



## Dimensions and determinants of food security in Bihar

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### Abstract

Food security remains a pressing developmental challenge in Bihar, one of India's most populous yet socioeconomically disadvantaged states. Despite national progress in reducing hunger and poverty, Bihar continues to exhibit high levels of undernutrition, stunting, and food insecurity, particularly among marginalised and rural households. Drawing on the Food and Agriculture Organization's (FAO) four-pillar framework—availability, access, utilisation, and stability—this paper examines the dimensions and determinants of food security in Bihar by analysing secondary datasets including Census 2011, <sup>[1]</sup> National Family Health Survey-5 (NFHS-5, 2019–21), National Sample Survey Office (NSSO) consumption rounds, and government program reports. The analysis reveals that agricultural dependence, fragmented landholdings, poverty, gender disparities, migration, and climate vulnerabilities significantly shape the food security outcomes of households in Bihar. Empirical evidence highlights widespread dietary inadequacy, with stunting at 42.9% and wasting at 22.9% among children under five (NFHS-5), alongside anaemia affecting 63% of women aged 15–49. Policy interventions such as the National Food Security Act (NFSA), Public Distribution System (PDS), Integrated Child Development Services (ICDS), Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), and the Jal Jeevan Mission play a critical role but remain hindered by governance challenges and coverage gaps. Linking Bihar's food security outcomes with Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger), SDG 1 (No Poverty), SDG 3 (Good Health), and SDG 13 (Climate Action), the paper argues that convergence across sectors is essential to break the intergenerational cycle of deprivation.

**Keywords:** Bihar, food security, determinants, NFHS-5, SDGs

### Introduction

Food security, defined as a condition in which all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food to meet dietary needs and food preferences for an active and healthy life (FAO, 2008) <sup>[3]</sup>, remains a cornerstone of human development. In India, national frameworks such as the National Food Security Act (NFSA, 2013) and global commitments, including the Sustainable Development Goals (SDGs), underscore the multidimensional nature of food security. Bihar, with a population of over 104 million, as per the 2011 Census, represents a unique case study where structural poverty, demographic pressure, climate vulnerability, and systemic governance challenges converge to perpetuate high levels of food insecurity. Despite being a part of India's "grain bowl," Bihar consistently lags behind national averages on food security and nutrition indicators (NITI Aayog, 2022) <sup>[9]</sup>.

This paper explores the dimensions and determinants of food security in Bihar through a multi-layered analysis. By applying the FAO's four-pillar framework, it examines how agricultural production, market access, health and sanitation, and socio-political stability intersect with socioeconomic determinants such as landholding, caste, gender, and migration. Furthermore, it links food security outcomes in Bihar to the SDGs, highlighting the role of state interventions, institutional capacity, and community-based approaches.

### Conceptual Framework: Dimensions of Food Security

The FAO framework identifies four interlinked dimensions of food security: availability, access, utilisation, and

stability (FAO, 2008) <sup>[3]</sup>. Food availability refers to the physical supply of food through production, distribution, and imports. In Bihar, availability is constrained by fragmented landholdings, low productivity, limited irrigation coverage, and high post-harvest losses (World Bank, 2022) <sup>[14]</sup>. Food access is determined by economic and physical resources to acquire food. In Bihar, high poverty levels, seasonal migration, and market distance restrict households' access to adequate nutrition (Sen & Himanshu, 2004) <sup>[10]</sup>. Food utilisation is related to dietary quality, safety, and the body's ability to absorb nutrients. Poor sanitation, unsafe water, and a high prevalence of anaemia and stunting reflect significant utilisation gaps in Bihar (NFHS-5, 2021). Food stability requires resilience against shocks such as drought, floods, and price volatility. Bihar's flood-prone riverine belts, drought-prone areas, and widespread wage insecurity create instability, deepening vulnerability to food insecurity (Mall *et al.*, 2019) <sup>[8]</sup>.

### Socio-economic Context of Bihar

Bihar ranks among India's poorest states, with 33.7% of its population living below the poverty line, according to NITI Aayog's Multidimensional Poverty Index (2022) <sup>[9]</sup>. Agriculture dominates rural livelihoods, employing more than 70% of the rural workforce; yet, productivity remains low due to dependence on rain-fed systems, small and fragmented holdings, and limited mechanisation (Government of Bihar, 2022) <sup>[4]</sup>. Caste and tribal identities further complicate the landscape of food security. Scheduled Castes (SCs), Scheduled Tribes (STs), and other backwards communities form a disproportionate share of Bihar's food-insecure households (Census, 2011) <sup>[1]</sup>. Women, particularly

in rural and tribal pockets, face multiple deprivations due to patriarchal norms, low decision-making power, and unequal access to resources. Migration is another defining feature, with seasonal and long-term out-migration influencing household incomes, remittances, and access to entitlements such as PDS benefits (Deshingkar *et al.*, 2020)<sup>[2]</sup>.

### Determinants of Food Security in Bihar

Food security outcomes in Bihar are determined by interrelated structural, social, economic, and environmental factors. Poverty and inequality remain core determinants, limiting households' purchasing power and food access. Agricultural determinants, including irrigation, crop diversity, and soil quality, shape food availability, while governance and program implementation determine access through safety nets such as PDS and MGNREGA (Kumar *et al.*, 2017)<sup>[7]</sup>. Health and sanitation play a significant role in determining utilisation, with NFHS-5 data indicating that only 63.3% of households in Bihar had access to improved sanitation facilities, compared to 70.2% nationally. Climate vulnerability, particularly recurrent floods in North Bihar and droughts in South Bihar, creates instability in food security outcomes. Education and women's empowerment emerge as cross-cutting determinants. Evidence suggests that maternal education has a strong influence on child nutrition outcomes, and female participation in SHGs and wage labour enhances household dietary diversity (World Bank, 2022)<sup>[14]</sup>. Thus, food security in Bihar cannot be understood solely in terms of agricultural production but requires a multi-sectoral lens.

### Methodology and Data Sources

This study employs a secondary data analysis approach, drawing from official datasets, policy reports, and peer-reviewed literature. The primary datasets include Census 2011 for demographic and socioeconomic characteristics, NFHS-5 (2019–21) for health and nutrition outcomes, NSSO Household Consumption Expenditure Surveys for patterns of food consumption, and Bihar government reports on PDS, MGNREGA, and ICDS. Program Management Information Systems (MIS) data for PDS/ONORC, Jal Jeevan Mission (JJM), and POSHAN provide operational insights. Analytical framing follows the FAO four-pillar model, complemented by SDG mapping to highlight policy linkages.

### Results and Discussion

Bihar's food security status reflects a paradox of agricultural abundance at the national level but persistent household-level deprivation. NFHS-5 data indicate that 42.9% of children under five in Bihar are stunted compared to the national average of 35.5%. Wasting affects 22.9% of children, while the prevalence of anaemia among women aged 15–49 is 63%, compared to 57% nationally (NFHS-5, 2021). These indicators demonstrate acute utilisation deficits. Poverty and underemployment remain central determinants. NSSO consumption data indicate that the average monthly per capita expenditure (MPCE) in rural Bihar remains one of the lowest in India, thereby constraining dietary diversity and caloric intake. The Public Distribution System (PDS), reformed under NFSA, provides subsidised cereals to 8.7 crore people in Bihar, covering nearly 86% of the state's population (Government of Bihar, 2022)<sup>[4]</sup>. However, leakages, inclusion/exclusion errors, and

lack of portability continue to undermine its effectiveness, especially for migrant households (Khera, 2011)<sup>[6]</sup>.

**Table 1:** Key Food Security Indicators in Bihar (NFHS-5, 2019–21)

Indicator	Bihar (%)	India (%)
Children under 5 stunted	42.9	35.5
Children under 5 wasted	22.9	19.3
Women (15–49) with anaemia	63.0	57.0
Households with improved sanitation	63.3	70.2
Households with improved drinking water	90.6	95.9

(Source: NFHS-5, 2021)

Agricultural determinants are equally stark. Less than 60% of Bihar's gross cropped area is irrigated, compared to over 80% in Punjab, making food production highly climate-sensitive (Government of Bihar, 2022)<sup>[4, 10]</sup>. Recurrent floods in North Bihar districts, such as Sitamarhi and Saharsa, and droughts in South Bihar districts, including Gaya and Nawada, reduce both food availability and stability (Mall *et al.*, 2019)<sup>[8]</sup>. Migration plays a dual role. While remittances enhance purchasing power, migrant households often face discontinuities in PDS access due to gaps in ration card portability (Deshingkar *et al.*, 2020)<sup>[2]</sup>. Moreover, seasonal migration leaves women with greater household responsibilities but limited income control, which affects both access and utilisation dimensions.

### Policy and Institutional Framework for Food Security in Bihar

Bihar's food security policies operate within the broader framework of the National Food Security Act (NFSA, 2013), which entitles 75% of the rural population and 50% of the urban population to subsidised food grains through the Public Distribution System (PDS). In Bihar, the PDS is particularly crucial due to the state's poverty profile, with approximately 8.7 crore beneficiaries enrolled (Government of Bihar, 2022). The state has adopted digital reforms, including Aadhaar seeding, electronic Point-of-Sale (ePoS) machines, and the "One Nation One Ration Card (ONORC)" scheme, to strengthen portability for migrant workers. However, persistent challenges, such as ration card exclusion, ghost beneficiaries, and leakages, undermine its effectiveness (Khera, 2011)<sup>[6]</sup>.

Other national programs significantly shape Bihar's food security outcomes. The Integrated Child Development Services (ICDS) provides supplementary nutrition, health check-ups, and preschool education to children and mothers, while the Mid-Day Meal Scheme (MDMS) offers meals to schoolchildren. The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) guarantees 100 days of rural employment per household, indirectly supporting food access by enhancing income security. The National Rural Health Mission (NRHM) and POSHAN Abhiyaan address health and nutrition directly by promoting maternal and child nutrition. Recent water and sanitation interventions under the Swachh Bharat Mission (SBM) and the Jal Jeevan Mission (JJM) are improving utilisation outcomes by reducing waterborne diseases and increasing access to safe drinking water. By 2022, 90.6% of Bihar's households reported improved drinking water sources (NFHS-5, 2021). However, sanitation remains a concern, as open defecation practices persist in rural areas, undermining child health.

## Linking Food Security with Sustainable Development Goals (SDGs)

Food security in Bihar is intrinsically linked with the global Sustainable Development Goals (SDGs). Specifically:

- **SDG 2 (Zero Hunger):** The direct goal of ending hunger and improving nutrition remains a central challenge for Bihar. Persistent malnutrition indicators underscore the gap.
- **SDG 1 (No Poverty):** High poverty levels directly restrict access to food. Social safety nets, such as MGNREGA and PDS, align with SDG 1 targets.
- **SDG 3 (Good Health and Well-being):** Nutrition outcomes overlap with maternal and child health, anaemia, and sanitation.
- **SDG 5 (Gender Equality):** Women's education and economic participation have a significant influence on food utilisation and household dietary diversity (Smith & Haddad, 2015) [12].
- **SDG 6 (Clean Water and Sanitation):** Food utilisation improves with access to safe water and sanitation.
- **SDG 13 (Climate Action):** Floods, droughts, and climate variability pose a threat to food stability in Bihar.

This convergence indicates that achieving SDG 2 cannot be done in isolation. Policies that address poverty, gender inequality, health, and climate resilience simultaneously create a multiplier effect for food security (UNDP, 2020) [13].

## Challenges in Achieving Food Security in Bihar

Despite multiple interventions, Bihar continues to face structural and operational challenges.

1. **Agricultural Productivity and Land Fragmentation:** Small landholdings averaging less than 1 hectare limit surplus production. Dependence on monsoon rainfall creates vulnerability to drought and floods (Government of Bihar, 2022) [4].
2. **Malnutrition and Health Gaps:** NFHS-5 data highlight persistent malnutrition, with stunting at 42.9%—among the highest in India. Inadequate dietary diversity and poor maternal nutrition sustain intergenerational cycles of undernutrition (ICMR, 2021) [5].
3. **Governance and Program Delivery:** Leakages in PDS, irregular MGNREGA payments, and weak monitoring of ICDS centres create gaps in service delivery. Migrant households often face portability issues in accessing entitlements (Khera, 2011) [6].
4. **Climate Vulnerability:** Bihar's geography, with 73% of its area prone to floods, regularly disrupts agriculture and food access. South Bihar districts face recurring droughts, further destabilising food availability (Mall *et al.*, 2019) [8].
5. **Social Inequalities:** Food insecurity disproportionately affects Scheduled Castes, Scheduled Tribes, and women-headed households due to structural discrimination and exclusion (Deshingkar *et al.*, 2020) [2].

## Future Policy Directions

To strengthen food security in Bihar, it is essential to adopt integrated and multi-sectoral strategies that address both immediate and structural challenges. Agricultural transformation must focus on expanding irrigation facilities, promoting crop diversification beyond cereals, and encouraging climate-smart practices such as the adoption of drought-resistant seeds to enhance productivity and resilience. At the same time, nutrition-sensitive interventions require significant strengthening of schemes like ICDS and POSHAN Abhiyan, with particular emphasis on adolescent girls and pregnant women. Meanwhile, community-based nutrition awareness (SBCC) should complement existing food transfer programs to ensure improved utilisation. Inclusive social protection measures, such as providing universal PDS portability, establishing effective grievance redressal mechanisms, and guaranteeing timely MGNREGA payments—especially for migrant households—are crucial for equitable access to entitlements. Gender empowerment must also be prioritised by enhancing women's participation in self-help groups (SHGs), improving land ownership rights, and expanding wage employment opportunities, thereby increasing their control over income and household nutrition decisions. Building climate resilience is equally vital, requiring flood-resilient infrastructure, the establishment of community grain banks, and shock-responsive employment schemes to stabilise food access during disasters. Finally, data-driven governance should guide these efforts through real-time monitoring systems such as MIS dashboards, along with the systematic use of NFHS indicators and Census data to identify gaps and effectively target interventions. Together, these interlinked strategies can create a comprehensive framework that not only addresses hunger and malnutrition but also builds long-term resilience in Bihar's food systems.

## Conclusion

Food security in Bihar is a multidimensional and structural challenge shaped by poverty, inequality, fragile agriculture, health deficits, and climate vulnerability. While national and state-level programs such as NFSA, PDS, MGNREGA, ICDS, and POSHAN have significantly expanded safety nets, persistent gaps in implementation and structural inequalities undermine their full impact. Evidence from NFHS-5 underscores that Bihar continues to report some of India's highest levels of child malnutrition, anaemia, and inadequate dietary diversity, reflecting deep utilisation and stability deficits. At the same time, Bihar's case illustrates the interlinkages between food security and multiple SDGs. Achieving SDG 2 (Zero Hunger) in Bihar depends on progress in poverty reduction (SDG 1), health improvements (SDG 3), gender equality (SDG 5), clean water and sanitation (SDG 6), and climate resilience (SDG 13). This convergence reinforces the need for an integrated policy framework rather than siloed interventions. Future strategies must prioritise district-specific, gender-sensitive, and climate-resilient interventions to ensure no community is left behind. Investing in women's empowerment, strengthening community-based food and nutrition systems, and building adaptive capacity to climate shocks will be critical for breaking Bihar's cycle of food insecurity. Ultimately, securing sustainable food security in Bihar will not only transform the lives of its 100+ million people but also represent a crucial step in India's journey toward achieving the SDGs by 2030.

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