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UNION TERRITORY OF
LADAKH

सत्यमेव जयते



POLICY BRIEF

Strengthening Wheat Flour Fortification (WFF) in Ladakh

Policy Priorities for Quality, Coverage
and Sustainability

Government of Ladakh & GAIN

February 2026



KEY MESSAGES

- **Critical Health Burden:** The National Family Health Survey (NFHS) indicated anaemia prevalence of over **90%** among women and children (NFHS-5, 2019–21) in the Union Territory (UT) of Ladakh, demanding immediate, population-wide dietary interventions alongside clinical supplementation. At the national level, **57%** of women and **67.1%** of children under five are anaemic, underscoring the scale of the challenge across India.
- **Strategic Vehicle Selection:** Wheat flour is a universal daily dietary staple across Ladakh. Distribution of fortified wheat flour via the Targeted Public Distribution System (TPDS) provides an ideal, low-disruption channel ensuring near-universal (**90–95%**) population coverage.
- **Comprehensive Micronutrient Scope:** While traditionally framed around anaemia control, the WFF programme systematically addresses multiple co-existing micronutrient deficiencies by fortifying flour with a carefully calibrated blend of **Iron, Folic Acid, and Vitamin B12**.
- **Core Operational Achievements:** Driven by strong administrative leadership, the UT Government has successfully absorbed **100%** of fortification costs (premix, microfeeders, and packaging). All **three** operational roller flour mills in Ladakh are fully compliant, integrated into a digitally traceable supply chain, and producing quality-assured fortified flour.
- **Key Future Priorities:** To evolve from a supply-driven operation to a sustainable public health success, Ladakh must transition to institutionalised capacity building, upgrade regional laboratories for internal quantitative testing, establish a formal premix vendor empanelment system, and drive multi-departmental convergence with health and nutrition platforms.

ACKNOWLEDGMENT

The institutionalization of wheat flour fortification in Ladakh would not have been possible without the visionary leadership and sustained support of the Department of Food, Civil Supplies and Consumer Affairs, Government of Ladakh.

The Department's stewardship in integrating food fortification within public food distribution and consumer protection systems has been instrumental in advancing programme sustainability and scale. We acknowledge the Department's commitment to coordination, operational oversight, and facilitation of state-level implementation, which has strengthened compliance, enhanced system ownership, and ensured alignment with national nutrition priorities.

Additionally, sincere gratitude is extended to the Department of Food, Civil Supplies and Consumer Affairs, Government of Ladakh, and to all stakeholders who generously shared their expertise, evidence, and insights in support of this policy brief.

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1. BACKGROUND AND CONTEXT

1.1 MALNUTRITION AND ANAEMIA IN LADAKH

Anaemia remains a severe and persistent public health concern across the Union Territory of Ladakh, well above the national average.

Anaemia, defined as a condition characterised by insufficient haemoglobin levels in the blood, often due to iron deficiency, remains a major public health concern in Ladakh. According to NFHS-5 (2019–21), anaemia among women and children in Ladakh is far above the national average of **57%** among women, indicating a severe and persistent challenge. While anaemia is a key concern, it reflects broader micronutrient deficiencies, including inadequate intake of iron, folic acid, and vitamin B12, which are critical for cognitive development, maternal health, and immune function.

92–93%

Anaemia prevalence among women & children in Ladakh

67.1%

Children under five affected by anaemia — national average

Source: National Family Health Survey (NFHS-5, 2019–21)

Data also suggest that anaemia rates in Ladakh have **risen** compared to previous NFHS survey rounds, reflecting persistent nutrition and micronutrient deficiency challenges. Although Ladakh-specific disaggregated data remain limited, the structural drivers of undernutrition—including constrained dietary diversity and access—remain highly relevant. These indicators reinforce the need for population-wide interventions such as fortified wheat flour, alongside broader nutrition and health strategies.

1.2 THE RATIONALE FOR WHEAT FLOUR FORTIFICATION

Wheat flour is a widely consumed daily staple in Ladakh, particularly among low-income households dependent on the Public Distribution System.

Fortification of wheat flour with **iron, folic acid, and vitamin B12** is therefore an effective strategy because it:

- Ensures regular and widespread consumption across the population.
- Leverages the existing and well-established PDS distribution network.
- Does not require any change in consumer behaviour or dietary practices.
- Provides a highly cost-effective approach to addressing micronutrient deficiencies.

THE ECONOMIC RATIONALE: A COMPELLING INVESTMENT CASE

THE COST OF INACTION — IDA BURDEN IN INDIA

8.3M

disability-adjusted life years (DALYs) lost annually to Iron Deficiency Anaemia

\$24,001M

estimated annual production losses — equivalent to about **1.3% of global GDP**

RETURN ON INVESTMENT

\$1



\$12–19

Every dollar invested in anaemia reduction returns USD 12–19 through improved productivity, health, and economic outcomes

THE COST OF ACTION — FORTIFYING WHEAT FLOUR

INR 0.08–0.10

additional cost per kilogram of flour — a minimal, marginal investment

Delivered through existing PDS infrastructure with no change in consumer behaviour required

This makes wheat flour fortification one of the most cost-effective strategies for reducing anaemia and improving nutritional status.

Sources: Cost of inaction — Plessow R. et al. (2015), [Social Costs of Iron Deficiency Anemia in 6–59-Month-Old Children in India](#), PLoS ONE. Return on investment — World Bank, [Open Knowledge Repository](#).

Furthermore, Ladakh distributes wheat through the PDS primarily in the form of milled wheat flour rather than whole grain. This unique characteristic makes wheat flour particularly well-suited as a fortification vehicle, enabling efficient delivery of micronutrients to a large proportion of the population through an existing government-supported food distribution system.

1.3 OVERVIEW OF THE TARGETED PUBLIC DISTRIBUTION SYSTEM IN THE WHEAT FLOUR SYSTEM IN LADAKH

The Public Distribution System (PDS) delivers subsidised fortified wheat flour to households through Fair Price Shops (FPS), locally referred to as Food Supply Centres (FSCs), covering:

- Antyodaya Anna Yojana (AAY) households
- Priority Households (PHH)
- Non-Priority Households (NPHH)

The system is governed by the **National Food Security Act (NFSA)** and supplemented by the **Ladakh Food Security Scheme (LFSS)**. The entire programme is implemented through a coordinated model led by the Department of Food, Civil Supplies and Consumer Affairs, Government of Ladakh, which oversees procurement, fortification, quality assurance, distribution, and programme monitoring.

FROM GRAIN TO BENEFICIARY: THE FORTIFIED WHEAT FLOUR SUPPLY CHAIN

The fortified wheat flour supply chain follows five key steps:

- **Procurement:** The Department of Food, Civil Supplies, and Consumer Affairs procures wheat grains via government channels and routes them to empanelled local mills.
- **Premix Distribution:** The Department centrally purchases the standardised multi-micronutrient premix (Iron, Folic Acid, Vitamin B12) and allocates it to millers in exact proportion to their assigned wheat quotas.
- **Milling and Quality Verification:** Local millers grind and fortify the wheat using calibrated microfeeders. The fortified flour is packaged in high-density polyethylene (HDPE) bags prominently displaying the national "+F" logo, nutritional values, and statutory declarations.
- **Logistics and Tracking:** Millers maintain digital records of fortified wheat flour production and distribution via the Integrated Aadhaar-Enabled Supply Chain Management System. The government handles transport from mill godowns to Fair Price Shops (FPS), locally termed Food Supply Centres (FSCs).
- **Beneficiary Handover:** At FPS/FSC outlets, beneficiaries collect fortified wheat flour as per their entitlement and beneficiary category.



Figure 1: Current Wheat Flour Fortification Supply Chain in Ladakh. Source: GAIN, 2025.

ENABLING SYSTEMS FOR SUSTAINABLE IMPLEMENTATION

The institutionalisation of wheat flour fortification in Ladakh is supported by three key enabling systems:

STATE-BACKED FINANCING

The UT Government bears the full cost of fortification, including procurement of micronutrient premix, installation and maintenance of microfeeders or dosing equipment, compliant packaging materials, and training of mill personnel.

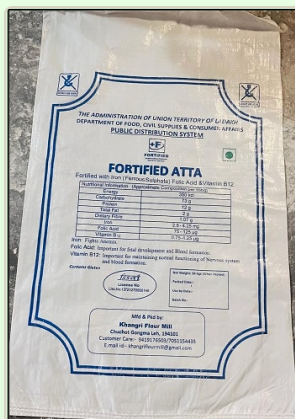
QUALITY AND STANDARDS

Regular inspections, sampling, and laboratory testing help ensure that fortified wheat flour meets prescribed standards and that packaging complies with regulatory requirements.

TECHNICAL PARTNERSHIPS

The Global Alliance for Improved Nutrition (GAIN) and the Karnataka Health Promotion Trust (KHPT) provide technical assistance for implementation, capacity building, and quality-control systems, supporting the Department's efforts to institutionalise and sustain the programme.





Fortified wheat flour packaged in HDPE bags prominently displaying the +F logo and statutory labels.



Fortified wheat flour bags stored at mill premises prior to distribution.

1.4 POLICY CONTEXT

The Wheat Flour Fortification program operates within India's broader food and nutrition policy landscape.

NATIONAL FOOD SECURITY ACT (NFSA), 2013

Mandates subsidised food distribution through the Public Distribution System (PDS), providing a primary platform for the delivery of fortified staple foods.

FSSAI FORTIFICATION REGULATIONS, 2018

National standards for food fortification, including specifications for micronutrient composition, dosing norms, packaging, and labelling requirements.

ANAEMIA MUKT BHARAT (AMB)

A comprehensive national strategy for anaemia reduction, promoting a life-cycle approach that includes supplementation, behaviour change, and the use of fortified foods.

ICDS & MID-DAY MEAL (MDM) SCHEME

Deliver supplementary nutrition to children, adolescents, and women alongside fortification efforts, though programme-level integration with Wheat Flour Fortification (WFF) remains limited.

Since 2016–17, the Government of India has issued directives and advisories promoting the inclusion of fortified staple foods, including wheat flour, within major social safety net programmes such as PDS, ICDS, and MDM, with early guidance complemented by the introduction of national standards and scale-up efforts.

Together, these policies create a strong enabling environment for a more coordinated, regulated, and impactful WFF program in Ladakh.



2. KEY ACHIEVEMENTS OF THE WFF PROGRAM IN LADAKH

Driven by strong administrative leadership, Ladakh has rapidly scaled a fully government-funded, quality-assured fortification programme.

3 / 3

Operational mills fully compliant — 100%

90–95%

Near-universal household coverage via PDS

225,000+

Beneficiaries covered since 2023

100%

Fortification cost absorbed by the UT Government

SINCE 2022

Strong Political Leadership & Rapid Rollout

Approved and operationalised swiftly in 2022 under high-level administrative leadership, reflecting strong political commitment to addressing Ladakh's severe anaemia burden.

SUPPLY CHAIN

Mill Compliance & Supply Chain Integration

All **three** operational flour mills in Ladakh are fully compliant and engaged in producing fortified wheat flour, supported by robust training, digital traceability, and QA mechanisms.

ACCEPTANCE

High Consumer Acceptance & Routine Consumption

Fortified wheat flour is widely accepted, with **no reported adverse effects or taste concerns**, and is routinely consumed in traditional Ladakhi diets.

FINANCING

Government-Funded, Low-Disruption

The UT Government absorbed the **full cost** of fortification (premix, equipment, packaging, training), enabling seamless integration without increasing costs to beneficiaries.

COVERAGE

Near-Universal Population Coverage via PDS

Leveraging the PDS (**90–95%** household coverage) to distribute fortified flour since 2023 — more than **225,000** beneficiaries now have access.

MICRONUTRIENTS

Comprehensive Fortification Blend

Beyond anaemia control, the programme addresses multiple co-existing deficiencies via a carefully calibrated blend of **Iron, Folic Acid, and Vitamin B12**.



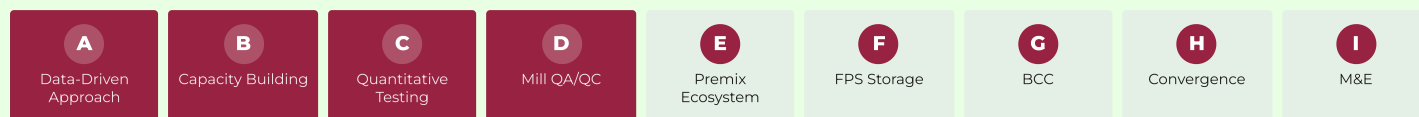
Millers checking pre-blend discharge from microfeeder (calibration) during on-site training.



Hands-on microfeeder calibration training with mill staff in Ladakh.

3. POLICY RECOMMENDATIONS FOR WHEAT FLOUR FORTIFICATION IN LADAKH

Ladakh has built strong operational foundations for WFF through the PDS. The following nine recommendations chart its evolution toward a high-impact, quality-assured public health programme.



A TRANSITION TO A DATA-DRIVEN, NEED-BASED APPROACH

Localised evidence is essential to determine the long-term appropriateness of a universal versus a targeted fortification strategy.

Conduct Nutrition Surveys: Execute context-specific baseline and follow-up nutrition surveys that extend beyond baseline NFHS data

Assess Exposure Risks: Map regional anaemia prevalence, micronutrient deficiencies, dietary patterns, and exposure to multiple fortified foods or parallel supplementation programmes

Determine Policy Tailoring: Use localised evidence to objectively evaluate universal versus targeted fortification approaches

B INSTITUTIONALISE CAPACITY BUILDING & TECHNICAL SUPPORT

Shifting from NGO-dependent support to self-sustaining, government-led training systems is key to long-term programme resilience.

Government-Led Ownership: Shift from reliance on NGO-dependent support to self-sustaining, government-led institutionalised training systems

Collaborate with Training Institutions: Partner with the National Institutes of Food Technology Entrepreneurship and Management (Kundli & Thanjavur) — Centres of Excellence for Food Fortification providing technical expertise, training, and knowledge support

C STRENGTHEN QUANTITATIVE TESTING & QUALITY SURVEILLANCE SYSTEMS

Internal quantitative validation and unannounced market surveillance close the loop between fortification and verified compliance.

Equip Regional Labs: Upgrade regional laboratories with quantitative testing tools (spectrophotometry / chromatography) for internal validation of Iron, Folic Acid, and Vitamin B12 levels; ensure readiness through regular calibration, reagent QC, and staff capacity-building

Institutionalise Market Surveillance: Establish unannounced, random sample collection across mill godowns, transit points, and FSCs; conduct annual checklist-based compliance audits by the State Food Department

D STRENGTHEN INTERNAL QUALITY ASSURANCE & QUALITY CONTROL AT MILLS

Structured documentation and sample retention protect against gaps in dosing accuracy and enable rapid resolution of quality disputes.

Mandate Structured Documentation: Enforce strict, daily microfeeder calibration protocols with precise logs of premix consumption against flour output

Enforce Sample Retention: Require reference samples from every production batch to be retained for 3–6 months for backward traceability

Continuous Training: Institutionalise periodic technical training to address staff turnover and maintain precision



FROM THE FIELD

An IEC poster, “Apna Jeevan Swasthya Banayen”, co-branded by the Union Territory of Ladakh, GAIN and KHPT, displayed at a Fair Price Shop. It explains the benefits of atta fortified with iron, folic acid and vitamin B12, helping beneficiaries recognise the +F logo at the point of collection.

A

Data-Driven
Approach

B

Capacity Building

C

Quantitative
Testing

D

Mill QA/QC

E

Premix
Ecosystem

F

FPS Storage

G

BCC

H

Convergence

I

M&E

E

BUILD A REGULATED PREMIX PROCUREMENT ECOSYSTEM**A transparent, state-approved vendor empanelment system safeguards nutrient dosage accuracy at the source.**

Implement Vendor Empanelment: Establish a transparent, state-approved empanelment system for premix suppliers based on verified FSSAI compliance and strict quality criteria; introduce regular quantitative testing of premix to verify nutrient dosage accuracy

Require Batch CoAs: Mandate that every delivered premix batch arrive with a manufacturer's Certificate of Analysis (CoA), uploaded to the state's tracking portal before deployment

F

STRENGTHEN STORAGE GUIDELINES & PRACTICES AT FAIR PRICE SHOPS (FPS)**Protecting nutritional integrity requires practical storage protocols and hands-on training at every retail node.**

Develop Enhanced Protocols: Formulate clear, practical warehouse and retail storage guidelines going beyond basic moisture control to include pest management, stock rotation, and hygiene rules

Execute Operator Trainings: Provide structured, hands-on training for FPS operators on safe storage, handling, and stacking of fortified wheat flour

Protect Nutritional Integrity: Systematically improve adherence to storage standards across all retail nodes to safeguard micronutrient levels and prevent spoilage

G

LAUNCH TARGETED BEHAVIOUR CHANGE COMMUNICATION (BCC)**Empowering Fair Price Shop owners as health messengers builds sustained community trust in fortified flour.**

Empower FPS Owners: Train Fair Price Shop owners as active health messengers, equipped with localised, low-literacy visual toolkits and print materials

Deploy Localised Media: Use regional languages across community radio, brief video segments, and mobile platforms to explain multi-micronutrient benefits, address safety queries, and counter misinformation

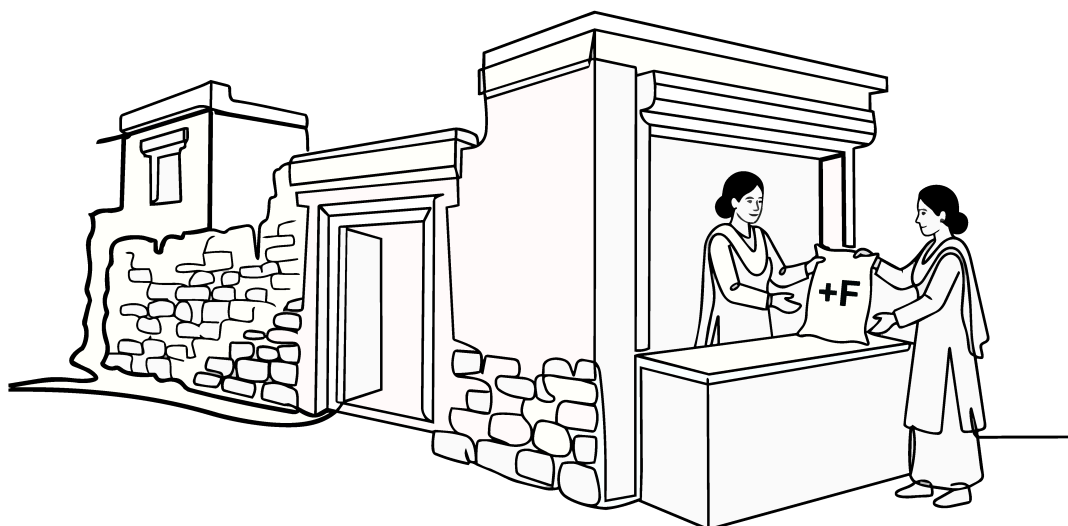
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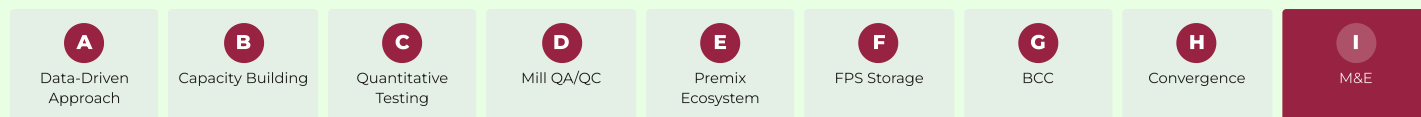
DRIVE CONVERGENCE WITH HEALTH & EDUCATION SECTORS**Cross-utilising frontline networks amplifies impact among high-risk paediatric and maternal demographics.**

Multi-Sectoral Task Force: Convene a dedicated working group linking the Department of Food & Civil Supplies with Health, Women and Child Development (WCD), and Education departments

Cross-Utilise Frontline Networks: Train ASHAs, Anganwadi Workers, and school health coordinators to champion fortified flour, aligned with the Anaemia Mukta Bharat (AMB) framework

Expand Delivery Vectors: Integrate verified fortified wheat flour into hot cooked meals served through ICDS centres and school education programmes to protect high-risk groups





I ENHANCE MONITORING, EVALUATION & TRANSPARENCY

Open data governance builds institutional trust and helps counter localised misinformation about fortified foods.

Multi-Tiered Framework: Develop a comprehensive M&E framework integrating coverage, internal mill quality, and outcome indicators to continuously track population-level nutritional impact

Open Data Governance: Transparently share monitoring findings, lab test compliance rates, and programme evaluation data with institutional stakeholders and local communities

Mitigate Misinformation: Use public data sharing to build deep institutional trust, address safety queries, and counter localised misinformation about fortified foods

4. CONCLUSION

Ladakh has demonstrated strong progress in scaling wheat flour fortification through the Public Distribution System, achieving high coverage, strong system integration, and widespread acceptance.

However, while implementation systems are well established, greater emphasis on quality assurance, monitoring, and programme integration will be essential to demonstrate measurable nutritional impact. With strengthened systems and sustained political commitment, Ladakh is well positioned to evolve into a high-impact public health model, offering valuable lessons for other geographically challenging regions.

The programme rollout was supported through technical assistance, capacity building, and implementation support from the Global Alliance for Improved Nutrition (GAIN) and the Karnataka Health Promotion Trust (KHPT), in close collaboration with the Department of Food, Civil Supplies and Consumer Affairs, Government of Ladakh.

Ladakh is well-positioned to become a model for high-altitude, geographically challenging regions — demonstrating *quality-assured, government-led, and health-focused* fortification at scale.

ABBREVIATIONS

AMB — Anaemia Mukh Bharat

FPS — Fair Price Shop

HDPE — High-Density Polyethylene

LFSS — Ladakh Food Security Scheme

NFSA — National Food Security Act

QA/QC — Quality Assurance / Quality Control

WFF — Wheat Flour Fortification

AAY — Antyodaya Anna Yojana

FSC — Food Supply Centre

ICDS — Integrated Child Development Services

MDM — Mid-Day Meal (Scheme)

NPHH — Non-Priority Household

SOP — Standard Operating Procedure

BCC — Behaviour Change Communication

FSSAI — Food Safety & Standards Authority of India

IEC — Information, Education & Communication

M&E — Monitoring and Evaluation

PHH — Priority Household

TPDS — Targeted Public Distribution System

CoA — Certificate of Analysis

GAIN — Global Alliance for Improved Nutrition

KHPT — Karnataka Health Promotion Trust

NFHS — National Family Health Survey

PDS — Public Distribution System

UT — Union Territory

Healthier Diets. For all.



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