Multitech Journal of Science and Technology (MJST)
Vol.3, No.10, 2026:1223-1246

Beyond Food Security: Seven Arenas of Power, Nutrition Information Gaps, and the Political Economy of Global Food Systems

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A R T I C L E I N F O

Keywords: Lobal Food Systems, Seven Arenas of Power, Nutrition Information Gaps, Misleading Nutrition Narratives, Financialisation, Decent Work, Unpaid Care, Food Sovereignty, Political Economy, Nutrition Equity, Governance

Received : 2 August
Revised : 20 September
Accepted: 20 October

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A B S T R A C T

Global food systems can expand output and trade without ensuring that nutritious diets, fair livelihoods, and ecological resilience are accessible to all. This critical qualitative literature review synthesises peer-reviewed research published during 2020-2026 through seven interconnected arenas of power: production, distribution, consumption, knowledge, policy, finance and investment, and labour and care. It examines how power operates through access to productive resources, supply-chain infrastructure, food environments, research and public narratives, rule-making, capital allocation, and paid and unpaid food work. The article uses the plain-language expression 'nutrition information gaps and misleading narratives', distinguishing documented deception from neglected evidence and culturally normalised assumptions. Recent research on mergers, investment criteria, workers' bargaining power, forced-labour risk, and unpaid care strengthens the explanation of who benefits and who bears the costs of food-system change. The framework does not equate concentration with misconduct, industry-funded research with invalid evidence, or observed knowledge gaps with deliberate concealment. It proposes testable cross-arena pathways, a seven-arena diagnostic matrix, and a three-stage reform sequence of diagnosis, expanded alternatives, and outcome evaluation. A holistic assessment of food systems should therefore examine healthy-diet affordability, meaningful choice, financial and labour protections, inclusive governance, and environmental performance together

DOI: https://doi.org/10.59890/mjst.v3i10.6
E-ISSN: 3089-9966
https://journalmjst.my.id/index.php/mjst/index

INTRODUCTION

1. The Central Paradox of Contemporary Food Systems

Food systems are commonly judged through the volume, stability, and affordability of food supply. Yet a production-centred appraisal cannot explain why ample aggregate supply can coexist with low dietary diversity, unaffordable healthy diets, nutritional inequalities, and ecological damage. Food-system transitions have improved access to calories in many settings without delivering equally favourable outcomes for environmental health, social inclusion, or diet quality. The literature therefore asks a question that extends beyond how much food is produced: who can shape the conditions under which food is produced, exchanged, understood, and governed (Ambikapathi et al., 2022; Schneider et al., 2023). Recent crises have exposed the fragility of assuming that food availability follows automatically from efficient global markets. COVID-19 disrupted mobility, employment, procurement, and food services, but responses differed sharply across regions and sectors. Disruption operated through purchasing power, institutional arrangements, and logistics rather than physical shortage alone (Carducci et al., 2021a; Fan et al., 2021; Bai et al., 2021; Laborde et al., 2021). At the same time, concentration in seed, input, trading, food manufacturing, and retail segments has raised questions about market power and meaningful choice. Concentration is not equivalent to misconduct, since economies of scale may foster quality control, investment, or innovation; a critical analysis must distinguish measurable concentration from its variable social consequences and examine the countervailing institutions available to less powerful participants (Clapp, 2021; Clapp et al., 2025). Food-policy controversies also concern what counts as reliable nutritional knowledge. Some debates emphasise nutrients, others foods, dietary patterns, processing, social conditions, or planetary impacts. These approaches illuminate different aspects of a complex problem and need not be mutually exclusive. Nevertheless, an unequal capacity to fund studies, advertise products, commission evidence, or participate in consultations can give some framings greater public presence than others. The commercial determinants of health offer a route for examining such processes without assuming that all scientific disagreement originates in manipulation (Gilmore et al., 2023; Friel et al., 2023).

2. Problem Statement and Objective

The overarching problem is the separation of material food-system analysis from analysis of cultural authority, scientific evidence, and rule-making. Studies may investigate patents, farm structure, supermarket access, nutritional marketing, conflicts of interest, or trade rules independently, yet these mechanisms interact: a production technology becomes consequential through procurement networks; retail conditions shape what consumers encounter; and policy rules can reward particular products or farming systems. The result is a set of interconnected arenas rather than a linear chain moving from farm to plate (Jacobi et al., 2021; Resnick and Swinnen, 2023). This article proposes a seven-arena account of power operating through (1) production, including seeds, land and agricultural technologies; (2) distribution, including logistics, procurement and retail; (3) consumption, including preferences, affordability and dietary

practices; (4) knowledge, including research, standards and nutrition narratives; (5) policy, including regulation, public support and trade; (6) finance and investment, including access to credit, ownership and the allocation of risks and returns; and (7) labour and care, including wages, working conditions, bargaining rights and unpaid household food work. Its primary objective is to assess which relationships contemporary journal research supports, which require context-specific testing, and where political assertions go beyond the available evidence (Keenan et al., 2023; Schneider et al., 2023; Blackstone et al., 2024).

3. Contribution and Scope

The review makes three linked contributions. Conceptually, it uses the accessible expression 'nutrition information gaps and misleading narratives' to examine whose knowledge circulates, which questions are under-researched, and when nutrition claims are demonstrably distorted. Analytically, it separates productive, infrastructural, dietary, informational, regulatory, financial, and labour-related power while identifying feedback among these processes. Normatively, it develops a reform agenda addressing healthy-diet affordability, producer and worker agency, responsible finance, scientific integrity and ecological resilience without assuming that all corporate concentration is harmful (Gilmore et al., 2023; Keenan et al., 2023; Meemken et al., 2024). The purpose is to analyse plausible mechanisms, not to pool causal effects or claim identical outcomes across diverse national food systems. Ecological integrity and climate resilience are treated as system-wide constraints and outcomes across all seven arenas. Two distinctions sharpen the agenda. The first is between control and dependence: a supplier with a large market share may be unable to impose unreasonable conditions when producers can switch, bargain collectively, or invoke effective regulation, whereas a small platform controlling unique data, certification, or market access may exercise disproportionate influence. Feasible alternatives, the allocation of risk, and voice in rule-making are therefore treated as observable manifestations of power instead of firm size serving as a complete proxy (Deconinck, 2020; Clapp, 2021; Klerkx and Rose, 2020). The second is between nutritional deprivation, meaning restricted access to foods and care needed for an adequate diet, and nutritional invisibility, meaning neglected populations, under-measured dietary outcomes, or evidentiary frames that make some policy options less salient. The two need separate evidence: food-price and diet data for deprivation, research and institutional records for invisibility (Carducci et al., 2021b; Gilmore et al., 2023; Burgess et al., 2024).

The review is organised as follows: Section 2 sets out conceptual foundations; Section 3 explains the method; Section 4 synthesises evidence across the seven arenas; Section 5 examines feedback, rival explanations and reforms; and Section 6 concludes.

LITERATURE REVIEW

1. Political Economy, Concentration, and Agency

Political-economy approaches treat markets as historically produced institutions embedded in law, property rights, access to capital, and asymmetric bargaining relationships. In agriculture, farm-size distribution and ownership patterns matter because they influence collateral, public support, labour conditions, and technological choices. Small farms remain important for livelihoods and production, whereas concentrated land ownership and a narrow range of commercially viable production models can create exclusionary pressures; farm size alone, however, does not establish efficiency, sustainability, or distributive justice (Lowder et al., 2021; Giller et al., 2021). Power should be decomposed into at least three mechanisms. Market power concerns the ability to affect prices, margins, contractual terms, or access. Material power concerns the ability to set technical standards, infrastructures, and viable organisational choices. Political power concerns influence over policies and collective decisions. A fourth, epistemic, dimension concerns the unequal capacity to determine which problems and evidence become visible. Concentration can support investments in research and logistics, but without contestability or accountability it can also limit the practical agency of producers and consumers, and these outcomes depend on institutional context rather than firm size alone (Clapp, 2021; Clapp et al., 2025; Hackfort, 2025). Financialisation adds another layer. Financial investors, creditors and funds may shape decisions about mergers, brand portfolios, growth strategies, input dependence and technology investment, with incentives that differ from those of producers, workers and consumers. Evidence on mergers and acquisitions shows patterned concentration, but its effects must be distinguished from presumed misconduct. Responsible finance may, by contrast, enable long-term investment in nutritious foods, environmental restoration and inclusive supply chains when metrics and accountability are credible (Wood, B. et al., 2023a; Keenan et al., 2023; Robinson et al., 2024).

2. Food Sovereignty, Political Ecology, and Socio-Technical Transitions

Food sovereignty directs attention to who has voice over land, seed, labour, and the organisation of diets; food security directs attention to availability, access, utilisation, and stability. The perspectives overlap but answer different questions: food may be affordable while producers lack bargaining rights, and locally governed systems may still fail to supply adequate nutrition if constraints on infrastructure, incomes, or production remain unresolved. Political ecology helps analyse how ecological change, institutional power, and unequal resource access are connected without presuming that all local arrangements are equitable (Jacobi et al., 2021; Lowder et al., 2021).

Agricultural technologies embody both possibility and risk. Data platforms, gene editing, targeted application, and mechanisation may raise productivity, yet proprietary standards, high fixed costs, restrictions on repair or seed reuse, and control of generated data can make some technologies difficult to exit. Publicly funded plant breeding, interoperable platforms, farmer organisations, and participatory agroecological research may preserve more

options, and smallholders are neither technologically uniform nor necessarily opponents of innovation (Clapp and Ruder, 2020; Runck et al., 2022; Bezner Kerr et al., 2023). Climate and ecological risks reinforce the need for multiple criteria: pesticides protect crops while creating risks for non-target ecosystems and human health, and agroecological adaptation can support resilience although evidence varies by crop, location, and farmer resources (Tang et al., 2021; Dagunga et al., 2023; Quintero et al., 2024; Hauser, 2023; Cordoba et al., 2020).

3. Nutrition Information Gaps, Misleading Claims, and Commercial Influence

Nutrition information is unevenly produced, shared and interpreted. Three processes must be distinguished. Deliberate distortion involves evidence of selective presentation, false claims or purposeful suppression. Structural information gaps arise when funding, datasets and expert participation overlook particular foods, people or health outcomes even in the absence of bad intent. Normalised assumptions arise when familiar beliefs about convenience, modernity, strength or health are repeated beyond what evidence supports. Each requires different methods and standards of proof; the existence of a research gap alone cannot establish intentional deception (Gilmore et al., 2023; Ulucanlar et al., 2023; Burgess et al., 2024). Commercial determinants of health scholarship identifies corporate practices, market structures, and political relationships that may shape population health, including advertising, product design, pricing, lobbying, and knowledge production. Corporate political activity has been documented in specific settings such as Colombia and the Philippines, providing evidence of mechanisms rather than grounds to declare every regulation or standard captured (Mialon et al., 2020; Huse et al., 2023; Slater et al., 2024). The epistemic question matters because a nutrient is not a food and a food is not a diet. Judging healthfulness through a limited nutrient list can overlook food matrices, displacement effects, processing contexts, and dietary patterns, and fortification can address specific deficiencies yet cannot resolve poverty or an unhealthy retail environment (Carducci et al., 2021b; Gearhardt et al., 2023; Lane et al., 2024).

4. Resilience, Governance, and Contestation

Systems resilience concerns maintaining, adapting, and transforming essential functions under shocks. It cannot be reduced to local self-sufficiency or maximum global integration: regional trade and distributed supply chains can spread risk and expand dietary choice, whereas global chokepoints and concentrated input dependence can transmit shocks across distant locations (Davis et al., 2021; Marusak et al., 2021; Wood, A. et al., 2023). Food-system transformation is also politically contested, since actors disagree about evidence, goals, framings, and acceptable distributional trade-offs. Multi-stakeholder coordination does not necessarily equalise influence, so procedures are needed in which public authorities remain accountable, vested interests are transparent, affected communities have meaningful voice, and conflicts between health, livelihoods, productivity, and the environment are negotiated explicitly (Resnick and Swinnen, 2023; Westengen et al., 2025; Slater et al., 2026).

5. Finance, Ownership and the Distribution of Economic Risk

Finance influences food systems through loans to farmers but also through control of investment priorities, corporate ownership, insurance and access to working capital. Capital allocation can favour scalable products or firms whose risks and returns fit investors' expectations, and agri-food technology narratives help determine which innovations attract support. Neither result establishes that finance is uniformly damaging; the relevant questions concern market alternatives, transparency, public benefits and the allocation of risks (Keenan et al., 2023; Sippel and Dolinga, 2023). Blended instruments, targeted nutrition investment and responsible investor engagement can mobilise resources where public budgets are insufficient, but promises of 'sustainable investment' should be tested against realised outcomes and access for smaller enterprises (Diaz-Bonilla et al., 2023; Shekar et al., 2023; Robinson et al., 2024).

6. Labour, Unpaid Care and the Social Foundations of Food Systems

Food systems depend on paid and unpaid human work: cultivating, processing, moving and selling food, preparing meals, and caring for household members. Labour power is not reducible to farm ownership or consumer choice, because employers, contractors, workers and households hold unequal capacities to set schedules, negotiate wages, or refuse hazardous work. Forced-labour risks and inadequate decent-work data show that performance cannot be judged through production, sales and nutritional intake alone (Blackstone et al., 2023; Meemken et al., 2024). Interview research in Myanmar, Papua New Guinea and the Philippines documents how women's responsibility for securing meals interacted with income loss and crisis risks; the findings are contextual, but they show why dietary guidance may fail when purchasing power, household bargaining and caregiving time are ignored (Davies et al., 2024; Forsythe, 2023; Blackstone et al., 2024).

METHODOLOGY

1. Design and Selection Logic

The manuscript employs a qualitative literature review (QLR) with a critical interpretive orientation. It is not a systematic review, meta-analysis, or bibliometric study. It juxtaposes research from agricultural economics, nutrition, public health, geography, sustainability science, law, and governance to elaborate a conceptual explanation of cross-arena power. Literature was assembled purposively from peer-reviewed scholarship issued in 2020-2026 through disciplinary searches, journal bibliographies, publisher records, DOI identification and citation chaining, with emphasis on works offering substantive mechanisms, comparative evidence, or important counterarguments. Studies of beneficial finance, trade, markets and technology were deliberately retained alongside critical analyses of power, and no exhaustive database retrieval or PRISMA-based screening is claimed (Diaz-Bonilla et al., 2023; Meemken et al., 2024).

2. Interpretation and Analytical Procedure

An initial analytic map allocated sources to the seven arenas. For each, the review examined actors, controlled resources, mechanisms, measurable consequences, feasible alternatives and evidentiary uncertainty, and the cross-arena synthesis then explored how creditor requirements influence production and procurement, how work and unpaid care constrain food choice, and how research and regulation affect investment. Claims were evaluated conservatively: association is not causal proof, high concentration is not automatically abuse, lobbying is not by itself regulatory capture, and a missing study cannot establish purposeful concealment (Gilmore et al., 2023; Keenan et al., 2023; Richards and Rutledge, 2023; Davies et al., 2024). The synthesis also distinguishes four types of source contribution (descriptive mapping, observational associations, model-based counterfactuals, and conceptual or normative arguments) and examines countervailing findings, such as cases where trading networks improve diets or technology raises productivity without diminishing agency (Chung and Liu, 2022; Nguyen and Qaim, 2025; Schneider et al., 2025).

3. Limitations

The review does not claim numerical comprehensiveness. Publication, language and geographic biases, uneven availability of worker-level data and methodological differences limit cross-country comparison. Establishing financial or labour power in a particular jurisdiction often requires ownership, lending, wage, contract, time-use and enforcement evidence not uniformly available in secondary research. The seven arenas are therefore a testable organising framework rather than a complete inventory of causal effects; their boundaries overlap, and ecological change, climate hazards and inequality operate across the whole system.

RESULTS

1. Production: Seeds, Land, and Technological Trajectories

The first arena concerns access to the means of production and the choices that remain feasible once a farm is integrated into a particular technological or contractual system. Intellectual-property law, licensing, the biology of hybrid varieties, and access to alternative germplasm each influence the capacity to save, exchange, or purchase planting material. It would be inaccurate to conclude that all commercial seeds legally require annual repurchase, since crop biology and national rules differ; the analytical issue is how combinations of intellectual property, supplier concentration, and credit arrangements limit choice or shift risk to producers (Clapp and Ruder, 2020; Suastuti et al., 2023). Concentration is better understood as a set of partly overlapping markets than as a single worldwide monopoly: it varies by crop and country, and biotechnology-trait markets may be more concentrated than seed supply itself (Deconinck, 2020; Clapp, 2021). Land tenure is similarly differentiated. Large-scale ownership can affect access to productive resources, whereas insecure smallholder tenure can deter investment and expose farmers to displacement. Landownership concentration, operational farm size, contract farming, and land-use decisions

must be distinguished, and collateral requirements, leasing contracts, irrigation access, and eligibility for programmes can differentiate farms of similar size. Gender and generational position matter too: access to titles, extension, equipment and credit differs within households and producer organisations, so tenure documentation or cooperatives will not necessarily include women, tenants, migrant workers or younger entrants unless representation and enforceable rights are designed in (Lowder et al., 2021; Giller et al., 2021; Cordoba et al., 2020; Bezner Kerr et al., 2023; Forsythe, 2023; Clapp et al., 2025). Technological lock-in is a related mechanism. A farmer who buys precision equipment may also depend on proprietary repair systems, data platforms, software standards and new financing. These can lower transaction costs and improve monitoring, but also create switching costs and asymmetric access to data. The critical question is not whether digital technology is intrinsically harmful but whether benefits and decision rights are fairly distributed; interoperability, collective bargaining, independent extension and clear farm-data rights are plausible safeguards (Runck et al., 2022; Klerkx and Rose, 2020; Hackfort, 2025). Technical performance must also be separated from governance of use: a precision irrigation system may reduce water stress, but its effect on dietary access depends on which crops receive water, who can finance installation, and whether produce reaches local consumers. Evidence on irrigation expansion and children's dietary diversity illustrates why nutrition-sensitive assessment must trace several links from infrastructure to household diets (Mehta et al., 2025; Ambikapathi et al., 2022). Production systems also shape ecological stability. Pesticides prevent serious losses but may expose water, soil and biodiversity to pollution, supporting monitoring, integrated pest management and reduced hazardous exposure rather than blanket prohibition; agroecological studies report the value of diversified practices and local knowledge, although generalisability is conditional on labour, support services and ecosystems. Meta-analytic evidence on rice systems indicates that diversification can offer productivity, biodiversity and ecosystem-service benefits, but not that every practice works everywhere (Tang et al., 2021; Bezner Kerr et al., 2023; Dagunga et al., 2023; Quintero et al., 2024; He et al., 2023; Crippa et al., 2021). The synthesis suggests a mechanism of constrained optionality: power over technologies or land becomes problematic when farmers lack meaningful alternatives and cannot negotiate costs, data rights, or environmental obligations. A subsidy for a specified input, for instance, can raise short-run output while disadvantaging less capitalised producers or agroecological alternatives, so production gains should be evaluated together with debt, income stability, ecological effects and participation (Giller et al., 2021; Ray et al., 2022).

2. Distribution: Markets, Logistical Chokepoints, and Retail Infrastructures

The second arena is the network through which food moves, changes form, acquires value, and reaches consumers. Procurement contracts, grading standards, processing capacity, storage, shipping and shelf space help determine which producers enter profitable markets. These networks are not neutral conduits: they can favour firms able to meet scale requirements while excluding

smaller enterprises lacking cold storage, information or working capital, although standardisation and modern logistics may also improve safety, reduce losses and stabilise supply when access is broadly distributed (Hobbs, 2021; Marusak et al., 2021). A farmer may receive a nominally competitive price yet be disadvantaged by rejection risk, delayed settlement, packaging costs or exclusive delivery terms; conversely, predictable standards can reduce waste when smaller producers can access finance, testing, storage and collective marketing on fair terms (Clapp et al., 2025). A useful differentiation is between productive coordination, where concentration reflects fixed costs in transport or processing, and exclusionary gatekeeping, where indispensable facilities impose conditions that cannot realistically be contested (Davis et al., 2021; Karakoc et al., 2023; Fan et al., 2021). COVID-19 and subsequent commodity-market disruptions show that vulnerability is not reducible to ownership. A network can fail because transport is interrupted, workers cannot reach facilities, inventories are over-concentrated, or major nodes lack substitutes. Modelling identifies structural chokepoints in agri-food supply chains, and Asian experiences show that targeted state responses, functioning logistics and private flexibility can preserve supplies under stress, albeit unevenly. Diversification should be assessed across products, firms, territories and transport modes, balancing redundancy against the efficiency of centralised distribution according to perishability, climate exposure and household vulnerability (Fan et al., 2021; Davis et al., 2021; Karakoc et al., 2023; Wood, A. et al., 2023). Price and nutritional affordability must be distinguished. Meeting nutritional recommendations is more demanding than securing sufficient calories, pandemic shocks worsened healthy-diet affordability among vulnerable populations, and a low staple price may coexist with dietary deprivation when vegetables, fruits and protein remain inaccessible (Bai et al., 2021; Laborde et al., 2021; de Pee and Turowska, 2022). Panel data from six rural African countries show that household production diversity is positively associated with dietary diversity but only modestly, while functioning markets play a larger role, so producer autonomy and dietary diversity are not opposing goals where local exchange is inclusive (Nguyen and Qaim, 2025). Retail environments add another layer: associations between retail settings and consumption are context-dependent rather than mechanically causal, and a 97-country analysis links the growth of chain retail with rising obesity without proving that chains caused it. Traditional markets, street vending and informal commerce can be nutritionally and economically indispensable, and interventions may support small retailers alongside nutrition-sensitive rules for large chains (Chege et al., 2021; Turner et al., 2021; Carducci et al., 2021b; Scapin et al., 2025). Trade can compensate for local crop failures and expand dietary choice, yet dependence on a few import origins, costly inputs or concentrated shipping routes creates exposure. The aim is resilient interdependence rather than a choice between autarky and unqualified liberalisation. The composition of trade matters: imports alter diet-related risk and mortality in both beneficial and adverse directions depending on the foods traded, so aggregate import dependence is an incomplete indicator of nutritional sovereignty (Alexander et al., 2023; Chung and Liu, 2022; Springmann et al., 2023).

3**. Consumption: Preference Formation, Food Cultures, and Dietary Quality**

The third arena examines how preferences are formed within environments shaped by affordability, availability, marketing, social relationships and the meanings attached to food. Commercial promotion can associate convenience or processed products with aspiration and status, yet culture is not simply imposed: people adapt foods to family practices, religion, time constraints and local tastes. Choice is structured by budgets, time scarcity, care obligations, food safety, aspiration and identity, so preferences are neither wholly autonomous nor wholly manufactured, and better explanations ask which opportunities for meaningful choice are created by retail location, working hours, cooking equipment, household bargaining and trusted cultural institutions (Wood, B. et al., 2023b; He et al., 2021; Carducci et al., 2021b; Davies et al., 2024). Product architectures such as portion size, packaging, pricing promotions and reformulation shape convenience and apparent value without requiring false claims. Processing is a spectrum covering preservation, milling, pasteurisation, fortification and highly formulated ready-to-eat products, and distinguishing their dietary implications is more defensible than treating all manufactured food as one risk category (Wood, B. et al., 2023a; Lane et al., 2024; Gearhardt et al., 2023). High ultra-processed food consumption is associated with adverse outcomes in observational syntheses, which justifies investigation and precaution; but classifications are heterogeneous and observational designs are vulnerable to confounding and measurement differences. The strongest inference is that prevailing high-exposure patterns warrant prevention-oriented action and more rigorous causal research, not that every product has an identical biological effect, and regulation can prioritise demonstrably unhealthy formulations and marketing while permitting beneficial preservation and affordability innovations (Gearhardt et al., 2023; Dai et al., 2024; Lane et al., 2024; Wang et al., 2024). The health burden of food systems also extends to occupational exposure, pollution and unequal resources, so a national average dietary improvement is insufficient evidence of an equitable transition (Zheng et al., 2024; Crippa et al., 2021; Blackstone et al., 2024). White rice illustrates overstatement. Milling removes bran-associated fibre and micronutrients, and reliance on a narrow staple pattern may reduce diversity, but rice is also a widely used energy source embedded in culinary and livelihood systems, and its effect depends on portions, complementary foods, preparation and enrichment. A nutrition-sensitive transition should expand affordable choices and variety without stigmatising a staple or culturally valued cuisine (Carducci et al., 2021a; Bai et al., 2021; He et al., 2023; Nguyen and Qaim, 2025). The nutritionism debate (revisited in Section 5.2) requires similar care: fortification may be useful where deficiency prevalence and efficacy justify it, provided it reaches the intended population, avoids excess intake and complements food-based improvements (Schneider et al., 2023; Carducci et al., 2021b; Krasovskaia and Just, 2025; Larrick et al., 2022). The dietary transition thus involves two intersecting inequalities: some consumers cannot afford diverse healthy foods, while others face abundant calorie-dense choices in heavily promoted environments. Recommendations can be regressive if they presume households can purchase costlier diets, which supports a concept of

constrained dietary agency: people may understand recommendations but lack money, transport, safe markets, refrigeration, time or culturally appropriate alternatives. Evaluations should combine dietary and affordability data with accounts of lived constraint and test whether reforms narrow rather than reproduce inequalities (He et al., 2021; Laborde et al., 2021; Dai et al., 2024; Scapin et al., 2025; Zheng et al., 2024).

4. Knowledge: Research Independence, Standards, and Competing Narratives

The fourth arena concerns authority over what is measured, studied, publicised and regarded as credible. Nutrition evidence is produced by universities, agencies, hospitals, industry laboratories and funders. Corporate support can expand research capacity, but financial relationships may create perceived or actual conflicts requiring disclosure and independent safeguards; guidance therefore concentrates on governance and integrity instead of presuming that funding source alone determines validity (Larrick et al., 2022; Gilmore et al., 2023). Power over the research agenda operates at several levels that must not be collapsed into a single allegation of scientific corruption: choices about which crops to study, which biomarkers to measure and which populations to recruit create uneven evidence even when individual studies are honest. Mapping funding flows and publication patterns can illuminate structural visibility, whereas deliberate suppression requires a more demanding record of conduct and intent (Burgess et al., 2024; Gilmore et al., 2023; Larrick et al., 2022). Deliberate distortion includes documented selective evidence use or messaging designed to obstruct credible health measures; structural gaps reflect underinvestment in dietary surveillance, neglected crops or long-run assessments; and normalised assumptions arise where advertising categories are accepted as nutritional facts. These must not be merged, and strategic distortion is best investigated through traceable organisational practices such as consultation submissions, archival communications, sponsored expert networks and discrepancies between internal and public statements (Ulucanlar et al., 2023; Slater et al., 2024; Ngqangashe et al., 2022; Mialon et al., 2020; Huse et al., 2023). Structural invisibility calls for a different design: informal vendors, women's work, Indigenous crops and migrant workers may be missing from major datasets because of resource limits, administrative definitions or weak representation, not a planned cover-up (Carducci et al., 2021b; Burgess et al., 2024; Meemken et al., 2024). Food standards illustrate a tension between coordination and exclusion. Codex-related systems and national standards such as Indonesia's SNI are formal institutions with public and private participants, and standards for safety, hygiene and product identity can protect consumers and build trust across distant markets. Yet drafting processes, participation costs, testing fees and technical complexity may privilege actors with greater legal and scientific resources, so assessment should examine representation, evidence used, compliance support and distributional effects, not assume that every international standard is privately controlled (Friel et al., 2023; Farmery et al., 2025; Slater et al., 2024). Framing also matters: a debate described as 'consumer choice' can produce different interventions from one framed around

'commercially structured environments', while cultural normalisation operates more diffusely than deliberate misinformation (Ngqangashe et al., 2022; Tak et al., 2024; Krasovskaia and Just, 2025). The result is not one hidden nutritional truth waiting to replace contemporary science but a governance problem concerning the distribution of scientific resources and voice. The response is stronger methods, open disclosure, transparent consultation and public research capacity, with transparency applying equally to philanthropic, governmental, civil-society and private funding; epistemic justice includes the possibility that research will reject favoured assumptions about either industrial or local food systems (Larrick et al., 2022; Gilmore et al., 2023; Burgess et al., 2024).

5. Policy: Regulation, Subsidy, and Trade Rules

The fifth arena concerns the rules that make particular production and consumption arrangements viable: access to subsidised inputs and credit, labelling, marketing, trade, competition enforcement and infrastructure. The policy problem is not the mere participation of commercial actors but inequalities in access, transparency, accountability and decision-making authority (Resnick and Swinnen, 2023; Slater et al., 2026). Agriculture ministries typically measure production and exports, health authorities prioritise diet quality and vulnerable groups, and environmental regulators use other metrics, so coordination requires common evidence, published trade-offs and institutions able to reconcile priorities, not an aspirational call for 'whole-of-government' action alone (Schneider et al., 2025; Farmery et al., 2025; Slater et al., 2026). Research in Colombia and the Philippines documents lobbying, coalition-building and framing around food regulation, and taxonomies show activities ranging from direct political participation to shaping scientific and public narratives. These studies do not show that every industry objection is illegitimate, and demonstrating capture requires tracing institutional decisions, conflicting interests and a defensible counterfactual (Mialon et al., 2020; Huse et al., 2023; Ulucanlar et al., 2023). A nuanced analysis separates consultation, access, lobbying, conflict of interest and regulatory capture, which call for different proof and safeguards such as meeting registers, balanced advisory committees, protected scientific review and independent evaluation (Ulucanlar et al., 2023; Slater et al., 2024; Friel et al., 2023). Policy narratives are also selection devices: reform framed as production shortage favours staple yields, framed as affordable access it favours logistics and income support, and framed as climate risk it favours diversification and emissions accounting (Ngqangashe et al., 2022; Resnick and Swinnen, 2023; Schneider et al., 2025). Subsidies should be assessed through incidence, not slogans. Support for irrigation, fertiliser, roads, storage or seed can raise output or protect livelihoods, yet an apparently universal subsidy may benefit larger farms if access depends on land title, volume or administrative capacity, while cancelling support without alternatives can expose smallholders to productivity losses (Alexander et al., 2023; Giller et al., 2021; Farmery et al., 2025). Global modelling suggests that redirecting part of agricultural subsidies toward fruit, vegetables and other nutritionally favourable production could improve health and environmental performance in the scenarios examined; these

are modelled options, not guaranteed national results, and transition costs fall on producers reliant on support (Springmann and Freund, 2022; Lowder et al., 2021; Clapp et al., 2025). Trade rules can support nutritional security by diversifying supply but can also transmit price shocks where imports are concentrated or domestic capacity has eroded, and their effects on diet-related mortality differ across countries according to the food basket they encourage (Chung and Liu, 2022; Springmann et al., 2023). Cross-sector governance is particularly challenging because agriculture, health, finance, labour, trade, environment and local-government bodies apply different metrics, and production priorities often remain institutionally dominant even when ambitions are multisectoral (Farmery et al., 2025; Schneider et al., 2023; Westengen et al., 2025; Meemken et al., 2024). Indicator dashboards should not disguise disagreement about whose welfare counts or what dependency is politically tolerable; open datasets, civil-society participation, public reasoning and scheduled review help turn conflicting priorities into revisable and contestable decisions (Schneider et al., 2025; Westengen et al., 2025; Farmery et al., 2025).

6. Finance and Investment: Credit, Ownership, Risk and Strategic Priorities

The sixth arena concerns which food-system activities receive capital, under what conditions, and who absorbs losses. Actors include commercial banks, development institutions, insurers, institutional investors, venture-capital funds, creditors and corporate owners. Finance may enable equipment, cold storage, research and nutritious-food enterprises, but may also channel resources to assets with short repayment horizons or predictable private returns, so analysis must identify specific instruments, ownership structures and contract terms instead of treating all financial participation as one form of control (Diaz-Bonilla et al., 2023; Shekar et al., 2023). Credit and liquidity can create dependence even when farms own their land and seeds: interest rates, collateral, repayment schedules, currency exposure, insurance exclusions and working capital shape whether smaller producers can adopt a technology, store crops or survive a poor season. Well-designed credit and insurance can reduce risk, while poorly matched repayment can transfer volatility to the least resilient producer; local evidence is needed before a lending arrangement is labelled exclusionary (Diaz-Bonilla et al., 2023; Lowder et al., 2021). Ownership is another channel. Analysis of mergers and acquisitions finds patterns of financialisation-linked concentration, with substantial horizontal and domestic activity. Such transactions can create scale economies or improve capital access, yet may reduce competitors or alter strategic priorities when entry barriers are high; a merger is not evidence of anticompetitive conduct, and credible assessment combines ownership records with market definition, pricing, governance and post-consolidation behaviour (Keenan et al., 2023; Clapp et al., 2025). Venture capital adds a logic of rapid growth and portfolio valuation, and narratives of digitally transformed food systems can be shaped to attract investors; benefits for health or ecology cannot be assumed because a pitch invokes sustainability (Sippel and Dolinga, 2023; Klerkx and Rose, 2020). Financial institutions can also be leverage points. Australian research finds opportunities for screening, engagement and

divestment, but little systematic incorporation of food-system effects into environmental, social and governance decisions, and investor declarations must be tested against independently measured food, workforce and ecological outcomes (Robinson et al., 2024). Public and blended finance may address underinvestment in healthy diets and resilient local markets, yet a loan, bond or guarantee can succeed financially without improving affordable nutrient diversity if beneficiaries are poorly selected or monitoring emphasises activities over outcomes (Shekar et al., 2023; Diaz-Bonilla et al., 2023). The central mechanism is financial conditionality: capital providers influence feasible choices through the price, duration, availability and covenants of finance. Diagnostic indicators include credit access by producer size and gender, ownership linkages, financing costs, insurance coverage, debt distress and outcomes for diets and livelihoods (Robinson et al., 2024; Shekar et al., 2023; Clapp et al., 2025).

7. Labour And Care: Working Conditions, Bargaining Rights and Everyday Food Work

The seventh arena concerns who performs the work on which food systems depend and what power they hold over pay, safety, time and livelihoods. Production, processing, distribution, retail and food services depend on wage, independent and family labour, while household food acquisition and preparation require often-unpaid effort. These forms of work interact: low pay makes healthy foods harder to buy, and long shifts and caregiving limit time to obtain and prepare them (Schneider et al., 2023; Meemken et al., 2024). A structural model using United States data for 2019-2020 estimated a change in bargaining power among food-system workers during the pandemic; its conclusions depend on model assumptions and should not be generalised mechanically to rural or informal work, but they show that wages cannot be understood from commodity prices or employer concentration alone (Richards and Rutledge, 2023). A study of forced-labour risk found it embedded across diverse food categories consumed in the United States; these are estimates of exposure, not verified counts of victims, yet they show why assessments that count carbon but omit recruitment conditions, coercion and grievance access remain incomplete (Blackstone et al., 2023; Blackstone et al., 2024). Evidence gaps are pronounced: nationally representative data on agricultural wages, conditions and intervention effectiveness are often inadequate, datasets may omit migrant, seasonal, subcontracted and informal workers, and company audits may not reflect workers' experiences (Meemken et al., 2024; Kurtz et al., 2021). Unpaid care connects labour power directly to food access. Interviews with women farmers and vendors in Myanmar, Papua New Guinea and the Philippines found income losses and higher costs compounded by responsibility for feeding households; household food provision consumes time, attention and transport that market statistics rarely capture, and advice to cook or diversify purchases may overestimate practical choice (Davies et al., 2024). Gender-based violence and harassment should likewise be treated as governance problems, and participation in food-system work should be distinguished from the power to negotiate its terms (Forsythe, 2023; Blackstone et al., 2024). Worker-driven standards, collective representation, transparent recruitment, living-wage

analysis, inspections and remedies can rebalance incentives, and social protection such as income transfers, sick leave, childcare and unemployment insurance links paid work, unpaid care and nutritional resilience; trade-offs such as employers passing costs into food prices should be tested rather than asserted (Kurtz et al., 2021; Meemken et al., 2024; Richards and Rutledge, 2023; Davies et al., 2024). Table 1 converts the seven findings into observable mechanisms, plausible evidence and institutional safeguards. It separates the existence of market or institutional influence from proof of resulting harm and is designed for comparison across jurisdictions rather than as seven predetermined accusations of corporate misconduct (Clapp et al., 2025; Keenan et al., 2023; Meemken et al., 2024).

Table 1. Cross-Arena Power Mechanisms, Diagnostic Evidence, and Institutional Safeguards. Entries Propose Testable Questions Rather Than Verified Causal Relationships.

Arena	Mechanism	Diagnostic evidence	Safeguards/Alternatives
Production	Intellectual property, land terms, digital interoperability	Crop-specific seed licensing; tenure and contract terms; data portability; measured farm outcomes	Farmer rights; open breeding; accountable extension; technology alternatives
Distribution	Procurement, logistics chokepoints, retail access	Price transmission; facility access; rejection terms; product variety; route diversity	Cooperative logistics; transparent buying terms; competitive market entry
Consumption	Marketing, affordability, cultural and dietary framing	Purchasing data; promotion exposure; nutrient adequacy; household constraints	Affordable healthy baskets; appropriate marketing rules; culturally responsive guidance
Knowledge	Research prioritisation, conflicts of interest, standard setting	Funding maps; excluded groups; disclosure records; expert representation	Independent research; open methods; transparent and inclusive standards
Policy	Subsidy incidence, lobbying, trade and regulatory rules	Beneficiary distribution; consultation records; nutrition and ecological impacts	Competition oversight; published deliberation; cross-sector monitoring
Finance and investment	Credit terms, ownership, risk allocation and investor incentives	Credit costs and access; debt stress; ownership links; investment and outcomes	Responsible lending; transparent ownership; inclusive risk-sharing; audited commitments
Labour and care	Wage bargaining, recruitment and safety; unpaid food work	Worker conditions; pay and contracts; care hours; representation and grievance access	Worker-driven safeguards; social protection; accessible care; robust labour data

The indicators in Table 1 should be examined jointly rather than combined into a single power score: an accessible loan can expand options yet create debt stress under volatile prices, and a retailer may improve food access while employees face insecure schedules. Proxies should not be over-read. Advertising volume is evidence of exposure, not proof that a campaign caused disease; unequal research budgets reveal neglect, not intentional suppression; and finance disclosures and voluntary codes are governance inputs, not proof that investments improved diets. Ecological thresholds and unequal exposure should stay visible in every comparison, and the most useful evidence matrix includes baseline conditions, the feasible alternative, the observed effect, uncertainty, and a distributional account of who benefits, who pays and whose agency is affected (Robinson et al., 2024; Richards and Rutledge, 2023; Gilmore et al., 2023; Ulucanlar et al., 2023; Burgess et al., 2024; Crippa et al., 2021; Schneider et al., 2023; Blackstone et al., 2024). Figure 1 maps the seven arenas as distinct but interconnected sources of influence, while Table 1 proposes indicators for examining them empirically. The arrows represent relationships to investigate, not verified causal links or the assumption that one actor dominates every arena. The figure should be read as a relational diagnostic rather than a chronological chain: finance can influence productive options and infrastructure; work and unpaid care affect what households can obtain and prepare; research frames policy; and policy reshapes capital and labour incentives, while feedback also runs the other way when worker organisations, consumer groups, public institutions and alternative suppliers alter practices (Schneider et al., 2023; Diaz-Bonilla et al., 2023; Davies et al., 2024; Clapp et al., 2025).

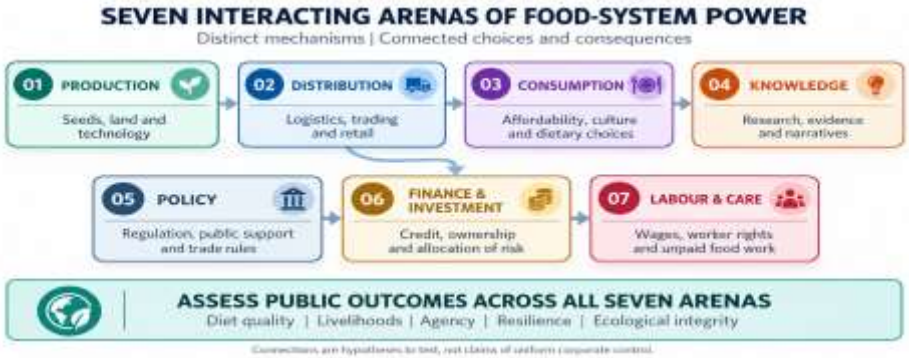

Figure 1. Seven Interconnected Arenas of Food-System Power. The Linkages Represent Potential Influence and Feedback, Not a Verified Universal Causal Network

DISCUSSION

1. From Seven Categories to a Relational Account Of Power

The central finding is that the seven arenas operate relationally and recursively. Input ownership matters partly through the finance and procurement options available to producers; investment conditions influence logistics and technology adoption; retail strategies interact with wages and purchasing power; paid and unpaid care shape time for dietary choice; scientific framing influences policy; and public institutions determine the investment, labour and research rules in force. A linear farm-to-fork model cannot on its own

explain unequal diets or power in food systems (Keenan et al., 2023; Schneider et al., 2023; Davies et al., 2024). An illustrative pathway begins with a proprietary production package that encourages specialisation; a processor then sets grading and delivery conditions suited to those crops, retailers promote predictable categories, research funding prioritises their productivity indicators, and policy support stabilises the configuration. The result may be efficiency, lower losses and affordable food, but also restricted entry, landscape simplification or limited dietary diversity, and whether the reinforcement is beneficial depends on outcomes and alternatives (Clapp and Ruder, 2020; Marusak et al., 2021; Ray et al., 2022). Corporate concentration and nutritional disadvantage should therefore not be treated as identical variables: a concentrated sector may face effective price regulation and independent standards, while a fragmented one may still exhibit exploitation or ecological harm, and cooperatives and public entities can also exercise power that deserves scrutiny (Clapp, 2021; Gilmore et al., 2023; Resnick and Swinnen, 2023). The relational model states conditions under which power crosses arenas: control of scarce assets becomes bargaining power when affordable credit and alternative suppliers are absent; procurement contracts and investor targets affect which retailers and products survive; wages, schedules and unpaid care mediate effective dietary options; and research resources and regulatory procedures influence what evidence becomes legitimate. These are testable mechanisms, not an established causal sequence. The distinction between control and agency yields a practical counterfactual: producer dependence should weaken if interoperable equipment, public breeding, cooperative procurement and enforceable contracts expand viable alternatives, whereas greater retail competition may fail to improve nutrition if all channels sell comparable products to households with inadequate budgets (Clapp et al., 2025; Robinson et al., 2024; Meemken et al., 2024; Deconinck, 2020; Scapin et al., 2025; Bai et al., 2021).

2. Nutrition Information Gaps and Misleading Narratives as Linking Mechanisms

Food choices depend not only on available products but also on what people and institutions can know about them. Labels and promotional claims circulate, researchers privilege particular metrics and populations, and policy debates highlight some outcomes while underplaying others, which can limit the visibility of dietary diversity, decent work, debt exposure or ecological costs. This does not assume that missing evidence was always hidden on purpose, and each form of imbalance needs its own observable mechanism (Ngqangashe et al., 2022; Gilmore et al., 2023; Meemken et al., 2024). A claim of deliberate distortion requires documented communications or practices indicating purposeful manipulation; structural neglect calls for comparisons of research budgets, datasets and expert representation; and normalised assumptions can be investigated through consumer interviews, media analysis and purchasing changes. None is established by a concentration ratio or an association between diet and disease (Larrick et al., 2022; Gilmore et al., 2023; Burgess et al., 2024). The nutritionism debate is a stress test. Nutrient-based recommendations,

fortification and reformulation can be socially useful, with limitations arising when they replace rather than enrich understanding of dietary patterns, food environments and social determinants. Rejecting fortification because companies profit would harm populations vulnerable to deficiency, while celebrating fortified products without examining their place in the diet could normalise unhelpful substitution (Carducci et al., 2021b; Gearhardt et al., 2023; Schneider et al., 2023). The framework risks becoming too broad if used to explain every instance of poor nutrition, so three tests preserve its usefulness: identify the particular information claim, trace how it became visible or invisible, and examine whether this changed decisions relative to feasible alternatives. Where records show only resource shortages, survey limitations or scientific disagreement, the conclusion should remain an information gap or uncertainty rather than an accusation (Burgess et al., 2024; Krasovskaia and Just, 2025; Larrick et al., 2022). Figure 2 distinguishes three processes that can leave the public with incomplete or misleading nutrition information. Each pathway has a different evidentiary threshold: records of intentional conduct, investigation of data and institutional gaps, or study of beliefs and recurring narratives. It is an evidence guide rather than a list of accusations, guarding against reading deliberate deception into an ordinary absence of data while preserving the ability to investigate verified manipulation (Gilmore et al., 2023; Ulucanlar et al., 2023; Burgess et al., 2024).

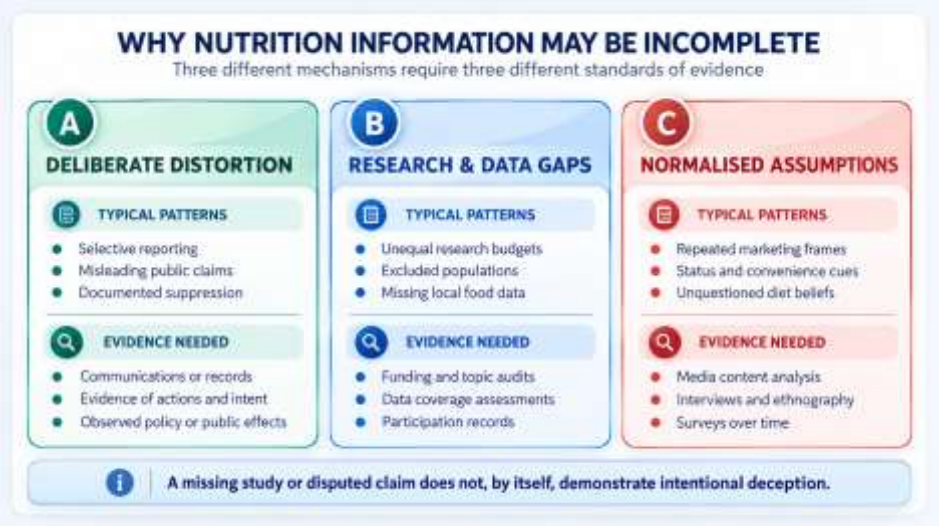

Figure 2. Three Pathways Shaping Nutrition Information: Deliberate Distortion, Research and Data Gaps, and Normalised Assumptions. the Required Evidence Differs Across Mechanisms; a Gap Alone Cannot Establish Intent.

3. How Financial Decisions and Human Work Reshape the Other Five Arenas

Adding finance and labour changes the interpretation of the original framework rather than merely adding headings. A bank's lending criteria can influence which farmers buy seeds or equipment, which processors build cold storage and which retailers extend fresh-food availability, with consequences for labour demand, wages and household capacity to buy nutritious diets;

conversely, worker organisation and care infrastructure can change supply reliability, income distribution and consumption options. These are plausible pathways, not claims that finance or labour determines all other decisions (Keenan et al., 2023; Richards and Rutledge, 2023; Davies et al., 2024). One feedback pathway begins with investors favouring standardised, high-growth businesses, which may make financing easier for capital-intensive processors and platforms than for smaller local enterprises; procurement and digital standards then reinforce the advantage. Benefits include lower transaction costs and rapid scaling, risks include exclusion, dependence and loss of diverse employment, and distinguishing them needs matched data on capital terms, prices, entry, wages, dietary access and environmental effects (Sippel and Dolinga, 2023; Robinson et al., 2024; Blackstone et al., 2024). A second pathway runs from labour and care to knowledge and policy: household food preparation, informal vending and migrant or seasonal labour are poorly represented in official datasets, so policies built around yields, prices and formal employment can overlook time poverty and the feasibility of nutrition recommendations. Worker participation, disaggregated surveys and care-sensitive evaluation can reduce this visibility gap without presuming the omission was intentional (Meemken et al., 2024; Davies et al., 2024; Forsythe, 2023). Climate and biodiversity outcomes cut across all arenas, so the account should avoid inventing a single 'ecological controller' and ask instead how environmental obligations, benefits and risks are allocated through each (Crippa et al., 2021; Diaz-Bonilla et al., 2023; Blackstone et al., 2024).

4. Global Asymmetries and Locally Specific Consequences

Power relations vary with geography and history. A smallholder cultivating a staple in a low-income district faces different options from an exporter integrated into premium supermarkets, and consumers who spend most of their disposable income on food cannot adapt to price changes as secure-income consumers can, so uniform prescriptions may create unequal burdens even when the aggregate effect looks favourable (Ambikapathi et al., 2022; He et al., 2021; Lowder et al., 2021). Indonesia illustrates the need for contextual caution. Farmer seed rights, rice consumption, national standards, trade integration and subsidised inputs have particular legal and institutional meanings; Indonesian scholarship points to tensions between plant-variety protection and the legal protection of farmers, but this does not justify inferring that all Indonesian farmers are contractually prohibited from saving seeds or that a national standard is controlled by private firms (Suastuti et al., 2023; Clapp and Ruder, 2020). Global interdependence adds further asymmetry: richer countries and large corporations can often access diversified credit, insurance and suppliers, while smaller enterprises and households face limited options when fertiliser, food or energy prices rise, yet exclusive reliance on self-sufficiency can overlook ecological costs and the benefits of regional specialisation (Alexander et al., 2023; Diaz-Bonilla et al., 2023; Davies et al., 2024). Evidence from rural Africa suggests that meaningful agency may involve participating on fair terms in dependable regional exchange as well as the right to produce locally adapted

foods, challenging an overly localist equation of self-provisioning with food sovereignty (Nguyen and Qaim, 2025; Mehta et al., 2025; Wood, A. et al., 2023).

5. Competing Explanations and Conditional Benefits

Critical scholarship is strengthened by examining cases that challenge its preferred interpretation. Seed innovation can improve resilience or yields even while licensing raises concerns about choice; processing can extend shelf life and enhance safety even while some products support poor diets; supermarkets may offer reliable cold chains while promotions favour calorie-dense products; and trade can protect consumers from crop failures while global logistics generate chokepoints. The question in each case is the net outcome, its distribution, and the availability of accountability mechanisms (Hobbs, 2021; Chung and Liu, 2022; Karakoc et al., 2023). Healthier diets are not automatically affordable and may create new demand for land, water or packaging, and a simplified preference for 'local' food ignores differences in efficiency, transport and season; local production, regional procurement and global exchange can complement one another (He et al., 2021; Wood, A. et al., 2023; Westengen et al., 2025). These counterarguments refine rather than invalidate the framework: market power is problematic when it reduces contestability or imposes unfair costs, technology when users cannot negotiate rights or exit, commercial scientific participation when independence and transparency fail, and trade when exposure outstrips adaptive capacity. The framework also distinguishes institutional from distributional benefit, since a cold chain can reduce spoilage while benefits accrue mainly to large suppliers (Clapp et al., 2025; Ulucanlar et al., 2023; Hackfort, 2025; Scapin et al., 2025; Springmann and Freund, 2022; Springmann et al., 2023).

6. A coordinated reform agenda

A credible reform strategy must work across all seven arenas. In production, governments can support fair land tenure, open extension and viable seed and technology alternatives; in distribution, storage, roads, reliable contracts and competitive procurement can reduce losses and exclusion; in consumption, diverse healthy diets must be made affordable and marketing and time constraints addressed without stigmatising staples (Lowder et al., 2021; Turner et al., 2021; Diaz-Bonilla et al., 2023; Davies et al., 2024). Knowledge and policy reforms should protect independent research, disclose funding and conflicts, broaden expert participation and subject regulation and subsidies to distributional evaluation. In finance, authorities and investors should examine loan terms, ownership links, risky exposures and the real effects of sustainability commitments; in labour and care, worker voice, safe recruitment, fair conditions, social protection and the costs of unpaid household food preparation deserve comparable attention (Larrick et al., 2022; Robinson et al., 2024; Blackstone et al., 2024; Meemken et al., 2024). A practical three-stage governance architecture combines diagnosis, expansion of options and public accountability. Diagnosis maps productive and logistical assets, ownership, financing terms, political influence, scientific funding, wage conditions and care burdens. Expanding options means improving access to alternative inputs and markets, suitable finance, worker representation, independent evidence and healthy food choices.

Accountability measures nutritional affordability, incomes, working conditions, debt burdens, environmental impacts and participation, disaggregated by place and social group. The process is iterative: diagnosis informs alternatives, evaluated outcomes reveal design flaws, and renewed diagnosis guides revision, because transparency alone may not change incentives and regulators need the capacity and authority to respond (Schneider et al., 2025; Robinson et al., 2024; Davies et al., 2024; Farmery et al., 2025; Clapp et al., 2025). Implementation begins with information systems that reveal both economic dependence and social invisibility, linking open procurement and subsidy records with disaggregated nutrition data, privacy-preserving credit indicators and representative workforce statistics, while respecting confidentiality and consent where data concern indebted households or vulnerable workers (Schneider et al., 2025; Meemken et al., 2024; Robinson et al., 2024). Expansion of alternatives is the next test: smaller producers may need shared storage, independent extension or accessible finance; workers need transparent recruitment, representation and protection; caregivers benefit from reliable water, transport and services that reduce unpaid work. These are complements, since cheaper credit does not compensate for unsafe work and nutrition lessons do not resolve an unaffordable basket (Diaz-Bonilla et al., 2023; Davies et al., 2024; Meemken et al., 2024). The final test concerns outcomes, not compliance paperwork: a programme may report more loans, higher sales or wider audit coverage while healthy-diet affordability, income stability and worker safety remain unchanged, so evaluation should use a credible baseline, document unintended cost shifts and explain who was not reached. The review proposes no uniform numerical targets (Schneider et al., 2023; Blackstone et al., 2024; Farmery et al., 2025). For Indonesia and other heterogeneous archipelagic or regional systems, a staged pilot could map financing and procurement dependence in one commodity, compare worker and caregiver needs in its supply chain, and monitor effects on local healthy-diet availability before adapting findings elsewhere (Suastuti et al., 2023; Schneider et al., 2025; Westengen et al., 2025). Figure 3 converts the seven-arena diagnosis into a sequence of institutional learning, a process model rather than a universal reform package. Where improvements are uneven or transient, the sequence returns to diagnosis and reconsiders both the intervention and the evidence used to justify it (Farmery et al., 2025; Westengen et al., 2025; Robinson et al., 2024; Springmann and Freund, 2022; Schneider et al., 2025).

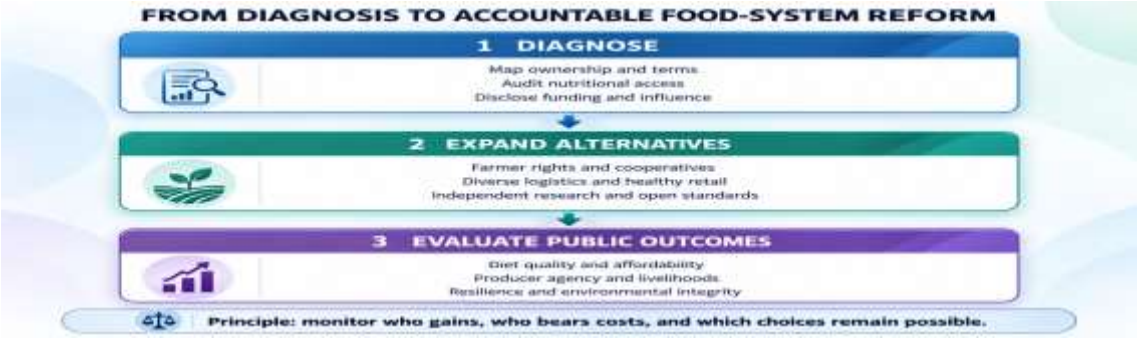

Figure 3. Integrated Pathways from Diagnostic Evidence to Accountable Food-System Transformation. the Indicated Interventions are Contextual Policy Options, Not a Universal Blueprint.

7. Research Implications and Falsifiable Propositions

The expanded framework generates researchable propositions. Contract-level studies can test whether lending terms amplify dependence on particular inputs after controlling for farm characteristics; supply-chain studies can examine whether concentrated procurement combined with expensive working capital reduces access for smaller suppliers or raises the relative price of nutritious foods; and linked employer-worker and household data can assess whether wage volatility and unpaid care hours mediate dietary quality. Natural experiments, transparent comparisons and process tracing are needed to distinguish these mechanisms from correlated economic conditions (Keenan et al., 2023; Richards and Rutledge, 2023; Davies et al., 2024). Further studies should compare research funding with neglected nutritional and labour needs, test whether investor commitments alter purchases, sourcing and worker outcomes, and investigate the participation of informal vendors, farmworkers, caregivers and smaller financiers in standard setting, separating intentional manipulation from legitimate uncertainty or thin data (Burgess et al., 2024; Robinson et al., 2024; Meemken et al., 2024).

CONCLUSIONS AND RECOMMENDATIONS

Food-system power cannot be understood through agricultural productivity or consumer choice alone. This review identifies seven related arenas (production, distribution, consumption, knowledge, policy, finance and investment, and labour and care) that together shape the resources, infrastructure, information, capital, rules and human work on which food access depends. Financial concentration, technological dependence and precarious work may narrow feasible options where countervailing institutions are weak, but neither scale nor private participation is sufficient evidence of harm. Each mechanism should be judged through credible measures of nutritional access, agency, livelihood security and environmental outcomes.

The article distinguishes deliberate nutrition misinformation, research and data gaps, and normalised but insufficiently tested assumptions. These cannot be inferred from poor dietary outcomes alone: evidence of manipulation requires documented conduct, while the other mechanisms require study of omitted populations, unequal resources and the circulation of familiar dietary

messages. Nutrition science, food processing, public-private research and fortification remain valuable when their benefits are independently assessed and they complement affordable, diverse diets.

The resulting policy agenda calls for accessible productive technologies, fairer procurement and markets, healthier food environments, transparent knowledge production and accountable regulation. It also demands responsible financial arrangements, scrutiny of ownership and risk allocation, decent-work protections, worker participation, gender-sensitive institutions and recognition of unpaid food-related care. Governments should consider how policy changes distribute income, credit risk, time burdens and ecological costs, rather than assuming that more output or aggregate investment is sufficient, and monitoring should be iterative and open to correction.

The limitations of this purposive review include uneven geographic representation, heterogeneous studies and difficulties in assigning causal effects across interacting institutions. It does not measure the global prevalence of intentional misinformation, the net effect of all financial investment or the extent of labour exploitation worldwide; these questions need representative data, case-level institutional inquiry and appropriately designed comparisons. Its principal contribution is a transparent seven-arena framework for asking who exercises power, through which mechanisms, under what constraints, and with what consequences for nutritious food, fair work, human agency and ecological sustainability.

FURTHER STUDY

This study still has some limitations, so further research on the topic Beyond Food Security: Seven Arenas of Power, Nutrition Information Gaps, and the Political Economy of Global Food Systems is needed to improve this study and provide more insights for the writer and readers.

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