

**#TheIndiaDialog Working Paper Series**  
Working Paper (WP–2023–013 November, 2023)<sup>1</sup>

**Rice Fortification<sup>2</sup>**

US Asia Technology Management Center  
521, Memorial Way, Knight Building  
Stanford University

Institute for Competitiveness  
155, National Media Center  
Gurgaon, Haryana, India

---

<sup>1</sup> The views presented here are those of the authors and do not necessarily represent the position of either Institute for Competitiveness or Stanford University. Working papers are in draft form. This working paper is distributed for purposes of comment and discussion only.

<sup>2</sup> Deliberations done at the Roundtable organized on October 20, 2023 in New Delhi

## Introduction

Hidden hunger, resulting from micronutrient deficiency-induced malnutrition, arises when essential vitamins and minerals are inadequately absorbed or consumed. This condition, concealed until clinical signs emerge, adversely impacts child development and hampers adult physical and mental function. Consequences include birth defects, cognitive impairment, maternal and infant mortality, childhood blindness, and reduced productivity.

In response, India mandated rice fortification in safety net programs, a proven and cost-effective strategy against malnutrition and its economic repercussions. With rice serving as the staple for 65% of the population, providing half of their energy intake, and integral to key government programs, such as PM Poshan Yojana, ICDS, and PDS, fortification aligns with successful global Large Scale Food Fortification (LSFF) initiatives. Enriching staple foods with essential micronutrients has the potential to significantly enhance nutrient intake, especially among vulnerable populations.

Against this background, a round table was organised by the **Institute for Competitiveness, India (IFC) and the US Asia Technology Management Center, Stanford University**, on **October 20, 2023**, at Shangri-La, **New Delhi**. The **keynote address** was delivered by **Shri. Amitabh Kant, Sherpa G 20, Government of India**. Other eminent experts included; **Sylvie Chamois**, Head of Nutrition, UNICEF; **Siddharth Waghulkar**, Deputy Head - Nutrition and School Feeding unit, World Food Program; **Sakshi Jain**, National Program Manager, Food Fortification Nutrition International; **Dr Richard Dasher**, Director, US-Asia Technology Management Centre, Stanford University; **Sunil Marwah**, CEO Food Industry Capacity & Skill Initiative; **Dr Mini Varghese**, Country Director, Nutrition International; **Ashi Kohli Kathuria**, Ex Nutrition Specialist, World Bank; and **Mili Asrani**, Program Policy Officer World Food Program; **Neha Khara**, Nutrition Security Advisor, GIZ India; **Rituj Sahu**, Food Systems Investment Portfolio, Asia Regional Office Rockefeller Foundation; **Harinder Oberoi**, Director, National Institute of Food Technology Entrepreneurship and Management; **Padmanabhan Jayadeep**, Chief Scientist & head Central Food Technological Research Institute; **Sunil Marwah**, CEO Food Industry Capacity & Skill Initiative; **Puneet Khanduja**, Senior Manager and Lead – Health and Nutrition, MicroSave; **Amit Sharma**, Director of Regulation and International Cooperation, FSSAI; **Kavita Ramaswamy**, Joint Director, FSSAI; **Neeraj Jain**, Country Director, PATH; and **Professor Sandeep Mann**, Author and Thinker.

The roundtable, which comes against the Prime Minister's proclamation two years ago on Independence Day to mandatorily supply fortified rice across safety net schemes in the country discussions offered an in-depth exploration of Rice Fortification in India, underscoring its vital role in addressing hidden hunger, which refers to micronutrient deficiencies of either minerals (like iron, iodine, or zinc) and/or vitamins (like vitamin A, vitamin D, folate, and vitamin-B12). It is imperative to note that this decision holds the potential to emancipate nearly 900 million individuals from the clutches of malnutrition. To effectuate such a transformation, decisive action at the highest echelons of governance is imperative, and this is precisely what our nation has undertaken.

Remarkably, the impact of this endeavour extends across multiple Sustainable Development Goals (SDGs), underscoring its substantial multiplier effect. This roundtable elucidates the

mechanisms underpinning the formulation of public policy decisions, thereby offering valuable insights for other nations seeking to embark on a similar trajectory.

### **Keynote Address: India's Campaign Against Hidden Hunger**

Sh. Amitabh Kant, reflecting on the significance of the study, emphasised its importance in addressing the development paradox faced by India. Despite achieving food security and transforming into a food surplus state, the country struggled to meet certain SDG targets related to hunger and malnutrition.

He highlighted the persistent challenges, noting slow progress in reducing malnutrition, particularly among children. With over one-third of children under five being stunted or malnourished and every fifth child experiencing wasting, malnutrition remained a critical issue. Mr Kant pointed out that maternal and child malnutrition accounted for a significant percentage of under-five deaths in India. The economic cost of malnutrition, according to the World Bank, is estimated at least 10 billion annually.

The focus then shifted to the critical issue of anaemia, which he referred to as a silent killer. Anaemia's prevalence and its consequences, including maternal deaths, depression, reduced work capacity in adults, and impaired cognitive function in children, were outlined. He underscored the economic burden of anaemia, estimated at 4% of the Gross Domestic Product. Amitabh Kant stressed that anaemia was intergenerational, posing a risk of wasting two generations, necessitating urgent attention as a public health emergency.

The keynote delved into the broader scope of undernutrition, encompassing both macronutrient and micronutrient deficiencies. Mr Kant noted that while macronutrient deficiency received attention through government programs, micronutrient deficiency, contributing to hidden hunger, had been overlooked.

He discussed India's dietary patterns, emphasising the dominance of carbohydrate-rich cereals in the population's diet. This dietary imbalance contributed to widespread nutritional deficiencies, creating a need for innovative, large-scale strategies to enhance micronutrient intake.

He proposed rice fortification as an ideal and cost-effective strategy to address nutritional deficiencies across all age groups. He cited successful pilots in various regions of India, leading to the government's announcement to mandate rice fortification in all social safety net programs by 2024.

Providing updates on the progress, Amitabh Kant shared statistics on fortified rice distribution, increased blending infrastructure, and efforts to adhere to quality assurance protocols. He expressed optimism that rice fortification could avert millions of anaemia cases and contribute to substantial savings.

Acknowledging the multi-pronged approach needed to combat malnutrition, Sh. Amitabh Kant highlighted government initiatives to promote millets for nutrition security. However, he stressed the importance of behavioural change and conscious efforts to encourage healthier dietary choices.

## Rice Fortification and Gandhian Principles

**Professor Sandeep Mann** reflects on the teachings of Mahatma Gandhi, highlighting the multifaceted aspects of well-being encompassing political, economic, social, and health dimensions. He underscores the importance of individual control and freedom in matters of health, advocating for a shift in mindset and attitude. Professor Mann notes that even among the literate and affluent, awareness of these dimensions may be lacking, and dietary habits may not be adequately diverse or balanced.

On a lighter note, he suggests fortifying popular snacks like "Kurkure" and Parle biscuits to enhance accessibility for children. Professor Mann believes that building self-esteem and promoting self-awareness is crucial. He envisioned a scenario where individuals take personal responsibility for their holistic well-being, fostering a proactive approach to health in all its dimensions.

**Professor Mann** emphasises the need for self-reliance and advocates against over-reliance on external support. He recognises the significance of a robust logistics and supply chain for fortified grains while also highlighting the critical issue of grain wastage and the need for effective clearance procedures.

Further, **Professor Mann** proposed the need for influential figures to serve as ambassadors for balanced nutrition. He encourages the promotion of colourful, nutrient-rich diets, emphasising the importance of leafy vegetables and dietary rotation. Additionally, he suggested occasional supplementation as a potential solution for addressing nutrient deficiencies. Overall, Professor Mann's insights emphasised the importance of individual agency and a proactive, holistic approach to nutrition.

### Potential for Global Scalability

**Ms Mini Varghese** highlighted that the rice fortification program demonstrated remarkable progress within a relatively short timeframe. The conducive policy environment, overall support, and operational ecosystem have encouraged states to adopt it. She mentioned the lab protocols and the comprehensive ecosystem that has facilitated this process. For instance, in Madhya Pradesh, the program expanded from one district to 52 in just 18 months. This required a focused approach, ensuring production capacities, accrediting millers, and establishing labs. The state system worked diligently to achieve this feat.

The scale and impact of this program are substantial. We have a robust tracking system in place, particularly within the Public Distribution System (PDS), which has been enhanced with fortification measures. This pre-existing distribution channel, coupled with technology-enabled tracking, has proven instrumental. India's ample production capacities have further bolstered our ability to operate efficiently. This experience provides valuable insights into rapid program scaling, ecosystem mobilisation, and leveraging existing capacities with effective governance.

Moreover, India's position as a major rice exporter, particularly to Western Africa, presents an economic advantage. Exploring the potential to expand the program in these export destinations could yield mutual benefits.

**Mr Neeraj Jain**, while reflecting on the distinctive involvement of PATH in the rice fortification program, recounted his participation in the 6th Global Micronutrient Forum, highlighting India's narrative and its relevance for global learning. Mr Jain expressed immense

pride in India's achievements and recalled spending the preceding week at the global meeting, engaging with representatives from various countries to discuss India's progress.

Reflecting on the extensive groundwork undertaken over the past 15 years, Mr Jain emphasised the solid scientific foundation preceding the program's implementation. Mr Jain recounted their engagements with representatives from various governments and colleagues from the Department of Food and Public Distribution. They emphasised the high level of interest and admiration generated by India's story.

Mr Jain discussed the ongoing focus on maintaining impact through quality assurance. They highlighted the government's efforts in establishing a digital quality traceability system, which received significant attention at the conference. Ensuring the quality of every grain of rice emerged as a crucial priority.

During the conference, Mr Jain noted feeling a strong sense of pride as international delegates approached him, seeking insights into India's approach. He underscored India's unique ability to demonstrate population-level impact, distinguishing it from global fortification efforts, typically on a smaller scale.

Mr Jain asserted India's readiness to share insights and information with any interested nation. Looking ahead, he anticipated India's potential to not only fortify its program but also lead globally in rice fortification. He emphasised the cost-effectiveness of this approach compared to fortifying wheat flour, which presents notable logistical challenges.

### **Challenges and Strategies of Rice Fortification in India**

**Ms Ashi Kohli Kathuria** was invited to share her insights on the design and implementation of the fortification program. Her involvement dates back to her tenure at the World Bank, where she collaborated with FSSAI. Ashi reflected on her experiences and emphasised that fortification had been part of the National nutrition policy since 1993. However, it faced significant challenges in transitioning from policy to actual implementation. She noted that successive 5-year plans had acknowledged food fortification, but its execution was delayed.

From Ms Kathuria's perspective, several crucial factors contributed to the program's realisation. Building political commitment was a substantial undertaking, requiring time and effort. Strong leadership at various levels was pivotal, with notable contributions from institutions like FSSAI, the Department of Food and Public Distribution (DoFPD), and NITI Aayog. Ms Kathuria also highlighted the vital role of technical assistance in providing the necessary scientific analysis and support to guide government decision-making. Overall, she emphasised the importance of aligning efforts and expertise to bridge the gap between policy and implementation.

**Dr. Padmanabhan Jayadeep** offered a technical perspective on the fortification process, focusing on quality assurance and control. He highlighted three critical factors: fortificant quality, rice kernel fabrication, and fortified rice. Dr Jayadeep underscored the challenge of adapting rice fabrication to diverse regional rice varieties, including parboiled and raw.

He also pointed out the low micronutrient content in fortified rice, emphasising the need for instrumental analysis, which poses a cost burden on regional food testing labs. Dr Jayadeep acknowledged the ongoing efforts by organisations by partner organisations in providing training programs and developing test methods to enhance micronutrient analysis.

Regarding potential concerns about nutrient levels, Dr. Deep discussed the variability in samples and the importance of distribution efficiency, detectable through staining methods. He advocated for pilot studies and continuous monitoring through accredited labs to ensure the quality of distributed rice.

### **Collaborative Role of Development Partners**

**Dr. Sylvie Chamois**, representing UNICEF, acknowledged the critical role of food fortification in addressing micronutrient deficiency levels, particularly in children. UNICEF has actively supported initiatives like the Comprehensive National Nutrition Survey (CNNS), which highlighted the prevalence of micronutrient deficiencies in the population, with a focus on children and adolescents. Additionally, UNICEF is a strong advocate for the government's anaemia combat strategy, which includes iron and folic acid supplementation, complemented by food fortification.

While it's early to assess the program's full impact, UNICEF anticipates positive outcomes and looks forward to the next NFHS survey to gauge progress in anaemia reduction.

**Siddharth Waghulkar** emphasised the paramount importance of seamless implementation. He underscores that while visionary leadership is pivotal, the efficacy of an idea hinges on its effective translation into actionable strategies on the ground. This nuanced perspective underscores the multifaceted nature of successful program execution.

Representing the World Food Program, Mr **Waghulkar** acknowledged the successful implementation of programs like the Gajapati project, emphasising the importance of rice fortification. However, it was noted that behavioural change and awareness about dietary diversity are crucial alongside fortification. The focus extends beyond fortification alone, emphasising the need for a diversified diet. The speaker emphasised their ongoing efforts in this direction, particularly in the context of nutrition and school feeding programs. Elements like kitchen gardens and various strategies for dietary diversification are integral to this approach.

Addressing the importance of dietary diversification, Mr **Waghulkar** acknowledged that creating awareness around this concept presents a challenge. He emphasised the necessity of positioning fortified rice as part of a comprehensive meal, rather than viewing it in isolation. This approach, coupled with the incorporation of millets, is seen as crucial for comprehensive nutrition at the school level. Ongoing efforts include school-level activities, Anganwadi-level initiatives, and endeavours to enhance nutrition and health education. The World Food Program is actively engaged in a range of social behaviour change communication campaigns, tailored to specific districts and states, with a view to advancing awareness and practices related to nutrition and fortified rice. These efforts contribute to building evidence and operational models at both regional and national levels.

**Puneet Khanduja**, who represents MicroSave, has been a significant partner in various government programs, including those across districts. Puneet highlights that this expansion can transform the global landscape, particularly in the context of learnings from the Global South. He emphasised the pivotal role played by political will, especially demonstrated by the honourable Prime Minister's deep commitment to nutrition.

Furthermore, Mr Khanduja underscored the importance of private-sector engagement. Initially, there were reservations regarding government commitment from the private sector, particularly in terms of investments. However, the government's proactive approach led to the successful

onboarding of the private sector. Currently, the program is capacitated to cover 629 out of 675 districts, surpassing initial expectations. This success story serves as a model for other nations, with Indonesia expressing interest in learning from India's fortification efforts.

Regarding dietary diversification, Mr Khanduja noted that the government is already inclined towards this concept, as demonstrated by recent policy measures. The focus on millets and the celebration of the Year of Millets reflects a commitment to diversifying the food supply. However, Mr Khanduja acknowledges that this transition involves complexities, including considerations related to production, procurement, and farmer livelihoods. The intent is there, but tangible outcomes may take time to materialise.

In **GIZ**, Ms **Neha Khara** said that they are involved in a global project centred on the transformation of agrifood systems, a part of the 'One World, No Hunger' initiative championed by former German Minister Mr Muller. Their work has revolved around a nutrition-sensitive integrated approach, particularly in Madhya Pradesh and Maharashtra, where they've observed that encouraging dietary diversification and supporting Community Nutrition Gardens can facilitate year-round production of fresh fruits and vegetables.

Moreover, considering the potential for South-South exchange, with GIZ being part of a global project involving India, Burkina Faso, and Madagascar, there is ample opportunity for knowledge dissemination and capacity building. India, as a leader in rice fortification, is poised to offer valuable insights to other nations grappling with policy challenges and implementation capacity.

On the gender front, there's room for improvement in adopting gender-transformative approaches. Recognising the critical role gender plays in all initiatives, GIZ is actively engaged in this sphere, aligning with the feminist development policy of the German government. They are working towards transformative approaches at individual, societal, and community levels.

In essence, Ms Khara highlighted that it's essential to remember that the ultimate beneficiaries of these endeavours are the communities themselves. Ensuring their active involvement and ownership of the solutions provided is paramount. She beckoned to continue to champion a bottom-up approach, amplifying positive stories from the grassroots and integrating them into the larger ecosystem.

**Mr Rituj Sahu** appreciated the role of the Rockefeller Foundation in the field and highlighted the need to focus on innovation to improve nutritional security and dietary diversity. He suggests exploring opportunities beyond fortified rice in boiled rice, and unpolished rice to enhance nutritional benefits and cost efficiencies. Rituj emphasised the importance of philanthropic foundations continuing to experiment in these areas.

Furthermore, he stressed the significance of building alliances, particularly with examples like the School Meals Coalition and the Fortified Whole Grain Alliance, to strengthen demand generation and work collaboratively on improving rice fortification and dietary diversity. Rituj encouraged partnerships with like-minded entities from philanthropy, civil society, think tanks, and academia.

Lastly, Rituj raises concerns about cost efficiency and suggests exploring alternative approaches in the supply chain to reduce the carbon footprint, such as addressing the stages of processing and polishing that lead to nutrient loss in rice. He advocated for a holistic approach to fortification that encompasses both nutritional gains and environmental sustainability.

## Seeking Efficiency: Mandatory vs Voluntary Debate in Food Fortification

**Ms Ashi Kathuria** delved into the intricate question of mandatory versus optional fortification. She appreciates the complexity highlighted in the report, emphasising the public health versus the individualised approach. Ashi firmly asserts that with vigilant population-level monitoring and adherence to safety limits, rice fortification is the optimal path, especially within safety net programs.

Expressing concerns about the logistical challenges of a voluntary system, Ashi envisions confusion between fortified and unfortified options, coupled with potential cost differentials and inadequate awareness about micronutrients. She underscored the importance of tolerable upper limits and the need for population-level monitoring, particularly in states with higher intake levels of food vehicles

**Ms Ashi Kathuria** acknowledged the matured state of the PDS program but pointed out the unique challenges in monitoring fortification quality at distribution points and end-user consumption levels. She advocated for robust monitoring systems and emphasised the significance of periodic evaluations, highlighting the role of partnerships with researchers and universities.

In considering the delicate balance between mandatory and optional fortification, **Ms Kathuria** underscores the necessity for more research. She identified existing gaps in systematic reviews, emphasising the varied factors influencing outcomes, such as fortificant preparation, duration of studies, and population age groups. She sees a golden opportunity to integrate research into the program, leveraging the diverse contexts present across the nation.

**Ms Kavita Ramaswamy** discussed the collaborative effort behind fortification regulation, involving the Ministry of Women and Child Development (WCD), DoFPD, and FSSAI. She acknowledged the challenges in implementing rice fortification, especially after it became mandatory. She emphasised the gradual progress from policy to program and recognised the time it takes to establish such initiatives.

Addressing the voluntary nature of the regulation, Ms Ramaswamy explained the careful consideration given to nutrient intake, ensuring that even with regular consumption, the nutrients do not exceed recommended dietary allowances. She delves into the specifics of iron, B12, and folic acid, highlighting their low bioavailability and negligible risk of toxicity.

Ms Ramaswamy touched on concerns about consumer choice and potential forces through PDS distribution. She noted the focus on populations prone to nutritional deficiencies, such as those with thalassemia and sickle cell anaemia. Regarding labelling, she acknowledged the need for communication improvements and mentioned ongoing efforts in capacity building among FRK manufacturers and tests in laboratories, expressing optimism about stabilisation and eventual consumer benefits.

**Mr Dasher** raised a crucial question about the decision-making process regarding the deployment of the fortification program on a large scale. He acknowledged the effectiveness of the pilot-to-scale approach in India as a risk mitigation strategy but sought insights into the coordination between research findings and the decision to implement the program.

**Neeraj Jain** responded by highlighting the extensive research undertaken before the program's deployment. He characterises the pre-deployment research phase as rigorous and, at times, challenging. Scientific committees, discussions with FSSAI, and impact evaluations were integral



to shaping the scale-up decision. He emphasised the continuous monitoring and impact evaluations planned for the program, recognising the potential emergence of new factors. He cautioned against perverse incentives and underscored the critical role of quality control and traceability, especially with government as the customer and private sector involvement.

Mr Jain also stressed the need for ongoing monitoring of adverse events, drawing parallels with vaccination protocols. He commended India's approach to research, trials, and scaling, describing it as commendable despite the challenges faced along the way.

### **Operational Challenges to Rice Fortification**

**Mr Harinder Oberoi**, who previously served as an advisor for standards and quality assurance at FSSAI, commended FSSAI and DoFPD for their commendable work in establishing standards and implementing the fortified rice program. Despite the positive outlook, he pointed out existing challenges in program implementation. He emphasised the dynamic nature of research requirements, mainly focusing on the crucial aspect of the shelf life of fortified rice.

Mr Oberoi raised concerns about the premix's purity, often imported from China, highlighting the absence of defined concentration limits for the premix components. He stresses the need for FSSAI to set standards and exert control over the entire premix system. Additionally, he underscored the importance of quality assurance, expressing reservations about the consistency and proficiency of nutrient analysis across laboratories in India.

Furthermore, Mr Oberoi addressed the need for more laboratories in key rice-producing states like Haryana, Punjab, and Uttar Pradesh. He advocated for capacity building among rice millers and establishing dynamic blenders. He outlined the challenges in scaling up the program, including the lack of dynamic blenders, limited labs, and potential issues in labelling and distribution.

Mr Oberoi specifically mentioned labelling challenges, emphasising the need for collaboration between DoFPD and FSSAI to address issues related to reaching the last mile and ensuring proper labelling, given the constraints faced by ration shop operators in dealing with and educating the public.

**Mr Amit Sharma** stressed the importance of addressing challenges in the fortified rice program's actual implementation. He acknowledged that the finalised draft standards for premixes, particularly focusing on iron, vitamin B12, and folic acid levels, are to be operationalised soon.

Highlighting challenges, Mr Sharma discussed discrepancies in micronutrient levels among rice millers, especially those who are also FRK manufacturers. He emphasised the need for comprehensive testing from micronutrient importers to premix and FK manufacturers, including addressing the blending capability of different manufacturers.

Mr Sharma drew attention to the potential issues arising from non-compliant and excessively fortified rice, emphasising the lack of facilities in FCI godowns for proper blending. Despite acknowledging the program's necessity and ongoing efforts, he urged the discussion of ground-level challenges to ensure consumers receive the desired fortification levels.

Touching on chemical testing challenges, Mr Sharma mentioned wide variations in iron and vitamin B12 levels, emphasising the need for repeatable testing at various stages, including

premix and FK levels. He briefly mentions concerns about the shelf life of FRKs, highlighting the need for manufacturers or FBUs to decide on shelf life under suitable conditions.

Mr Oberoi emphasised the need for enhanced skills among rice manufacturers, noting that their current capabilities in blending and testing fall short of the required standards. He highlighted the scarcity of labs equipped for the envisioned scale of the fortified rice program. Addressing the capacity gap, he further mentioned initiating on-the-job practical capacity-building programs at the shop floor level. While acknowledging limitations due to their status as a research organisation with limited staff, he outlined plans to kickstart training initiatives for a few rice millers. The goal is to create role models who can, in turn, inspire and guide others in the industry.

**Mr Sunil Marwah** highlighted the critical skill gap in transitioning workers from mechanical to pharmaceutical operations in rice manufacturing. As a representative of the food processing sector skill council, he outlines initiatives to address this challenge, such as an online course for rice fortification technicians and a resource centre with experts providing guidance.

Mr Marwah discusses collaborations with educational institutions to provide training opportunities and industry visits. He emphasised the importance of upskilling the workforce and mentioned engagement with food technology students to create awareness and build capabilities for future industry leaders.

Additionally, Mr Marwah suggested a strategic approach to success by associating a reputable brand with fortified rice in the public distribution system (PDS). He proposed encouraging rice manufacturers to offer branded products in PDS, establishing accountability and ensuring traceability. This, he believes, will be more effective than relying solely on regulatory oversight.

### **Learnings from the Roundtable**

**Amit Kapoor** highlighted the fact that India did find a substantial level of success in bringing out people from poverty since its independence, and now with rice fortification, it seeks to bring nutritional security to 900 million people. He brought out an important perspective outlined in the paper, which highlights India's rice fortification program's effectiveness in improving nutritional accessibility, encapsulated in what is referred to as the '6 As of Rice Fortification'. These '6 As' encompass Accessibility, Availability, Acceptability, Affordability, Adequacy, and Awareness. This framework serves as a comprehensive guideline to evaluate and enhance the accessibility of fortified rice, ensuring that it meets the diverse needs of the population.

**Richard Dasher** added that rice fortification is based on objective science and backed by credible data both of which are captured in the research being tabled. He further emphasized that India's progress in rice fortification represents a significant milestone, with the current imperative being the expansion of the program's replicability. The model adopted by India in respect of this initiative offers a potential model in other nations as well. Additionally, he raised the prospect that India, given its achievements in rice fortification, may eventually become an exporter of fortified rice.

**Ms Mili Asrani** emphasised the need for concrete steps in advancing the fortified rice program. She outlined three key actions that the government of India, philanthropic organisations, and the corporate sector should focus on:

1. **Capacity Building for Laboratories:** Ms Asrani underscored the importance of enhancing the capacities of laboratories, particularly in quality control and assurance of the premix, a critical ingredient in combating malnutrition. This emphasis on quality control at multiple levels is deemed essential for the success of the fortification scheme.
2. **Community Awareness:** Ms Asrani highlighted the necessity of raising awareness among the community about fortified rice. She mentioned that there is a lack of understanding at the grassroots level, leading to misconceptions such as the association of fortified rice kernels with plastic. To address this, social behaviour change communication strategies, including posters and danglers, have been implemented, but further efforts are required to ensure sustained community awareness.
3. **Addressing Myths and Misconceptions:** Millie stresses the importance of dispelling myths and misconceptions surrounding fortified rice, such as the belief that it contains plastic or foreign matter. She shares experiences of community members, including school cooks, mistakenly removing fortified rice kernels due to a lack of awareness. Practical activities, like cooking demonstrations, are being employed to showcase the similarities in sensory acceptability between fortified and non-fortified rice.

Overall, Millie advocated for a comprehensive approach, starting from quality assurance at the production level to community-level awareness and dispelling myths to ensure the success of the fortified rice program.

**Ms Sakshi Jain** emphasised the collaborative and sustained effort required for the success of the fortified rice program. She acknowledged the time and efforts invested in formulating policies and emphasised that addressing malnutrition is an ongoing process, not achievable in a short period. **Ms Jain** introduced three additional principles, the "Three C's," to the existing "Six A's":

1. **Collaboration:** Sakshi advocates for collaboration across the government, private sector, academia, and the development sector. She believes that a collective effort is essential for effectively combating malnutrition.
2. **Consciousness:** Recognizing and accepting challenges is crucial, and Sakshi emphasised the need for a conscious approach to work together in overcoming obstacles. She urged stakeholders to be realistic about the complexities involved.
3. **Cooperation:** Sakshi underscored the importance of mutual cooperation, emphasising that individuals must work together towards a common goal. She emphasized the impact of decisions made today on the future of the country, particularly for the well-being of the next generation.

In conclusion, **Ms Jain** encouraged a united and conscious approach, stressing that cooperation is vital in shaping a positive future for the country, especially in the context of addressing malnutrition

**Ms Kathuria** acknowledged the existing research efforts in response to a question about research areas and emphasised the need for further investigation. She identified specific areas that require attention and suggested potential research directions. She also noted that the levels of fortification in the program may differ from the recommended levels, highlighting the importance of assessing the effectiveness of the current fortification levels. She emphasised the need to understand that fortified foods are not a "magic bullet," and outcomes are influenced by

factors such as water, sanitation, and hygiene practices. She suggested that research should consider various contexts and test small designs to examine these factors.

Additionally, **Dr Jaydeep** pointed out the importance of studying the impact of fortification in areas with endemic hookworm infestations and malaria. He stresses the need for well-designed research to explore potential differential impacts in these regions. On a similar note, **Ms Kathuria** emphasised the significance of research in assessing the impact of fortification on health. She suggested conducting baseline studies in districts newly introduced to fortified rice and developing pilot programs in collaboration with relevant stakeholders to facilitate comprehensive health impact studies over time.

## **Conclusion**

This roundtable initiative, a part of the India Dialogue, was a collaborative research endeavour and public program jointly conducted by the Institute for Competitiveness and the US Asia Technology Management Center at Stanford. While one might expect a topic such as Rice fortification to fall within the domain of public health, the present approach transcends traditional boundaries. The discussions at the roundtable examined this subject in the broader context of factors influencing governmental decision-making, including prioritisation, as well as the intricacies of implementation in a vast and diverse nation like India.

The discussions were deemed fruitful by the participants, reflecting on the challenges and journey of the rice fortification program in India. It was acknowledged that the program's success required an understanding that significant transformations take time. The transition from partner-driven efforts in the past decade to government-led initiatives between 2020 and 2030 was highlighted.

Various areas needing attention were identified, including quality control, quality assurance, and capacity building for key stakeholders. The importance of continued research in areas such as fortification levels, contextual factors, and dietary impacts was emphasised. The need for collaboration across government, private sector, academia, and development sectors was underscored to effectively address malnutrition.

The participants collectively recognised the need for continuous learning, documentation, and dissemination of their experiences, with a view to benefiting not only India but also other countries facing similar nutritional challenges. The dialogue concluded with a commitment to further collaboration and knowledge-sharing.