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FOOD SYSTEMS GOVERNANCE AND THE SECURITY SUSTAINABILITY NEXUS IN PAKISTAN

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Abstract

Despite sufficient agricultural production, food insecurity remains alarmingly persistent in many low- and middle-income countries. This study interrogates the paradox of hunger amid abundance in Pakistan, where 36.2% of the population faces food insecurity despite a national dietary energy surplus. We argue that the root of this disconnect lies not in food availability, but in fragmented governance—manifested through policy incoherence, institutional misalignment, and the exclusion of local voices from decision-making. Employing a mixed-methods approach, we assess the coherence of 13 national and provincial food-related governance instruments using a custom-built Principle–Criteria–Indicators (PCI) framework. This framework evaluates policy alignment across four core food security dimensions: availability, access, utilization, and stability. Complementing the policy analysis are 45 semi-structured interviews with stakeholders across Islamabad, Punjab, and Sindh, offering ground-level insights into implementation realities. Our findings reveal stark inconsistencies between policy intent and execution, particularly in areas related to economic access, nutritional utilization, and inter-ministerial coordination. While newer strategies like the National Food Security Policy (2018) show higher coherence scores, they are constrained by outdated legal frameworks, inadequate monitoring systems, and poor integration with subnational governance. The study proposes a participatory governance redesign that integrates marginalized actors into food system planning, aiming to realign national priorities with SDG 2 (Zero Hunger) and SDG 12 (Sustainable Consumption and Production). By combining diagnostic policy tools with participatory evidence, this research offers a scalable framework for diagnosing food system fragmentation—providing timely insights for countries grappling with structural barriers to food equity.

Keywords: Food Security; Policy Coherence; PCI Framework; Participatory Governance; Institutional Fragmentation.

1. INTRODUCTION

Food insecurity today is not primarily a crisis of scarcity, but one of systemic governance failure—a fundamental blind spot in the global implementation of Sustainable Development Goals (SDGs) (Atukunda et al. 2021; Pérez-Escamilla 2017). Although global food systems generate enough calories to feed more than 10 billion people, an estimated 828 million individuals continue to suffer from chronic hunger (HLPE 2020; WFP (World Food Program) 2024). This enduring paradox—abundance coexisting with

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deprivation—is increasingly recognized because of institutional fragmentation, policy misalignment, and exclusionary governance structures that restrict equitable access to food (Béné et al. 2020; Clapp and Moseley 2020).

Food security, as defined by the FAO, is achieved when “all people, at all times, have physical and economic access to sufficient, safe and nutritious food” (FAO 1996). Yet more than 2.4 billion people globally remain food insecure, even as technological advances push agricultural productivity to new heights (FAO 2023). The persistence of food insecurity is further compounded by climate shocks (FAO 2023), geopolitical instability (WFP (World Food Program) 2024), and unsustainable production practices (IFPRI 2022)—factors that simultaneously disrupt supply chains and expose institutional weaknesses (Muna 2024). Meanwhile, 20% of all food produced is wasted each year (FAO 2024; Srivastava 2019), eroding sustainability and revealing structural inefficiencies that hinder progress toward SDG 2 (Zero Hunger) and SDG 12 (Responsible Consumption and Production).

Despite an increasing reliance on data-driven farming, biotech inputs, and supply chain digitization, many food governance systems continue to overlook the deeper political economy of access (Barrett 2021; Trevisan and Formentini 2024). These technologies, while promising, often bypass marginalized producers, entrench global trade dependencies, and perpetuate top-down planning structures. Overdependence on a narrow set of crops—namely wheat, rice, and maize—further limits resilience and dietary diversity (Lin et al. 2023; Liu and Qiu 2024; Muna 2024). Simultaneously, policy frameworks tend to prioritize production volume over equitable distribution, overlooking the social and institutional conditions necessary for systemic food security (Devaux et al. 2018; Fahad et al. 2024).

Food insecurity, despite the availability of abundant food resources, is fundamentally linked to systemic failures in governance and policy misalignment (Clapp and Moseley 2020; George and Adelaja 2022; Mirzabaev et al. 2023; Muna 2024). This governance failure is not simply a matter of scarcity but rather an outcome of fragmented policy frameworks that overlook access and equitable distribution (Béné et al. 2020; Haddad et al. 2016). While global literature increasingly highlights the role of technological innovation and data-driven agriculture, the political economy behind food access remains underexplored (Barrett 2021; Trevisan and Formentini 2024), with insufficient attention to social and institutional conditions that enable sustainable food security (Barrett 2021; Hassan et al. 2021; UNCCD 2017; Zawojska and Siudek 2025).

Although food governance and policy coherence are acknowledged barriers to SDG implementation, there is a significant gap in developing empirical models that can diagnose and rectify misalignments in national food policies (Lin et al. 2023; Liu and Qiu 2024; Muna 2024). Moreover, much of the research on food systems governance has been geographically concentrated in high-income countries, while Global South nations, such as Pakistan, have received comparatively less attention, despite the stark contrast

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between agricultural production and food insecurity levels (Anwar et al. 2024; Hameed and Salam 2020; Ishaq, Khalid, and Ahmad 2018)

While policy efforts like Pakistan's National Action Plan (NAP) have focused on input-driven, supply-side strategies, these continue to neglect access, market distortions, and the critical need for federal-provincial coordination (Sohail 2024; Ullah, Khan, and Marwat 2024). This gap in policy integration and alignment is exacerbated by competing priorities within sectoral ministries, leading to implementation failures that hinder progress toward SDGs related to food security (Arif and Mahsud 2024; GOP 2022). Therefore, this research seeks to address the lack of empirical frameworks for evaluating policy coherence in food systems governance, especially in developing nations like Pakistan, where food security frameworks remain misaligned and fragmented.

Therefore, this study sets out to: (1) Diagnose institutional and policy-level bottlenecks that fragment food governance in Pakistan using a multidimensional policy coherence framework; (2) Evaluate the alignment of the National Action Plan (NAP) with SDG 12, applying an empirically grounded Principle–Criteria–Indicators (PCI) model to assess coherence across availability, access, utilization, and stability dimensions; and (3) Develop participatory governance recommendations, informed by stakeholder interviews and coherence analysis, that center marginalized communities and enable integrated, equity-driven food system reforms.

This research draws on a convergent mixed-methods design, combining quantitative scoring of 13 governance instruments with qualitative discourse analysis and 45 stakeholder interviews conducted in Islamabad, Punjab, and Sindh. The PCI framework operationalizes food security through 43 rigorously selected indicators, allowing for layered insights into federal-provincial alignment, sectoral silos, and thematic gaps. Coherence matrices, radar plots, and thematic heatmaps are employed to visualize fragmentation and trace implementation inconsistencies.

By grounding the analysis in both institutional structures and on-the-ground perspectives, this study proposes a paradigm shift: from technocratic, production-focused interventions to participatory, coherence-oriented governance. The findings are relevant not only to Pakistan but to many Global South countries where food security frameworks are structurally misaligned. As the 2030 Agenda looms, the path forward does not lie in producing more food—but in governing it more justly.

2. MATERIAL AND METHODS

2.1. Study design and scope

This research adopted a convergent mixed-methods design to evaluate the coherence of food security governance frameworks across Pakistan's federal and provincial levels. This design was selected due to its ability to simultaneously capture structural, institutional, and stakeholder dimensions of governance, ensuring both breadth and depth of insight (Aslam et al. 2023; Creswell and Plano Clark 2018).

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Central to the study is a principle–Criteria–Indicators (PCI) framework, which categorized food security into four interconnected dimensions: availability, access, utilization, and stability. This operational model reflects globally recognized dimensions of food security (FAO-UN 2021) and supports multi-scalar governance diagnostics (OECD 2021; Waheed, Bernward Fischer, and Khan 2021). The PCI framework also draws from earlier work assessing policy coherence in environmental and sustainability planning under CPEC (Waheed, Muhammad Irfan, and and Fischer 2025), making it especially relevant for the Pakistani context.

The framework's design enabled mapping and scoring of 13 national and provincial food governance instruments, following established criteria for evaluating policy alignment across thematic pillars (Medina Hidalgo et al. 2022; Zembe, Nemakonde, and Chipangura 2022). The analysis also aligned with Sustainable Development Goals, particularly SDG 2 (Zero Hunger), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action), all of which are directly impacted by fragmented food and climate governance structures (Thow et al. 2018). Visual representation in Figure 1 illustrates how the overlap and integration of the four PCI dimensions reflect improved governance coherence. To simplify complex scoring dimensions and make methodological logic transparent, examples from stakeholder interactions and policy mapping sessions were embedded into the explanatory framework. Familiar governance instruments—such as the National Action Plan (NAP) and provincial food strategies—were assessed using this structured, replicable method without redundant explanation (Barling, Lang, and Caraher 2002; Parsons and Barling 2022).

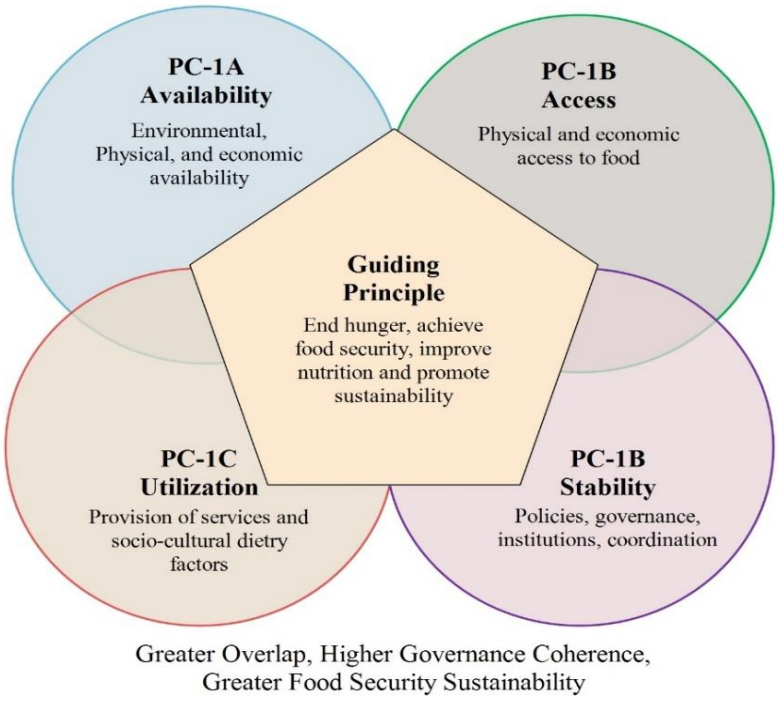

Figure 1: The conceptual Venn diagram of PCI dimensions.

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2.2. PCI Framework Development

The principle–Criteria–Indicators (PCI) framework was built through a combination of literature review, policy analysis, and expert consultation workshops with stakeholders from government, civil society, and academic sectors. This iterative process allowed for a comprehensive understanding of Pakistan's food security governance system and was informed by both global best practices and localized knowledge (Béné et al. 2020; Thow et al. 2018).

The development of the PCI framework led to the identification of 11 thematic criteria and 43 indicators, which were deemed most relevant for evaluating the coherence and effectiveness of food security policies in Pakistan. These criteria and indicators were selected through a multi-phase process that involved synthesizing existing policy frameworks, governance reports, and academic literature (Silvius and Marnewick 2021). The identified indicators were categorized under four key domains: environmental, social, governance, and policy, ensuring a multidimensional approach that integrates interdisciplinary perspectives on food security (FAO-UN 2021; Kelleher, Henchion, and O'Neill 2019).

Each thematic domain was assigned unique codes to facilitate systematic analysis and to ensure consistency across evaluations of various food security policies. The coding structure was carefully designed to reflect the nuanced intersections of the indicators and allow for comparative analysis across federal and provincial levels. Table 1 provides a detailed overview of this coding structure, clarifying how the dimensions, criteria, and thematic areas are interrelated, and how indicators were categorized to maintain methodological rigor (Aslam et al. 2023; Medina Hidalgo et al. 2022; OECD et al. 2019).

Table 1: Systematic coding logic under the PCI framework: dimensions, criteria, domains, and indicators

PCI Code	Dimension (PC)	Criterion Description	Thematic Domain	Indicator Format
PC-1X.CN. Dx. nn	PC-1A to PC-1D	Criterion *n* within food security dimension	E = Environmental S = Social/Economic G = Governance P = Policy/Institutional	PC-1X.CN. Dx. nn

PC-1X (Food Security Dimension): A = Availability; B = Access; C = Utilization; D = Stability

CN (Criterion Number): Refers to the specific sub-theme or evaluative category under each dimension (e.g., C1 = Agro-ecological resilience; C5 = Economic access).

Dx (Thematic Domain Code: E = Environmental***;*** S = Social/Economic***;*** G = Governance***;*** P = Policy/Institutional (e.g., inter-agency coordination, legal frameworks, monitoring) ***nn – (Indicator Number);*** Sequential number assigned to each measurable indicator nested within a given criterion (e.g., .1, .2, .3).

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2.3. Data Collection and Tools

Data for the study were collected from both primary and secondary sources, ensuring a comprehensive and triangulated approach to understanding food security governance in Pakistan. Primary data included interviews, focus groups, and surveys with key stakeholders from governmental bodies, non-governmental organizations (NGOs), and local communities across Islamabad, Punjab, and Sindh.

This multi-method data collection was designed to capture both the top-down and bottom-up perspectives on food governance, ensuring broad representation and insights (Creswell and Plano Clark 2018; Teddlie and Tashakkori 2011).

Secondary data were obtained from governmental and institutional records, including those from the Pakistan Agricultural Research Council (PARC), provincial agriculture departments, and food security reports from national agencies.

These documents provided a rich secondary dataset, reflecting the formal policy and institutional frameworks that shape food security governance (Aslam et al. 2023; Zembe, Nemakonde, and Chipangura 2022).

All governance instruments and data were systematically coded using the PCI framework, ensuring consistency and rigor in the analysis. The coding process followed established guidelines for qualitative data analysis, allowing for the categorization of information into thematic domains of food security, governance, and sustainability (Patton, Sawicki, and Clark 2015).

To measure policy coherence, a SMART-based scoring matrix was employed, ensuring that specific, measurable, achievable, relevant, and time-bound indicators were assessed consistently and objectively.

This scoring matrix provided a clear and structured approach for evaluating the alignment between policies and the SDGs, particularly SDG 2 and SDG 12 (Aslam et al. 2023; Medina Hidalgo et al. 2022; Waheed, Muhammad Irfan, and and Fischer 2025).

2.4. Analytical procedure and scoring mechanism

Each PCI indicator was rated on an ordinal scale from 0 to 5, reflecting the degree to which policy documents addressed coherence aspects across the environmental, social, governance, and policy domains.

The research team first conducted an in-depth review, applying the established SMART criteria (Specific, Measurable, Achievable, Relevant, Time-bound) to ensure the indicators were assessed consistently and objectively (Aslam et al. 2023; Medina Hidalgo et al. 2022).

Table 2 outlines the scoring framework, which includes the specific meaning of each score and the corresponding symbol.

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Table 2: Ordinal Scoring Framework Based on SMART Criteria for Evaluating Food Security Policy Coherence Using the PCI Model.

Coherence Level	Score	Symbol	Description
Excellent	5	●	Fully aligned and explicitly addressed
Adequate	4	◕	Strong integration with measurable outcomes
Fair	3	◑	Moderate coverage with partial alignment
Partial	2	◔	Weak references or inconsistent framing
Poor	1	○	Marginal mention without actionable detail
Not Addressed	0	∅	No reference or relevance to PCI dimension

The scoring process involved calculating the overall Policy Coherence Index (PCI) for each policy, which takes the average score across all indicators for each individual policy instrument (Eq.1).

$$PCI_p = \frac{1}{N}\sum_{i=1}^{N} S_{ip}$$

The PCIp represent the coherence index for policy p; where N Total number of PIC indicators assessed for that policy, and Sip refers to the score assigned to indicator i under policy p.

Next, the coherence was analyzed by dimension (DCI) to evaluate how each policy performed within specific dimensions of food security. This was done using the Coherence Index by Dimension formula, which computes the mean score across all indicators within a specific dimension (Eq.2).

$$DCI_{p,d} = \frac{1}{n_d}\sum_{i\in d}^{N} S_{ip}$$

The $DCI_{p,d}$ represents the coherence index for policy p within dimension d, where n_d is the number of indicators under dimension d, i ∈ d refers to the indicators belonging to dimension d, and Sip is the score of indicators i for policy p.

Finally, the Coherence Index by Criterion (CCI) was computed to assess how policies aligned with specific criteria (Eq.3).

$$CCI_{p,c} = \frac{1}{n_c}\sum_{i\in c}^{N} S_{ip}$$

The $CCI_{p,c}$ represents the coherence index for policy p within criterion c, where n_c is the number of indicators under criterion c, i ∈ d refers to the indicators belonging to criterion c, and Sip is the score of indicators i for policy p. The final phase of scoring integrated both quantitative scoring and qualitative content analysis, allowing for a comprehensive synthesis of findings. This combined approach provided a clear and structured framework for evaluating the policy coherence at multiple levels of governance.

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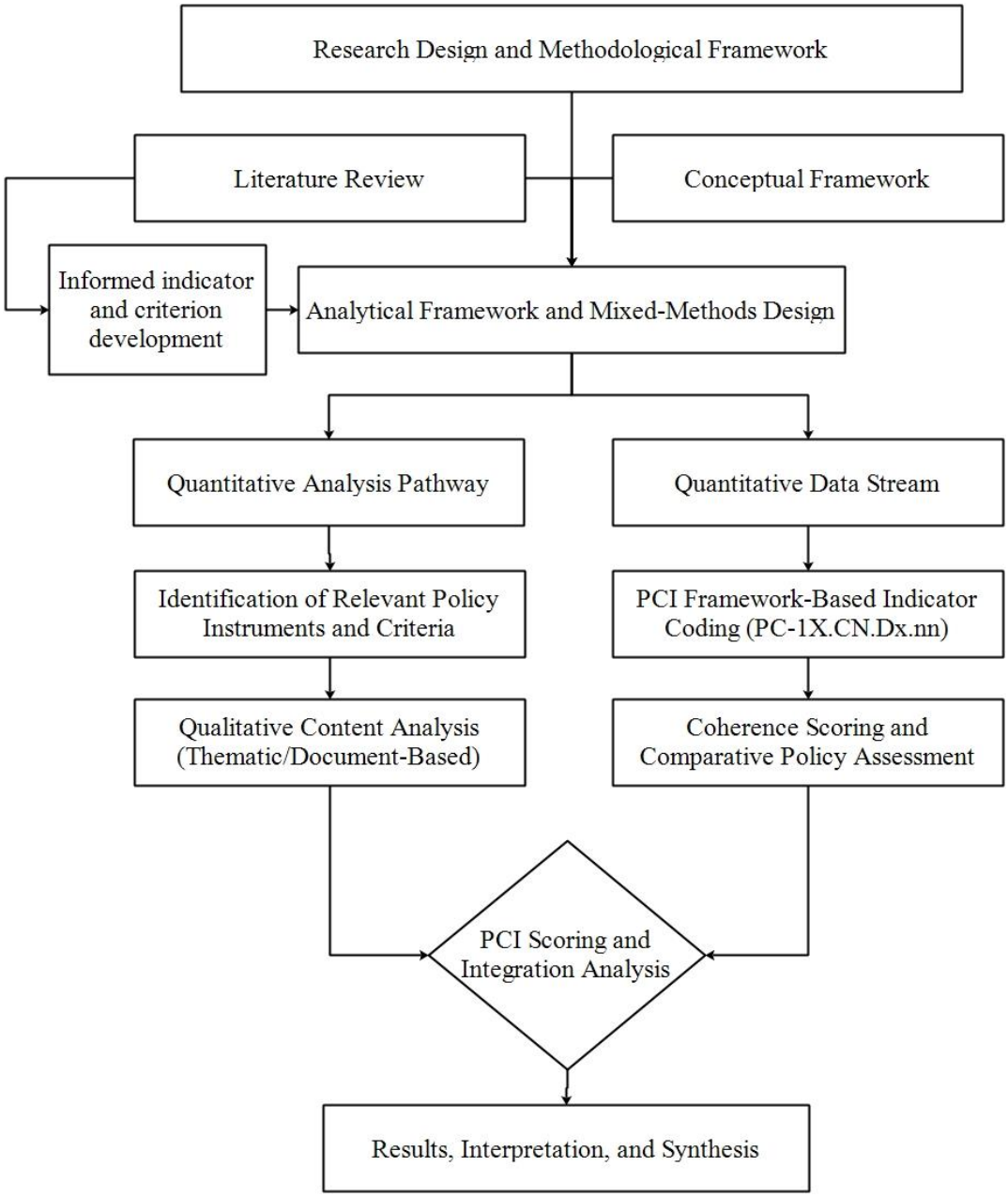

Figure 2: Methodological process flowchart

2.5. Visualization and Synthesis

To identify patterns of policy synergy and fragmentation, coherence matrices were developed. Visualization techniques such as radar plots and heatmaps highlighted strengths and weaknesses in the food security governance framework across all PCI dimensions. These visual tools played a key role in interpreting results and formulating recommendations for improving policy integration and governance coherence.

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3. RESULTS

3.1. Overview of policy instrument coverage

A total of thirteen governance instruments were systematically reviewed to assess their alignment with the principles and pillars of food security in Pakistan. These instruments comprise a diverse legislative ecosystem that spans both federal and provincial levels, including two strategic visions (e.g., Strategic Vision 2023–27), four national-level policies (e.g., National Food Security Policy, 2018), Six legal acts (e.g., Pure Food Ordinance, 1960; Pakistan Standards and Quality Control Authority Act, 1996), and one provincial regulatory framework (e.g., Punjab Food Pure Regulations, 2018). Their temporal range extends from 1960 to 2023, reflecting a layered governance landscape that has evolved to address emerging public health, environmental, and socio-economic dimensions of food systems. While strategic instruments offer a broad vision of food security, their operationalization is constrained by institutional fragmentation, jurisdictional overlaps, and regulatory inertia. Table 3 summarizes the classification of these instruments, alongside their degree of food security integration and gaps in implementation architecture.

Table 3: Analytical appraisal of food security governance instruments in Pakistan (1960-2023)

Governance Instrument	Food Security Integration	Implementation Architecture and Regulatory Gaps
Strategic Vision 2023–27	Strategically aligns agriculture productivity, climate resilience, and poverty reduction within a unified food system framework	■ Absence of operational indicators for food security outcomes ■ No defined coordination mandates across federal/provincial tiers ■ Lacks institutional embeddedness for periodic monitoring
NAP-SCP, 2017 *(National Action Plan on Sustainable Consumption and Production)*	Advocates sustainable food systems, waste minimization, and sustainable agricultural inputs	■ Weak cross-linkages with food security institutions ■ Lacks rural implementation pathways ■ Unclear SCP enforcement mechanisms
NCCP, 2021 *(National Climate Change Policy)*	Recognizes food security vulnerability in climate-sensitive sectors	■ No implementation linkage with food pricing/stabilization ■ Limited role in local food adaptation efforts ■ Missing focus on women-led food access during climate events
NFSP, 2018 *(National Food Security Policy)*	Fully aligns with four SDG-linked food pillars	■ Federal-provincial role ambiguity ■ Financing for implementation unclear ■ Weak feedback for adaptive learning
NWP, 2018 *(National Water Policy)*	Supports agriculture-water nexus and food productivity	■ No integration with price/income-based food access ■ Weak community-level water governance ■ Lacks food system-specific risk planning

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NDWP, 2009 *(National Drinking Water Policy)*	Promotes safe water as a public nutrition right	■ Unlinked from agricultural/irrigation governance ■ No food-linked water safety surveillance
PFOA, 1960 *(Pure Food Ordinance Act)*	Prohibits adulterated/unsafe food products	■ Enforcement varies widely by province ■ Language outdated for modern food system ■ Traceability mechanisms lacking
PFL, 1963 *(Pakistan Pure Food Laws)*	Regulates additives, preservatives, and contaminants	■ Not aligned with Codex standards ■ Informal sector unregulated ■ Nutrition indicators not included
CPFA, 1966 *(Cantonment Pure Food Act)*	Extension of PFOA for cantonments	■ Limited to military zones ■ No revisions to urban food threats
PHRA, 1976 *(Pakistan Hotels and Restaurants Act)*	Covers hygiene in hotels and restaurants	■ Neglects informal eateries ■ Weak inspection systems ■ No links to nutritional quality enforcement
PSQCA Act, 1996 *(Pakistan Standards and Quality Control Authority)*	Sets technical and quality standards for food safety	■ Isolated from health/nutrition goals ■ Dependent on periodic testing, not real-time monitoring ■ Mandate overlaps with provincial food bodies
PFAA, 2011 *(Punjab Food Authority Act)*	Strong surveillance, vendor licensing, and enforcement capacity in Punjab	■ Limited to Punjab; no replication in other provinces ■ Sectoral coordination gaps (health, agriculture) ■ More reactive than preventive in practice
PFPR, 2018 *(Punjab Food Pure Regulations)*	Targets preservatives, additives, labeling, shelf life	■ Ignores local dietary diversity and nutrition culture ■ Rural enforcement remains underdeveloped ■ Mandate duplications with PFAA detected

3.2. Dimension-level coherence assessment

This section examines the coherence index calculated for each of the four core dimensions of food security: Physical Availability of Food (A), Economic and Physical Access to Food (B), Food Utilization (C), and Stability (D). Table 4 summarizes the average coherence scores across all analyzed policy instruments, providing insight into how well current policies align with these fundamental dimensions.

The results reveal that Physical Availability of Food holds the highest average coherence score (M = 2.66), indicating relatively stronger policy integration and focus in this area. In contrast, Food Utilization shows the lowest coherence (M = 2.19), highlighting a critical gap where policies are less coordinated and less effective in addressing nutritional adequacy and related factors. The dimensions of Stability and Economic and Physical

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Access to Food fall in between, with moderate coherence scores of 2.20 and 2.26 respectively, suggesting room for improvement in these areas as well.

Figure 3, which includes both a radar chart, visually captures these differences in coherence across dimensions. The visualization emphasizes the relative policy strengths surrounding food availability, while also illustrating the need for enhanced alignment and integration especially concerning food utilization and stability. These findings point to important priorities for policymakers aiming to strengthen the overall coherence of food security strategies.

Table 4: Average Coherence Index across Food Security Dimensions

Dimension (PC)	Average coherence per dimension
Food Utilization (C)	2.185897
Stability (D)	2.199794
Economic and Physical Access to Food (B)	2.259325
Physical Availability of Food (A)	2.662659

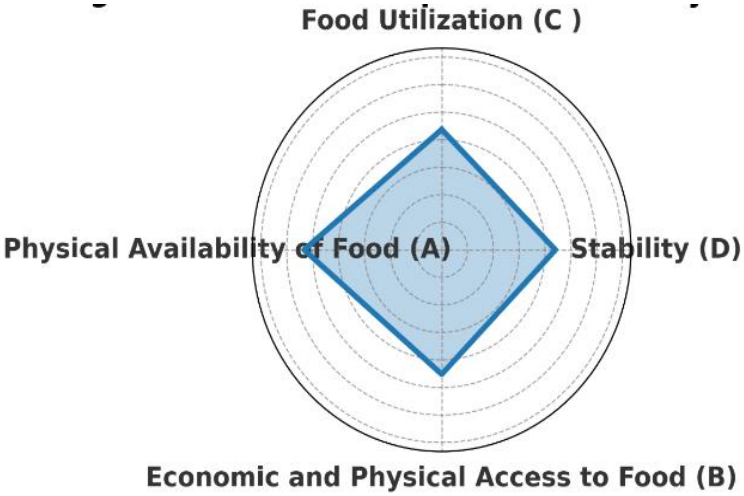

Figure 3: Coherence index per food security dimension.

3.3 Criterion-level coherence patterns

To explore the granularity of policy alignment, a criterion-level coherence assessment was conducted across all four food security dimensions—Availability, Access, Utilization, and Stability. The average coherence score for each criterion was computed and visualized using a clustered heatmap (Figure 4), while a comprehensive matrix is provided in Annex Table X. This analysis allows for a deeper inspection of thematic strengths and policy gaps within each dimension.

Among the criteria, the Environmental criterion under Physical Availability (C1) exhibited the highest coherence (M = 2.89), demonstrating a strong presence of environmental considerations across most policies, particularly NFSP2018, NWP2018, and NCCP2021. Similarly, Socio-cultural choices (C1) under Food Utilization (M = 2.80) and Physical

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Access (C1) under the Access dimension (M = 2.57) also ranked prominently, reflecting relatively cohesive attention to culturally sensitive food preferences and market access mechanisms.

In contrast, Economic Access (C2) under the Access dimension revealed the lowest coherence score (M = 1.61), signaling considerable fragmentation and weak alignment across governance instruments in supporting affordability-related interventions. Coherence was also modest for criteria like Policies & Governance (C1) and Provision of Services (C2), suggesting underdeveloped institutional frameworks and inconsistencies in service-related policies.

These findings underscore the uneven integration of food security principles within policy instruments, with a noticeable gap in addressing economic enablers of access and institutional governance. The results point to a need for targeted reforms and policy harmonization, especially in economic and governance-oriented criteria to ensure holistic food security outcomes.

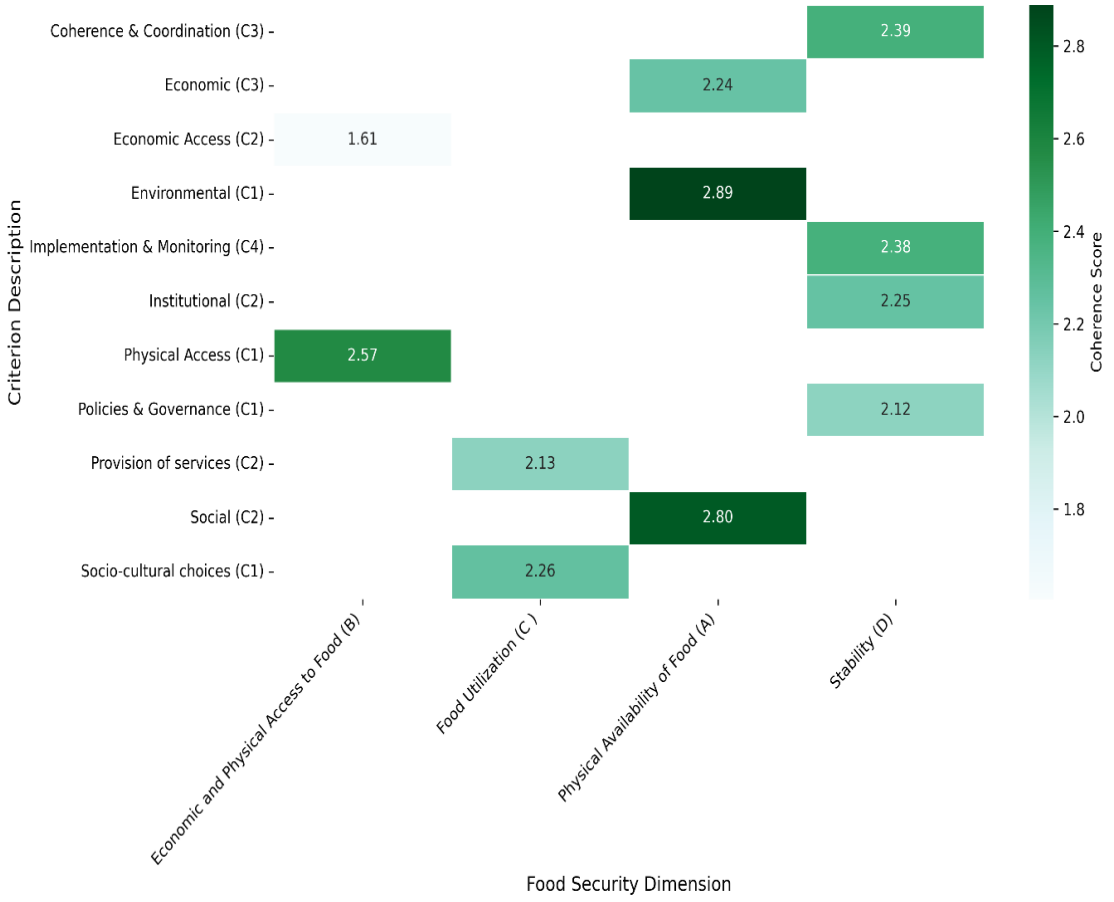

Figure 4: Average policy coherence index across food security criteria and dimensions.

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3.4 Policy-Wise Coherence Index

To assess the relative alignment of individual governance instruments with food security dimensions, a coherence index was computed for each policy document. This metric captures the average level of integration across all 13 policies with respect to the core dimensions and criteria of food security. Figure 5 present the overall coherence scores in descending order, highlighting notable trends across policy types and timelines.

The Strategic Vision 2023–27 and the National Food Security Policy (2018) emerged as the most coherent instruments, each achieving an average score above 4.0, indicating strong alignment with multidimensional food security objectives. Their comprehensive scope, recent enactment, and cross-sectoral mandates likely contribute to their superior coherence.

In contrast, older instruments such as the Pure Food Ordinance (PFOA) 1960, Pakistan Pure Food Laws (PFL) 1963, and the Cantonment Pure Food Act (CPFA) 1966 displayed the lowest coherence, with average scores below 1.5. These laws, while foundational in food safety, lack the integrative, multi-dimensional approach required to address contemporary food security challenges.

Mid-range performers include the Punjab Food Authority Act (2011) and National Water Policy (2018), which reflect moderate but uneven coverage across food availability, access, and stability domains.

This policy-level mapping reveals a clear temporal gradient in coherence: newer policy frameworks tend to exhibit higher coherence, reflecting evolving awareness and institutional learning in food security governance. However, the coexistence of outdated and fragmented instruments underscores the need for harmonization and regulatory updating across tiers of governance.

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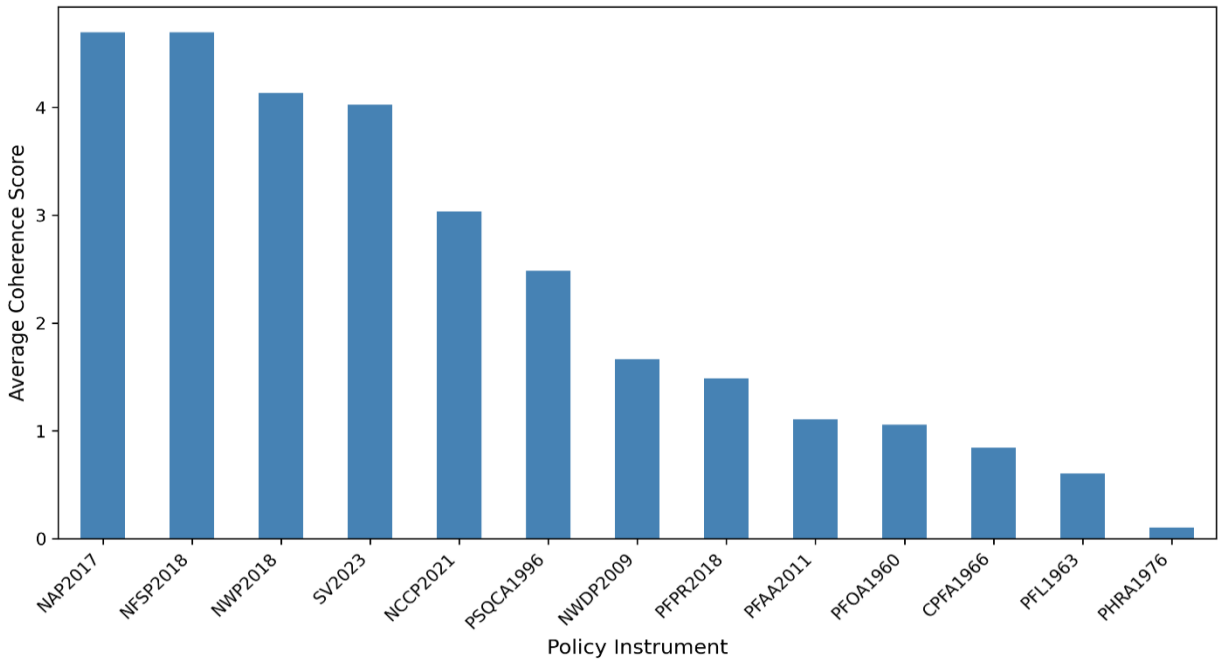

Figure 5: Overall Coherence Index by Policy Instrument.

3.5 Fragmentation and Internal Consistency

While coherence index reveals overall policy alignment, fragmentation analysis highlights internal consistency within individual instruments. Figure 6 illustrates the standard deviation of coherence scores for each policy, serving as a fragmentation index.

Notably, the National Water Policy (2018), despite a high coherence average, demonstrated the highest fragmentation (SD = 1.40), pointing to inconsistencies in addressing different food security criteria. Similarly, the National Climate Change Policy (2021) showed a standard deviation of 1.28, suggesting selective focus on environmental dimensions with limited integration of access and utilization criteria. In contrast, legacy instruments such as the Pure Food Ordinance (1960) and Pakistan Hotels and Restaurant Act (1976) had low fragmentation values (SD < 0.15), though this reflects their narrow scope rather than holistic coherence. This diagnostic reveals that high coherence does not imply internal consistency, underscoring the need for thematic balance within policy design.

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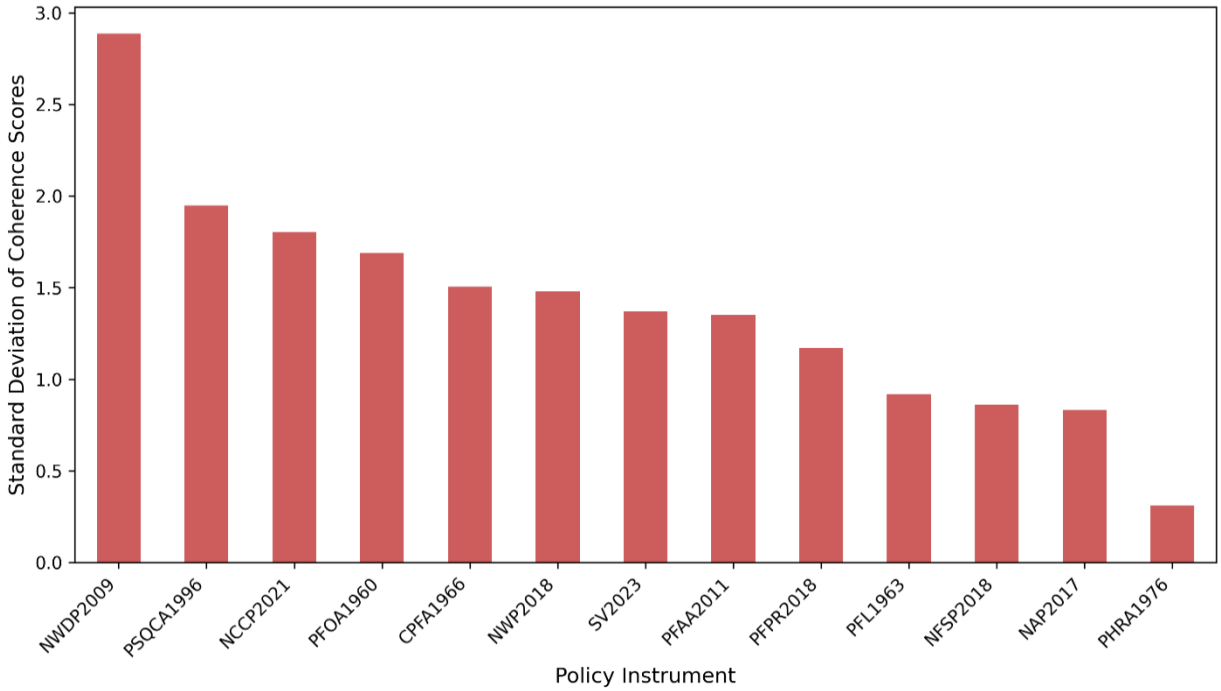

Figure 6: Fragmentation Index (Internal Consistency)

3.6 Thematic gaps of Criterion–Policy Intersections

To pinpoint specific areas of thematic alignment or neglect, a cross-sectional analysis was conducted between food security criteria and policy instruments. Figure 7 presents a bubble plot that maps coherence scores across all policy–criterion intersections, with bubble size indicating the strength of alignment. This visualization helps isolate criteria that are comprehensively addressed versus those systematically overlooked.

The analysis revealed notable thematic gaps, particularly in criteria related to “Coherence and Coordination” and “Implementation and Monitoring” under the Stability dimension. These were largely under-addressed across most policy instruments, with the exception of the National Food Security Policy (2018) and the PSQCA Act (1996), which showed comparatively stronger coverage in institutional monitoring and coordination aspects.

Similarly, older food safety laws—such as the Pure Food Ordinance (1960) and the Pakistan Pure Food Laws (1963)—showed minimal alignment with newer governance dimensions like Socio-cultural food utilization or Environmental sustainability, reflecting their limited scope and temporal context. This was especially evident in criteria like “Diversify food choices” and “Climate adaptation measures”, where several instruments scored zero or near-zero.

Conversely, recent frameworks such as NAP-SCP (2017) and NCCP (2021) demonstrated relatively balanced coherence across environmental and access-oriented

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criteria but showed inconsistency in coverage of economic access and institutional mechanisms.

This criterion-level mapping reveals that policy gaps are not evenly distributed, but cluster around specific themes—particularly those involving cross-sector coordination, nutritional awareness, and socio-cultural inclusivity. Such findings reinforce the need for strategic updating and cross-cutting policy reforms that can bridge longstanding thematic blind spots and institutional fragmentation in food security governance.

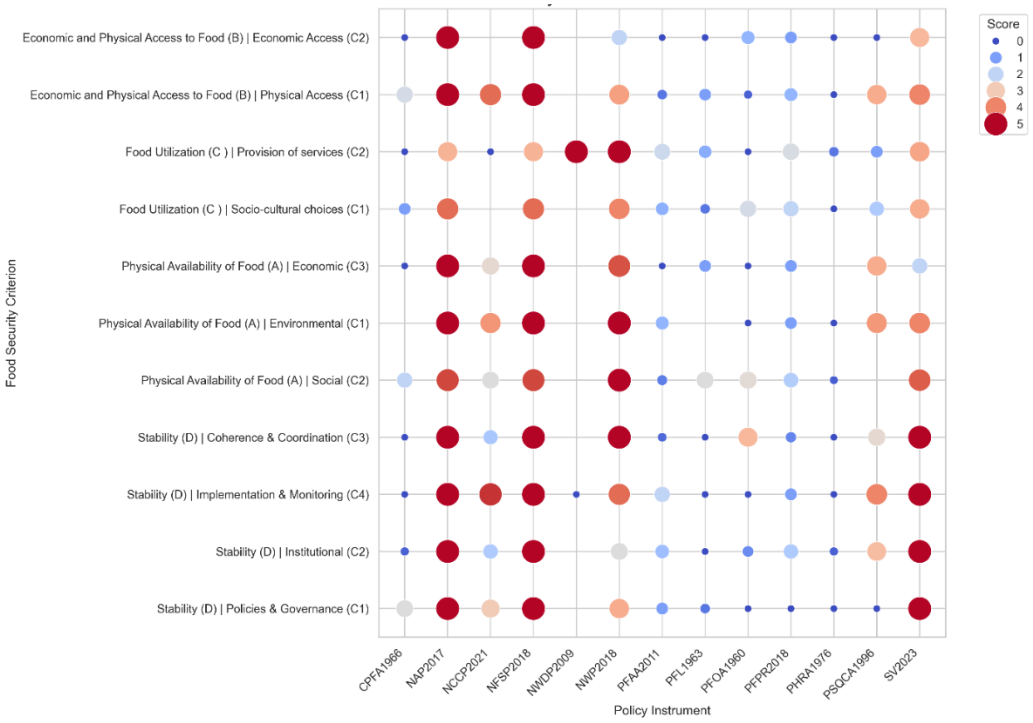

Figure 7: Coherence scores across all policy–criterion intersections.

3.7 Governance instrument typology and performance

Governance instruments were categorized into four major types: strategic visions, policies, acts/ordinances, and regulations. Their coherence scores were averaged and compared to evaluate performance consistency across categories (Figure 8).

Policy instruments (e.g., NFSP2018, NAP2017) demonstrated the highest average coherence (M = 3.78), underscoring their comprehensive scope and alignment with multidimensional food security frameworks. Strategic documents like SV2023 also performed well (M = 3.71), reflecting their holistic mandates and planning-based focus.

In contrast, older legal frameworks such as acts and ordinances (e.g., PFOA1960, PHRA1976) showed the lowest coherence scores (M = 1.42), indicative of thematic limitations and regulatory obsolescence. Regulatory instruments, including PFAA2011 and PFPR2018, occupied a middle ground, with targeted but sometimes narrow focus.

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These findings highlight the temporal and functional variance in governance performance, suggesting that while strategic and policy-level instruments are structurally more adaptive, legacy legal frameworks require substantial updating to meet contemporary food security objectives.

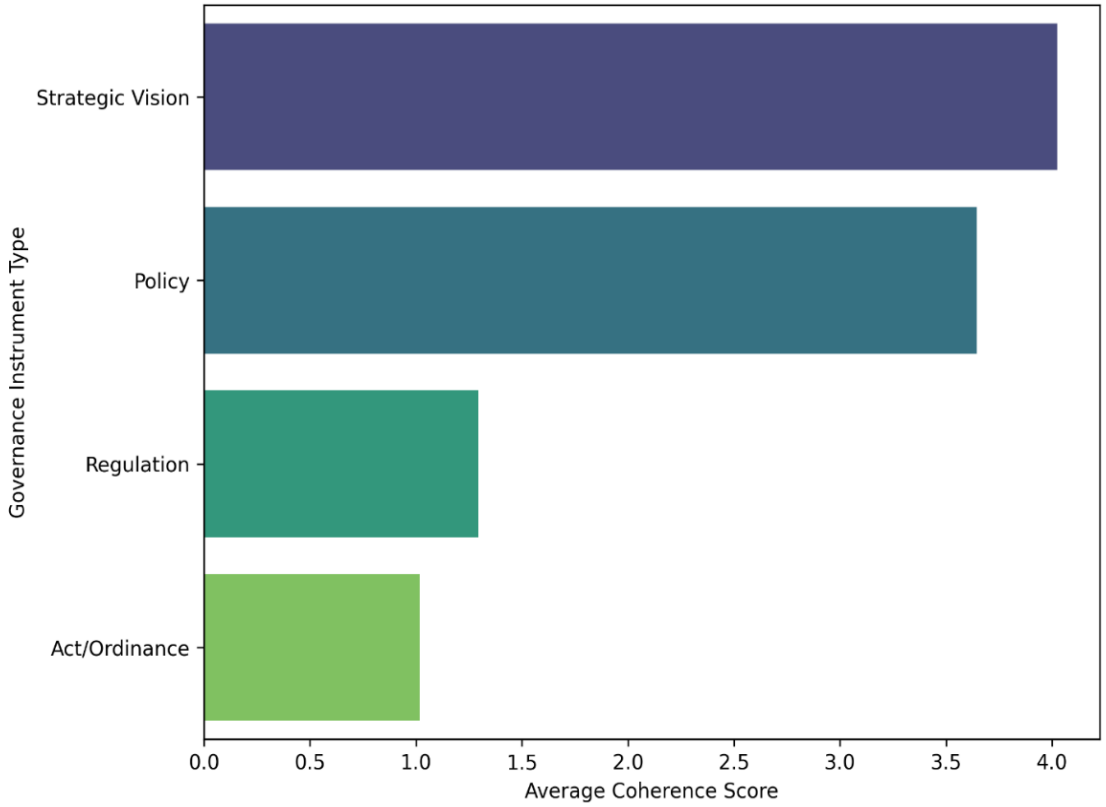

Figure 8: Typology-wise coherence comparison.

3.8 Synthesis: Coherence vs. Implementation Potential

The assessment of coherence across governance instruments provides a structured understanding of alignment with food security dimensions. However, policy coherence does not automatically equate to effective implementation. A synthesis of findings suggests that implementation potential is often constrained by systemic factors, regardless of a document's conceptual completeness or strategic alignment.

Several instruments, notably NFSP2018, NAP-SCP (2017), and SV2023, demonstrated strong coherence across multiple dimensions. Yet, field consultations and institutional reviews highlight persistent execution barriers. These include fiscal limitations, lack of decentralized planning capacities, and fragmented institutional mandates, which collectively erode the efficacy of even well-designed policies.

Moreover, older legal frameworks, such as PFOA (1960) and PFL (1963), remain technically in force but are misaligned with modern multi-sectoral food security

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challenges. Their operational capacity is limited, and jurisdictional overlaps often hinder enforceability—particularly in provinces where regulatory mandates are duplicated or inconsistently enforced.

Another critical limitation lies in inter-ministerial coordination. Coherence scores related to criteria such as “Coherence & Coordination” and “Monitoring & Implementation” were consistently low across most instruments. This indicates a gap between planning and delivery, particularly in translating cross-sectoral integration into actionable programs with measurable outcomes.

In summary, while this study highlights encouraging trends in the evolution of policy coherence, it also points to an urgent need for governance innovation, improved institutional clarity, and financial realism. Future efforts should prioritize not only the formulation of coherent instruments but also their operational viability, resourcing mechanisms, and monitoring architectures to ensure meaningful progress toward national food security targets.

4. DISCUSSION

Despite a growing policy arsenal aimed at tackling food insecurity, Pakistan continues to witness high malnutrition and hunger—underscoring a paradox between policy ambition and lived reality. This study's findings highlight that while many governance instruments appear coherent on paper, the persistence of food insecurity reflects a deeper problem: systemic misalignment between strategic intent and policy execution. In a country where per capita dietary availability exceeds minimum caloric requirements, the continued prevalence of undernutrition, particularly child stunting, raises fundamental questions about institutional design and governance functionality (Aslam et al. 2023).

One of this study’s key contributions is its empirical application of the Principle–Criteria–Indicators (PCI) framework to assess food policy coherence across four core dimensions: availability, access, utilization, and stability. Here, policy coherence refers to the degree of thematic alignment, implementation potential, and consistency across governance levels and sectors. The results revealed significant asymmetries: while “Availability” attained relatively high coherence scores (M = 2.66), “Utilization” and “Economic Access” scored markedly lower (M = 2.19 and 1.61, respectively), suggesting critical gaps in addressing nutrition diversity, affordability, and equity. These findings echo broader critiques in global literature, where access and utilization remain underdeveloped in national food strategies despite being central to food security outcomes (HLPE 2020).

Notably, newer policy instruments like the National Food Security Policy (2018) and Strategic Vision 2023–27 demonstrated high coherence, yet failed to translate into effective implementation due to persistent fragmentation. Coherence indicators related to coordination, monitoring, and financing mechanisms scored consistently below 2.0 across instruments, exposing a key institutional shortfall. Similar governance gaps have

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been documented in other Global South contexts, where centralized planning often fails to accommodate local realities and multi-actor needs (Piguet 2022).

The typology-based analysis of instruments further underscores the institutional inertia embedded in Pakistan's food governance. Legacy frameworks such as the Pure Food Ordinance (1960) and Pakistan Pure Food Laws (1963), while legally active, are largely incompatible with contemporary food system challenges, lacking focus on climate resilience, socio-cultural food preferences, and dynamic risk planning. This mirrors global evidence showing that outdated food safety and agriculture laws often serve as barriers to holistic food systems reform (MOE-GOP 2009).

At the same time, strategic documents and policy-level instruments showed more adaptability. Their stronger coherence scores suggest greater potential for systemic integration—if supported by implementation pathways. However, the analysis also uncovered high fragmentation in these same instruments (e.g., National Water Policy, 2018), suggesting selective emphasis on certain themes (like environmental sustainability) while neglecting others (like economic access and food justice). This form of "selective coherence" reinforces recent arguments that technocratic approaches, while necessary, are insufficient for resolving deep-rooted structural inequities in food systems (Clapp and Moseley 2020).

Importantly, the PCI framework not only diagnoses alignment gaps but offers a practical tool for reform. It highlights under-addressed policy themes such as nutrition utilization, cross-sector coordination, and participatory governance—all of which are essential to advancing SDG 2 and SDG 12. Its indicator-based architecture allows governments, donors, and civil society to evaluate not only whether policies exist, but how well they function in concert.

That said, the study's scope was limited to Islamabad, Punjab, and Sindh, and coherence scores, while systematically derived, involve expert judgment that may vary across contexts. Furthermore, coherence does not inherently guarantee implementation. Barriers such as fiscal constraints, political economy dynamics, and capacity gaps—frequently noted in institutional assessments—can disrupt even the most coherent policy architecture (UNDP Pakistan 2022).

Looking forward, future research should explore how coherence intersects with budget allocations, grassroots participation, and climate adaptation planning—especially in contexts where overlapping vulnerabilities challenge policy traction. There is also scope to extend the PCI framework with new dimensions such as gender responsiveness and digital governance.

In sum, this study reveals that food insecurity in Pakistan stems not from the lack of policy frameworks but from their fragmented architecture and limited operational traction. By empirically mapping coherence and fragmentation across instruments, it advances a systems-level understanding of food governance and offers a replicable method for reform. If the Sustainable Development Goals are to move beyond rhetoric, coherence

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must become a lived institutional practice—embedded not only in plans but in power, participation, and performance.

5. CONCLUSION

This study explored a persistent paradox: why food insecurity endures in Pakistan despite strategic planning and agricultural abundance. The answer, grounded in both data and lived realities, lies not in the production of food but in the fragmented systems meant to govern its equitable access. Through the development and deployment of the PCI framework, this research introduces a method to evaluate the coherence of food security policies—not only in theory but in how they align with real-world needs across four essential dimensions: availability, access, utilization, and stability. What the findings reveal is sobering. While policy instruments like the National Food Security Policy (2018) and Strategic Vision 2023–27 appear coherent on the surface, their operational traction is often undermined by jurisdictional ambiguities, outdated legislation, and institutional silos. A closer look exposes that coherence—on paper—does not always translate to meaningful implementation.

Thematic gaps in nutrition, affordability, and local inclusion remain deeply entrenched. And in a country where wheat is abundant, yet malnutrition persists, these gaps take on human form. A child in Sindh suffering from chronic stunting is not a marginal case; they are the consequence of a system where governance is well-intentioned but structurally misaligned. The value of the PCI framework lies not only in its diagnostic precision but in its adaptability. Though anchored in the Pakistani context, it can serve as a replicable tool for other countries in the Global South where food systems are similarly shaped by institutional legacies, policy inertia, and competing mandates. For researchers and policymakers alike, it offers a lens through which to see beyond production figures and into the architecture of equity itself. This study is not without limitations. Its geographic focus excludes provinces such as Balochistan and Khyber Pakhtunkhwa, and while the PCI framework assesses policy alignment rigorously, it does not yet measure implementation outcomes—a vital next step. Moreover, coherence alone is not a guarantee of success. Funding realities, political dynamics, and bureaucratic capacity all influence how even the most coherent plans unfold. Still, the broader message endures: transforming food systems requires more than growing more—it demands governing differently. A commitment to food security must be mirrored in institutional clarity, cross-sector coordination, and the political will to prioritize the most vulnerable. If sustainable development is to be more than an ambition, then governance must not merely exist—it must function, adapt, and serve.

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