and food environments. The ACTIONABLE Framework identifies policy entry points by distinguishing food-system activities, outcomes, and drivers and links those entry points to regulatory, market-based, behavioural, and information-based interventions [89]. Research on Dynamic Food Procurement in English school meals illustrates the potential of digital procurement to support local sourcing, while identifying barriers related to entrenched commercial practices, policy inconsistency, and legal complexity [90]. A review of ultra-processed foods argues that conventional food-policy approaches often target isolated prices, labels, or product attributes while under-addressing deeper system structures and paradigms [91]. Evidence does not support assuming that a single instrument will simultaneously improve nutrition, equity, and environmental sustainability. A scoping review of 196 reviews identified triple-duty potential for sustainable agricultural practices and school-food programmes, while multi-component interventions showed particular promise for improving nutrition and reducing nutrition-related inequalities. Evidence concerning environmental outcomes and food-supply-chain policies remained limited [28]. Expert prioritisation likewise identified potential synergies and trade-offs that require contextual design and monitoring [29]. Food labelling, front-of-pack warnings, sustainability claims, and certification can improve information and sometimes stimulate product reformulation. Their effects, however, vary by label design, literacy, socioeconomic position, product availability, and the surrounding food environment. Labelling should therefore be treated as one component of a broader policy mix rather than as a substitute for fiscal, regulatory, procurement, or access-oriented measures [28,92]. Public food procurement can use the purchasing power of schools, hospitals, universities, and other institutions to influence meal quality, production standards, and market access. Public procurement has been examined as a potential food-system transition instrument, with attention to actor networks, implementation barriers, and brokerage relationships within procurement systems [93]. A systematic review found that procurement research frequently assumes sustainability benefits but rarely evaluates outcomes consistently across environmental, social, economic, and health dimensions [94]. Procurement standards should therefore specify measurable criteria and be accompanied

by implementation support, supplier engagement, and monitoring. Evidence from policy reviews suggests that school-food programmes can have double- or triple-duty potential, although poorly designed provision may also increase food waste [28]. Retrospective evidence from high-income countries shows that nutrition policies have often relied on education and voluntary action while making less use of regulatory and economic instruments [92]. Multi-component interventions generally produce more consistent effects than information-only approaches [28]. Food safety is a necessary component of sustainable food systems. Regulatory frameworks, including those established within the European Union, address hygiene, traceability, official controls, food information, inspection, and quality assurance [95–99]. In lower-middle-income settings, compliance with food-safety requirements may place substantial technical and financial demands on small-scale producers and public authorities. Policy design should therefore consider how enforceable standards can be supported by laboratory capacity, inspection, extension, infrastructure, and proportionate support for compliance [57,67,99]. Overall, regulatory measures are more likely to influence behaviour when they are combined with changes in the decision context, public investment, and supportive governance. An umbrella review found that information-based interventions commonly improve awareness but are insufficient on their own; defaults, portion changes, feedback, and other contextual interventions show promise, although long-term and observed-behaviour evidence remains limited [100]. Instrument choice should therefore reflect the target behaviour, affected population, institutional capacity, and risk of unintended distributional effects.

4.3. Agricultural and Food-System Policies for Sustainable Transformation

Agricultural policy shapes whether food systems can jointly support livelihoods, nutrition, environmental sustainability, and resilience. Policies may promote diversification, resource-use efficiency, agroecology, climate-resilient practices, research, extension, and rural infrastructure [9,50,67]. These approaches require attention to market access, farmer incentives, labour, risk, and nutritional demand rather than focusing solely on yields [9,50,67]. A scoping review identifies sustainable agricultural practices as potentially contributing to multiple nutrition and sustainability objectives, while highlighting limitations in the available evidence on environmental outcomes [28]. Organic agriculture is one policy option within broader strategies for sustainable farming. It is supported through certification, financial incentives, advisory services, procurement, and market-development measures [101,102]. As with local food chains, whose sustainability relative to global chains depends on the context and criteria assessed [103], organic certification should not be treated as a universal proxy for sustainability. Evidence from Warsaw indicates that organic-food consumption may be associated with other sustainable food-related behaviours, but this cross-sectional association does not establish policy effectiveness or national representativeness [104]. Agricultural diversification may reduce dependence on a limited range of crops and contribute to and improve the availability of fruits, vegetables, pulses, and other nutrient-dense foods. Its nutritional effects are not automatic: they depend on access to markets, storage, extension, women's control of resources, prices, and whether diversified production translates into household consumption [50,67]. Diversification should therefore be considered within nutrition-sensitive value chains and evaluated against livelihood, environmental, and dietary outcomes [28,50,67]. Food-system policy also encompasses storage, cold chains, processing, transport, retail, and logistics. Investments in these components may reduce post-harvest losses and improve access but can also accelerate the availability of inexpensive ultra-processed foods when nutrition objectives and market governance are weak [1,105]. Value-chain modernisation should therefore be assessed for its effects on dietary quality, small-enterprise participation, food loss and waste, emissions, and afford-

ability [1,105,106]. Multimodel scenario analysis suggests that combining healthier diets, productivity improvements, and halved food waste could substantially restructure global agriculture by 2050 [107]. Research on food loss and waste further highlights the importance of assessing its implications for food-system policies [106]. In lower-middle-income countries, agricultural transformation is frequently constrained by finance, extension capacity, infrastructure, market access, and exposure to climate and price shocks [18,25,67]. Consequently, sustainable intensification, agroecology, diversification, climate adaptation, value-chain development, and food-loss reduction should be treated as context-dependent components of a wider policy mix rather than as universally applicable solutions [25,67]. Recent policy analysis argues that low-carbon food-system transformation may require combinations and sequencing of harder and softer policy tools rather than reliance on a single instrument [108], while a broader review highlights the need to address agricultural disruption, food loss and waste, distribution, and governance within climate-related transformation strategies [109].

4.4. Governance and Institutional Policies for Sustainable Food-System Transformation

Effective food-system governance requires more than the coexistence of sectoral policies. It requires mechanisms for identifying conflicts among agricultural, nutrition, health, environmental, trade, and social objectives and for developing a coherent mix of instruments [12]. Policy coherence should therefore be assessed in relation to institutional mandates, budgeting, implementation, and observed interactions among policy instruments rather than inferred from broad strategy language. Cross-sectoral coordination is particularly important because relevant authority is distributed across agriculture, health, education, environment, trade, finance, and social protection [110]. Comparative policy research identifies supportive mandates, incentives, shared framing, engagement platforms, long-term relationships, and ongoing learning as important enablers of cross-sectoral nutrition action [32]. Budget analysis also shows that formal coordination can remain weak when sustainability objectives receive limited resources [14].

Stakeholder participation can contribute practical knowledge, legitimacy, and implementation capacity, but governance arrangements should specify who participates, whose knowledge is recognised, how conflicts of interest are managed, and how decisions are made [46,79,80]. Without such safeguards, multi-stakeholder processes may reproduce existing power imbalances [15,48]. Implementation capacity includes staffing, technical expertise, fiscal resources, data systems, regulatory authority, and administrative capability at national and local levels. Uneven capacities have been documented in India, sub-Saharan Africa, and the Pacific region, creating gaps between policy commitments and delivery [14,67,110], and municipal staff coordinating urban living labs in Europe also navigate administrative and political constraints [111]. Capacity-building should be linked to defined responsibilities and implementation resources rather than treated as a stand-alone recommendation [14,32]. Monitoring should connect policy inputs and implementation processes with multidimensional outcomes [112]. Existing frameworks propose indicators that cover nutritional, environmental, economic, and social dimensions [56,57], but public data are less available for food-system activities such as processing, distribution, and retail than for drivers and outcomes [53], and indicator selection involves trade-offs between conceptual coverage and data availability [113]. A national indicator framework developed for Sweden illustrates how food-system sustainability monitoring can support priority setting, comparison, assessment, accountability, and analysis of interactions among sustainability dimensions [27]. Governance and monitoring therefore represent cross-cutting functions supporting policy design, implementation, evaluation, and learning across agricultural production, food value chains, and food environments. They also provide mechanisms for

examining trade-offs and assessing progress towards nutritional, environmental, social, and economic objectives.

4.5. Consumer-Oriented Policies for Sustainable Diets and Healthy Food Environments

Consumer-oriented policies influence the conditions in which food choices are made. They include dietary guidance, nutrition education, marketing regulation, public procurement, fiscal measures, product standards, labelling, social protection, and changes in retail and institutional food environments [28,92]. Their effectiveness depends on how they interact with availability, affordability, commercial practices, and social inequalities.

Food-based dietary guidelines increasingly consider dietary patterns rather than isolated nutrients, and some include environmental or cultural considerations [114]. Guidance alone, however, does not change the prices, availability, convenience, or marketing of foods. It is best understood as a normative and educational component of a broader food-system strategy [4,6,115].

Nutrition education and public communication can improve knowledge and attitudes but tend to have limited effects when healthier choices remain unaffordable, unavailable, inconvenient, or heavily displaced by commercial marketing [92,100]. Reviews of high-income nutrition policy and environmentally sustainable dietary interventions therefore support combining education with structural food-environment measures [92,100].

Food-environment policies can regulate marketing to children, establish nutrition standards in schools and other public institutions, encourage product reformulation, and influence retail availability and placement [28,29,92]. Their importance is heightened by the expansion and concentration of ultra-processed-food markets, which shape product availability, price, desirability, and political influence [1]. Analysis of the global corporate fast-food industry further highlights its market expansion and financial strategies, with implications for food environments and the availability of meat-based and ultra-processed foods [116].

Behavioural interventions such as default options, product placement, portion changes, prompts, feedback, and goal setting can support healthier or more environmentally sustainable choices. Evidence is more consistent for some food-waste interventions than for meat reduction, and many studies rely on stated rather than observed behaviour [100]. Such measures should therefore complement, not replace, regulatory, fiscal, procurement, and access-oriented policies [28,100].

Policies must also address unequal access to healthy diets. Evidence from Nigeria and Bangladesh demonstrates substantial differences in the affordability of healthy diets, particularly across income groups, rural and urban areas, and geographical regions [44,45]. Low-income households may face constraints related to food price inflation, transport, retail infrastructure, time, and housing or cooking conditions [44,117]. Social protection, school feeding, targeted food support, and subsidies for nutrient-dense foods can improve access, but their design should be assessed for dietary quality, coverage, dignity, administrative feasibility, and unintended effects [16,28]. Consumer-oriented policies are most credible when combined with structural measures that alter the opportunities available to households [28,100].

4.6. Critical Synthesis of Global Policy Approaches

As summarised in Table 2, the reviewed literature does not support a simple distinction between high-income countries prioritising environmental sustainability and lower-income countries focusing primarily on food security. National policy priorities reflect different combinations of nutritional, environmental, affordability, livelihood, and resilience concerns, and cross-country analyses illustrate how the trade-offs of food-system transformation vary across socioeconomic and institutional contexts [16,25,47,118].

Table 2. Selected Evidence on Food-System Policy Approaches, Implementation Conditions, and Assessment.

Analytical Theme & Policy Focus	Illustrative Key Studies	Main Findings and Evidence Limitations	Implications for Policy Design and Implementation
Governance & Policy Coherence: Cross-sectoral coordination, multi-stakeholder platforms, and power relations	[68,79–81,83,84,119]	Studies of multi-stakeholder platforms describe opportunities for engagement, boundary spanning and policy learning, but report uneven representation, limited influence over established policy agendas and risks associated with corporate power and conflicts of interest. The reviewed studies do not establish a general effect of formal coordination on food-system or nutrition outcomes.	Cross-sectoral arrangements may support joint problem framing and learning. Their contribution to implementation depends on representation, decision-making authority, conflict-of-interest safeguards and resources; these conditions should not be equated with demonstrated transformative effectiveness.
Nutrition-Sensitive Agriculture: Crop diversification, climate adaptation, and agricultural incentives	[18,19,42,120]	Policy analyses identify diversification, climate adaptation and nutrition-sensitive agricultural planning as relevant intervention areas, while documenting funding, inter-agency coordination and market-linkage constraints. Evidence on farmers' preferences for adaptation options and trade-offs in intensive production settings is context-specific; the selected studies do not establish a consistent causal improvement in diets or livelihoods.	Diversification and adaptation measures need to be assessed together with resource constraints, farmer preferences, market access and implementation arrangements. The mechanisms connecting changes in production to affordable, nutritious diets remain contingent on food-system conditions and require separate evaluation.
Healthy Food Environments (Structural): Public food procurement and food-environment regulation	[90–93]	A retrospective policy review identifies limited adoption of structural food-environment measures in the jurisdictions examined. Studies of public procurement show how actor networks, contractual conditions, commercial practices and legal requirements may facilitate or constrain implementation. A review of ecological regulation discusses possible responses to ultra-processed foods, but the selected evidence does not quantify population-level dietary effects of procurement or establish the superiority of particular regulatory mixes.	Procurement and food-environment regulation are potentially relevant intervention instruments. Their intended nutritional, social and environmental contributions depend on policy design, contracting, enforcement and institutional capacity; these outcomes require empirical assessment rather than being assumed from the instrument type.
Healthy Food Environments (Consumer): Dietary guidelines, consumer information, and affordability constraints	[45,114,121–123]	Dietary-guideline analyses outline ways to incorporate environmental criteria, while consumer studies report associations between food choices, knowledge, preferences and price-related barriers. Evidence from Bangladesh documents constraints on the affordability of recommended diets. Most selected studies investigate guidance, consumer responses or diet costs rather than effects of implemented information campaigns, front-of-pack labelling or product reformulation.	Dietary guidance and consumer information provide potential policy inputs, but their contribution to changes in purchasing or consumption cannot be inferred from consumer attitudes or proposed guidelines alone. Affordability and food availability should be examined alongside informational measures.

Table 2. *Cont.*

Analytical Theme & Policy Focus	Illustrative Key Studies	Main Findings and Evidence Limitations	Implications for Policy Design and Implementation
Environmental Sustainability: Food loss and waste, low-carbon policy mixes, and environmental trade-offs	[106–109,124]	The selected literature includes economic and scenario modelling, expert interviews, reviews and policy proposals. These sources identify potential environmental consequences and distributional trade-offs of dietary shifts, food-loss and waste reduction, and low-carbon policy mixes. The magnitude and direction of projected effects depend on scenario assumptions and where interventions occur in the food system; they should not be reported collectively as observed policy impacts.	Environmental instruments should be considered together with potential socioeconomic trade-offs, feasibility and supply-chain effects. Modelling and policy proposals help identify options for assessment, but evidence of implemented greenhouse-gas or food-waste reductions must be established separately.
Monitoring & Evaluation: Multidimensional indicators and assessment tools	[27,57,112,125]	National and institutional indicator frameworks provide methods for assessing nutritional, environmental and social dimensions together and identifying potential trade-offs. A school-food assessment tool was adopted as a regional monitoring framework in Italy, while reviews and viewpoints identify remaining gaps in multidimensional evidence. These publications do not demonstrate that indicator adoption alone improves accountability or policy outcomes.	Integrated monitoring can support the assessment of progress and policy trade-offs when indicators are feasible, credible and used in decision processes. Its contribution to adaptive learning and institutional accountability depends on uptake, reporting responsibilities and follow-up action.

Note: The table summarises illustrative studies, their principal findings, evidence limitations, and implications for policy design and implementation across the five analytical themes; healthy food environments are presented in two rows, covering structural and consumer-oriented approaches. Supplementary Table S1 contains the full evidence extraction database.

Successful implementation cannot be inferred from the adoption of a policy document. It depends on coherent objectives, mandates, financing, cross-sectoral coordination, stakeholder engagement, local delivery capacity, monitoring, and the use of evidence in policy adjustment [12,14,32]. These conditions also shape whether trade-offs are anticipated and whether affected groups can influence implementation.

Important evidence gaps remain. Evaluations are concentrated in selected food-environment interventions, while evidence on supply-chain policies, environmental effects, implementation over time, and equity is comparatively limited [28]. Studies on food-system monitoring highlight challenges in data availability and indicator coverage across sustainability dimensions [52,53]. An analysis of Australian food policies by de Melo et al. [126] further illustrates the distinction between the adoption of policy measures and their assessed transformative potential.

A similar caution applies to participatory governance, where multi-stakeholder platforms are often perceived as a sign of inclusive decision-making. Nevertheless, the success of participatory governance cannot be judged solely by its existence or the number of participants. Thorpe et al. [119] highlighted the importance of assessing whether these platforms help achieve their intended goals and whether the outcomes can be linked to their activities. This emphasises the importance of monitoring. For example, Petruzzelli et al. [125] developed a framework of 42 indicators to measure the nutritional, environmental, and social sustainability of school food systems, which was later used for regional monitoring. These limitations should be reflected in the interpretation of the Bangladesh and Poland cases.

5. Bangladesh: Policy Landscape and Sustainable Food-System Transition

5.1. Evolution of Food and Nutrition Policies in Bangladesh

Since independence in 1971, Bangladesh has made substantial progress in food availability, supported by agricultural investment, irrigation, improved crop varieties, input use, and extension. Earlier policy was strongly oriented towards rice production and aggregate food security. Over time, persistent micronutrient deficiencies, inadequate dietary diversity, climate vulnerability, and uneven access to nutritious foods broadened the policy agenda towards nutrition-sensitive and multisectoral approaches [17,67].

The national policy architecture has progressively broadened beyond production to include access, nutrition, and climate resilience through successive multisectoral frameworks and investment plans [127–129]. These broad frameworks are complemented by targeted action plans for nutrition [130] and climate resilience, such as the National Adaptation Plan 2023–2050 [131,132]. This progression should not be interpreted as evidence that integration has been achieved. Monitoring of the Second Country Investment Plan identified continuing challenges in dietary diversity, programme delivery, market and value-chain investment, and food-loss reduction [133]. Earlier institutional analysis likewise identified coordination, enforcement, technical capacity, and local implementation as continuing constraints [17]. Rapid urbanisation and the expansion of ultra-processed-food markets across Asia add further pressure, although regional evidence should not be treated as direct national evaluation [1,134].

Bangladesh has therefore moved from a predominantly production-centred food-security agenda towards a broader architecture that includes nutrition, climate resilience, food safety, social protection, and multisectoral planning. The principal analytical question is no longer whether these objectives appear in policy documents, but how consistently they are financed, coordinated, implemented, monitored, and adjusted.

5.2. Sustainable Food-System Transition: Current Policies, Governance, and Challenges

Bangladesh has incorporated nutrition sensitivity, crop diversification, climate adaptation, food safety, and social protection into several national policies, although 'sustainable diets' do not operate as a single, clearly defined national policy objective. The National Agriculture Policy [131] supports diversification, nutritious and safe food production, marketing, natural-resource efficiency, research, and extension, while the National Adaptation Plan [132] gives explicit priority to climate-resilient agriculture for food, nutrition, and livelihood security [131,132]. Evidence from coastal agricultural systems nevertheless illustrates how salinity, water management, and climate exposure constrain implementation in vulnerable locations [135].

Institutional coordination is organised through bodies and planning mechanisms involving food, agriculture, health, fisheries, livestock, environment, education, local government, finance, development partners, civil society, and the private sector. The National Food Policy, NPAN2, the National Food and Nutrition Security Policy Plan of Action 2021–2030 [127], and the country investment plans provide formal mechanisms for coordinating objectives and investments [17,127,130,136]. Project-level initiatives such as NICE also demonstrate approaches to policy dialogue, decentralised capacity building, and data-informed planning in secondary cities, but should not be interpreted as evidence of nationwide implementation [137].

Several gaps continue to slow implementation. Responsibilities remain distributed across many institutions; administrative, laboratory, inspection, and monitoring capacity is uneven; and local delivery is constrained by resources and climate exposure [17,67]. Existing monitoring is stronger for conventional food-security and nutrition indicators than for food environments, biodiversity, emissions, food waste, and integrated policy outcomes.

Addressing these gaps requires a feasible indicator set, defined institutional responsibilities, and mechanisms linking evaluation results to budget and programme adjustment [53,56].

Overall, Bangladesh has developed a broad multisectoral policy architecture for food security, nutrition, climate adaptation, and social protection. Its main challenge is translating this architecture into coordinated and adequately resourced implementation and demonstrating outcomes through integrated monitoring. An overview of the specific policy instruments, governance mechanisms, and implementation challenges in Bangladesh is summarized in Table 3.

Table 3. Overview of Historic and Current Food-System Policies, Governance Mechanisms, and Implementation Gaps in Bangladesh.

Policy, Plan, or Investment Framework	Status	Analytical Theme(s)	Key Focus & Identified Implementation Consideration
National Food Policy (2006) [128]	Historic/Recently concluded	Governance & Policy Coherence	Focus: Broadened food security beyond aggregate production to include access, nutrition, and food safety. Gaps: Early stages of multisectoral integration; local administrative enforcement remained weak.
National Nutrition Policy (2015) & NPAN2 (2016–2025) [130]	Historic/Recently concluded	Healthy Food Environments; Governance	Focus: Maternal/child nutrition, dietary diversity, and social protection. Gaps: Coordination challenges across decentralized delivery channels; affordability of recommended diets remains a barrier for rural populations.
National Agriculture Policy (2018) [131]	Current	Nutrition-Sensitive Agriculture	Focus: Crop diversification, safe food production, and agricultural research. Gaps: Implementation heavily biased toward rice production; weak market linkages for diversified, nutrient-dense crops.
Country Investment Plans (CIP2 2016–2020; CIP3 2021–2025) [129,133,136]	Historic/Recently concluded	Governance & Policy Coherence; Monitoring	Focus: Multisectoral financing and tracking for nutrition-sensitive and resilient food systems. Gaps: Persistent shortfalls in value-chain investments, food loss reduction, and integrated monitoring of environmental impacts.
National Food and Nutrition Security Policy (2020) & Action Plan (2021–2030) [127]	Current	Governance & Policy Coherence	Focus: Updates national architecture linking food security with climate resilience and cross-sectoral planning. Gaps: Fragmented institutional responsibilities; lack of integrated data systems combining socio-economic and environmental metrics.
National Adaptation Plan (2023–2050) [132]	Current	Environmental Sustainability & Resilience	Focus: Climate-resilient agriculture, ecosystem-based adaptation, and livelihood security. Gaps: Uniform adaptation packages fail to account for variable farmer risk-aversion (e.g., in saline coastal zones); limited financial capacity.

5.3. Affordability, Dietary Access, and Climate Vulnerability

Affordability is one of the major barriers to shifting food and nutrition policies towards sustainability in Bangladesh. Based on national food-based dietary guidelines and household expenditure survey data, Islam et al. [45] found that the recommended food cost about BDT 83 per person per day. However, around 43% of households could not afford this diet,

whereas the burden fell mainly on rural households. In Bangladesh, starchy staple foods are the prime source of household spending, while expenditure on protein-rich foods, fruits, and dairy products remained inadequate. Thus, improvements in overall food availability do not indicate access to a nutritionally balanced diet. Affordability, therefore, needs to be considered as an integral part of food-system policy rather than as a separate economic issue of Bangladesh.

Hossain et al. [138] found that existing research has focused mainly on food availability and access, while stability and utilisation have received much less attention. The review also identified that environmental drivers were studied less frequently than socioeconomic factors. These gaps matter because adoption of nutritious food is influenced not only by accessibility but also by monthly income, demographic and environmental factors, and whether households can maintain long-term access to natural resources. Future monitoring should therefore consider dietary affordability, dietary diversity, environmental exposure, and socioeconomic conditions together instead of analysing each factor independently.

Crop diversification may help improve resilience and increase the availability of nutrient-rich foods. Nandi et al. [18] reported that progress has remained limited despite the existence of several policies and projects promoting crop diversification in Bangladesh. Key barriers included an excessive focus on production, weak markets for diversified crops, poor coordination among government agencies, short-term project-based interventions, limited financing, and insufficient market development. Therefore, crop diversification should be considered not only as an agronomic strategy but also as a market and institutional challenge.

Climate vulnerability makes these problems more difficult, especially in coastal areas affected by salinity. A study of 200 coastal rice farmers from four districts found that preferences for adaptation measures differed depending on farmers' risk attitudes and socioeconomic circumstances [19]. Salinity-tolerant rice varieties were the most preferred adaptation practice for reducing risk, while fair output prices were also encouraging for coastal farmers for the adoption of variety. Depending on the different levels of risk aversion, farmers did not always favour the same policies. Thus, a single adaptation package may not work equally well for all the farmers. Climate-resilient food-system policy in Bangladesh will bring limited nutritional benefits if crop diversification, water management, market incentives, and financial support cannot be implemented simultaneously. Diversified foods remain unaffordable to consumers if farmers lack reliable markets and incentives to produce them.

6. Poland: Policy Landscape and Sustainable Food-System Transition

6.1. Evolution of Food and Nutrition Policies in Poland

Poland's agri-food sector has undergone extensive structural change since market-oriented economic reforms began in 1989. Accession to the European Union in 2004 accelerated integration into the Single Market, regulatory harmonisation, investment, and farm modernisation. Support provided through the Common Agricultural Policy, together with access to EU markets, contributed to growth in agricultural output, farm income, and agri-food trade, although persistent differences in farm size, productivity, and income limited structural convergence [20].

Since EU accession, the CAP has been the principal programming and funding framework for agricultural and rural-development policy in Poland. Environmental and food-system sustainability became more prominent in the policy agenda from the late 2010s, particularly following the adoption of the European Green Deal in 2019 [21] and the Farm to Fork Strategy and EU Biodiversity Strategy in 2020 [101]. These frameworks expanded the policy agenda to include climate mitigation and adaptation, biodiversity protection,

sustainable resource management, food loss and waste reduction, and healthier, more sustainable diets. In Poland, however, these frameworks did not create a unified national food policy. Instead, these objectives have been pursued through existing EU and national instruments and, in agricultural policy most directly, through Poland's CAP Strategic Plan for 2023–2027 [21,22]. At the national level, the Strategy for the Sustainable Development of Rural Areas, Agriculture and Fisheries to 2030, adopted by the Council of Ministers in 2019 and updated in 2023, provides the domestic strategic framework complementing the CAP Strategic Plan [139].

Nutrition and food-safety policies have evolved through partly separate institutional and regulatory streams. These include the National Health Programme [140–143], evidence-based dietary guidelines [144], and the harmonised EU food-law system governing traceability, hygiene, and official controls [95–98].

These developments expanded and harmonised the regulatory framework for food safety and consumer protection. Nevertheless, agricultural, nutritional, environmental, and social measures continue to operate largely through separate policy streams. Poland has therefore developed a broader food-related policy mix, but not a comprehensive cross-sectoral strategy for sustainable food-system transformation [145].

6.2. Current Policy Instruments, Governance, and Implementation Challenges

Current agricultural and rural-development policy in Poland is implemented primarily through the CAP Strategic Plan for 2023–2027. The Plan includes CAP conditionality requirements, eco-schemes, agri-environment-climate commitments, support for organic farming and animal welfare, investment measures, and knowledge-transfer activities, while also pursuing farm income, productivity, competitiveness, generational renewal, and rural-development objectives [22,146]. The presence of sustainability-related instruments does not demonstrate that the Plan is sufficient to produce systemic transformation. An environmental and climate assessment of the initial CAP Strategic Plan raised concerns about the balance between income-support expenditure and funding for several environmental interventions [147]. The Plan also operates within a changing EU strategic context. The European Green Deal, Farm to Fork Strategy, and EU Biodiversity Strategy remain important reference points for the transition towards more sustainable agri-food systems. However, the European Commission's [148] Vision for Agriculture and Food signals a rebalancing of priorities rather than a formal replacement of the Farm to Fork Strategy. While retaining environmental, climate, and biodiversity objectives, the Vision gives greater prominence to food security, resilience, competitiveness, regulatory simplification, the attractiveness of farming, and viable farmer livelihoods [148]. A policy analysis by Förell et al. [149] identifies a corresponding shift from the transformative sustainability narrative of the Farm to Fork Strategy towards competitiveness, security, simplification, and the economic position of farmers. Candel and Daugbjerg [150] similarly conclude that the Green Deal's food-system agenda produced only limited structural change in the traditionally sector-centred system of EU agri-food policymaking. These developments shape the policy context for Poland, although their national effects depend on the design and implementation of specific regulatory and financial instruments. The CAP framework is complemented by the national Framework Action Plan for Organic Food and Farming in Poland 2021–2030, updated in 2025, which supports organic production, processing, and market development and sets a target of at least 7% of utilised agricultural area under organic farming by 2030 [102]. Beyond agricultural policy, Poland's food-related instruments address several complementary areas, including public health, food environments, food access, waste prevention, and public procurement (Table 4). Public-health and consumer-oriented measures include the National Health Programme (2021–2026), national dietary guidance, and the levy on speci-

fied sweetened beverages, alongside harmonised EU food-safety and consumer-information legislation [140–144,151]. Assessments of Poland's healthy food-environment policies have identified implementation gaps [152]. The levy on specified sweetened beverages represents a fiscal intervention intended to encourage healthier choices and product reformulation. Post-introduction research documented reformulation among the beverages studied, while a national audit identified weaknesses in monitoring the health-related use of levy revenues [153,154]. School food environments are addressed through both regulatory and educational instruments. An important development is the Minister of Health's regulation, effective 1 September 2026, setting updated requirements for food sold and meals served in educational institutions. It includes plant-based alternatives and requires a legume-based, animal-product-free dish at least weekly [155]. The EU-supported Programme for Schools complements these measures by providing selected fruit, vegetables, milk, and dairy products, along with nutrition education [156,157]. Although the EU framework allows preferences for organic, local, and environmentally beneficial products, the Polish programme does not establish general requirements for organic certification or sourcing through short supply chains [157–159]. Other instruments address food access, food-waste prevention, and institutional purchasing. The Meal at School and at Home Programme (2024–2028) provides targeted meal assistance and supports school-meal infrastructure, while the EU co-financed European Funds for Food Aid 2021–2027 Programme (2021–2027) provides food assistance to people experiencing material deprivation [139,160]. These programmes primarily address the social dimension of sustainable diets by improving food access rather than pursuing explicit environmental objectives. The Act on Preventing Food Waste establishes food-donation and waste-prevention obligations for covered retailers. The public procurement framework allows environmental and social considerations to be incorporated into purchasing decisions, although it does not prescribe uniform sustainable food requirements for institutional catering. The scope and implementation considerations of these instruments are summarised in Table 4. These instruments differ in their legal status, scope, target groups, and administrative responsibility. They are administered by different ministries, agencies, and levels of government and do not form a single integrated food-system policy. Governance is therefore multi-level but sectorally dispersed, involving EU institutions, national ministries and implementing agencies, regional and local authorities, and, in selected areas, civil-society and market actors [145,152]. Research across European urban living labs shows that municipal staff face political and administrative constraints when coordinating food-system initiatives, which can also limit the justice potential of public participation [111]. Evidence from national policy assessments indicates important gaps in this framework. In the Polish Food-EPI assessment, eight of the 22 food-environment policy indicators were rated as showing no or very weak implementation, four as weak, seven as moderate, and only three as strong. Infrastructure support was assessed somewhat more favourably, although substantial gaps also remained [152]. A 2025 audit by the Supreme Audit Office similarly concluded that the government had not developed a coherent national nutrition policy and identified shortcomings in institutional coordination, supervision, implementation, and outcome monitoring, including in the educational institutions covered by the audit [161]. Local evidence illustrates how some of these implementation challenges may operate in practice. A pilot study involving public-catering stakeholders in Rybnik identified limited sustainability-related knowledge and indicated a need for education and training concerning green public procurement [162]. Given its local and exploratory design, the study identifies possible implementation barriers but cannot be treated as representative of Poland as a whole. Formal policy instruments are also complemented by bottom-up initiatives, including alternative food networks. Goszczyński et al. [163] distinguished between imitated, embedded, and mixed forms of Polish alternative food networks, demonstrating

how externally developed models are adapted to local traditions, social relationships, and market conditions. This typological evidence illustrates the social and institutional diversity of the Polish transition but does not establish the effectiveness or national-scale impact of these initiatives.

Overall, Poland has developed a broad but sectorally dispersed set of instruments relevant to the transformation of the food system. The transition remains ongoing and uneven rather than being governed through a unified national food-system framework. The available evidence therefore points less to an absence of policy instruments than to their dispersion across policy sectors and to uneven evidence on implementation and multidimensional outcomes. Cross-country consumer evidence from Poland, Germany, and Czechia indicates that environmental concerns and openness to innovation are associated with willingness to choose sustainably produced dairy foods [164]. Citizen-participation research shows that design-driven processes can bring everyday consumer knowledge into food-policy deliberation, while open participation can still reproduce social biases [165]. Evidence from Polish field-crop farms indicates that policies promoting agricultural value addition can involve trade-offs with calorie-oriented production efficiency, which should be considered in policy design [166]. Analysis of Austria's meat regime shows that sustainable dietary transition is shaped by competing political projects and power relations among producers, civil society, and corporate retailers, not only by consumer choice [167]. Poland's COVID-19 experience revealed disruptions, uncertainty, financial losses, and behavioural adaptation across the food system, while also demonstrating relative system resilience and informing future public policy preparedness [168]. Polish family-focused evidence supports incorporating healthy and sustainable diet principles into public-health programmes aimed at strengthening children's awareness and household food practices [169]. Polish consumer research identifies motives and barriers affecting pulse consumption, offering context-specific evidence for efforts to shift protein intake towards plant sources [123]. Research on sustainable food decision-making argues that behaviour should be addressed within the wider systemic environment rather than targeting individuals in isolation [170]. Survey evidence from Polish city-dwellers suggests that sustainability knowledge remains relevant to empowering consumers and supporting food-policy measures [122]. Integrated monitoring combining environmental, nutritional, economic, and social indicators could strengthen policy evaluation and make synergies and trade-offs more visible [56,171]. Its effectiveness, however, would depend on adequate institutional coordination, data availability, and the systematic use of evaluation results in policy adjustment. Recent European- and Poland-specific studies also show that the implementation of sustainability goals matters more than their formal presence in policy documents. Bazzan [23] highlights the difficulty of coordinating sustainability, food access, and environmental objectives with the complex EU food governance. In addition, Frank and Schanz [172], analysing the French and German CAP Strategic Plans, found that existing measures are not mandatory for farmers to accept, and these voluntary measures are not strong enough to drive major structural change. Although the study did not focus on Poland directly, it reflects wider limitations within CAP Strategic Plans that also shape Poland's policy environment. Similar issues can be seen in discussions of the Farm to Fork Strategy. While Eliasson et al. [173] found broad agreement on the need to transform food systems, much less agreement was found on how this should be achieved. Their study highlighted the importance of governance, as the process of food-system transformation is likely to vary across regions and stakeholder groups. Thus, adopting approaches that reflect local conditions and needs is necessary. In a survey of 920 people in southeast Poland, Kowalska and Emvalomatis [174] found that intentions to reduce red meat consumption were influenced mainly by perceived behavioral control, while health concerns had little effect. This suggests that raising awareness alone

may not be enough to encourage dietary change. Other factors, such as affordable alternatives, supportive regulations, reliable information, and practical conditions that make sustainable choices easier, are also likely to play an important role. Effective implementation of sustainability policies at both EU and national levels remains equally important. Table 4 details the current policy instruments, multi-level governance mechanisms, and identified implementation gaps in Poland.

Table 4. Selected EU Frameworks and Polish Food-System Policy Instruments: Main Focus and Implementation Considerations.

Policy, Plan, or Regulatory Framework	Status	Analytical Theme(s)	Key Focus and Implementation Considerations
European Green Deal (2019), Farm to Fork Strategy and EU Biodiversity Strategy (2020), and Vision for Agriculture and Food (2025) [21,101,148,175]	EU strategic frameworks	Governance & Policy Coherence Environmental sustainability and resilience	Focus: Establish EU-level strategic objectives for agriculture and food systems. Consideration: The 2025 Vision places greater emphasis on food security, farm viability, competitiveness, and resilience without formally replacing the Farm to Fork Strategy. Implementation depends on specific legislation, funding instruments, and national measures.
Poland's CAP Strategic Plan (2023–2027) [146]	Current; fifth amendment approved on 27 March 2026	Agriculture; Environmental sustainability and resilience	Focus: Combines environmental conditionality, eco-schemes, agri-environment-climate commitments, and support for organic farming, animal welfare, farm viability, and rural development. Consideration: Earlier assessments raised concerns about environmental ambition and funding priorities, but predate subsequent amendments [147].
Strategy for the Sustainable Development of Rural Areas, Agriculture and Fisheries 2030 [139]	Current national strategy; updated in 2023	Agriculture; Governance and policy coherence	Focus: Addresses agricultural development, food security, rural resilience, and environmental protection. Consideration: Its predominantly sectoral scope provides limited integration with nutrition, public health, and social protection.
Framework Action Plan for Organic Food and Farming in Poland 2021–2030 [102]	Current national action plan; updated in 2025	Agriculture; Environmental sustainability and resilience	Focus: Supports organic production, processing, and market development, with a target of at least 7% of utilised agricultural area under organic farming by 2030. Consideration: Implementation extends beyond farmland conversion to processing, distribution, and consumer demand, which require separate monitoring.
Public Health Act (2015), National Health Programme (2021–2026), and Healthy Eating Plate guidance (2020) [140,141,143,176]	Binding statutory framework, current programme, and non-binding dietary guidance	Food environments and consumer-oriented policies	Focus: Address prevention of diet-related diseases, health promotion, nutrition education, and dietary recommendations. Consideration: National assessments identified shortcomings in food-environment policy implementation, institutional coordination, and monitoring [152,153].
Levy on specified sweetened beverages (since 2021) (Public Health Act, as amended) [151]	Binding fiscal measure	Food environments and consumer-oriented policies	Focus: Applies composition-related charges to specified beverages, with the aim of encouraging healthier choices and product reformulation. Consideration: Post-introduction research documented reformulation among the beverages studied, while a national audit identified weaknesses in monitoring the health-related use of levy revenues [153,154].

Table 4. *Cont.*

Policy, Plan, or Regulatory Framework	Status	Analytical Theme(s)	Key Focus and Implementation Considerations
Regulation on foods sold and meals provided in educational institutions[155]	Binding; in force since 1 September 2026	Food environments and consumer-oriented policies	Focus: Establishes updated requirements for foods sold and meals served in educational institutions, including at least one weekly plant-based meal based on legumes and provisions encouraging seasonal and locally sourced foods. Consideration: Implementation requires adjustments to menu planning, food sourcing, and catering practices.
EU School Scheme—Programme for Schools (Polish implementation) [156,157,159]	Ongoing EU-supported and nationally co-financed programme	Food environments and consumer-oriented policies	Focus: Provides selected fruit, vegetables, milk, and dairy products to eligible primary-school pupils alongside educational activities. Consideration: Although the EU framework allows preferences for organic, local, and environmentally beneficial products, the Polish 2026/2027 distribution requirements do not establish a general obligation for organic certification or sourcing through short supply chains (under Art. 23(11) of the Regulation) [159].
Meal at School and at Home Programme (2024–2028) and European Funds for Food Aid 2021–2027 (2021–2027) [139,160]	Current national and EU-supported assistance programmes	Food environments and consumer-oriented policies	Focus: Provide targeted meal assistance, support for school-meal infrastructure, and food assistance to eligible groups. Consideration: The programmes primarily address food access and material deprivation through distinct funding and delivery arrangements, without an overarching environmental sustainability mandate.
Act on Preventing Food Waste (2019) [151]	Binding legislation, subsequently amended	Environmental Sustainability & Resilience	Focus: Establishes food-waste prevention and donation obligations for covered food retailers. Consideration: Its scope is concentrated on specified retail activities rather than food loss and waste across the entire supply chain.
Public Procurement Law (2019) and State Purchasing Policy (2026–2029) [142,143]	Binding procurement law and national strategic purchasing policy	Food environments and consumer-oriented policies	Focus: Provide a general framework for incorporating environmental and social considerations into public purchasing. Consideration: Neither instrument establishes uniform sustainable-food requirements for institutional catering; their application depends on individual procurement decisions and institutional capacity.

Note. Analytical themes correspond to those used in Table 2 (Governance: governance and policy coherence; Agriculture: nutrition-sensitive and climate-resilient agriculture; Food environments: healthy food environments and consumer-oriented policies; Environment & resilience: environmental sustainability and food-system resilience; Monitoring: monitoring, evaluation, and adaptive learning). None of the instruments listed is dedicated primarily to integrated monitoring of food-system outcomes.

7. Sustainable Food-System Transformation in Different National Contexts: Bangladesh and Poland

7.1. National Policy Frameworks Relevant to Sustainable Diets and Food-System Transformation

The two countries prioritise different combinations of policy objectives. Bangladesh's current architecture gives prominence to food and nutrition security, affordability, agricultural diversification, climate adaptation, and rural livelihoods [127,132,136]. Poland's policy mix combines farm viability, competitiveness, rural development, food safety, public health, environmental protection, and climate action within EU and national frameworks [22,145].

Both countries have nevertheless broadened their policy agendas beyond aggregate production. In Bangladesh, the National Food and Nutrition Security Policy, its Plan of Action, CIP3, NPAN2, and the National Adaptation Plan connect food security with nutrition, resilience, social protection, and multisectoral coordination [127,130,132,136]. In Poland, relevant objectives are pursued through the CAP, EU sustainability strategies, national health and dietary guidance, food law, public procurement, and food-waste measures, but these instruments remain sectorally dispersed [21,22,101,142,145,151,175].

7.2. Comparative Governance and Institutional Capacity

Both Bangladesh and Poland use multisectoral and multilevel arrangements, but they differ in formal authority, financing, administrative capacity, and monitoring. Comparative policy research indicates that effective cross-sectoral action depends on mandates, incentives, shared framing, platforms for engagement, long-term relationships, and institutional learning [12,32].

Poland operates within a more formalised EU–national regulatory and financing architecture, but responsibility remains dispersed across agricultural, environmental, health, education, food-safety, and social-policy institutions. Monitoring is largely sector-specific, and national assessments identify gaps in nutrition-policy coherence, implementation, financing, supervision, and outcome evaluation [152,161]. Bangladesh has created explicit interministerial planning and investment mechanisms through the National Food Policy, NPAN2, the Plan of Action [127], and successive country investment plans, but implementation is constrained by fragmented responsibilities, uneven local capacity, financing, and data limitations [17,67,133].

The two cases do not support a simple contrast between less developed and more integrated governance arrangements. Bangladesh has established explicit multisectoral planning mechanisms, while Poland operates within an extensive EU–national regulatory framework; nevertheless, both face documented coordination and implementation challenges. The comparative governance and policy characteristics of the food systems in both countries are summarised in Table 5.

Table 5. Selected Policy and Governance Characteristics in Bangladesh and Poland: A Qualitative Comparison.

Dimension	Bangladesh	Poland	Implications of the Comparison
Policy orientation	Emphasis on food and nutrition security, diet affordability, agricultural diversification, climate adaptation, and rural livelihoods [127,132,136].	Multi-objective policy mix encompassing farm viability, competitiveness, rural development, food safety, environmental protection, climate action, and public health [22,145,177]	In both countries, objectives relevant to sustainable diets span multiple policy sectors, although the degree of explicit cross-sectoral planning and the institutional arrangements differ.
Governance structure	Explicit multisectoral planning and investment-coordination mechanisms (NFNSP Plan of Action, CIP3, NPAN2), with responsibilities distributed across many institutions [17,67,127,130,136].	Multilevel EU–national governance, with responsibilities dispersed across sectoral policies and institutions [145].	Bangladesh's explicit multisectoral planning arrangements coexist with implementation constraints, while Poland faces coordination challenges within a sectorally dispersed policy framework.
Institutional capacity	Implementation constrained by financing, uneven technical and administrative capacity, and limitations in local delivery [17,67,133].	EU-supported regulatory and financing structures; national audit findings identify shortcomings in the coordination, oversight, implementation, and monitoring of healthy-eating measures [161].	The reviewed sources highlight different implementation constraints, with financing and local delivery particularly prominent in Bangladesh and coordination and supervision gaps documented in Poland.

Table 5. *Cont.*

Dimension	Bangladesh	Poland	Implications of the Comparison
Monitoring and evaluation	Documented monitoring arrangements for the Second Country Investment Plan (CIP2), including food-security and nutrition indicators [133].	Largely sector-specific monitoring; national assessments identify gaps in the implementation and oversight of healthy food-environment and nutrition policies [152,161].	The reviewed sources provide limited evidence on how existing monitoring arrangements are used to assess multidimensional food-system outcomes in either country.
Climate-policy orientation	Emphasis on climate adaptation, climate-resilient agriculture, disaster resilience, and livelihood protection [132].	Mitigation and adaptation objectives incorporated into EU and CAP policy instruments [22,101,147].	Bangladesh places particular emphasis on adaptation and livelihood protection, whereas Poland integrates mitigation and adaptation objectives within EU and national frameworks.
Agricultural policy	Rice-centred production; policies support crop diversification, nutrition-sensitive agriculture, and climate resilience, but limited progress in diversification has been reported [18,131].	CAP-based policy combining farm-income support, competitiveness, environmental measures, organic farming, and rural development [22,147].	The country-specific evidence reviewed here provides limited assessment of how agricultural policy instruments translate into dietary and broader food-system outcomes.
Consumer-oriented policy	Policy commitments concerning dietary diversity, social protection, food safety, and food access [127,130]; substantial affordability barriers to the recommended diet documented in a national cost-of-diet assessment [45].	EU and national instruments addressing food information, school food environments, and a sweetened-beverage levy [97,151,154]; implementation gaps identified by the 2022 Food-EPI assessment [152].	Dietary affordability remains a major constraint in Bangladesh, while Polish policy assessments identify gaps in the implementation of healthy food-environment measures.
Food-safety governance	Food-safety policy and regulatory arrangements incorporated into national food-security and nutrition governance, with implementation challenges discussed in the reviewed literature [17,127].	Harmonised EU food law and official controls covering traceability, hygiene, and food information [95–98].	The comparison identifies differences in formal regulatory arrangements, but the reviewed evidence does not permit a comparative assessment of enforcement effectiveness or policy outcomes.

Note. Entries summarise Sections 5–7 and the cited sources. The table provides an illustrative qualitative synthesis and does not constitute a standardised assessment of institutional capacity, policy effectiveness, or the transferability of specific instruments.

7.3. Selected Outcomes and Continuing Food-System Challenges

Available evidence does not permit causal attribution of national food-system outcomes to the policy packages reviewed here. Bangladesh's policy monitoring records progress in food availability and selected nutrition indicators alongside continuing challenges in dietary diversity, programme delivery, value chains, and food loss [133]. Modelling of dietary transformation in Bangladesh also identifies potential socioeconomic, health, and environmental trade-offs rather than a single unambiguous transition pathway [178]. In Poland, food safety is governed by harmonised EU food law and official controls [95–98], whereas policy assessments identify continuing gaps in healthy food-environment policy, national nutrition-policy coherence, implementation, and the monitoring of policy effects [152,161].

Environmental policy orientation also differs. Bangladesh gives particular prominence to adaptation, disaster resilience, climate-resilient agriculture, food and livelihood security, and ecosystem-based approaches [132]. Poland combines mitigation and adaptation objectives through EU and CAP instruments addressing climate, biodiversity, soil, water, organic farming, and resource management, while their ambition, funding, and implementation remain contested [22,101,147]. These are differences in policy orientation and

institutional setting, not evidence that either country has already achieved sustainable food-system outcomes.

The comparison highlights the need for policy approaches that accommodate diverse vulnerabilities, institutional capacities, and policy priorities. Historical and political analysis can reveal path dependencies and help anticipate resistance, lock-in, and unintended consequences [15,179]. Policy coherence should be treated as an ongoing process of managing interactions and trade-offs rather than as a final institutional state [12]. The comparison illustrates that broadly similar food-system objectives are pursued through different institutional and policy arrangements. Hegwood et al. [124] identified several common opportunities to improve production practices, reduce food loss and waste, and promote healthier diets by comparing Brazil, Colombia, Kenya, and the United Arab Emirates. However, they also showed that socio-demographic conditions, economic conditions, and national circumstances strongly influenced the implementation process.

Context-dependence is also evident in Bangladesh and in Europe. In Bangladesh, farmers' preferences for adaptation policies vary with risk attitudes and economic conditions [19]. In Europe, research points to complex governance arrangements and the possibility of several different pathways towards food-system transformation rather than a single model [23,173]. The reviewed evidence identifies coordination, implementation capacity, stakeholder participation, and monitoring as recurring governance considerations, although their specific roles and practical implications depend on national circumstances. The exact mix of agricultural, fiscal, regulatory, social-protection, and consumer-focused measures should still be designed around each country's institutional capacity, socioeconomic conditions, vulnerabilities, and overall food-system structure.

8. Integrated Synthesis of Review Findings

The synthesis is organised around the five analytical themes used to classify the reviewed literature (Section 2.4, Table 2, and Supplementary Table S1): governance and policy coherence; nutrition-sensitive and climate-resilient agriculture; healthy food environments and consumer-oriented policies; environmental sustainability and food-system resilience; and monitoring, evaluation, and adaptive learning. Across these themes, the identified literature places greater emphasis on policy approaches, commitments, and governance arrangements than on their implementation and observed outcomes. This pattern should be interpreted in light of the policy- and governance-oriented search strategy and the limitations discussed at the end of the section.

Evidence on agricultural and food-environment interventions indicates the potential for multiple benefits, alongside important limitations in the available evaluations. Burgaz et al. [28] identified sustainable agricultural practices and school-food programmes as interventions with the potential to address nutritional, inequality-related, and environmental objectives simultaneously. Their review found that multi-component interventions were the most effective in improving nutrition and reducing nutrition-related inequalities, while evidence concerning environmental outcomes and women's empowerment remained limited and the overall quality of evidence was poor, particularly for food supply chains. Ran et al. [100] found that information-based interventions alone were generally insufficient to achieve substantial changes in environmentally sustainable dietary behaviour, while interventions modifying the choice context showed promise, although evidence on long-term behavioural outcomes remains limited.

The potential nutritional contribution of agricultural diversification depends on broader food-system conditions, including market access and household access to nutritious foods, as discussed by Pingali and Sunder [50]. In Bangladesh, Nandi et al. [18] identified barriers to crop diversification associated with production-oriented policies, market

constraints, and project-based approaches. Dietary affordability represents an additional constraint, as illustrated by evidence from Bangladesh [45] and modelled trade-offs in emerging and developing economies [16]. The reviewed studies also address environmental sustainability and resilience through modelling, policy analyses, and assessments of specific challenges, including food loss and waste, greenhouse-gas mitigation, and climate-related risks [106–109]. These sources provide limited direct evaluation of the outcomes of implemented environmental policies.

The governance literature highlights challenges associated with cross-sectoral coordination, institutional mandates, financing, and stakeholder participation [12,14,32]. Studies of multi-stakeholder governance also indicate that formal participation does not necessarily ensure equitable influence over decisions, particularly where power imbalances and competing interests persist [80,82–84]. Thorpe et al. [119] identify methodological challenges in assessing the effectiveness of multi-stakeholder platforms, particularly concerning causal attribution and the measurement of intended outcomes. Multidimensional indicator frameworks have broadened the scope of food-system assessment [27,52,56,113], and Petruzzelli et al. [125] provide an example of a school-food sustainability assessment tool formally adopted for regional monitoring in Italy. However, evidence concerning the extent to which monitoring findings inform policy adjustments and contribute to improved food-system outcomes remains limited in the literature identified.

The Bangladesh–Poland comparison illustrates how these findings relate to distinct institutional and socioeconomic contexts (Tables 3–5). Bangladesh has established multisectoral planning and investment-coordination arrangements, but fragmented responsibilities, financing constraints, limitations in local implementation capacity, and dietary affordability remain important challenges [17,45,67,127,133]. Poland operates within an extensive EU–national regulatory and financing framework, yet food-related responsibilities remain dispersed across sectors, with documented gaps in policy implementation and outcome monitoring [152,161]. The comparison illustrates that implementation and evaluation challenges persist under different governance arrangements, without establishing a simple distinction between weaker and stronger institutional systems. Figure 2 provides a graphical summary of the findings across the five analytical themes, including the principal policy approaches, implementation considerations, and characteristics of the available evidence.

Limitations of the Review

This review has several limitations. First, the academic database search was restricted to English-language publications indexed in the Web of Science Core Collection and Scopus and may therefore underrepresent relevant national research published in Bangla, Polish, or other languages. Official policy documents and the additional publications identified through citation tracking were selected purposively and may not be exhaustive. Second, the search was designed to capture the literature on food-system policy and governance, in line with the review questions; it combined diet and food-system terms with policy and governance terms and excluded evaluation-related terms. The evidence base therefore contains more governance and policy-design studies than outcome evaluations, and most records concern European or other high-income settings; the relative scarcity of outcome evaluations reported here should be interpreted partly in this light. Third, the narrative synthesis was not designed to estimate pooled effects, and no formal risk-of-bias assessment was conducted; the core and supplementary classifications therefore indicate relevance to the review questions rather than methodological quality or the certainty of the evidence. Finally, the analysis of Bangladesh and Poland is a comparison of two cases, and its findings are not generalised to other national contexts.

A. Type of evidence identified along the policy cycle

Policy approaches and commitments
Extensively documented in strategies, plans, and policy analyses

Implementation
Documented mainly through case studies, policy analyses, and national assessments

Observed outcomes
Evaluated mainly for selected food-environment interventions and agricultural practices

*Pattern partly reflects the policy- and governance-oriented search strategy (**discussed at the end of Section 8**).*

B. Findings across the five analytical themes

Analytical theme	Principal policy approaches	Implementation considerations	Evidence characteristics
1 Governance and policy coherence	• Cross-sectoral coordination • Integrated strategies and investment plans • Multi-stakeholder platforms	• Coordination, institutional mandates, and financing • Formal participation does not necessarily ensure equitable influence	• Largest share of records • Mainly case studies and policy analyses • Contribution to outcomes difficult to assess
2 Nutrition-sensitive and climate-resilient agriculture	• Crop diversification • Sustainable agricultural practices • Climate adaptation	• Nutritional contribution depends on market and household access to food • Adaptation preferences vary with farmers' risk attitudes	• Potential benefits across nutrition, inequalities, and environment in reviews • Country evidence mainly descriptive
3 Healthy food environments and consumer-oriented policies	• School food and public procurement • Fiscal measures and reformulation • Labelling and dietary guidance	• Information alone generally insufficient • Diet affordability constrains dietary change	• Most frequently evaluated area • Multi-component interventions most effective for nutrition and inequalities • Limited evidence on long-term behaviour
4 Environmental sustainability and food-system resilience	• Food loss and waste reduction • Greenhouse-gas mitigation • Climate-risk management	• Possible affordability trade-offs in emerging and developing economies • Position of losses in the supply chain matters	• Mainly modelling and policy analyses • Little evaluation of implemented policies
5 Monitoring, evaluation, and adaptive learning	• Multidimensional indicator frameworks • Sector-specific assessment tools	• Use of monitoring results to adjust policy rarely documented	• Mainly indicator development • Example of formal adoption in regional school-food monitoring

C. Country contexts (Tables 3–5)

Bangladesh
Architecture: Explicit multisectoral planning and investment coordination (NFNSP Plan of Action 2021–2030, CIP3, NPAN2, National Adaptation Plan 2023–2050)
Main challenges identified: Fragmented responsibilities; financing; local implementation capacity; diet affordability; climate exposure

Poland
Architecture: EU–national regulatory and financing framework (CAP Strategic Plan 2023–2027, National Health Programme, sweetened-beverage levy, 2026 school-food regulation)
Main challenges identified: Responsibilities dispersed across sectors; documented gaps in implementation and outcome monitoring

Shared finding: gaps between policy commitments, implementation, and evaluation persist under different governance arrangements; the comparison does not support a simple distinction between weaker and stronger systems.

Figure 2. Graphical summary of the review findings across the policy cycle (Panel (**A**)), the five analytical themes (Panel (**B**)), and the illustrative national contexts of Bangladesh and Poland (Panel (**C**)), based on the reviewed global literature (Table 2 and Supplementary Table S1) and comparative country analyses (Tables 3–5).

9. Policy Recommendations

Governments should prioritise mechanisms that improve coherence across agriculture, nutrition, health, environment, education, trade, and social protection. Institutional mandates, financing, implementation responsibilities, and procedures for resolving policy conflicts should be specified rather than assumed [12,14,32]. Agricultural policy should connect diversification and climate resilience with nutrition, market access, farmer viability, extension, and rural infrastructure. Food-environment policy should combine education and labelling with public procurement, marketing regulation, fiscal measures, product standards, and targeted support for affordability [28,29,100].

Integrated monitoring should use a feasible set of nutritional, environmental, economic, social, and implementation indicators, with clear responsibility for data collection, public reporting, review, and policy adjustment [52,53,113]. Evaluation should distinguish implementation outputs from food-system outcomes and assess distributional effects on smallholders, women, workers, young people, and other potentially marginalised groups. Future research should prioritise longitudinal and comparative evaluations of policy mixes, cross-sectoral governance, and implementation under different institutional and socioeconomic conditions.

10. Conclusions

The reviewed evidence places greater emphasis on policy formulation and governance arrangements than on the evaluation of implementation and outcomes. Evaluative evidence was identified primarily for selected food-environment interventions, while evidence concerning the implementation and outcomes of agricultural, environmental, and cross-sectoral policies remains more fragmented, particularly regarding distributional effects. Although this pattern partly reflects the policy- and governance-oriented search strategy, it limits the conclusions that can be drawn from the evidence identified in this review about policy effectiveness and transferability. The Bangladesh–Poland comparison shows that policy priorities and implementation arrangements reflect different socioeconomic conditions, climate vulnerabilities, historical trajectories, and governance systems. Bangladesh has developed an explicit multisectoral architecture centred on food security, nutrition, resilience, and investment coordination, but faces substantial constraints in implementation and monitoring. Poland operates within a more formalised EU–national framework with stronger regulatory and financing capacity, but its food-related policies remain sectorally dispersed and important implementation gaps persist. The review points to governance lessons that are more likely to transfer between contexts than specific policy instruments: coordination supported by clear mandates and resources, stakeholder participation with appropriate safeguards, and monitoring that encompasses nutritional, environmental, and distributional outcomes. Their application requires context-specific adaptation. Greater emphasis should also be placed on evaluating the implementation and outcomes of existing policies and identifying the conditions under which they contribute to sustainable diets.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/nu18223836/s1, Table S1: Characteristics and Key Findings of Included Studies (N = 110).

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