

Linkages between Food Security and the SDGs among Tribal Communities in Bihar

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Abstract—Food security is a multidimensional concept encompassing the availability, access, utilisation, and stability of food, and it closely intersects with the Sustainable Development Goals (SDGs). Among the tribal (Adivasi) communities in Bihar, who constitute approximately 1.3% of the state's population, the challenges of food security are compounded by geographical isolation, seasonal livelihoods, insecure land tenure, and barriers to accessing state entitlements. This study examines the linkages between food security and the SDGs within these tribal communities, situating the analysis in a district-level context. Drawing on secondary datasets such as Census 2011, NFHS-5, and program MIS (PDS, MGNREGA, ICDS, JJM), the research outlines how SDG 2 (Zero Hunger) is interdependent with SDG 1 (No Poverty), SDG 3 (Good Health), SDG 5 (Gender Equality), SDG 6 (Clean Water and Sanitation), SDG 8 (Decent Work), SDG 10 (Reduced Inequalities), and SDG 13 (Climate Action). The results indicate that while entitlements such as PDS portability and ICDS/POSHAN services improve access and utilisation, systemic gaps in FRA implementation, health coverage, and WASH infrastructure constrain long-term stability. The findings emphasise the need for convergence-based strategies that integrate livelihood security, nutrition interventions, climate resilience, and governance reforms. In doing so, the study contributes to policy discourse on inclusive development by highlighting that improving food security for tribal communities is not only a matter of entitlement delivery but also of enabling structural transformations aligned with the SDGs.

Keywords: Food security, Sustainable Development Goals, Tribal communities, Bihar, Convergence strategies

I. INTRODUCTION

Tribal (Adivasi) communities in Bihar constitute a small but distinct share of the population (about 1.3% as per Census 2011), concentrated in pockets such as West Champaran, Katihar, Purnea, Banka and Siwan. While the state's overall development challenges are well-documented, tribal communities often face layered vulnerabilities—geographical isolation, insecure land tenure, seasonal livelihood dependence, and barriers to accessing state entitlements—that directly and indirectly shape their food security. Food security—defined internationally as a situation where all people, at all times, have physical and economic access to sufficient, safe and nutritious food—has four mutually reinforcing dimensions: availability, access, utilisation, and stability. This framework is widely used by the FAO/World Bank and humanitarian clusters, providing a practical lens for connecting local realities to the SDGs (World Bank, n.d.; Global FS Cluster, n.d.).

Because food security encompasses multiple aspects, including livelihoods, health, water and sanitation, social protection, gender, climate resilience, and governance, it is inherently multi-SDG. For tribal communities in Bihar, progress on SDG 2 (Zero Hunger) depends on progress across SDG 1 (No Poverty), SDG 3 (Good Health), SDG 5 (Gender Equality), SDG 6 (Clean Water and Sanitation), SDG 8 (Decent Work), SDG 10 (Reduced Inequalities), SDG 13 (Climate Action), and SDG 16 (Institutions), among others. The National Food Security Act (NFSA), PDS/ONORC portability, ICDS/POSHAN, MGNREGA, Forest Rights Act (FRA), PM-JANMAN, and Jal Jeevan Mission are among the policy instruments that tie these SDG strands together in practice (PIB, 2022; NITI Aayog, 2022).

II. TRIBAL CONTEXTS IN BIHAR: DISTRIBUTION, LIVELIHOODS, VULNERABILITIES

Population and distribution: Tribal households in Bihar are sparsely distributed, with distinct clusters in each district. Official compilations and exam-prep summaries (drawing on the 2011 Census and state lists) generally identify the Santhal, Oraon, Kharwar, Gond, and Tharu as among the larger groups, with Particularly Vulnerable Tribal Groups (PVTGs) present in smaller numbers. At the same time, most tribal-majority areas were transferred to Jharkhand during the state bifurcation in 2000, leaving Bihar with a significantly smaller overall ST share. Tribal (Scheduled Tribes, ST) communities are sparsely distributed in Bihar, with prominent groups including the Santhal, Oraon, Kharwar, Gond, and Tharu, as well as some PVTGs present in smaller numbers. The 2000 bifurcation that created Jharkhand led to a reduced tribal share in Bihar (Wiki, n.d.).

Livelihoods: In tribal pockets, livelihoods often blend rain-fed smallholder farming, NTFP collection, daily wage labour, migration, and handicrafts. These activities are highly seasonal and climate-sensitive, so shocks—such as droughts, floods, and price fluctuations—have a disproportionately large impact on household food access and dietary diversity.

Access to entitlements: Bihar has pushed reforms under PDS (including One Nation One Ration Card portability)—important for migrants from tribal households—yet gaps persist in coverage, inclusion errors, and last-mile delivery. Nutritional support under ICDS/POSHAN has improved; however, Bihar has reported lower coverage rates for take-home rations and growth monitoring compared to many states, which affects utilisation (child growth, women's nutrition) (PIB, 2022; NITI Aayog, 2022).

Land, forest, and identity: The implementation of the Forest Rights Act (2006)—encompassing both individual and community forest rights—is pivotal for secure access to land and forest products, which underpin seasonal food availability and livelihood stability. Parallel employment guarantees (MGNREGA) and newer housing initiatives, such as PM-JANMAN (with recent approvals targeting PVTG families in Bihar), can indirectly strengthen food security by reducing consumption volatility and smoothing shocks (IDRonline, n.d.; TOI, 2025).

Health and nutrition: Nationally and across states, NFHS rounds show high burdens of stunting, wasting, and anaemia among low-income and marginalised groups; Bihar's nutrition profile has improved in places but remains a public health concern. District-level NFHS-5 data highlight the magnitude of undernutrition challenges, although state- or district-disaggregated data are sparse in public fact sheets. The macro pattern—nutrition deficits concentrated in poorer, rural households—is relevant for tribal pockets (NITI Aayog, 2022; Rural India Online, n.d.).

III. FOOD SECURITY AND SDGS: A PRACTICAL LINKAGE MAP

The table below synthesises how major SDGs interact with the four pillars of food security for tribal communities in Bihar, and highlights relevant schemes and indicative indicators you can track. (Where state- or India-level references are used, treat them as directional rather than ST-only numbers unless specifically disaggregated.)

IV. METHODOLOGY: DATASET AND ANALYTICAL APPROACH

IV.1. DATA SOURCES

The study employs a mixed-methods approach, drawing primarily on **secondary datasets** that provide demographic, socioeconomic, nutrition, and program coverage indicators relevant to food security and SDG linkages in Bihar's tribal communities. The key datasets include:

1. **Census of India (2011):** Used to identify the spatial distribution of Scheduled Tribe (ST) populations across districts in Bihar, including demographic profiles and settlement patterns. Census data form the baseline for stratifying tribal clusters and analysing population shares at sub-district levels.
2. **National Family Health Survey-5 (NFHS-5, 2019–21):** Provides district-level indicators on nutrition (stunting, wasting, anaemia), maternal and child health, WASH, and service utilisation. Although NFHS does not provide fully disaggregated ST estimates at the district level, the survey serves as the gold standard for outcome benchmarks and contextualising tribal food security within broader state trends.
3. **Program Management Information Systems (MIS):** Administrative data from schemes such as the Public Distribution System (PDS/ONORC), Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), Integrated Child Development Services (ICDS), Jal Jeevan Mission (JJM), and Swachh Bharat Mission (SBM) are used to assess program coverage, service delivery, and entitlement uptake in tribal-dominated blocks.
4. **Policy and SDG Metadata (UN & NITI Aayog):** Provides definitions, indicators, and alignment frameworks to map food security outcomes against SDG targets.

IV.II. ANALYTICAL FRAMEWORK

Data are analysed through the four-pillar lens of food security (availability, access, utilisation, stability), with each pillar mapped to relevant SDGs. A results-chain approach (Inputs → Outputs → Outcomes → Impacts) is applied to connect program interventions with tribal food security outcomes. This design ensures both breadth (state- and district-level patterns) and depth (tribal block-level operational insights), while recognising the limitations of ST-disaggregated public data.

V. RESULTS AND DISCUSSION

V.I. DIAGNOSING FOOD SECURITY IN TRIBAL BIHAR WITH THE FOUR-PILLAR LENS

Availability: Food availability in tribal Bihar is shaped by the interplay of land, water, and forest resources. Most tribal households own small and fragmented plots, which are heavily dependent on rain-fed agriculture, resulting in highly variable and vulnerable productivity, particularly to droughts or erratic rainfall (Chaudhuri & Gupta, 2020). Limited irrigation coverage means that yield stability remains weak, while market distance and inadequate storage/cold chains cause post-harvest losses and inflated retail prices. Beyond agriculture, non-timber forest products (NTFPs)—such as mahua, sal leaves, and lac—play a crucial role in supplementing diets and incomes (Sarap & Das, 2021). However, declining forest productivity and insecure access to commons reduce the reliability of this food source. Policy levers to enhance availability include expansion of minor irrigation and watershed programs under PMKSY (linked to SDG 6 and 13), community grain banks to buffer seasonal shortages (SDG 2), and reliable implementation of the Public Distribution System (PDS). Crucially, proper enforcement of the Forest Rights Act (FRA) secures tribal tenure, ensuring sustained access to forest foods and incomes, thereby supporting SDGs 1 and 16.

Access: Even when food is available, access is often constrained by economic, social, and administrative barriers. Documentation gaps, such as unseeded ration cards or a lack of Aadhaar linkage, prevent many tribal households from accessing subsidised food under the PDS (Kumar et al., 2019). Migration, which is widespread among tribal populations in Bihar, interrupts continuity of food entitlements, highlighting the importance of portability through the One Nation One Ration Card (ONORC). Seasonal wage volatility and lean-season unemployment further limit purchasing power, forcing families to adopt coping strategies such as borrowing, meal skipping, or distress sales of assets. To improve access, interventions include strengthening ONORC and last-mile Aadhaar–bank–ration seeding (SDGs 1 and 10), aligning MGNREGA employment with lean agricultural seasons, and

designing extraordinary works in forest areas (SDG 8). Value addition and marketing support for NTFPs through TRIFED and SHGs can also improve price realisation, linking tribal producers to sustainable markets (SDG 8).

Utilisation: Utilisation refers to the nutritional quality, safety, and biological absorption of food. In tribal Bihar, utilisation is undermined by widespread anaemia among women, high prevalence of child stunting and wasting, and low dietary diversity, with diets often dominated by cereals (NFHS-5, 2021). Poor WASH (Water, Sanitation, and Hygiene) conditions—unsafe drinking water, open defecation, and limited access to toilets—further exacerbate malnutrition by increasing the risk of diarrheal diseases and inhibiting nutrient absorption (Jha & Ghosh, 2020). Cultural and behavioural factors, such as delayed complementary feeding, low consumption of animal-source foods, and food taboos, also contribute to poor outcomes. Addressing utilisation requires strengthening ICDS and POSHAN interventions, improving the quality of Take-Home Rations (THR), and ensuring regular growth monitoring (SDG 2). Expanding access to safe water under the Jal Jeevan Mission and improving sanitation through the Swachh Bharat Mission (SDG 6) can reduce the disease burden. At the same time, maternal and child health services—such as antenatal care, iron-folic acid supplementation, deworming, and immunisation—under the National Health Mission (NHM) are crucial for improving access and utilisation (SDG 3).

Stability: Stability refers to a household's ability to maintain food security over time, despite experiencing various shocks. Tribal households in Bihar are highly vulnerable to recurrent floods in riverine areas, droughts in rain-fed southern districts, heat stress, and rising food prices, all of which undermine their stability (IPCC, 2021). Illness and sudden medical expenses can also force households into consumption cuts, weakening their nutritional resilience. Programs such as MGNREGA function as automatic stabilisers, ensuring minimum wage support during lean seasons (SDG 1 and 8). Crop and health insurance schemes can mitigate risks, while climate-smart agricultural practices—such as micro-irrigation, drought-tolerant crops, and watershed management—strengthen long-term resilience (SDG 13). Secure housing and basic services for Particularly Vulnerable Tribal Groups (PVTGs) under PM-JANMAN reduce exposure to climate shocks, stabilising consumption indirectly (SDG 11).

V.II. PROGRAMMATIC LEVERS AND SDG MAPPING

Several programmatic interventions can strengthen food security for tribal communities in Bihar:

1. **Strengthening PDS/ONORC for Migrants** – Ensures continuity of food entitlements for seasonal migrants by Aadhaar–bank–ration seeding, dealer training, and grievance redressal (SDGs 1, 2, 10, 16).
2. **Improving ICDS/POSHAN Coverage and Quality** – Enhances child nutrition through improved THR, regular growth monitoring, and culturally relevant SBCC in tribal languages (SDGs 2, 3, 5).
3. **Job Security through MGNREGA** – Protects incomes during lean months by aligning work with agricultural calendars and prioritising asset-building projects such as feeder roads, ponds, and check-dams (SDGs 1, 8, 13).
4. **FRA Implementation and Resource Management** – Secures tenure and enhances predictable access to forest foods and incomes, fostering community-managed value chains (SDGs 1, 2, 8, 15, 16).
5. **Climate-Smart Agriculture and Water Security** – Promotes micro-irrigation, kitchen gardens, drought-tolerant crops, and village seed banks (SDGs 2, 6, 13).
6. **Women's Economic Agency and Nutrition Leadership** – Empowers women via SHGs for nutrition gardens, poultry, and livestock, ensuring female participation in MGNREGA and control over earnings (SDGs 5, 2, 8, 10).

7. **Housing and Basic Services for PVTGs** – Provides secure housing, water, and sanitation to reduce vulnerability and improve health outcomes (SDGs 1, 6, 11, 13).

Together, these levers emphasise that food security in tribal Bihar is not just about increasing agricultural output but about integrating rights, resilience, and institutional accountability within the SDG framework. Ensuring sustained improvements requires a holistic, context-sensitive, and equity-focused approach that addresses both immediate nutritional needs and long-term livelihood security.

V.III. HOW SDG TARGETS TRANSLATE INTO A TRIBAL FOOD SECURITY RESULTS CHAIN

Inputs, Outputs, Outcomes, and Impact: The food security of tribal households in Bihar can be conceptualised through a results chain that maps programmatic inputs to eventual long-term impacts. Inputs include provisions such as Public Distribution System (PDS) food grains, take-home rations through ICDS, iron-folic acid (IFA) supplementation, MGNREGA wage funds, facilitation of Forest Rights Act (FRA) claims, micro-irrigation kits, rural water supply schemes, and self-help group (SHG) credit. These inputs generate outputs such as ration card portability through One Nation One Ration Card (ONORC), functional village health and nutrition days (VHNDs), completed works like ponds and check-dams, issuance of FRA titles, installation of household taps, and the establishment of SHG kitchen gardens. Together, these outputs contribute to outcomes such as greater dietary diversity, a lower incidence of diarrheal disease, enhanced female control over income, reduced hunger during lean seasons, and more stable income from non-timber forest products (NTFPs). The ultimate impact includes reductions in child stunting, wasting, and anaemia, fewer food-insecure months, stronger resilience to climatic and livelihood shocks, and breaking the cycle of intergenerational deprivation (FAO, IFAD, UNICEF, WFP, & WHO, 2022; NITI Aayog, 2022). This framework emphasises that no single program can achieve SDG 2 (Zero Hunger); instead, convergence across SDG-linked initiatives is crucial.

Data Use for Tribal Food Security Monitoring: Robust monitoring of tribal food security in Bihar requires triangulation of multiple data sources. The National Family Health Survey (NFHS-5, 2019–21) provides district-level benchmarks for nutrition and service utilisation, serving as the gold standard for outcome indicators despite the absence of Scheduled Tribe (ST)-disaggregated microdata (IIPS & ICF, 2021). Census 2011 remains the official baseline for the spatial distribution of ST populations, guiding sampling frameworks and program targeting. Meanwhile, scheme-level management information systems (MIS) from PDS/ONORC, MGNREGA, ICDS, Jal Jeevan Mission (JJM), and Swachh Bharat Mission (SBM) offer near real-time operational data on coverage and quality. For global comparability, policy and program indicators should be aligned with UN SDG indicator metadata, especially for Goal 2 and its cross-linkages with Goals 1, 3, 5, 6, 8, 10, 13, and 16 (UNSD, 2020).

A Compact Block-Level Strategy: A practical strategy for blocks with significant tribal habitations can be organised under the four food security pillars. Availability can be enhanced by constructing and rehabilitating five check-dams and ten ponds under MGNREGA, alongside promoting 200 SHG-led kitchen gardens. Access requires full ONORC activation, grievance redressal for all PDS complaints within 15 days, and ensuring tribal households receive at least 40 person-days of MGNREGA work during lean months. Utilisation focuses on monthly VHNDs in every tribal hamlet, achieving 90% IFA compliance among pregnant women, strengthening social behaviour change communication (SBCC) on complementary feeding, and expanding coverage of piped water and household toilets. Stability can be built through FRA claim camps, the establishment of community grain banks, shock-responsive MGNREGA during climate events, and targeted implementation of PM-JANMAN for Particularly Vulnerable Tribal Groups (PVTGs) (TOI, 2025; PIB, 2022).

Monitoring and Governance for Convergence: Effective governance is the backbone of a convergence-driven food security strategy. Quarterly convergence reviews, chaired by the Block Development Officer (BDO), can ensure interdepartmental coordination, while social audits for PDS and MGNREGA strengthen transparency and accountability. Community-level scorecards, combined with simple public dashboards displaying PDS coverage, MGNREGA uptake, JJM/SBM access, and nutrition outcomes, can foster grassroots accountability. These governance mechanisms reinforce the “last-mile” delivery needed for tangible improvements in tribal hamlets (World Bank, 2022).

Key Takeaways: The analysis highlights four significant insights. First, food security for tribal households is inherently multi-sectoral, requiring parallel progress in livelihoods, entitlements, health, and WASH. Second, achieving SDG 2 outcomes depends on synergistic progress across multiple SDGs, particularly SDG 1, 3, 5, 6, 8, 10, 13, and 16. Third, quick wins can be achieved through improving ONORC portability and POSHAN/ICDS service quality, while structural stability depends on FRA implementation, MGNREGA scaling, and climate-resilient water interventions. Fourth, integrating PM-JANMAN housing and basic service expansion for PVTGs accelerates resilience and reduces health shocks, leading to sustained improvements in nutrition (NITI Aayog, 2022; UNSD, 2020).

VI. CONCLUSION

Food security among tribal communities in Bihar is deeply intertwined with the broader Sustainable Development Goals (SDGs), reflecting the multidimensional nature of hunger and nutrition. This paper, through the four-pillar lens of food security—availability, access, utilisation, and stability—demonstrates how tribal households experience a convergence of vulnerabilities shaped by geography, livelihoods, and systemic barriers to entitlements. These vulnerabilities are not isolated but closely linked to structural determinants such as poverty, gender inequality, inadequate health services, poor WASH conditions, and climate shocks, thereby underscoring that SDG 2 (Zero Hunger) cannot be achieved in isolation but must be pursued in tandem with related goals.

From the perspective of availability, tribal agriculture in Bihar is constrained by fragmented holdings, rain-fed cultivation, and insecure access to forest resources. Limited irrigation infrastructure and weak market linkages often reduce the stability of local production. Addressing this requires a stronger emphasis on watershed development, minor irrigation projects, and tenure security under the Forest Rights Act (MoTA, 2022). These measures contribute not only to SDG 2 but also to SDG 6 (Clean Water and Sanitation) and SDG 13 (Climate Action). In terms of access, migration, wage volatility, and documentation barriers hinder the ability of tribal households to procure food consistently. While reforms such as the One Nation One Ration Card (ONORC) scheme have expanded portability, gaps in Aadhaar seeding and last-mile delivery persist (PIB, 2022). Here, convergence between SDG 1 (No Poverty), SDG 10 (Reduced Inequalities), and SDG 16 (Strong Institutions) becomes crucial, as institutional efficiency and inclusiveness directly impact the reliability of entitlements such as the PDS and MGNREGA. Utilisation of food, which is closely tied to nutrition and health, remains an area of acute concern. High levels of stunting, wasting, and anaemia among tribal women and children indicate that caloric sufficiency does not translate into nutritional adequacy (IIPS & ICF, 2021). Behaviour-driven barriers—such as low intake of animal-source foods, feeding taboos, and inadequate complementary feeding practices—compound the structural deficits. Interventions such as POSHAN Abhiyaan, Integrated Child Development Services (ICDS), and the National Health Mission (NHM) provide critical entry points for improvement, aligning with SDG 3 (Good Health and Well-being) and SDG 5 (Gender Equality). Ultimately, stability underscores the ability of tribal households to withstand shocks. Bihar's tribal regions, being prone to floods, droughts, and price fluctuations, often experience seasonal food insecurity and sudden consumption cuts due to health or livelihood shocks (NITI Aayog, 2022). Programs such as MGNREGA, crop insurance, and PM-JANMAN offer safety nets, but practical implementation

and convergence are vital to ensure resilience. Climate-smart agricultural practices, coupled with community-based grain banks, further enhance stability, connecting directly with SDG 11 (Sustainable Communities) and SDG 13 (Climate Action).

The evidence suggests that convergence is the driving force behind advancing tribal food security in Bihar. No single program or SDG can achieve meaningful outcomes in isolation. Instead, synergies across social protection (PDS, MGNREGA), health and nutrition (POSHAN, NHM), natural resource management (FRA, watershed projects), and gender empowerment (SHGs, women's leadership in nutrition) are essential. Monitoring and accountability mechanisms, including community scorecards and public dashboards, can strengthen transparency and foster trust. In conclusion, linking food security to the SDGs provides not only a diagnostic framework but also a strategy for action. Tribal food security in Bihar reflects the interdependence of hunger reduction, poverty alleviation, gender equality, and climate resilience. Addressing these issues requires both programmatic integration and community participation, ensuring that policies are not merely delivered but are co-owned by tribal communities themselves. Moving forward, the success of Bihar's tribal food security initiatives will depend on embedding SDG convergence into local governance, enabling resilience, and reducing intergenerational deprivation.

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