

Health by Design - The Role of Food Fortification and Nutraceuticals

September 2023

The Associated Chambers of Commerce and Industry of India

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Deepak Sood
Secretary General
ASSOCHAM

MESSAGE

India is gradually moving towards a food secured nation, however, our nation continues to face the challenge of being nutritionally deficit. Despite the increase in agrarian productivity and overall food production, there is a gap in nutritional uniformity in the rural and urban areas.

Inclusion of Fortification and Nutraceuticals of food products asserts the restoration of health and vitality and can help in the maintenance of public health as a long term and large-scale strategy. There is a need for dietary diversification combined with nutrition and health education and public health measures that are long-term sustainable strategies for combating micronutrient deficiencies.

Awareness about both nutraceuticals and large-scale fortification is still needed to make the masses understand the need of the hour and the rational approaches to combat public health risks. These products and strategies can aid in establishing food and nutritionally secure nation and even beyond. There is a strong need to deliberate the opportunities and challenges faced by the stakeholders to enable create awareness about food fortification and nutraceuticals to eradicate malnutrition.

With a view of taking the initiatives towards boosting the adoption of fortified, nutritious and nutraceutical food products forward, a new paradigm must be adopted to implement strategies for ensuring India's food security and nutritional sustainability. This step will further help in laying the roadmap for future growth and development of Indian Food Fortification & Nutraceuticals industry.

ASSOCHAM jointly with Resurgent India Ltd. has come out with this report on the subject highlighting various aspects of Food Fortification & Nutraceuticals. We hope that the contents of the report will provide significant insights into the concept of food fortification and its relevance for the well-being of the citizens of our country. This will provide way forward to the stakeholders and industry leaders in the food processing sector, practitioners, scientists, farmers, dieticians, organized agriculture, civil society, and NGOs. The discussion at the conference and sharing of best practices will assist in deliberating the opportunities and challenges faced in ensuring food and nutrition security, while moving towards the vision of a healthy nation.

Deepak Sood



Jyoti Prakash Gadia
Managing Director
Resurgent India Ltd.

MESSAGE

According to a recent study, nearly seventy-six percent of India's populace experience a deficiency in vitamin D. Moreover, standing at the 107th position out of 121 countries on the Global Hunger Index, India's ranking emphasizes the critical imperative of prioritizing food and nutrition security. Here, the value of food fortification becomes evident. The objective of food fortification is twofold: enhancing the nutritional value of foods and addressing targeted nutrient deficiencies.

The timeless wisdom attributed to Hippocrates, the Greek physician, resounds in the timeless phrase: "Let food be thy medicine and medicine be thy food." This centuries-old insight underscores the profound connection between nourishment and healing, acknowledging the inherent therapeutic potential of nutrients within a diverse range of foods. Nutraceuticals, a fusion of "nutrient" and "pharmaceutical," embody this wisdom and provide supplementary health benefits. Nutraceuticals, naturally occurring micronutrients, elevate nutrient content in our daily food intake, making it easier for individuals to enjoy a healthier, nutrient-rich diet by incorporating certain ingredients.

The government and regulatory entities, such as FSSAI and NABARD, have taken several steps towards enhancing food and nutrition security in India, with food fortification emerging as a progressive pathway. This report is geared to provide valuable insights into the concept of food fortification and its relevance for the well-being of the citizens of the country.

I extend my best wishes for the success of the ASSOCHAM conference on '**Food Fortification and Nutraceuticals -- The Way Forward for Achieving Nutrition Security**'.

Jyoti Prakash Gadia

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1.

Introduction to Food Fortification

In many low- and middle-income countries, a significant number of individuals experience widespread deficiencies in essential micronutrients like iron, zinc, and vitamin A. These deficiencies have far-reaching effects, impacting the physical and cognitive abilities of millions of people. Food fortification is the process of adding essential nutrients or micronutrients to food items during the production process.



The goal of food fortification is to improve the nutritional quality of foods and to address specific nutrient deficiencies in populations. This practice aims to enhance the nutritional content of commonly consumed foods without significantly altering their taste, appearance, or texture. Food fortification is usually regulated by government agencies to ensure that the added nutrients are safe, effective, and accurately labelled. The process requires careful consideration of factors such as the nutritional needs of the population, the stability of the added nutrients during processing and storage, and potential interactions with other food components.

Approximately 7.3% of the global disease burden is attributed to micronutrient deficiencies, with iron and vitamin A deficiency ranking among the top 15 contributors to this burden. This deficiency-related issue contributes to the annual deaths of over one million children. According to the World Health Organization (WHO), anemia affects around 42% of children under 5 years old and 40% of pregnant women worldwide. Severe anemia in pregnant women doubles the risk of maternal mortality during or shortly after pregnancy, and inadequate micronutrient intake during pregnancy

can lead to adverse outcomes such as low birth weight and developmental issues in the children, including brain and spinal defects. Food fortification, therefore presents an economically efficient approach that has been proven to yield positive health outcomes as well as social and economic advantages.

Main Types of Food Fortification

The suitability and efficacy of a particular fortification approach within a specific country hinge on multiple factors. These factors encompass the extent of prevalent micronutrient deficiencies, the populations primarily impacted, dietary patterns, existing infrastructure, food processing capabilities, production systems, as well as the regulatory framework and government involvement at the national level. The main types of food fortification are as follows:

Industrial or large-scale food fortification

Industrial or large-scale food fortification involves adding micronutrients to commonly consumed foods during processing, such as salt, flours, oil, sugar, and condiments. It can be mandatory, governed by governments, or voluntary, within limits set by regulations.



Over 130 countries mandate iodized salt. Wheat flour fortification is mandated in 85 countries since 1942. Vitamin A is added to edible oils in 27 countries, and milk is fortified in 14 countries with Vitamin A and D. Voluntary fortification, adhering to regulations, is exemplified by companies like Olam in Ghana, fortifying rice with essential nutrients. India and Kenya also showcase how voluntary initiatives have driven more comprehensive legislation and a favorable environment for fortification efforts.

Biofortification

Biofortification involves enhancing the nutritional value of food crops during their growth. This is achieved through plant breeding or agronomic methods, focusing on nutrients like iron, zinc, and provitamin A carotenoids. Examples include iron-enriched rice, zinc-fortified wheat, and Vitamin A-enriched sweet potatoes.



Biofortification improves the nutritional content of staple crops through traditional breeding and agronomic techniques. Genetic engineering is explored for introducing multiple micronutrients simultaneously in a single crop, potentially leading to highly nutritious crops. It benefits families in rural areas with limited access to industrially fortified foods. These families often rely on subsistence farming and can cultivate, consume, and sell their own fortified crops, addressing nutritional deficiencies.

Home Fortification

Home fortification involves adding vitamins and minerals to cooked food ready for consumption. The WHO adopted the term “point-of-use” for home fortification in 2012. This approach is recommended in various settings, including schools and refugee camps. Complementary foods for children aged 6–24 months are often fortified with micronutrient powders (MNPs) to address deficiencies. MNPs are single-dose packets of powdered vitamins and minerals that can be sprinkled onto food without altering taste or color. Originally designed for anemia and iron deficiency treatment, MNPs have evolved to meet the broader nutrient needs of young children.

Areas affected by Food Fortification

Health

Iron deficiency and vitamin A deficiency contribute to a substantial number of deaths globally. Large-scale food fortification has significant public health impacts in both high-income countries and low-

and middle-income countries. A review of 50 studies in LMICs demonstrates that fortification with iodine, folic acid, vitamin A, and iron has led to substantial reductions in serious diseases.

Despite the considerable advantages of food fortification in improving nutritional status, certain studies have contradicted these benefits. A study involving Brazilian children aged six and below revealed that iron-fortified flour had no impact on anemia rates. This four-year study, encompassing multiple surveys and assessing dietary intake and hemoglobin levels, surprisingly discovered an elevated anemia prevalence among the children.



Despite an average daily consumption of 100 g of fortified flour, the poor diet quality and low iron bioavailability in the children undermined the anticipated benefits of fortification. Moreover, current global discussions, both internationally and within specific nations, revolve around the effectiveness and safety of fortification initiatives. These debates address concerns about potential negative health impacts due to the accumulation of fortified micronutrients in the body. Complications may arise when a single population heavily consumes fortified foods or when various food sources are fortified simultaneously.

Human rights and Society

The World Food Summit and international declarations emphasize the right to safe and nutritious food as a fundamental human right, enshrined in various global agreements. Human Rights Obligation: Combating hunger and malnutrition is not only a moral duty but also a legally binding obligation under human rights laws, making it complex in many low- and middle-income countries. COVID-19 Impact: The COVID-19 pandemic, with lockdowns and economic slowdowns, further exacerbates food insecurity and malnutrition, making food fortification crucial to mitigate risks.

The SDGs and the 2030 Agenda aim to eliminate hunger and malnutrition, promoting global partnerships as a way to achieve these goals. Food fortification is a key element here. It involves collaboration between the private sector, governments, civil society, and consumers, highlighting the role of multi-stakeholder partnerships.

Economy

Food fortification is a cost-effective approach to enhance the nutritional status of populations, yielding high economic benefits. Micronutrients are consistently ranked as the most cost-effective development intervention, offering substantial returns for a relatively low cost. Biofortification, or enhancing nutrient content in crops, offers substantial health benefit-to-cost ratios, with an estimated ratio of USD 17 in benefits for every USD 1 invested. Despite economic potential, barriers hinder global food fortification scale-up. These include limited private-public partnerships and inadequate national regulations on food fortification. Successful fortification strategies necessitate partnerships between governments and food industries, along with capacity development for small industries. Regulatory monitoring is crucial for quality control.

Nutraceuticals - An Introduction

Nutraceuticals, which combine the terms “nutrient” and “pharmaceutical,” are dietary constituents with medicinal properties. They offer additional health advantages and are essential additions to our daily diets. These substances play a proven role in enhancing our immune responses and bolstering our body’s ability to combat illnesses. At the heart of the concept of nutraceuticals lies the principle of using food as a form of medicine. The term itself, “nutraceutical,” was coined in 1989 by Stephen DeFelice, MD, who is the founder and chairman of the Foundation for Innovation in Medicine (FIM) located in Cranford, New Jersey.



Beyond providing basic nutrition, dietary elements serve advantageous roles, which has given rise to the notions of functional foods and nutraceuticals. A functional food that benefits one consumer may function as a nutraceutical for another. Nutraceuticals differ from dietary supplements:

- In addition to supplementing the diet, nutraceuticals are designed to contribute to disease and/or disorder prevention and treatment.
- Nutraceuticals can serve as conventional foods or as sole items of a meal or diet.

Nutraceuticals can be classified into two main groups: traditional nutraceuticals and non-traditional nutraceuticals. Traditional nutraceuticals encompass natural foods that contain various inherent components offering benefits beyond basic nutrition. Examples include lycopene found in tomatoes, omega-3 fatty acids in salmon, resveratrol sourced from grapes, and saponins present in soybeans.

On the other hand, non-traditional nutraceuticals comprise artificially crafted foods that incorporate bioactive elements intended to enhance human well-being. This category can be further divided into fortified and recombinant nutraceuticals. Fortified nutraceuticals refer to foods that have been enriched through agricultural breeding or by the addition of extra nutrients. For example, calcium-fortified orange juice, cereals supplemented with vitamins and minerals, folic acid-infused flour, and milk with cholecalciferol. Recombinant nutraceuticals, a subcategory of nontraditional nutraceuticals, pertain to energy-providing foods produced using biotechnology. This group includes items like bread, alcohol, fermented starch products, yogurt, cheese, and vinegar.

2. Brief Rundown of Food Fortification in India

Amidst the expanding global landscape, a crucial focal point of human existence pertains to the health advantages offered by functional foods. Consequently, it is only natural that prominent corporations are invested in creating these types of foods to promote the overall health and prosperity of the human population.

Startling statistics from a report indicated that an approximate 76% of India’s populace experiences a deficiency in vitamin D. This investigation encompassed assessments of over 2.2 lakh individuals conducted across 27 Indian cities. The results unveiled that 79% of men and 75% of women, collectively, exhibited insufficient levels of vitamin D within their systems. Among the cities included in the study, Vadodara (89%) and Surat (88%) demonstrated the highest prevalence of vitamin D deficiency, while Delhi-NCR showcased the lowest incidence at 72%. The experts suggest having enough exposure to sunlight and consuming fortified food to prevent Vitamin D deficiency.

Global Hunger Index

India ranks 107 out of 121 countries on the Global Hunger Index in which it fares worse than all countries in South Asia barring war-torn Afghanistan. The Global Hunger Index (GHI) scores rely on the measurements of four fundamental indicators: undernourishment, child stunting, child wasting, and child mortality. The GHI score is computed on a scale of 100 points, which signifies the extent of hunger severity, with zero indicating the most favorable score (indicating no hunger) and 100 representing the most critical. With a score of 29.1, India’s placement falls within the ‘serious’ category. In order to show progress and improve, India needs to buckle up in its nutrition mission and security.



Initiatives and Scheme

Within India, initiatives aimed at ensuring nutritional well-being, like the Mid-Day Meal (MDM) Scheme and Integrated Child Development Services (ICDS), are crafted to tackle health and nutrition concerns among infants, children, as well as pregnant and lactating mothers. **A potent strategy for enhancing the micronutrient intake of recipients involves integrating fortified foods as an extra supplement alongside the nourishing meals provided through these programs.**



At present, Double Fortified Salt (DFS) is being offered by 20 states within the framework of the MDM Scheme. Within this scheme, Maharashtra has implemented fortified wheat flour across three districts; Haryana has introduced fortified wheat flour and rice in Ambala, while Rajasthan provides fortified oil. In Karnataka, fortified rice is incorporated into mid-day meals across three districts, with plans to expand to more districts. The integration of fortified foods into the ICDS has commenced in specific areas of Haryana and is set to initiate in other states shortly. Additionally, a few states are including fortified wheat flour and fortified oil through the Public Distribution System (PDS). Most of the Anganwadis (87.19%) are regularly open for the provision of various ICDS services.

National Nutrition Mission

In the Indian state of Andhra Pradesh, women and children frequently experience deficiencies in micronutrients. Acknowledging this issue, the National Nutrition Mission was introduced by the Prime Minister's office in early 2018. This initiative highlights staple food fortification as a cost-effective strategy to mitigate deficiencies in vitamins and minerals. Among the array of staples accessible in Andhra Pradesh, rice emerges as the most potent medium to reach economically disadvantaged populations. It's one of the two staples capable of effectively transporting a diverse array of minerals and vitamins when fortified well.

At present, plans have been devised by fifteen states to initiate the incorporation of fortified rice into the MDM, ICDS, and PDS schemes. To enhance the effectiveness of these initiatives, Sight and Life,

in partnership with Tata Trust and the local government, have introduced an encouraging and budget-friendly blending technique termed as continuous blending. This marks the maiden implementation of such an approach in India, aimed at fortifying rice under extensive government programs.

POSHAN Abhiyaan

Launched in March 2018, the POSHAN Abhiyaan (formerly National Nutrition Mission) aims to enhance the nutritional status of children aged 0-6, adolescent girls, pregnant and lactating mothers in a time-bound manner. It strives to reduce stunting and wasting in children (0-6 years) and combat anemia among women, children, and adolescent girls. Implemented across all 36 States/Union



Territories, including Tamil Nadu and Odisha, the Abhiyaan's key elements encompass technological utilization, convergence, and behavior change communication through the Jan Andolan initiative. Further reinforcing proper nourishment are PoshanVatikas or Nutri-gardens, which are being established nationwide to provide accessible and affordable sources of fruits, vegetables, medicinal plants, and herbs.

Poshan 2.0 places emphasis on diet diversity, food fortification, harnessing traditional knowledge systems, and promoting the consumption of millets. Within Poshan 2.0, nutrition awareness strategies are geared towards fostering lasting health and well-being by establishing regional meal plans that effectively address dietary deficiencies.

Food fortification is acknowledged as a pragmatic strategy in public health due to its ability to target broader vulnerable populations using established food distribution networks, all without necessitating significant alterations to prevailing consumption habits. This approach effectively bridges immediate nutritional shortfalls within a populace. For a sustainable, enduring strategy, the encouragement of increased consumption of locally sourced, seasonal foods serves as the long-term solution for dietary diversification. Simultaneously advancing these sustainable practices to diversify dietary behaviors among citizens, food fortification emerges as a significant pathway for enhancing the health of the citizens of the country.

3.

Food and Nutrition Security

Nutrition Security encompasses the availability of well-rounded diets, safe drinking water, a secure environment, and comprehensive healthcare (both preventive and curative) for all individuals, involving aspects of physical, economic, and social access. The effective utilization of these services necessitates education and awareness. Food and nutritional security share a deep interconnection, as solely adopting a food-centric strategy can effectively combat malnutrition in a way that is both economically viable and socially sustainable. Food security is a four-dimensional concept and comprises of availability to food, access to food, utilization and stabilisation.

- **Availability:** This pertains to the physical aspect, ensuring that ample food is accessible to people.
- **Accessibility:** This is achieved when a household possesses adequate resources to procure a suitable diet.
- **Utilization:** This depends on biological and social factors, as well as proper healthcare.
- **Stability:** True food security implies uninterrupted access to sufficient food, even during unforeseen shocks or recurring events. Stability encompasses both the availability and access aspects of food security.



Food Inflation

Food security prevails when every individual consistently possesses the physical and financial means to acquire enough food, ensuring their nutritional requirements for a productive and healthful existence are met. Food inflation serves as a significant metric through which we can assess the economic ability to obtain food. In July, food inflation in India, constituting approximately half of the complete consumer price index, surged significantly to 11.51% led by cost of vegetables (37.3%), spices (21.6%), cereals (13%), pulses (13.3%) and milk (8.3%), contrasting with a revised 4.55% in June. Retail food inflation reached its highest level since January 2020. A recent study has revealed that a mere one percent rise in food inflation results in a corresponding 0.3 percent increase in both infant and child mortality rates, along with a 0.5 percent uptick in undernourishment cases.

The impact of food inflation is most severely felt by individuals with low incomes, as they allocate a significant portion of their earnings towards food. When prices escalate, these individuals, who are already facing challenges, find it difficult to afford and obtain essential food items, consequently pushing a greater number of them into poverty.

Policy Initiatives

Addressing the complexities of malnutrition necessitates the adoption of a comprehensive approach that blends short-term and long-term strategies, while also fortifying the connections between preventable and treatable factors, as well as developmental and humanitarian measures.

Consecutive Five-Year Plans starting from the 1950s have established policies, multifaceted approaches, and inter-sectoral initiatives aimed at enhancing the availability and accessibility of food, as well as promoting effective absorption and integration. Despite securing global standings as primary producers of milk, vegetables, and fruits, India's per capita consumption of these vital resources has remained unchanged due to financial constraints and limited awareness regarding their indispensable nutritional contributions. Government has initiated several nutrition 'safety net programmes' to increase the food availability in India:

Rashtriya Krishi Vikas Yojana

Launched in 2007, the RKVY scheme fosters comprehensive agricultural and allied sector growth. It incentivizes states to boost public investment in these sectors. The Cabinet sanctioned the continuation of the Centrally Sponsored Scheme as RKVY-RAFTAAR from 2017 to 2020, allocating Rs. 15,722 crores. The renewed focus aims to make farming economically rewarding by enhancing farmer endeavours, minimizing risks, and fostering agricultural entrepreneurship



Mission for Integrated Development of Horticulture (MIDH)

The Mission for Integrated Development of Horticulture (MIDH), a Centrally Sponsored Scheme, encompasses a wide spectrum of horticultural growth, encompassing fruits, vegetables, spices, and more. The Government of India contributes 60% of the developmental outlay in most states, with state governments contributing the remaining 40%. However, in the North East and Himalayan states, the GOI's share increases to 90%.

National Food Security Mission (NFSM)

During its 53rd meeting on May 29, 2007, the National Development Council (NDC) adopted a resolution to initiate a Food Security Mission, aiming to enhance rice, wheat, and pulses production by 10 million tonnes, 8 million tonnes, and 2 million tonnes respectively by the end of the Eleventh Plan (2011-12). The 'National Food Security Mission' (NFSM), a Centrally Sponsored Scheme, was consequently launched in October 2007. The Mission triumphed, attaining the set production targets

Public Distribution System (PDS)

The Government of India, operating through the Ministry of Consumer Affairs, Food and Public Distribution, implemented the Public Distribution System (PDS) as an Indian food security mechanism. Its primary goal is to provide subsidized food and non-food essentials to the impoverished populace. The system encompasses vital commodities like wheat, rice, sugar, and essential fuels such as kerosene. These are distributed via a network of fair price shops (also called ration shops), strategically situated across multiple states. The Food Corporation of India, a state-owned entity, is responsible for procuring and managing the PDS.



Integrated Child Development Services (ICDS)

Integrated Child Development Services (ICDS) is a governmental initiative offering children under 6 years of age and their mothers a comprehensive package of benefits. These encompass nutritional meals, early childhood education, and essential healthcare services including immunization, health evaluations, and referrals.

Micronutrient Supplementation Initiatives

These include a) the anemia prophylaxis program, which entails distributing iron-folic acid tablets to pregnant and lactating women, children, and adolescent girls; and b) a high-dosage vitamin A program, administering 100,000 IU of oral vitamin A to children aged 1-6 years. Exploring connections with measles immunization to reach younger children is currently being experimented with.

NABARD's Strategic Initiatives

NABARD, founded in 1982 by an Act of Parliament, serves as India's leading development bank. Its primary goal is to foster sustainable and fair agricultural and rural development. Over its span of over forty years, this eminent development financial establishment has brought about positive changes in rural Indian communities. This positive impact has been achieved through various means including agricultural finance, the enhancement of infrastructure, advancements in banking technology, the facilitation of microfinance, and the encouragement of rural entrepreneurship through Self-Help Groups (SHGs) and Joint Liability Groups (JLGs). NABARD remains dedicated to its role in the nation's progress by actively contributing to financial and non-financial advancements, introducing innovative practices, implementing technology, and facilitating institutional growth within rural regions.



NABARD's interventions in Food and Nutrition Security

NABARD, driven by its mission to cultivate and enhance rural prosperity, has assumed a pivotal role in safeguarding both food security and nutrition within the nation. Its commitment extends beyond immediate solutions, encompassing a holistic vision that encompasses both short-term strategies. With a comprehensive approach, NABARD recognizes that ensuring food security and nutrition isn't solely about addressing immediate hunger or malnutrition concerns, but also about addressing the underlying factors that contribute to these issues. This multifaceted perspective involves implementing strategies that not only provide immediate relief but also promote sustainable agricultural practices, improved infrastructure, and enhanced economic opportunities within rural communities.

1. Fortifying food processing sector

Food processing and warehouse infrastructure are integral components of the food value chain, bridging the gap between raw materials and consumable, culturally relevant food products. Recognizing their pivotal roles, addressing the challenges associated with providing sustainable diets to all individuals becomes intricate without placing increased emphasis on food processing. This dual role of food processing is instrumental in ensuring both food security and nutritional well-being.

2. Financing Rural infrastructure

NABARD plays a significant role in India's rural infrastructure domain. Over its 26-year journey, the Rural Infrastructure Development Fund (RIDF) has transformed into a reliable, cost-effective, and punctual funding source for rural infrastructure initiatives led by state governments. Upon the completion of RIDF projects endorsed across key sectors, the cumulative projected outcomes encompass the establishment or restoration of a large number of irrigation projects, construction of roads, and erection of bridges in the countryside.

3. Extending Assistance for Research and Dissemination of knowledge

NABARD consistently funds research initiatives aimed at enhancing food production on a national scale. Collaborating with the Centre for Research in Rural and Industrial Development, Chandigarh, NABARD sponsored a study in Haryana. This study aimed to identify the most profitable crop combinations for the region, resulting in significant recommendations. NABARD engaged the Xavier Institute of Management, Bhubaneswar, to conduct Action Research on SAS. This comprehensive effort sought to comprehend the intricate connections between diverse factors influencing sustainable agriculture.

In collaboration with institutions like the Indian Council of Agricultural Research, state agricultural universities, and Krishi Vigyan Kendras, NABARD facilitates the dissemination of agricultural knowledge, research findings, and innovative practices to empower farmers and promote sustainable agricultural development. It provides farmers with the opportunity to witness new and innovative farming methods in action. NABARD actively supports agricultural events such as Krishi melas, fairs, and workshops. These platforms showcase agricultural products, machinery, and pioneering practices.

4. The Food Safety and Standards Authority of India (FSSAI)

FSSAI is a legal entity formed under the jurisdiction of the Ministry of Health & Family Welfare, Government of India. Its establishment is rooted in the Food Safety and Standards Act of 2006, a comprehensive legislation pertaining to food safety and control within India. FSSAI holds the mandate of safeguarding and enhancing public health by overseeing and enforcing regulations concerning food safety.



Food Safety and Standards (Fortification of Foods) Regulations, 2018

Food Safety and Standards (Fortification of Foods) Regulations, 2018 has been gazette notified on 2nd August, 2018. Following are the general principles of standards on fortification:

1. Micronutrients may be appropriately added to foods for the purpose of contributing to any of the following:
 - (a) Preventing or reducing the risk of, or correcting, a demonstrated deficiency of one or more micronutrients in the population or specific population group;
 - (b) Reducing the risk of, or correcting, inadequate nutritional status of one or more micronutrients in the population or specific population group;
 - (c) Meeting requirements or recommended intake of one or more micronutrients;
 - (d) Maintaining or improving health;
 - (e) Maintaining or improving the nutritional quality of foods.
2. When fortification of a food is made mandatory, it shall be based on severity and extent of public health need as demonstrated by generally accepted scientific evidence.
3. The Food Authority may, specify mandatory fortification of any staple food on direction of the Government of India.
4. Wherever “Iron (As Fe)” is used as a source of nutrient, heme iron shall not be used in any form in any article of food.
5. Fortified Processed Foods may be prepared from fortified food articles that may be cereals and/or milk;

6. The Fortified Processed Food shall provide 15-30% of the Indian adult RDA of micronutrient based on an average calorie intake of 600 kcal from processed foods (approximately 1/3rd of daily energy requirement for an adult);
7. High Fat Sugar Salt (HFSS) Foods shall be excluded from Fortified Processed Foods category. The definition of HFSS foods shall have the same meaning as specified under the Food Safety and Standards (Labelling and Display) Regulations, 2020.

General Obligations:

Quality Assurance

Every manufacturer and packer of fortified food shall give an undertaking on quality assurance and submit evidence of steps taken in this regard to the Food Authority or such other authority which the Food Authority may designate. The undertaking shall be given twice a year and shall include, the following, namely:-

- (a) Certification by a food laboratory notified by the Food Authority that the fortified food is in compliance with the provisions of the Act and regulations and standards specified therein;
- (b) Up-to-date record keeping and continuous inventory of fortificants used in the manufacturing or packing process, including the source of its procurement;
- (c) Appropriate monitoring procedures at different stages of manufacturing or packing process;
- (d) Random testing of fortificants and fortified food;
- (e) Regular audit of technical equipment and processes;
- (f) Such good manufacturing practices, as may be specified by the Food Authority from time to time.
- (g) Provisions for the reference of the purity criteria of micronutrients, generally accepted by pharmacopoeias, namely, Indian Pharmacopoeia, British Pharmacopoeia, Food Chemical Codex, Joint Food and Agriculture Organization or World Health Organisation Expert Committee on Food Additives or CODEX Alimentarius may be adopted by food Business operators.

Packaging and Labeling Requirements

1. All fortified food shall be packaged in a manner that takes into consideration the nature of the fortificant added and its effect on the shelf life of such food.
2. Every package of fortified food (exceptions specified in the FSSAI regulations) shall carry the words “fortified with (name of the fortificant)” and the logo, on its label. It may also carry a tag line “Sampoorna Poshan Swasth Jeevan” under the logo.

3. Provisions of the Food Safety and Standards (Packaging and Labeling) Regulations, 2011, shall also apply to the fortified foods.
4. Every package of food, fortified with Iron shall carry a statement “People with Thalassemia may take under medical supervision”.
5. All manufacturers and packers of fortified food complying with the provisions of the Act and rules or regulations made thereunder on fortified food shall be permitted to make a nutrition claim in relation to an article of fortified food under the Food Safety and Standards (Packaging and Labeling) Regulations, 2011.

Standards for fortification of processed food products

- Back in 2018, the FSSAI established fortification standards for five staple product categories: milk, edible oil, rice, flour, and salt. Additionally, they introduced the ‘F+’ logo to be displayed on labels of fortified food items to facilitate easy identification by consumers.
- After establishing fortification standards for staple foods, the Food Safety and Standards Authority of India (FSSAI) has introduced regulations specifying acceptable levels of micronutrients for fortifying processed food items. These products include breakfast cereals, biscuits, breads, rusks, pasta, noodles, buns, and fruit juices.
- Manufacturers of such products have the option to voluntarily enrich them with micronutrients.
- However, High Fat Sugar Salt (HFSS) Foods will not fall within the category of fortified processed foods.
- Fortified processed foods may contain fortified staples as ingredients or may be supplemented with permitted micronutrients and additives as outlined in the Food Safety and Standards (Food Product Standards and Food Additives) Regulation, 2011.
- The FSSAI has established limits on the extent of fortification, allowing for a range of 15-30 percent of the average daily dietary intake. This measure aims to ensure balanced consumption of micronutrients in fortified products. The fortified processed foods should contribute 15-30 percent of the Indian adult Recommended Dietary Allowance (RDA) of micronutrients. This is based on an average calorie intake of 600 kcal from processed foods, approximately one-third of an adult’s daily energy requirement.
- Companies are permitted to fortify their products with various micronutrients including iron, folic acid, zinc, vitamin B12, and vitamin A. The notification provides specific levels for these vitamins and minerals per 100 grams of the product. For instance, iron levels have been set at 1.4-

1.7 mg per 100 grams of cereals. These regulations were part of the Food Safety and Standards (Fortification of Foods) First Amendment Regulations, 2020.

- Similarly, acceptable levels of nutrients like iron, zinc, vitamin B1, vitamin B12, and vitamin B3 have been defined. When fortified, fruit juices should contain Vitamin C in the range of 6-12 mg per 100 ml.

FSSAI under the regulation of fortified food category FFRC (Food Fortification Resource centre) covers the following products to be fortified with listed micronutrients:

Food commodity	Fortified with
Wheat flour	Iron, Folic acid, Vitamin B12
Rice	Iron, Folic acid, Vitamin B12
Double fortified Salt	Iron, Iodine
Edible Oil	Vitamin A and Vitamin D
Milk	Vitamin A and Vitamin D

5. Employing Digital Technologies in Food Fortification

Digital technologies have the potential to be utilized in food-system nutrition interventions to enhance nutritional results. The global trend shows a growing incorporation of these technologies, indicating their capacity to boost overall effectiveness and efficiency in the fortification supply chain.

WFP Innovation Accelerator

The United Nations World Food Programme (WFP) Innovation Accelerator identifies, nurtures, and expands impactful innovations aimed at eradicating hunger and advancing the sustainable development goals. By harnessing remarkable progress in digital innovation, including mobile technology, artificial intelligence, big data, and blockchain, through the Innovation Accelerator, WFP is revolutionizing its approach to aiding vulnerable communities globally.

Rooted in WFP’s established culture of innovation, the Innovation Accelerator was established in 2015 with the goal of experimenting with novel solutions and amplifying promising innovations to realize the ambition of eliminating hunger, achieving what is known as “Zero Hunger.”

An example:

The process of digitizing the data management system for the School Meals Programme (SMP) in the Kakuma and Dadaab refugee settlements of Kenya aims to elevate the visibility, accountability, transparency, and precision of the information collected from schools. This digital transformation is designed to substantially enhance our ability to offer assistance to those who require it.



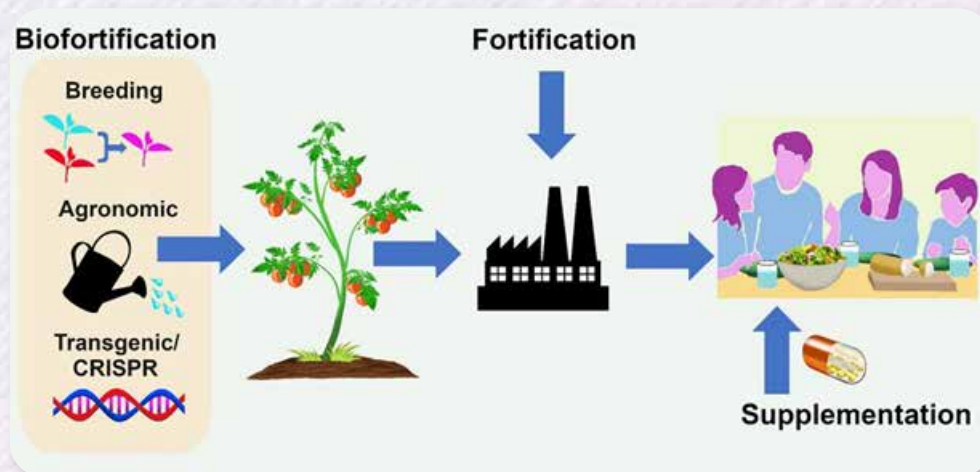
Adhering to the human-centered design (HCD) approach, the WFP Innovation Accelerator carried out trials of two prospective digital solutions: School Connect, a tool under the WFP umbrella, and NEMIS, a tool developed by the Government of Kenya to oversee education-related data.

The introduction of digitalization to the school meals program has resulted in notable time savings for teachers, who would have otherwise invested substantial efforts in calculating the necessary daily food quantities. Furthermore, the School Connect application provides improved visibility into school feeding data, facilitating streamlined monitoring processes.

“This gives us a real-time report of how school feeding is going on. We get to know daily the attendance of students in the school and meals served. It is a game-changer... This is the new way for WFP; we will make it work,” said Samal Lukonu, Programme Policy Officer, Kakuma Sub Office, Kenya.

Bio-fortification techniques

Biofortification of crops typically pertains to cultivating them to possess improved nutritional content. This enhancement can be accomplished through traditional selective breeding methods or by utilizing genetic engineering techniques. In developing nations, numerous initiatives focused on both breeding and transgenic methods are in progress to augment essential crops with micro-nutrients.



Among these approaches, selective breeding stands out as a potent technique for biofortifying staple crops. This method entails the cross-breeding of existing varieties that are enriched in micro-nutrients. Additionally, biotechnological techniques are employed to support these breeding endeavours. For instance, molecular marker-assisted selection is utilized, significantly enhancing the success of efforts to elevate the nutritional content of crops. Genetic engineering methods offer a means to create novel cultivars showcasing desirable traits. This process taps into a vast pool of genes for transferring and expressing favourable characteristics from one organism to another,

which are evolutionarily and taxonomically distinct. In the transgenic approach, genes are incorporated into the genome of the crop to produce the micronutrient e.g., golden rice.

iCheck Device

Utilizing innovative technology, BioAnalyt has developed the iCheck pipeline capable of assessing a wide spectrum of vitamins and minerals. The iCheck devices offer portability, swiftness, affordability, and user-friendliness surpassing traditional laboratory equipment. These devices have demonstrated their effectiveness in over 60 low- and middle-income countries. iCheck contributes to enhancing compliance by streamlining monitoring processes through cost-efficient and real-time data collection and analysis.



Currently undergoing testing in Pakistan and Nigeria, the project team is actively developing iCheck Connect, a digital counterpart to the iCheck devices. This digital companion facilitates the sharing of food fortification data, aiding in analysis and incentivizing adherence to national regulations.

The digitization of fortification data brings about substantial advantages for the food industry. It enhances product quality, mitigates risks, lowers expenses, elevates the overall reputation and credibility of quality data for oversight agencies, and enhances customer contentment. Integrating fortification quality measurement devices with digital platforms further simplifies analytics and data administration, benefiting both internal and external monitoring mechanisms.

6.

The Way Forward

On a worldwide scale, India's commitment to attaining nutritional stability, eradicating severe impoverishment, and decreasing child mortality holds immense importance due to the high count of children under five facing mortality, stunted growth, and malnutrition. Furthermore, a large population of the impoverished and undernourished resides in India. To realize nutritional security by 2030, the following steps can be undertaken:

Transitioning from Food Grain Security to Nutritional Security

Shifting the focus from mere food grain security to comprehensive nutritional security involves a profound evolution in our approach towards nourishing populations for better health and well-being. India's food safety nets prioritize staples like rice over nutritious alternatives like coarse grains, pulses, fruits, and vegetables. A comprehensive nutritional approach must include protein-rich foods to combat deficiencies. Mere caloric provision won't suffice for addressing widespread micronutrient deficiency and anemia among women and children. Public Distribution System (PDS) should offer diversified, fortified food options. In the future, the food-based safety nets (like, PDS) could gradually transition to providing cash to beneficiaries via direct benefit transfers (DBT). This approach empowers beneficiaries to align cash usage with their consumption needs and dietary preferences. Furthermore, reallocating some wheat and rice subsidy towards nutritious foods has the potential to alleviate food insecurity.

Improving Maternal Health

Improving maternal health, quality antenatal care, and women's nutrition can substantially enhance child nutritional outcomes. Targeted strategies like India NewBorn Action, launched in 2014, focusing on ANC, adolescent health services, nutritional counseling, and micronutrient supplementation, are crucial for nutritional security. Strengthening regulations on breast milk substitutes and promoting diverse diets are vital, along with increased healthcare investment and accessible institutional deliveries at primary health centres, district hospitals and government run hospitals to make it inclusive for the poor.

WASH for Nutrition Security

WASH stands for safe drinking water, universal sanitation coverage and hygiene agenda of the Sustainable Development Goals. The Swachh Bharat Abhiyan, a significant ongoing government initiative, aligns with the WASH agenda. Its success in providing safe water, sanitation, and hygiene

is projected to lower child mortality and malnutrition rates. The interplay between WASH efforts and nutritional interventions will notably amplify nutritional outcomes. The Nutrition and WASH interventions can jointly address vulnerable groups like children under five, pregnant and lactating women, and adolescent girls. Additionally, these interventions can be geographically co-located, with a preference for marginalized rural and urban areas. Progressing further, WASH initiatives can adopt a nutrition-sensitive approach, involving concerted hygiene promotion and addressing child risk factors and behaviours in a coordinated manner.

Integrated Nutrition Policy

India faces risks of undernutrition and micronutrient deficiencies due to insufficient iron, micro-nutrients, and a lack of diverse diets. High rates of anemia in women and children heighten mortality and child under-nutrition risks. To address this, nutritional interventions like the Comprehensive Programme on Anaemia Prevention, National Iron Plus Initiatives, and Anaemia Mukh Bharat have been implemented through POSHAN Abhiyan. These efforts encompass supervised iron folic acid supplementation, deworming, and treatments for different age groups, backed by Anganwadi workers and community engagement to enhance awareness. Concentration of underweight and stunted children, particularly in areas characterized by low wealth index, high poverty, limited women's education, and prevalent open defecation, emphasize the necessity for a focused strategy to address nutritional gaps in these high-risk regions.

Aligning Agricultural Programs and Nutrition-sensitive Interventions

Balancing agricultural growth and nutrition is crucial. Emphasizing “nutrition sensitivity” in agricultural policies and programs, alongside diet diversification, supports both nutrition and development goals. The government should encourage diverse food consumption through schemes, while also focusing on producing coarse cereals, pulses, fruits, and vegetables. The proposed promotion of millets under the public distribution system, facilitated by Niti Aayog, requires expedited implementation to address malnutrition. Leveraging bio-fortification, led by institutions like ICAR and CGIAR's Harvest Plus, enhances household diets and child nutrition sustainably.

About ASSOCHAM

The Knowledge Architect of Corporate India

The Associated Chambers of Commerce & Industry of India (ASSOCHAM) is the country's oldest apex chamber. It brings in actionable insights to strengthen the Indian ecosystem, leveraging its network of more than 4,50,000 members, of which MSMEs represent a large segment. With a strong presence in states, and key cities globally, ASSOCHAM also has more than 400 associations, federations, and regional chambers in its fold.

Aligned with the vision of creating a New India, ASSOCHAM works as a conduit between the industry and the Government. The Chamber is an agile and forward-looking institution, leading various initiatives to enhance the global competitiveness of the Indian industry, while strengthening the domestic ecosystem.

With more than 100 national and regional sector councils, ASSOCHAM is an impactful representative of the Indian industry. These Councils are led by well-known industry leaders, academicians, economists and independent professionals. The Chamber focuses on aligning critical needs and interests of the industry with the growth aspirations of the nation.

ASSOCHAM is driving four strategic priorities – Sustainability, Empowerment, Entrepreneurship and Digitisation. The Chamber believes that affirmative action in these areas would help drive an inclusive and sustainable socio-economic growth for the country.

ASSOCHAM is working hand in hand with the government, regulators, and national and international think tanks to contribute to the policy making process and share vital feedback on implementation of decisions of far-reaching consequences. In line with its focus on being future-ready, the Chamber is building a strong network of knowledge architects. Thus, ASSOCHAM is all set to redefine the dynamics of growth and development in the technology-driven 'Knowledge-Based Economy. The Chamber aims to empower stakeholders in the Indian economy by inculcating knowledge that will be the catalyst of growth in the dynamic global environment.

The Chamber also supports civil society through citizenship programmes, to drive inclusive development. ASSOCHAM's member network leads initiatives in various segments such as empowerment, healthcare, education and skilling, hygiene, affirmative action, road safety, livelihood, life skills, sustainability, to name a few.



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