

UNVEILING THE NUTRITIONAL LANDSCAPE OF INDIA

July 2023



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GLOSSARY



AAY	:	Antyodaya Anna Yojana	MDM	:	Mid Day Meal
ANM	:	Auxiliary Nurse Midwife	MWCD	:	Ministry of Women and Child Development
ASHA	:	Accredited Social Health Activist	NFHS	:	National Family Health Survey
AWW	:	Anganwadi Workers	NFSA	:	National Food Security Act
CSE	:	Centre for Science and Environment	PDS	:	Public Distribution System
CPI	:	Consumer Price Index	PHH	:	Priority Household
DFS	:	Double Fortified Salt	POS	:	Point of Sale
FCI	:	Food Corporation of India	RUTF	:	Ready to Use Therapeutic food
FPS	:	Fair Price Shops	SAM	:	Severe Acute Malnutrition
HCM	:	Hot Cooked Meal	SC	:	Scheduled Caste
ICDS	:	Integrated Child Development Scheme	ST	:	Scheduled Tribe
ICT	:	Information and Communication Technology	THR	:	Take Home Rations
IFA	:	Iron and Folic Acid	TB	:	Tuberculosis



EXECUTIVE SUMMARY



Malnutrition in India is a multifaceted issue, encompassing both undernutrition and overnutrition. According to the State of Food Security and Nutrition in the World 2022 Report, around **224.3 million Indians are undernourished**. Inadequate access to diverse and healthy diets causes micronutrient deficiencies, especially in children and women.

Nutrition has gained **prominence on the policy agenda in India** due to its significant impact on public health and development. Several policies - Integrated Child Development Services, National Nutrition Policy, and Poshan Abhiyan - aim to ensure food and nutrition security, promote healthy dietary practices, and enhance the effectiveness of nutrition interventions for various target groups.

Touchpoints such as Anganwadi centres, Community centres, Sub Health Centres and Referral Sites provide nutrition-related services to infants and children under 5, adolescents, pregnant women, and lactating mothers. The current **private solutions ecosystem** operates on three levers - awareness and prevention of malnutrition, strengthening service delivery channels by identification of malnourished individuals, treatment specific to malnutrition and follow-ups.

Achieving universal healthcare in the field of nutrition entails overcoming various obstacles. Political challenges arise from the **poor execution and monitoring of existing initiatives** like the Mid Day Meal Programme, inadequate funding allocations and unauthorised diversions. Additionally, economic challenges stem from **inflation and the unaffordability of diversified diets**, resulting in inadequate consumption of nutritious food among the intended beneficiaries. **Social disparities** further expose marginalised populations, including adolescent girls, women, and underprivileged castes, to the risk of malnutrition. Proposed **technological solutions face limited adoption rates**, and persistent challenges exist regarding the availability of data and inconsistencies in nutrition indicators. Legislative measures like the National Food Security Act have certain limitations, including exclusions and incomplete implementation. Furthermore, environmental factors such as **the impacts of climate change and pollution** contribute to the vulnerability of the target groups.

Emerging smart innovations in the healthcare sector offer **potential solutions to bridge gaps and improve accessibility to nutritious foods**. Government schemes have incorporated food fortification as a sustainable long-term strategy. Smart proteins, as a climate-friendly solution, are gaining momentum and have the potential to generate USD 4.3 billion in economic opportunities by 2030. Nutraceuticals, serving as dietary supplements and functional foods, are increasingly being recognised for their ability to manage health concerns and cater to lifestyle needs. However, a few emerging trends in the nutraceutical industry, like multivitamin gummies and protein bars, pose health challenges for consumers due to the high presence of sugar and calories, especially in the absence of regulatory mechanisms.



BACKGROUND AND CONTEXT



Nutrition is the process of taking in food and converting it into energy and other vital nutrients required for life.

Better nutrition is related to



Improved
infant, child, and
maternal health



Stronger
immune systems



Safer
pregnancy and
childbirth



Lower risk of
non-communicable
diseases (such as diabetes
and cardiovascular diseases)

(WHO 2019)

However, a lack of adequate nutrition can lead to malnutrition.

STUNTING

(Low height for age)

WASTING

(Low weight for height)

UNDERWEIGHT

(Low weight for age)

OVERWEIGHT

(High weight for height)

DIET-RELATED

Non-communicable Diseases



India aims to end all forms of malnutrition by 2030.

2

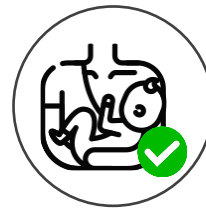
ZERO
HUNGER

By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under five years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women, and older persons.

India is on course to meet some of the targets.



99.51% of beneficiaries were covered under the National Food Security Act 2013, in 2019-20 (NITI Aayog 2021).



With **63.7%** of infants under six months exclusively breastfed, India is **on track** to meet the exclusive **breastfeeding target** (NFHS 5).



A comparison of all NFHS rounds shows that the prevalence of low weight has come down by **21 percentage points**, and the prevalence of stunting has reduced by **16.5 percentage points** in 28 years.

(United Nations Development Programme n.d.)



But there is still a long road to cover to achieve the nutrition targets (1/2).

Consumption

- **63.7% of children under the age of six months** are exclusively breastfed.
- **11.1% of children aged 6-23 months** receive an adequate diet.
- **96% of children aged 2-4 years** consumed grains, roots, and tubers, while **62%** consumed dairy products. Only **5%** ate fruits and vegetables rich in vitamin A.
- **41% of adolescents** ate fruits, while **35%** consumed eggs, and **36%** ate fish, chicken or meat.

Outcomes

1. UNDERNUTRITION

Deficiency of Micronutrients

24%
school-age children
were anaemic.

28%
Adolescents
were anaemic.

57%
women aged 15-49
were anaemic*.

Anthropometric Status

17.29%
newborns were born
with low birth weight.

32.1%
of children under five
are underweight.

35.5%
of children under five
are stunted.

19.3%
of children under five
are wasted.

18.7%
of women aged 15-49 have a
body mass index below normal.

35.5%
of men aged 15-49 have a body
mass index below normal.

(*Anaemia would not be measured from NFHS-6)

(NFHS-5, Comprehensive National Nutrition Survey 2018, Girotra et al. 2023)



But there is still a long road to cover to achieve the nutrition targets (2/2).

Consumption

- **63.7% of children under the age of six months** are exclusively breastfed.
- **11.1% of children aged 6-23 months** receive an adequate diet.
- **96% of children aged 2-4 years** consumed grains, roots, and tubers, while **62%** consumed dairy products. Only **5%** ate fruits and vegetables rich in vitamin A.
- **41% of adolescents** ate fruits, while **35%** consumed eggs, and **36%** ate fish, chicken or meat.

Outcomes

2. OVERNUTRITION

3.4%

children under the age of 5 are overweight.

5.2%

is the rate of increase in adult obesity per year.

24%

of women aged 15-49 are affected by obesity.

22.9%

of men aged 15-49 are affected by obesity.

3. RISE IN NON-COMMUNICABLE DISEASES

1%

of school age children and adolescents have diabetes.

13.5%

of women aged 15 and above have high or very high blood sugar levels.

15.6%

of men aged 15 and above have high or very high blood sugar levels.

21.3%

of women aged 15 and above have high blood pressure.

24%

of men aged 15 and above have high blood pressure.

(NFHS-5, Comprehensive National Nutrition Survey 2018, Girotra et al. 2023)



Infants, children under five, and adolescents are **most susceptible to malnutrition.**



Infants and Under Five Children

- **1.4 million children** in India are severely malnourished (Ministry of Women and Child Development [MWCD] 2023).
- Low birth weight babies are susceptible to **neonatal complications, recurrent hospitalisations and chronic medical conditions.**
- Malnourished children **do not attain optimum growth and development**, leading to **cognitive impairment**, resulting in diminished productivity.
- Undernutrition raises the risk of infection (e.g. diarrhoea, measles, malaria, pneumonia), while chronic malnutrition impairs a child's physical and mental development.
- Stunted children grow up to become shorter adults. Research suggests a **difference in pay** among taller and shorter adults.



Adolescents

- Inadequate access to diverse and healthy diets can cause micronutrient deficiencies, especially **iron**, in young adults.
- **Adolescent females are more vulnerable** due to limited access to nutritious food, education, and services caused by cultural norms.
- 40% of adolescent females and **18%** of adolescent males are anaemic (Comprehensive National Nutrition Survey 2018).
- External factors like **peer pressure and aggressive food marketing** often influence adolescents' eating habits.

(Scaria et al. 2022; Singh 2020; Coffey & Spears 2017; UNICEF n.d.)



Pregnant women, elderly individuals and patients with chronic illness are also highly prone to malnutrition.



Pregnant Women

- **52.2%** of pregnant women aged 15-49 years are anaemic (NFHS-5).
- Poor maternal diets deficient in essential nutrients (iodine, iron, folate, calcium, zinc) can cause **maternal complications** (anaemia, pre-eclampsia, haemorrhage, death).
- Lack of a healthy diet can lead to **adverse outcomes for the child** (stillbirth, low birth weight, stunted growth, developmental issues).



Elderly Individuals

- Older adults with health issues often **experience malabsorption of both macronutrients and micronutrients**.
- Elderly malnutrition increases infection risk, slows healing, prolongs hospital stays and causes muscle and weight loss, higher fragility and fall risk, broken bones, incapacity, and loss of independence.
- **27%** of older adults aged sixty and above **are underweight**, while **22% are overweight or obese**, indicating both undernutrition and overnutrition burdens (Ministry of Social Justice and Environment).



Patients with Chronic Illness

- Undernutrition is a factor in about 34% of India's yearly TB cases (Khatter 2023).
- Undernutrition **delays the recovery of tuberculosis patients**, and severely undernourished patients have a two to four times higher risk of mortality.
- About **40%** of children with cancer are found to be malnourished at the time of diagnosis (Cuddles Foundation 2021).

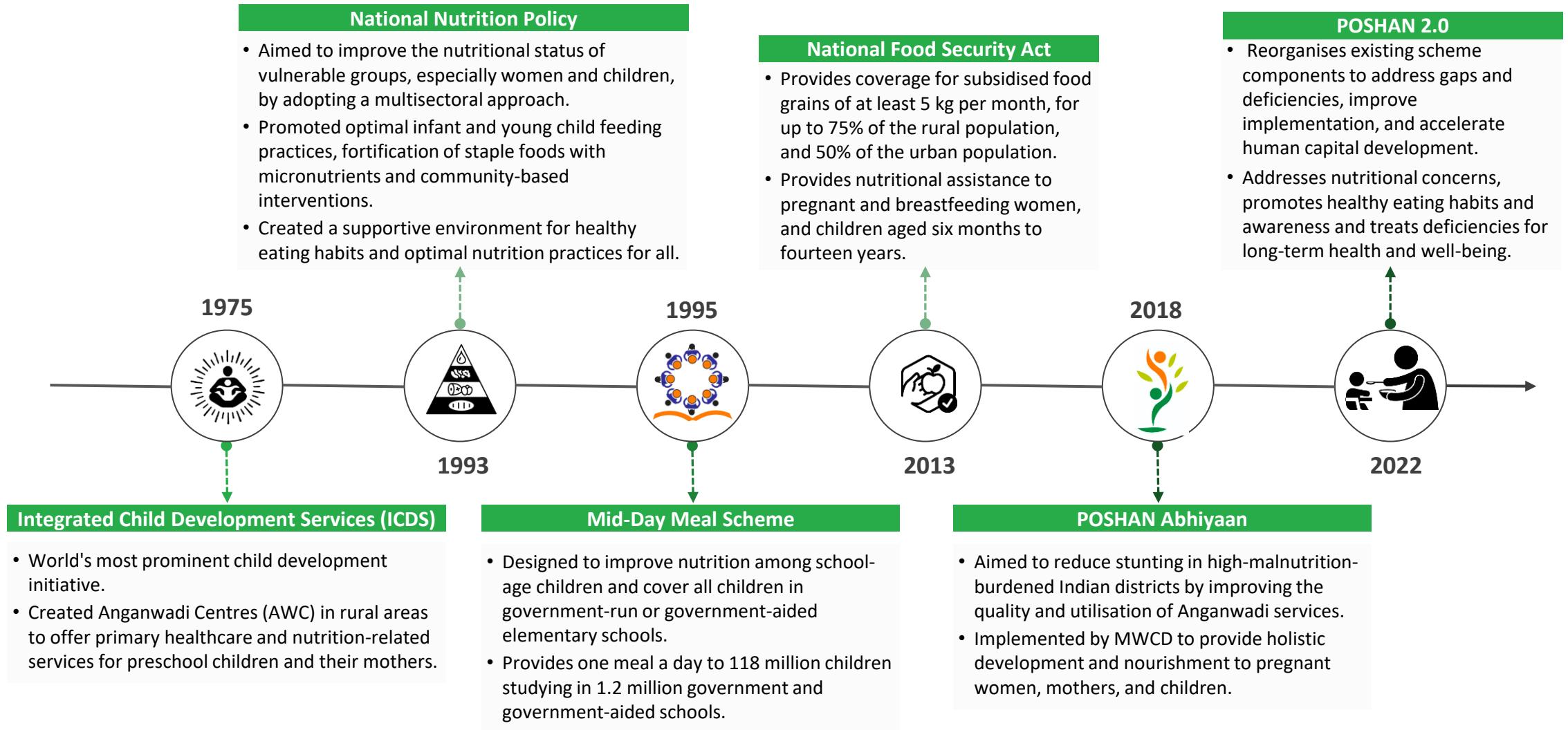
(UNICEF n.d.)



EVOLUTION OF THE NUTRITION POLICY LANDSCAPE TO TACKLE MALNUTRITION



The nutrition policy landscape has evolved over the years.



(Ministry of Women and Child Development n.d.; Ministry of Education n.d.; Department of Food and Public Distribution n.d.)

The National Food Security Act of 2013 (NFSA) marks a paradigm shift in the approach to food security from welfare to rights-based.

The Act takes a life-cycle approach and guarantees free nutritious meals to pregnant women, lactating mothers, and children aged six months to fourteen years.

Responsibilities		Features of the Act
Centre	<ul style="list-style-type: none"> Allocates necessary foodgrains to states/UTs. Transports foodgrains to specified depots in each state/UT. Gives central assistance to states/UTs to distribute foodgrains from designated FCI godowns to the fair price shops' (FPS) doorsteps. 	<ul style="list-style-type: none"> Governs the Public Distribution System (PDS). Provides highly subsidised foodgrains to 75% of rural and 50% of urban populations through Antyodaya Anna Yojana (AAY) and Priority Household (PHH). Allots 35 kg of food grains monthly to AAY households, while PHH members get 5 kg. State/UT governments identify beneficiaries based on their criteria. The Central Issue Prices of Re.1, Rs. 2, and Rs. 3 for coarse cereals, wheat, and rice remain unchanged till June 2019. Foodgrain allotment under NFSA for all states/UTs remains the same, with any gaps being filled by Tide-Over allocation. Entitles pregnant and breastfeeding women to receive a cash maternity payment of at least Rs. 6,000 to supplement their nutrition and make up for wage loss during pregnancy.
State	<ul style="list-style-type: none"> Identifies eligible households. Distributes foodgrain entitlements. Licenses and monitors FPS dealers. Establishes grievance redress mechanisms. Strengthens the Targeted Public Distribution System (TPDS). 	

(Department of Food and Public Distribution)



POSHAN 2.0 aims to address malnutrition holistically.

- It aims to address the challenges of malnutrition among children, teenage girls, pregnant women, and breastfeeding mothers through a strategic change in nutrition content and delivery, as well as the development and promotion of practices that enhance health, well-being, and immunity.
- Mission Poshan 2.0 will contribute to the country's human capital development, solve nutritional concerns, promote nutrition knowledge and healthy eating habits for long-term health and well-being, and address nutrition-related inadequacies through key methods.

Components of the Mission

Governance

Nutritional status will be tracked using the software. A cell phone will be issued to AWWs and supervisors. Growth monitoring devices (stadiometer, infantometer, infant weighing scale, and mother and child weighing scale) will also be provided.

Convergence

The Abhiyaan would ensure the convergence of all MWCD nutrition-related programmes on the target population. To achieve this, the ministry will set targets, hold sector meetings, convene a joint meeting of Secretaries, create guidelines, conduct monitoring visits, and conduct decentralised planning.

Capacity Building

The Incremental Learning Approach will be used to teach 21 thematic modules during training and capacity building. Frontline workers will receive instruction from Master Trainers.

POSHAN Abhiyaan

Poshan Abhiyaan will be a vital pillar for outreach, encompassing innovations in nutritional support, ICT interventions, media advocacy, research, community outreach, and Jan Andolan.

Key Strategies

Corrective Strategies

Nutrition Awareness Strategies

Communication Strategies

Creation of Green Ecosystems

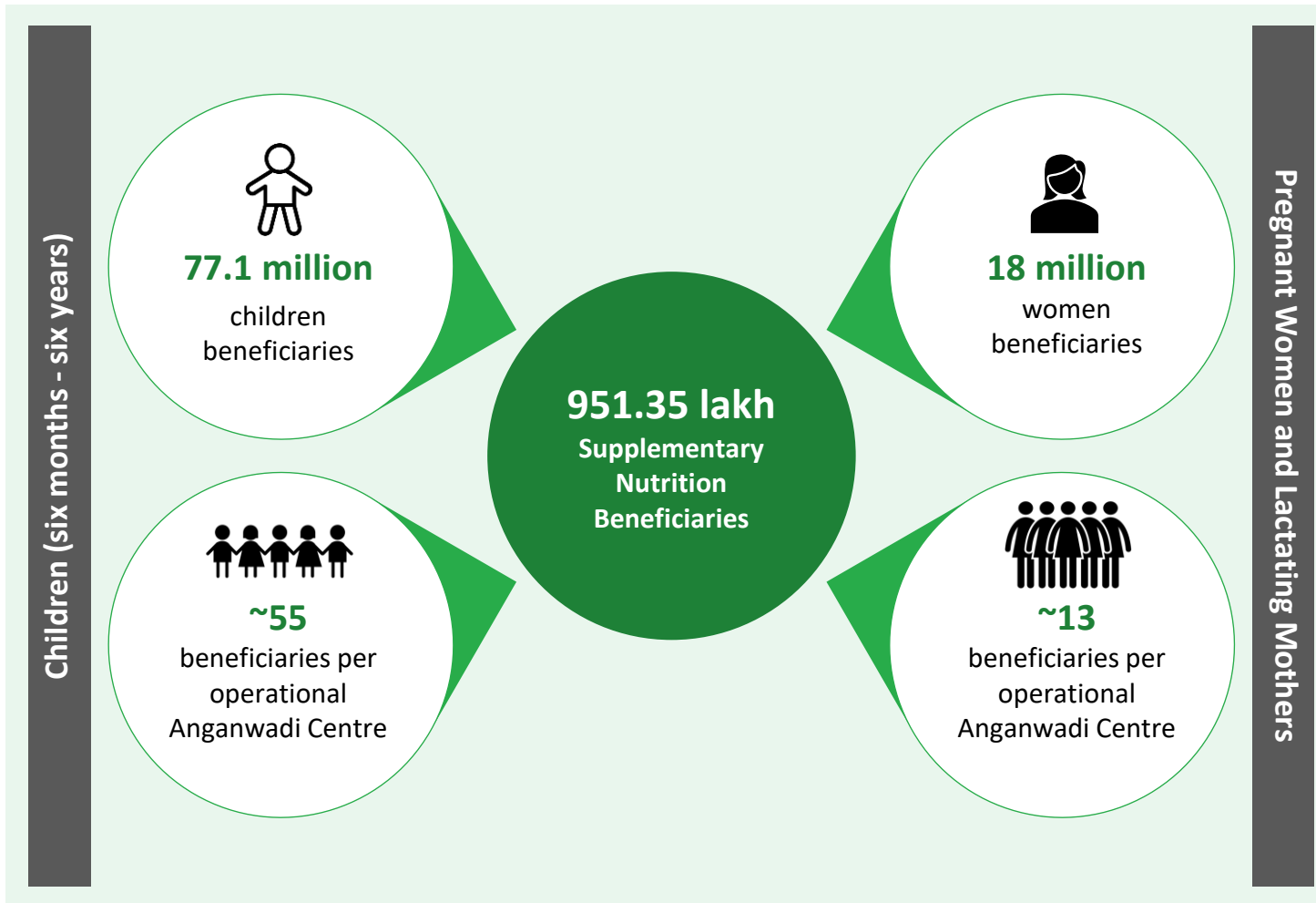
(MWCD 2022)



DELIVERY OF NUTRITION- RELATED SERVICES



Anganwadi centres play a crucial role in delivering nutrition-related services...



(MWCD 2023)

Nutrition Related Services provided by Anganwadi Centres

Infants and under-six Children

- Children below three years receive age-appropriate Take Home Rations (THRs) in the form of pre-mix/ready-to-eat food.
- Children from three to six years receive more than one meal, including morning snacks in the form of milk/banana/egg/seasonal fruits/micronutrient-fortified food, followed by a Hot Cooked Meal (HCM).
- Severely underweight children in the age group of six months to six years receive additional food items in the form of micronutrient-fortified food and energy-dense food.

Pregnant Women

- Pregnant women and lactating mothers receive age-appropriate Take Home Rations (THRs) in the form of pre-mix/ready-to-eat food.



...along with other public health care touchpoints.

	Providers	Infants and under-five Children	Adolescents	Pregnant Women
Community Level	AWW, ASHA	<ul style="list-style-type: none"> • Identification and care of high-risk newborns. • Iron supplementation and growth monitoring. • Identifying underweight children. • Management of SAM children through Bio Fortified wheat products and Nutrition therapy through RUTF products 	<ul style="list-style-type: none"> • Detection and referral for SAM. • Prevention for anaemia, iron supplementation. • Counselling on improving nutrition. 	<ul style="list-style-type: none"> • Counselling for breastfeeding and complementary feeding. • Promotion of local foods and family feeding. • Follow up to ensure • IFA compliance in normal and anaemic cases.
Sub Health Centres	AWW, ANMs, ASHA	<ul style="list-style-type: none"> • Management of high-risk newborns. • Management of diarrhoea and vitamin A supplementation. • Identification of severely underweight children requiring medical attention. • Regular Fixed Monthly Village Health Nutrition Days. 	<ul style="list-style-type: none"> • Detection and treatment for anaemia. • Detection, referral, and follow-up for SAM. • Management of acute diarrhoea. 	<ul style="list-style-type: none"> • Counselling on diet, rest and IFA compliance. • Referral for complications during pregnancy. • Antenatal check-up, including screening of anaemia, IFA and calcium supplementation.
Referral Sites	ASHA, ANMs, Medical Officers	<ul style="list-style-type: none"> • Care for high-risk newborns. • Treatment of severe diarrhoea cases. • Vitamin K for premature babies. 	<ul style="list-style-type: none"> • Management of growth abnormality. • Counselling at adolescent health-friendly clinics. 	<ul style="list-style-type: none"> • Antenatal and postnatal care of high-risk cases. • Management of severe anaemia.

(Ministry of Health and Family Welfare 2018; MWCD n.d.)



Private stakeholders such as non-profit organisations play a significant role in awareness, strengthening delivery channels and follow-ups.

Awareness and prevention of malnutrition

Reaching relevant groups through outreach programmes, increasing awareness of diet diversity, breastfeeding and immunisation.

Supporting the uptake of nutrition-related services

Works to ensure the implementation of nutrition-related services through collaboration with stakeholders and capacity building of health workers and volunteers

Strengthening service delivery channels

Identification and referral of affected individuals

Measuring anthropometric indicators such as weight for age, height for age, and body mass index and referring them to relevant points of care.

Diet, supplementation and clinical interventions

Directly addressing malnutrition indicators of stunting and wasting through growth monitoring, nutrition supplements, meals and clinical interventions.

Follow-up

Community-based follow-up and periodic monitoring of response to treatment to avoid a relapse. Priority to vulnerable groups in accessing food rations from Public Distribution Systems.



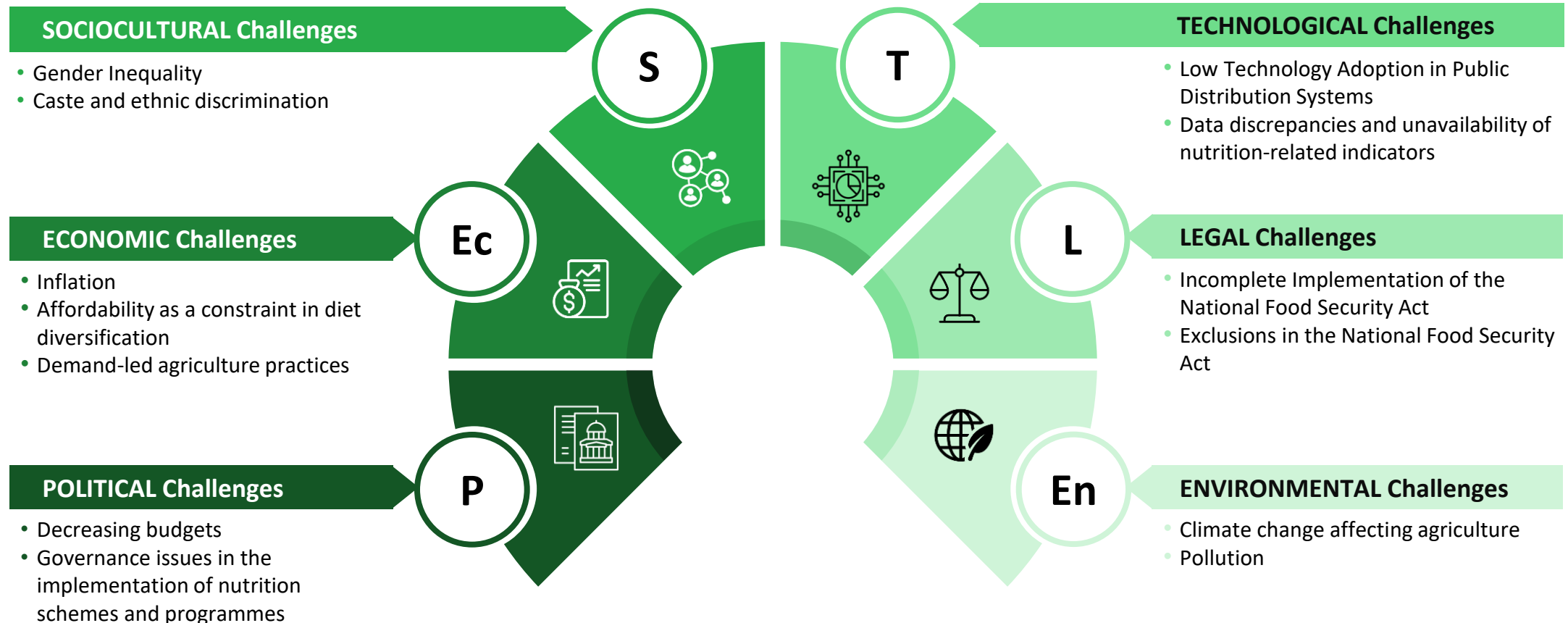
Indicative list of non-profit organisations and foundations providing nutrition-related services.



CHALLENGES ACROSS THE NUTRITION ECOSYSTEM



Although policies exist for implementing nutrition across various target groups, major challenges still prevail.





Political Challenges

Decreasing Budgets

- The Central Budget for Mid-Day Meal (MDM) was **₹11051 crores in 2014-15. It was reduced to ₹11000 crores in 2020-21**, the year when the COVID-19 pandemic struck and the CPI food inflation was **5.15%** (International Growth Centre 2021; Ministry of Finance 2015; Ministry of Statistics & Programme Implementation 2022).
- The allocation for Mission POSHAN 2.0 in 2021-22 was down by **18.5%** from the aggregate allocation for the four merged programmes (Anganwadi services, POSHAN Abhiyan, Scheme for Adolescent Girls, and National Creche Scheme) in 2020-21 (Pant & Ambast 2021).

Governance issues in the implementation of nutrition policies

- The quality of food (unhygienic cooking conditions and contaminated water) served for the Mid Day Meals programme led to the **food poisoning of 9646 children from 2009-2022** (Sharma 2022).
- **Illegal diversion** accounted for more than **40%** of funds spent on food subsidy programmes. Leverages accounted for 53% of funds missing from the supplementary nutrition component of the Integrated Child Development Services Programme (Chaturvedi 2022).
- **Low incentives and inadequate supervision** have led to a 40% absenteeism rate of service staff in primary health centres (Birner & Sekher 2017).
- **NFSA ration card lists have not been updated** for the past decade because state-wise population changes have not been updated by the centre, which has led to **45%** of Indians being excluded from the act (Khatter 2023).





Economic Challenges

Inflation

- Food inflation is currently at an all-time high due to growing production costs, surging international commodity prices, and significant weather-related disruptions.
- **Consumer Food Price Index (CFPI) inflation rose by 327% in 2021**, while the consumer price index (CPI), which includes CFPI, has increased by 84% (CSE 2022).

Affordability as a constraint in diet diversification

- According to the Centre for Science and Environment (CSE)'s survey, **71% of Indians cannot afford healthy food, and 1.7 million people die each year** as a result of diseases caused by inadequate diet (CSE 2022).
- Lack of dietary diversification refers to diets deficient in fruits, vegetables, whole grains, and diets high in processed meat, red meat, and sugary drinks by nutritional composition.
- Disorders due to lack of diet diversification include respiratory problems, diabetes, cancer, strokes, and coronary heart disease.

Demand-led agricultural practices

- The system of Minimum Support Price has historically favoured the cultivation of rice and wheat, which hampered crop diversification.

(CSE 2022; Dev & Pandey 2022)





Sociocultural Challenges

Gender inequality

- Malnutrition among women is high and **75%** of teenage mothers **are anaemic** and gain less weight than the global norm during pregnancy (The World Bank 2013).
- By age 15, there is a considerable gender discrepancy in the variety of food consumed, with **boys having a significant advantage** in India. The gender disparity in eating appears to be most pronounced in households with strong educational goals for their children.

Caste and ethnic discrimination

- Despite constant efforts to strive for fairness through national-level policies, programmes, and treatments, marginalised communities endure a greater burden of child mortality, malnutrition, and anaemia.
- **SC and ST children** continue to have a **51% and 30%** higher risk of under-five mortality respectively, than children from castes of higher social status and socio-economic development (Raushan et al. 2022).

(The World Bank 2013; University of Oxford 2016; Raushan et al. 2022)





Technological Challenges

Low technology adoption of public distribution systems

- Biometric Point of Sale devices linked with Aadhar governed the functioning of PDS. However, the lack of infrastructure, such as telecommunication systems and information technology personnel, acted as a hindering factor for ICT adoption.
- **Device design of biometric point of sale (POS) systems** which consisted of device size, device speed, quality of display, and weak batteries, made it difficult for the sales personnel to carry out transactions swiftly.
- **Double entry of transactions**, both in the POS system and manual entry, leads to double work by sales personnel.

Data discrepancy for nutrition-related indicators

- The Food and Agriculture Organization's report on "The State of Food Security and Nutrition in the World" **does not contain data from India for 2014-2020**. India did not allow the publication of this data.

Data availability for nutrition-related indicators

- Precise and pertinent data on dietary intake is not gathered regularly and systematically causing significant gaps in addressing the population's health and nutrition needs and hindering efforts to enhance and maintain optimal nutrition.

(1. Chhabra et al.2018, 2. Rajalakshmi 2022, 3. Jyoti 2022)





Legal Challenges

Incomplete implementation of the National Food Security Act

- Many states have still **not established a working food state commission** as mandated by the NFSA, 2013. Noncompliance with the provisions diminishes the significance of a fundamental right to wholesome and nutritious food, particularly for women and children, which is the Act's goal.

Exclusions in the National Food Security Act

- The Act specifies that the Central and State governments shall not be liable to claims by a person entitled under the Act in situations of **war, flood, drought, fire, cyclone or earthquake**.
- **The linking of PDS schemes with the Aadhar biometric identity** programme has led to the exclusion of genuine beneficiaries.

(Press Trust of India 2017; Sen 2020)





Environmental Challenges

Climate Change Affecting Agriculture

- The negative impact of climate change on food security and economic livelihoods in the form of diminishing rainfall, rising temperatures, and consequently greater severity of drought and flooding, is unavoidable.
- **A 2.5 to 4.9 degree Celsius increase in temperature** across the country might result in **a 41%-52% decline in wheat yield and a 32%-40% decrease in rice yield** (Gupta & Pathak 2016).

Pollution

- Foetuses and newborns, when exposed to **Fine Particulate Matter (PM 2.5) particles**, suffer from height deficits.
- Pollutants such as **ground-level ozone (O₃)** are damaging the nutritional quality and yield of food crops like rice and wheat in half.

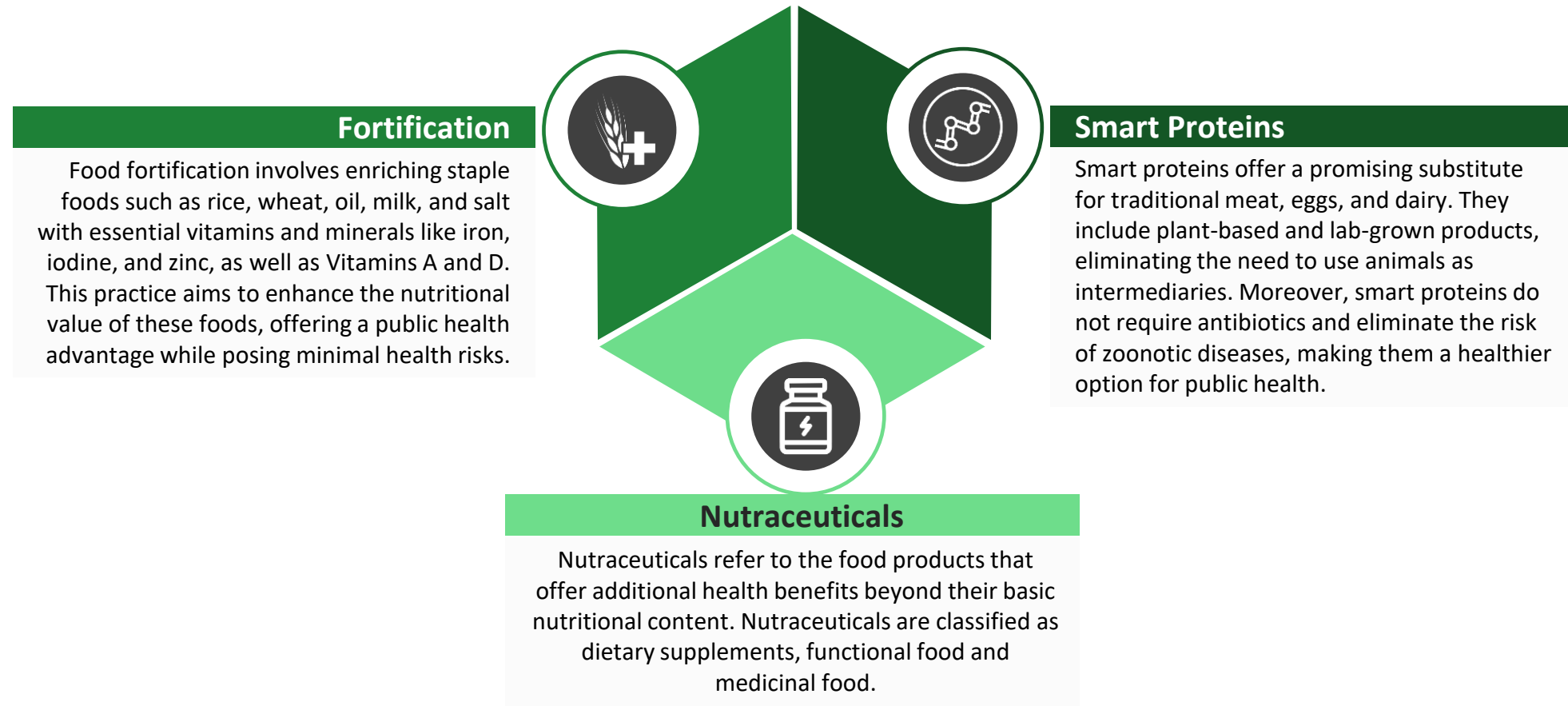
(Gurram 2022; Spears et al. 2019; Brown 2019)



EMERGING TRENDS IN NUTRITION IN INDIA



The emergence of **smart innovations** can help to bridge the gaps and lead to accessible nutrition.



(Research, Documentation and Information System 2022; Deshpande 2022; Meštrović 2022)



Food fortification acts as a cost-effective policy to fight malnutrition.



The global food fortification market is expected to reach \$235 million by 2031 (Fortified Foods Market 2022).



Provides a **cost-effective, scalable, and long-term global solution** that addresses the issue of vitamin deficiencies.



The **benefit-to-cost ratio** of food fortification is **very high**. According to the Copenhagen Consensus, every rupee spent on fortification generates 9 rupees in economic benefits.



The Food Safety and Guidelines Authority of India (FSSAI) created guidelines for **rice, wheat flour, edible oil, double-fortified salt (DFS), and milk fortification**.



The Public Distribution System, Mid-day Meal Scheme, Integrated Child Development Scheme, and Rajiv Gandhi Scheme for Adolescent Girls (SABLA) are important food fortification schemes.



The government had issued guidelines requiring the use of fortified staples in safety net programmes, such as incorporating **double fortified salt (DFS) and fortified edible oil** into the mid-day meal scheme and ICDS.

(Lok Sabha Secretariat 2022; FSSAI n.d.; Bhatnagar & Kanoria 2022)



Smart proteins can help India to move towards protein diversification.

Smart proteins provide a delicious, nutritious, and sustainable alternative to animal-derived protein and the associated public health challenges. Indigenous pulses and millets, along with culinary innovation, are helping to drive nutrition as well as bring diversity in ingredients for plant-based meat, eggs and dairy products.



Potential to create a **\$4.2 billion** economic opportunity and **400,000 jobs** in India by 2030 (Good Food Institute).



Diversifying protein sources can **mitigate environmental degradation** and **build a resilient agricultural system**.



Investing in smart proteins is gaining attention as a **high-impact climate solution** among emerging climate-tech investors in India.

(Kar 2022)



Nutraceuticals serve as cleaner alternatives for nutrition.



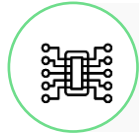
Nutraceuticals had a **\$4 billion** market in 2020 and are expected to grow by **7%** till 2024 (Ministry of Food Processing Industries).



Nutraceuticals, functioning as **dietary supplements** and **functional foods**, play a dual role by providing essential nutrients and exhibiting potential preventive and therapeutic effects against diverse diseases or disorders.



These meet evolving consumer preferences through research, innovation, and the introduction of products like **fish oil, ultra-refined black seed oil, and calcium tablets**. These supplements cater to specific health needs or promote general wellness.



Nutraceuticals are gaining significance in managing specific health concerns and overall wellness due to **advancements in digital technology and the expansion of D2C and e-commerce channels**.



These are increasingly used to **address lifestyle needs** like sleep, bone, heart, brain, and eye health, as well as overall physical and mental wellness, and to support immunity.



However, some emergent nutraceutical trends pose a threat to the health of consumers, such as the high sugar and calories present in supplements like **multivitamin gummies and protein bars**.

(Dudeja & Gupta 2017; Sood 2023; Meštrović 2022)



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