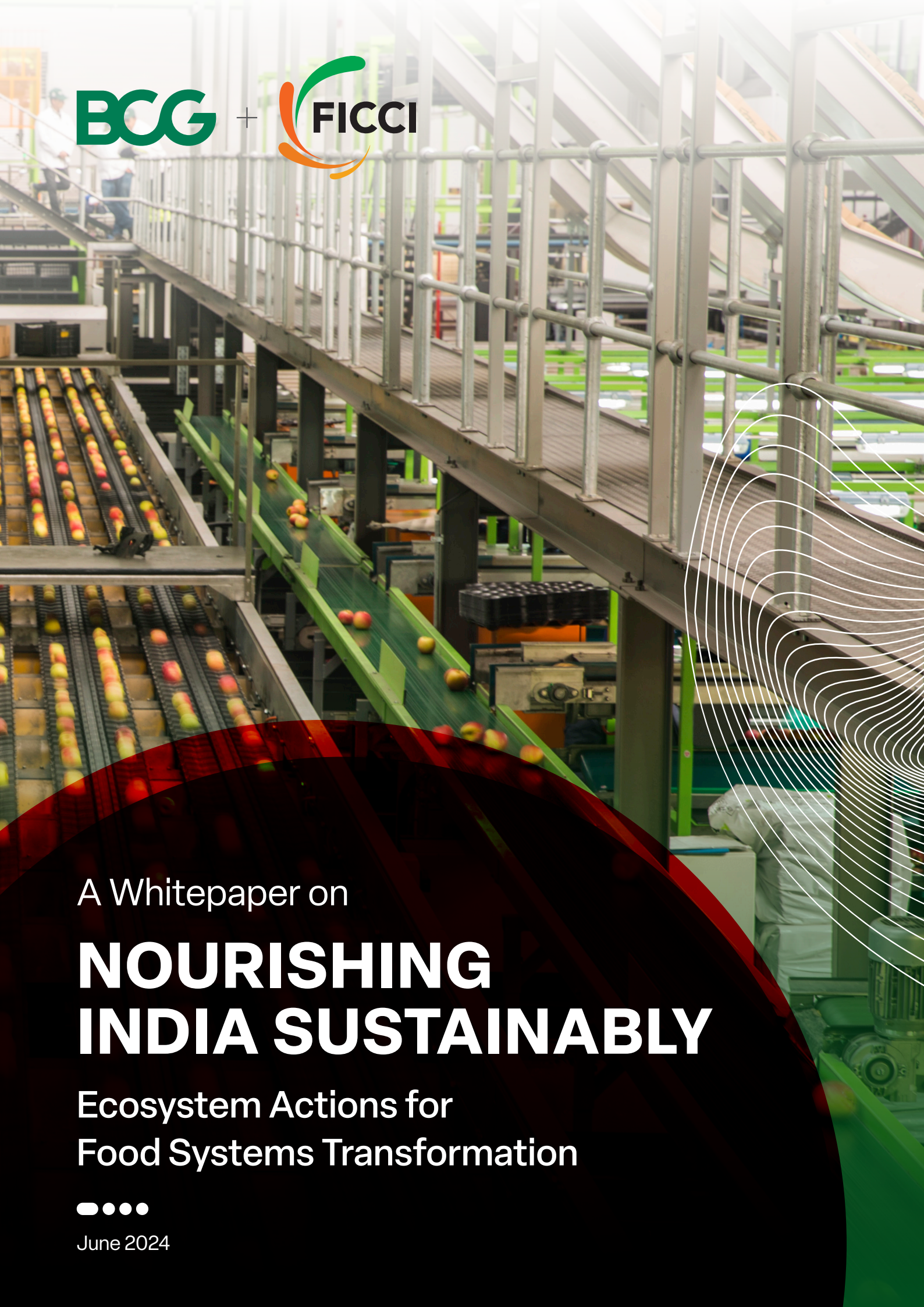


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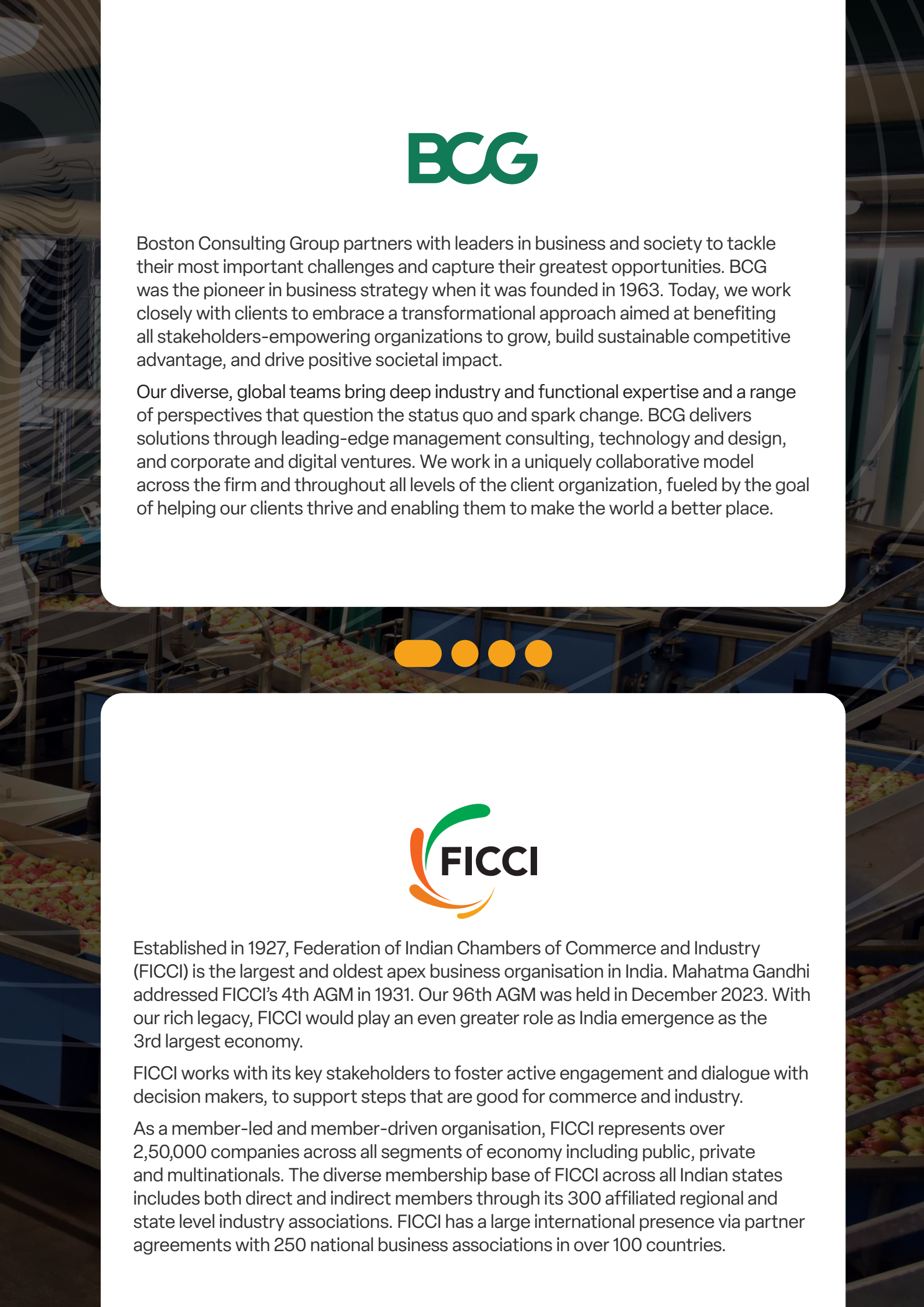
A Whitepaper on

NOURISHING INDIA SUSTAINABLY

Ecosystem Actions for Food Systems Transformation

June 2024





Boston Consulting Group partners with leaders in business and society to tackle their most important challenges and capture their greatest opportunities. BCG was the pioneer in business strategy when it was founded in 1963. Today, we work closely with clients to embrace a transformational approach aimed at benefiting all stakeholders-empowering organizations to grow, build sustainable competitive advantage, and drive positive societal impact.

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Established in 1927, Federation of Indian Chambers of Commerce and Industry (FICCI) is the largest and oldest apex business organisation in India. Mahatma Gandhi addressed FICCI's 4th AGM in 1931. Our 96th AGM was held in December 2023. With our rich legacy, FICCI would play an even greater role as India emergence as the 3rd largest economy.

FICCI works with its key stakeholders to foster active engagement and dialogue with decision makers, to support steps that are good for commerce and industry.

As a member-led and member-driven organisation, FICCI represents over 2,50,000 companies across all segments of economy including public, private and multinationals. The diverse membership base of FICCI across all Indian states includes both direct and indirect members through its 300 affiliated regional and state level industry associations. FICCI has a large international presence via partner agreements with 250 national business associations in over 100 countries.

Message from Secretary, Ministry of Food Processing Industries

WORLD FOOD INDIA 2024 19th to 22nd September Processing for Prosperity

अनीता प्रवीण, भा.प्र.से.
ANITA PRAVEEN, IAS

सत्यमेव जयते

आज़ादी का अमृत महोत्सव

सचिव
भारत सरकार
खाद्य प्रसंस्करण उद्योग मंत्रालय
Secretary
Government of India
Ministry of Food Processing Industries

MESSAGE

India is growing, and with that, its food and nutritional needs are increasing. Food processing plays a vital role to not only cater to these requirements but also ensure reduction in the wastage and enhancing shelf life of food products, thereby ensuring value addition to agricultural produce.

This whitepaper captures the key megatrends affecting Indian food systems and highlights systemic challenges within the agri-food value chain that are of major concern for the food systems. Collaboration between the government and industry is essential to elevate the food processing sector to a higher growth trajectory, while ensuring both food and nutrition security. The recommendations in this whitepaper for an ecosystem-led transformation is a step in the right direction.

June 03, 2024

(Anita Praveen)

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Message from the Federation of Indian Chambers of Commerce and Industry

FICCI, in collaboration with BCG, is pleased to present the White Paper on "NOURISHING INDIA SUSTAINABLY - Ecosystem Actions for Food Systems Transformation."

India is a global leader in agricultural production and food processing, impacting millions of lives. Food Processing directly increases incomes and value addition. Recent growth in food processing has been driven by private and public initiatives and favourable macroeconomic conditions. Now, it is crucial to focus on the future to ensure our food systems are sustainable and continue to deliver nutritious products.

Global food systems, including India's, are rapidly transforming due to trends in food production and consumption. Consumers are increasingly prioritizing health and nutrition, leading to a greater demand for processed foods that meet these criteria. Meanwhile, geopolitical shifts and climate change introduce volatility and uncertainty.

This White Paper underscores the critical necessity of sustainably transforming food systems. It details five key imperatives: Improving Processing Efficiency, Encouraging Product Diversification, Fostering Climate Resilience, Reducing Food Waste, and Balancing Nutrition with Taste and Affordability. Additionally, the paper identifies four significant challenges: achieving the health-taste-affordability trifecta, supporting processors, enhancing infrastructure, and ensuring economic viability for all stakeholders. It also proposes solutions to address these challenges.

We trust that all stakeholders will find this White Paper insightful and engaging.



S K Pathak

Secretary General, FICCI

Message from FICCI Food Processing Committee

In recent years, India has witnessed a paradigm shift in consumer preferences. With growing awareness of health and nutrition, geopolitical shifts, and increasing affluence, consumers are demanding more nutritious food. This evolving scenario presents a timely opportunity for action in India. By 2030, 50% of annual households are expected to have incomes exceeding INR 5 lakh, up from the current 21%. Rising affluence has already led to an increase in processed food consumption, from 21% of urban household food expenditure in 2011 to 27% in 2022, and this trend is likely to continue. This presents both a unique opportunity and a responsibility for the food processing sector to transform nationwide food production, ensuring these foods are both healthy and sustainable.

Innovation will be the cornerstone of transforming our food systems. Historically, various companies have promoted health and sustainability, but these efforts have often been fragmented. The scale of today's challenges requires urgent, coordinated action, presenting a tremendous opportunity for the industry to unite. By taking ecosystem-level interventions and driving synergies, we can create a joint movement to achieve a healthy and sustainable transformation in our practices.

Further, multiple companies are already driving sustainability initiatives that involve and empower local communities to ensure sustained change. To scale these efforts, it is critical to make this an ecosystem-level movement. The entire food value chain must collaborate to drive collective action, ensuring that the benefits of these practices are felt throughout the industry. This collective effort will help create a resilient food system capable of meeting the demands of a growing population in a nutritious and sustainable manner. By uniting our efforts, we can build a healthier, more sustainable future for all.

We are pleased to highlight the release of the whitepaper, "Nourishing India Sustainably: Ecosystem Actions for Food Systems Transformation." This whitepaper not only identifies the challenges ahead but also provides a roadmap for stakeholders to follow. We anticipate that the insights and strategies outlined will help scale up the sector's growth and transformation efforts, paving the way for a healthy and sustainable future in India's food systems. By fostering innovation and collaboration, we can ensure a sustained, positive impact on both local communities and the broader food value chain.



Hemant Malik

Chair-FICCI Food Processing Committee and Executive Director, ITC Ltd.



Prashant Peres

Co-Chair, FICCI Food Processing Committee & Managing Director, India and South Asia, Kellanova



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Co-Chair, FICCI Food Processing Committee and Executive Director (Nutrition and Ice Cream), Hindustan Unilever Ltd.

Foreword

India is experiencing a gradual shift in consumption patterns, driven by the increasing affluence of its population and an increased awareness of health and nutrition. As dietary preferences evolve, it's imperative that we serve the new consumer plate in an innovative and sustainable manner. This brings with it the imperative to scale up agricultural productivity and diversify crops to include key emerging healthier food groups, while ensuring resilience and sustainability across the supply chain. Our food systems also need to innovate to be able to balance health, taste, and affordability to meet the evolving needs of the future Indian consumers. However, realizing this vision entails overcoming several systemic challenges.

Our whitepaper, "Nourishing India Sustainably: Ecosystem Actions for Food Systems Transformation," delves into the megatrends shaping both Indian and global food systems and identifies the crucial imperatives necessary for sustainably enriching India's food plate. The whitepaper not only highlights the challenges inherent in achieving these goals but also proposes an ecosystem-level coalition plan designed to drive coordinated efforts across the industry. By fostering robust collaborations across key verticals such as innovation, last-mile infrastructure, and catalytic funding, we believe we all can collectively pave the way for a sustainable food systems transformation in India.

FICCI's Food World India 2024 presents a unique platform to seize this great opportunity for collaboration. We believe that the insights and action plan presented can catalyze strong partnerships and unlock synergies essential for promoting healthier and sustainable food systems across India. Together, we can forge a new future for India's food systems—one that is both people and planet positive.



Abheek Singhi

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Executive Summary

Food systems worldwide are rapidly transforming due to megatrends affecting production and consumption. The increasing global population demands a comprehensive evolution of food systems incorporating health, nutrition, and sustainability. India's economic growth has boosted incomes with 50% of households expected to earn over INR 5 lakhs annually by 2030, as per BCG analysis. Monthly food spending has more than doubled, with a notable shift towards packaged foods, beverages, and increased fruit and vegetable consumption. Global food discussions are now increasingly focusing on health, sustainability, and security. Geopolitical changes are affecting agricultural trade, and India's dependency on imports for pulses and vegetable oils has doubled, necessitating a reassessment of food sufficiency strategies. Sustainability is a critical theme within food systems, with the dual imperative of becoming resilient to climate change as well as minimizing the impact on the environment.

The consumer food plate is expected to evolve in line with these megatrends. It is imperative to transform food systems to sustainably deliver to the new Indian consumer's food plate. This involves five key imperatives across the food value chain, from agricultural production to processing and end consumption, to ensure food and nutrition security.



Scale up agricultural productivity

With limited agricultural land, enhancing productivity is crucial to meet the food and nutrition needs of a growing population and ensure food security.



Drive crop diversification and self-reliance

To meet the evolving consumer preference for healthier foods and mitigate geopolitical risks, it is vital to diversify crops locally, requiring farmer training and improved market infrastructure.



Foster climate resilient practices

Sustainable agricultural practices are vital for protecting yields from climate impacts and enhancing productivity, supporting natural resource replenishment and enabling multiple cropping cycles.



Reduce food loss and wastage

Significant food losses at various stages of the supply chain highlight the need for comprehensive interventions to minimize loss and wastage and ensure that more food reaches the consumers.



Innovate to balance nutrition, taste, and price

Consumer demand for nutritious, tasty, and affordable food calls for innovative solutions to achieve the balance of health, taste, texture, and price effectively.

As we work towards the imperative of sustainably serving the new Indian consumer food plate, we face four key challenges that span the entire food value chain and involve all stakeholders.

Challenge 1: High complexity for producers to achieve the trifecta of health, taste and affordability

Industry-wide collaboration and investment in research and development need to be increased to streamline testing, regulatory approval, and market introduction processes. Additionally, consumers need to be educated on the benefits and availability of healthier, alternative food products to boost acceptance and adoption.

Challenge 2: Insufficient support for farmers to transition to the 'needed' agricultural practices

Farmers struggle with access to essential inputs, specialized equipment, tailored advisory services, and understanding subsidies, finding markets, and managing potential short-term losses, making it difficult to implement and sustain new agricultural practices.

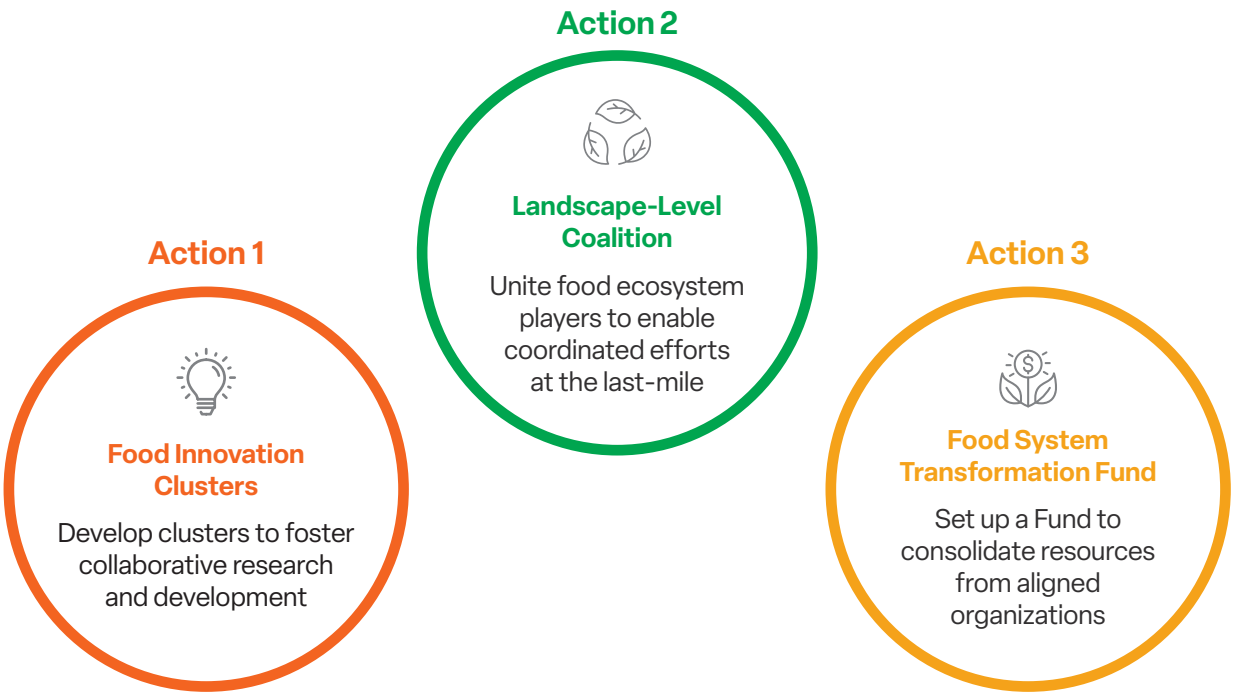
Challenge 3: Inadequate last-mile infrastructure and linkages for processing and storage leading to post harvest food loss and wastage

Farmers lack awareness of best practices and access to mechanization, leading to improper handling and spoilage. Additionally, limited storage, transportation, and processing infrastructure cause delays and waste, exacerbating food losses across the supply chain.

Challenge 4: Limited economic viability for individual stakeholders to drive transition to new practices

Innovations in product formulations, sustainable agriculture, and crop diversification lack immediate economic benefits, making transitions difficult for stakeholders. Additionally, while the costs may be borne by one stakeholder, benefits may accrue to another or to the ecosystem as a whole, further diluting the business case and deterring necessary investments in sustainable practices.

Each highlighted challenge requires a holistic, ecosystem-level solution for scalable and sustained transformation of food systems. While stakeholders address specific issues individually, synergizing these efforts can unlock significant collective value and accelerate transformation. Three key actions are essential for driving this change.



Action 1: Develop 'Food Innovation Clusters' to foster collaborative research & development, delivering people and planet positive nutrition

- Create collaborative clusters that bring together key stakeholders—including the private sector, government, regulatory bodies, startups, and academia—to systematically translate research into commercially viable opportunities, supported by policy frameworks.
- Implement consumer education campaigns and market access programs to build awareness and trust in new products, enabling companies to successfully bring innovations to market.

Action 2: Unite food ecosystem players into a 'Landscape-level Coalition' to enable coordinated efforts and access to shared extension cadre and infrastructure at the last-mile

- Establish strategic alliances within defined regions to introduce sustainable agricultural practices, enhancing collaboration among stakeholders and creating significant synergies for interventions like crop diversification, sustainable agriculture practices, mechanization, and processing.
- Implement shared last-mile farmer support, unified communication, common storage and processing facilities, and streamlined credit access to achieve economies of scale, reduce costs, and boost local economies.

Action 3: Set up 'Food Systems Transformation Catalytic Fund' to systematically pool funds across organizations with aligned objectives

- Create an integrated financial mechanism to pool resources from government schemes, subsidized loans, and private sector contributions, providing substantial and cohesive funding for large-scale food systems transformation projects.
- Serve as a centralized funding source to increase project viability, and provide technical assistance, ensuring efficient implementation of sustainable practices.



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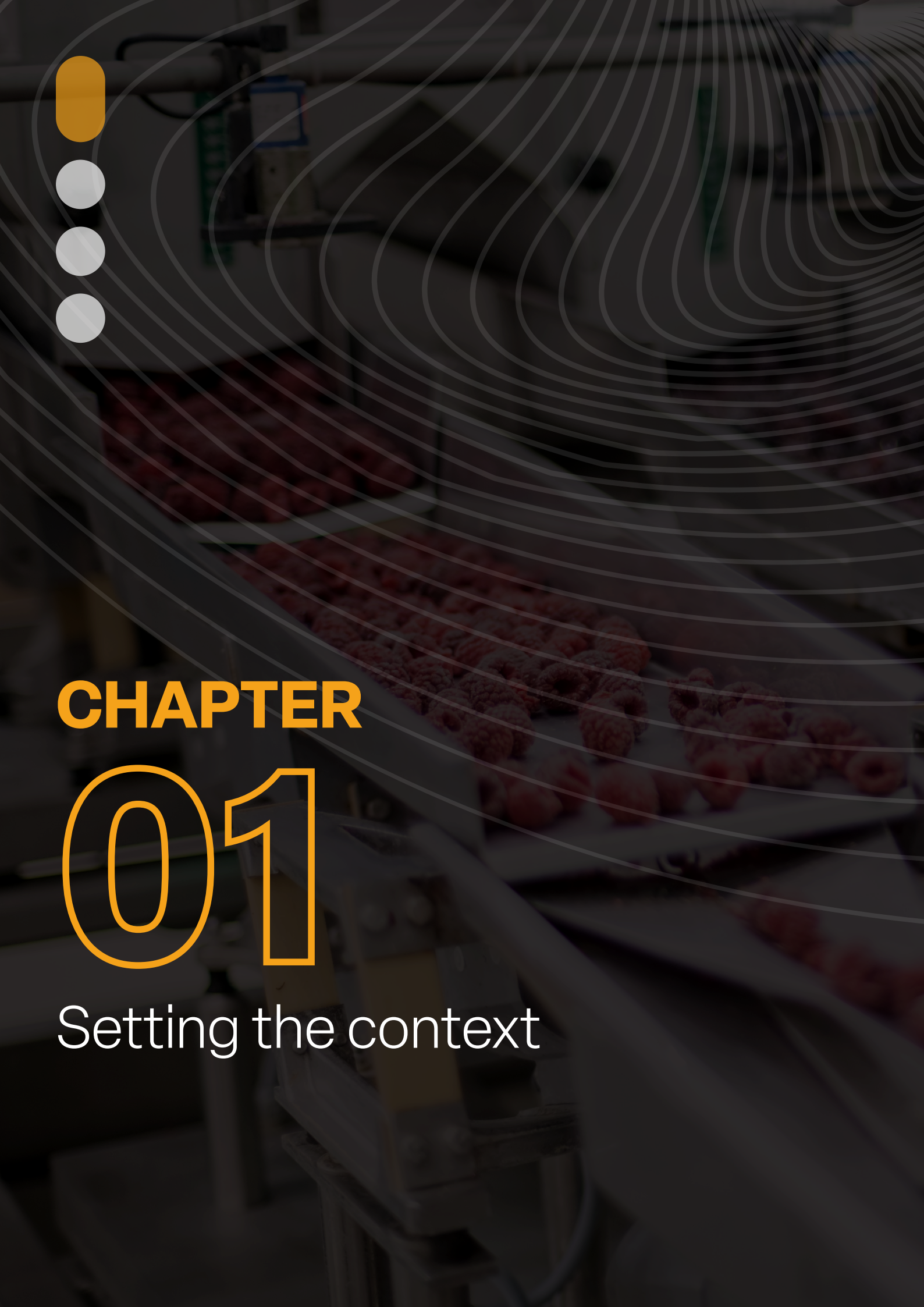
2.4 Limited economic viability for individual stakeholders to drive transition to new practices

Chapter 3: Need for ecosystem level actions

3.1 Develop 'Food Innovation Clusters' to drive collaborative research and development

3.2 Formulate 'Landscape-level Coalitions' to enable coordinated efforts at the last-mile

3.3 Set up 'Food Systems Transformation Fund' to consolidate resources from aligned organizations



CHAPTER 01

Setting the context



Key megatrends impacting Indian food systems

Food systems around the world are undergoing rapid transformation, fueled by key megatrends that are reshaping how food is produced and consumed. As populations grow, the increasing demand for food necessitates a comprehensive evolution of food systems across health, nutrition, and sustainability. This requires an end-to-end transformation of the food value chain. In that context, four critical megatrends are poised to shape the future of food systems, influencing a wide spectrum of facets ranging from consumption patterns to production methods.

1 Rise in income and expenditure, changing consumer food preferences

2 Increased awareness of health and nutrition

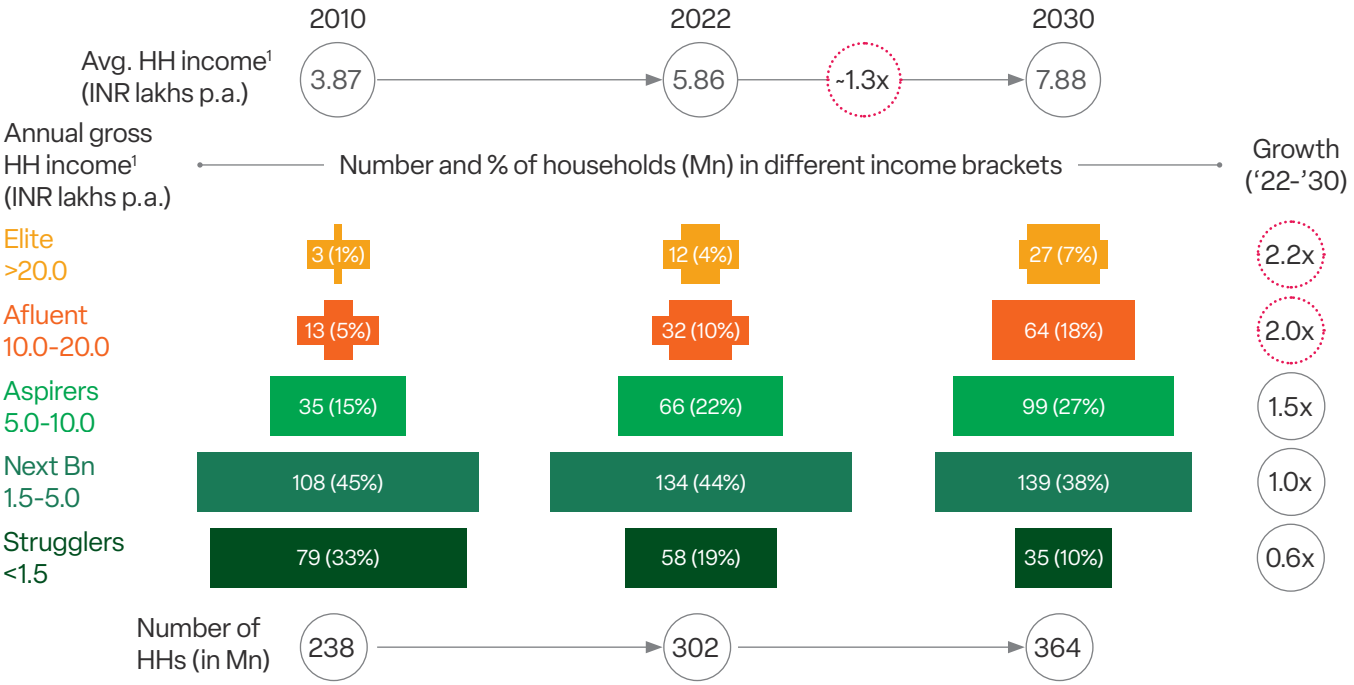
3 Geopolitical shifts driving greater uncertainty and volatility

4 Growing interplay between climate change and food systems

1 Rise in income and expenditure, changing consumer food preferences

India's remarkable economic growth over the past few decades has led to an increase in disposable incomes. By 2030, it is projected that 50% of Indian households will have an annual income exceeding INR 5 lakhs (in constant prices), indicating a substantial rise in affluence across various socio-economic segments[1].

Rising affluence in Indian households



Note: 1. Annual household gross income are based on 2018 prices
Source: CCI proprietary income database, BCG analysis

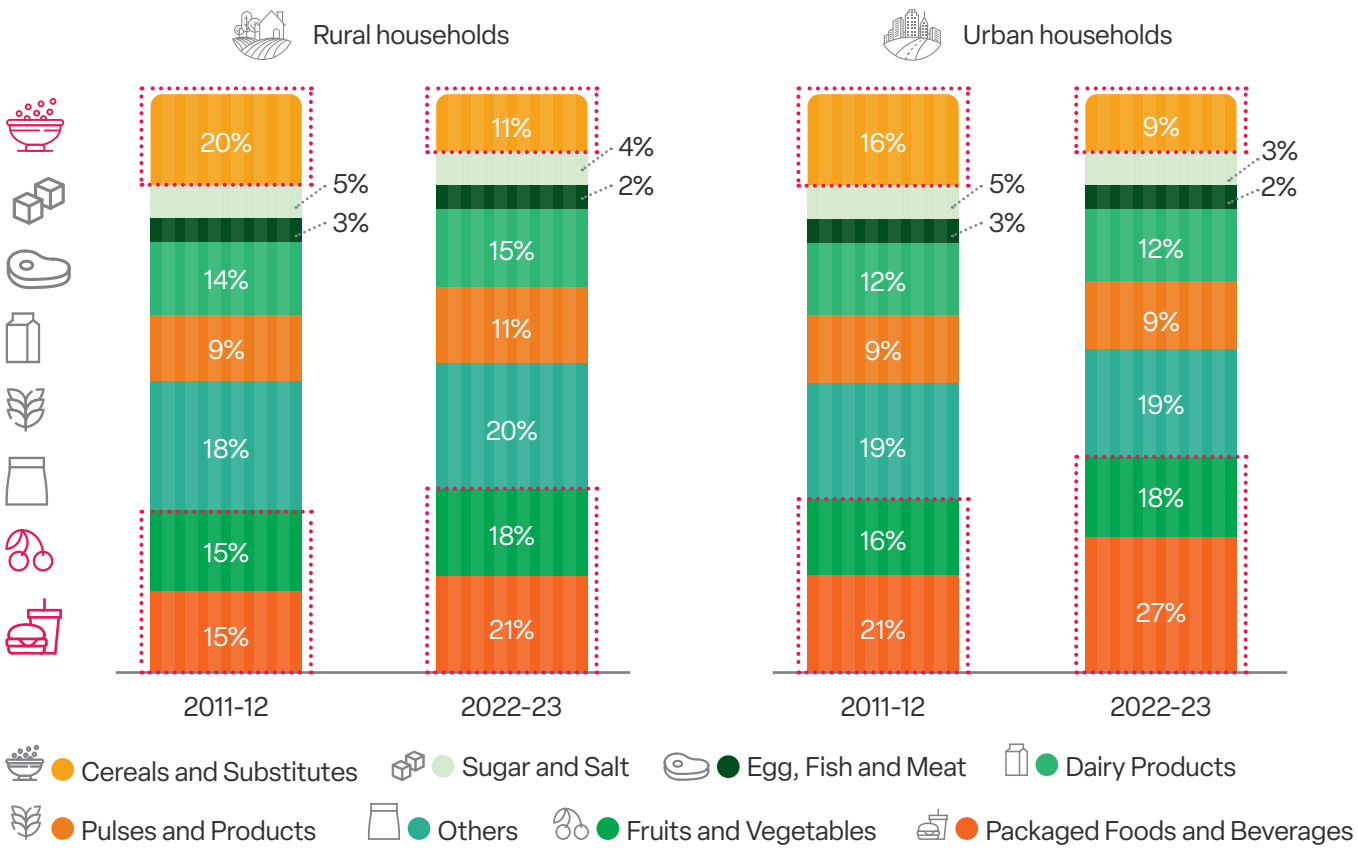
1. BCG Center for Consumer Insight (CCI)

Rising affluence will inevitably lead to increased consumption and expenditure across categories, including food. This is evidenced by the fact that in the last ten years, the absolute monthly expenditure on food has more than doubled in both rural and urban households, as per the latest Household Consumption Expenditure Survey[2].

Additionally, there has been a significant shift in spending across food categories:

- Share of expenditure on cereals has decreased from 20% to 11% in rural households and from 16% to 9% in urban households[2].
- This reduction is mainly a result of increased consumption of packaged foods and beverages, along with a marginal increase in spending on fruits and vegetables.
- Expenditure on packaged foods and beverages has increased from 15% to 21% in rural households and from 21% to 27% in urban households[2].
- Spending on fruits and vegetables has risen from 15% to 18% in rural households and from 16% to 18% in urban households[2].

Shift in monthly household consumtion expenditure across food groups in the last ten years



Source: Household Consumption Expenditure Survey: 2022-2023

With rising income levels and changing consumer preferences, we are likely to see the continued evolution of the food basket towards more fruits and vegetables, dairy and meat, in addition to a greater demand for packaged foods.

2. "Survey on Household Consumption Expenditure", 2022-23, by Ministry of Statistics and Programme Implementation

2 Increased awareness of health and nutrition

The global discourse on food has significantly expanded, encompassing a wide range of topics. Health, sustainability, and food security are emerging as prominent themes. An analysis of relevant media articles globally[3], sourced from top tier national, international and local news platforms, reveals that between 2019 and 2024, discussions around sustainability and food security increased ten-fold and five-fold, respectively.

Discussions about healthy foods continue to dominate with approximately one in every four articles addressing the effects of healthy eating. Sub-themes include superfoods, alternative protein sources, gut health, and organic foods. Additionally, there is a growing emphasis on food wastage, underscoring the significant disparity between food produced and food reaching the end-consumer.

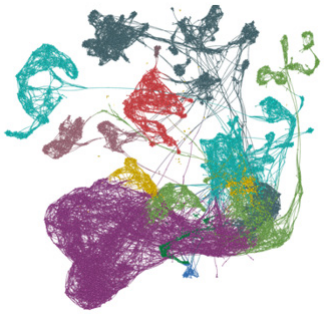
Thematic cluster maps of food systems over a period of five years

5 years ago (2019)*
Only ~1k article



Analysis of press articles from global top tier news sources

..Now (2024)**
~4k articles



Themes	Number of press articles 2019*	2024**	
Sustainable Agriculture and Food Production	51	598	10X
Food Security	162	726	5X
Healthy Foods	332	1162	4X
Superfoods	*78*	*449*	
Alternative Protein Sources	*58*	*183*	
Gut Health	*33*	*161*	
Organic Food	*34*	*74*	
Others (Olive Oil, Energy Drinks, etc.)	*80*	*191*	
Urban Farming	139	457	
Food Waste and Recalls	60	195	3X
Food Labels and Certifications	100	184	2X
Processed and Packaged Foods	72	157	
Food Prices	19	58	
Others	175	348	

3. Thematic cluster maps formed basis analysis of press articles globally sourced from top tier national, international and local news sources
*Jan-June 2019; **Jan-May 2024; BCG Center for Growth and Innovation Analytics (Quid)

Overall, this indicates a growing awareness of the key themes of health, nutrition, and sustainability of food systems with green shoots being observed in India.

3 Geopolitical shifts driving greater uncertainty and volatility

Geopolitical shifts and global conflicts are on the rise worldwide. These events are significantly impacting global agricultural trade by increasing shortages, inflating prices, causing volatility in commodity markets, and exacerbating food insecurity. Hence, it is essential for countries to reevaluate their food sufficiency strategies to ensure stability and resilience.

India's dependency on imports has increased for several key food groups, notably pulses and vegetable oil, which are crucial for the future food plate. The value of pulses and vegetable oils imported has approximately doubled in the period 2019 - 2023, with pulses rising from $1.2 Bn to $2.0 Bn[4] and vegetable oils increasing from $9.8 Bn to $20.8 Bn[5].

This import of essential commodities makes us vulnerable to geopolitical shifts. An instance of this occurred with the onset of the war in Ukraine in early 2022 which disrupted the global supply of sunflower oil, leading to a sharp rise in prices for nearly all vegetable oils across the globe[6]. India, being one of the major importers of sunflower oil, was impacted by the increase in sunflower oil prices by 17%, soya oil prices 16%, and plam oil prices by 21%, during this period[7].

Hence, it is crucial to reassess India's crop profile with a focus on food sufficiency, as the nation grows further, both in size and income.

4 Growing interplay between climate change and food systems

India finds itself in the midst of a growing global climate crisis, grappling with environmental impacts such as rising temperatures, changing precipitation patterns, and rising sea levels.

Climate change poses a significant threat to agricultural yields. According to the Indian Council of Agricultural Research, rainfed rice yields could decrease by up to 20% in 2050 without active climate adaptation measures, with similar trends in irrigated rice, wheat, and kharif maize, thereby jeopardizing India's food security[8]. There is a critical need for robust, proactive measures to enhance adaptive capacities across vulnerable regions, ensuring that resilience-building and sustainable development go hand in hand.

At the same time, food systems themselves are a significant contributor to the climate crisis, contributing approximately 30% of GHG emissions and consuming 70% of the fresh water in the world[9]. Additionally, 14% of the food produced in India is lost and wasted across the supply chain and at the household level[10]. This quantity, if salvaged, could provide for nearly one-third of India's population[11]. Lowering food waste will not only contribute to fulfilling the growing population's requirements but also protect natural resources and minimize GHG emissions.

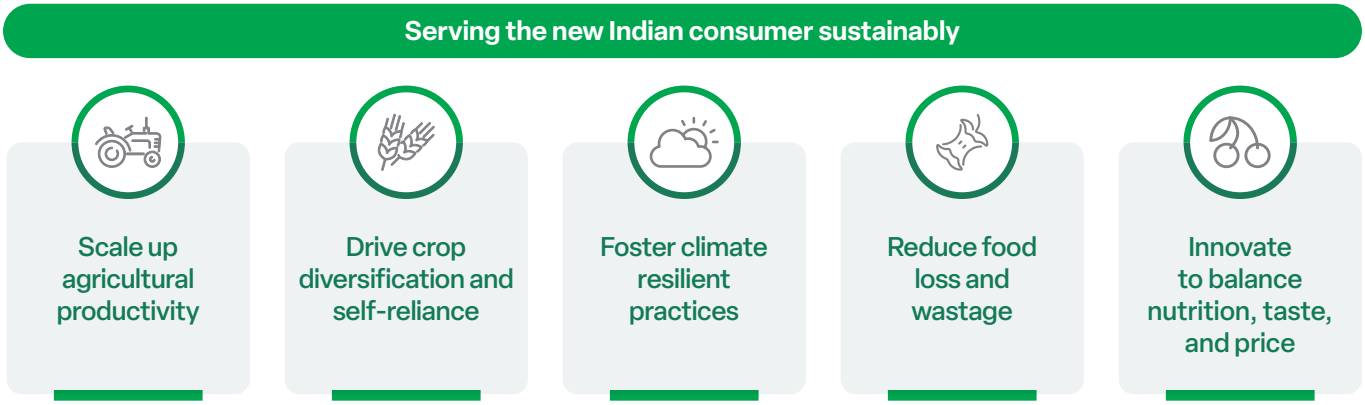
Building a resilient food system that can withstand the impact of climate will be critical to achieving India's food security goals.

4. "India Import Statistics for Pulses", 2019-2023, AgriExchange Trade Portal, APEDA, Government of India
5. Report on "Agricultural Statistics at a Glance", 2019-2022, Department of Agriculture and Farmers Welfare, Ministry of Agriculture and Farmers Welfare
6. "The Impact of the Ukraine Crisis on the Global Vegetable Oil Market", 2022, International Food Policy Research Institute (IFPRI)
7. FCA Information Portal, Department of Consumer Affairs
8. "Study by National Innovations on Climate Resilient Agriculture", 2021, under Ministry of Agriculture and Farmers Welfare
9. "Brief on healthy diets from sustainable food systems",2019, by EAT-Lancet Commission
10. "Study to determine post-harvest losses of agri produces in India", 2022 by Ministry of Food Processing Industries and NABCONs; "Food Wastage Index Report", 2024 by UN Environment Programme
11. BCG Analysis: Annual food wastage as a percentage of annual dietary intake as per ICMR

The imperative: Serving the new Indian consumer sustainably

As highlighted in the megatrends, the consumer food plate is expected to undergo significant evolution in the coming years due to rising affluence and changing consumer preferences. Additionally, the escalating risks posed by climate change and geopolitical factors to food production and supply emphasize the urgent need for a transformation of food systems. This transformation is essential to ensure the fulfillment of food and nutrition security in an innovative and sustainable manner.

This holistic transformation of the food systems will entail **five imperatives across the food value chain**, starting from agricultural production, to processing by companies, to reduction in food loss and wastage and end consumption.



1. **Scale up agricultural productivity:** As the land under agriculture is expected to either remain the same or decline, it becomes imperative to enhance agricultural productivity to fulfill the food and nutrition requirements of India's expanding population. Currently, Indian farmers yield an average of only 25 tons of tomatoes per hectare, significantly lower than the impressive 400 tons per hectare achieved by farmers in the Netherlands, as per FAOSTAT data[12]. Bridging this productivity gap is crucial for ensuring food security and catering to the needs of a growing populace.
2. **Drive crop diversification and self-reliance:** As consumer preferences lean towards healthier options like pulses, fruits, and vegetables, and considering geopolitical shifts, ensuring local production of key imports such as oilseeds and pulses becomes important. Embracing widespread crop diversification becomes important to cater to the evolving consumer food requirements, as the nation expands in both size and affluence. This transition demands equipping farmers with insights into suitable crops for their specific agro-ecological zones, alongside providing them with training in cultivation techniques. Furthermore, establishing robust market linkages and processing infrastructure is imperative for the successful execution of this initiative.

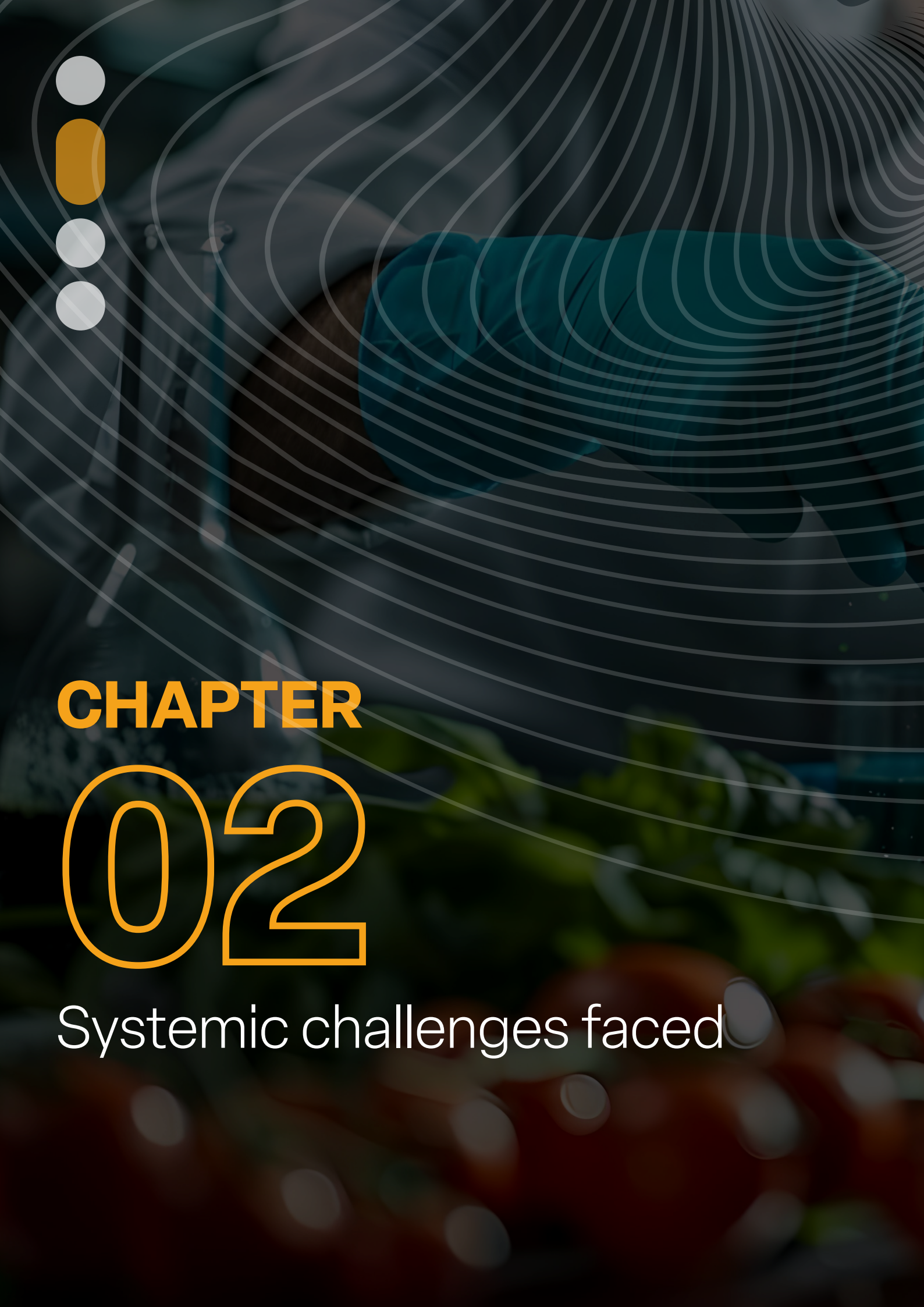
12. Food and agriculture statistics 2022, by Food and Agriculture Organization (FAO)

3. **Foster climate resilient practices:** Implementing sustainable agriculture practices is essential for safeguarding yields from future climate change impacts while enhancing current outputs. These practices also aid in replenishing and protecting vital natural resources, i.e., soil and water, thereby enabling farmers to cultivate their land multiple times a year. This increase in cropping frequency, coupled with diversification into key food groups, will help boost overall production across food groups.

4. **Reduce food loss and wastage:** Currently, India faces significant food losses at various stages of the supply chain, from harvesting to final processing. It is estimated that approximately 6.5% of the food harvested is lost before it reaches the consumer[10]. These losses vary by crop type, with cereals experiencing losses of 4-7% and vegetables facing losses of 8-15%, as per the Ministry of Food Processing Industries. This underscores the urgent need for comprehensive interventions across the entire supply chain.

5. **Innovate to balance nutrition, taste, and price:** As the consumer plate evolves there is an increased emphasis on health but at the same time, taste and price are expected to continue as key drivers of purchase decisions. Innovation is the key to achieving this balance of delivering healthy and nutritious food while retaining taste, texture, and mouthfeel on one hand, and price point on the other.

10. "Study to determine post-harvest losses of agri produces in India", 2022 by Ministry of Food Processing Industries and NABCONs; Wastage excludes dairy and livestock



CHAPTER 02

Systemic challenges faced



Systemic challenges faced

As we work towards the transformation required to sustainably deliver to the new Indian consumer food plate there are four key challenges spanning the entire food value chain that need to be addressed.

1 High complexity for producers to achieve the trifecta of health, taste and affordability

For food companies to meet evolving consumer preferences, there is an increasing need to achieve the balance of health, taste, and affordability. While there is initial action on this front, there is scope to accelerate efforts across the following three dimensions:



Boost R&D efforts at an industry level: There is a need for increased collaboration and investment in research and development to ensure that innovation does not take place in silos and the entire ecosystem can benefit from innovation.



Improve pace of testing and commercialization: The necessary processes for testing, regulatory approval, and bringing new products to market can consume considerable time. This could hinder the industry's ability to innovate and respond swiftly to evolving consumer needs.



Drive consumer awareness about new/alternate products and ingredients: While consumers want healthier foods, most consumers are not fully aware of the benefits and availability of alternative food products and ingredients. There is a need to effectively educate the public on nutritional advantages, sustainability, and taste profiles, which is critical for increasing acceptance and adoption.

These multifaceted challenges highlight the need for collaborative efforts across various stakeholders in order to deliver nutrition in an innovative manner at scale.

2 Insufficient support for farmers to transition to the 'needed' agricultural practices

As mentioned earlier, the food systems transformation will necessitate substantial changes within the agricultural sector. The adoption of the 'needed' agricultural practices by farmers, including crop diversification, sustainable agriculture, and climate-resilient techniques, will be pivotal in driving sustained change.

Although initial efforts have been made in this direction by different stakeholders, farmers encounter five key challenges in transitioning to these 'needed' practices:



Lack of access to farm inputs and specialized equipment: Farmers face difficulties in obtaining essential inputs like high-yield variety seeds, bio-inputs, irrigation infrastructure, and specialized equipment like super seeders, seed drills, etc., which will play a key role in driving transition to sustainable agri practices and crop diversification.



Limited access to quality advisory services and continuous engagement: The absence of customized advisory services like input preparation and usage, cultivation techniques, pest management, and real-time weather updates makes it challenging for farmers to effectively implement new methods. Without continuous support and engagement, farmers may struggle to sustain these changes and may revert to traditional practices.



Inadequate understanding and access to subsidies: Many farmers are unaware of the subsidies that they can avail and the processes required to obtain them, leading to missed opportunities for financial assistance.



Unclear benefits / market opportunities: Farmers often struggle to understand the benefits of transitioning to new agricultural practices. They tend to seek immediate tangible benefits such as better prices, or improved market access, or improved yield in the same crop season – which may or may not happen in the short-term. Without a clear understanding of the benefits and adequate market access, the transition to new practices becomes less attractive and economically viable.



High cost of transition; losses in the short term: Transitioning to new agricultural practices can often result in short-term yield losses, and farmers typically lack support mechanisms to mitigate these losses. This financial strain, compounded by the need for new equipment and infrastructure, poses a significant economic burden. Without adequate financial support, the high costs can deter farmers from adopting food systems transformation practices such as sustainable agriculture, crop diversification to key food groups, etc.



3 Inadequate last-mile infrastructure and linkages for processing and storage leading to post harvest food loss and wastage

As discussed in the earlier sections, there is a significant amount of food lost across the supply chain. A majority of food losses occur at the farm gate, primarily due to inconsistent harvesting practices, often stemming from insufficient knowledge and mechanization among farmers. Additionally, discrepancies in primary sorting and grading by farmers lead to heterogeneous batches, resulting in portions of these batches being wasted or rejected. Beyond the farm gate, further losses are incurred due to inadequate storage and transportation infrastructure, as well as insufficient processing facilities. These issues cause delays in transporting, storing, and processing food, leading to spoilage and waste.

To summarize, three key challenges driving post harvest food loss in India include:

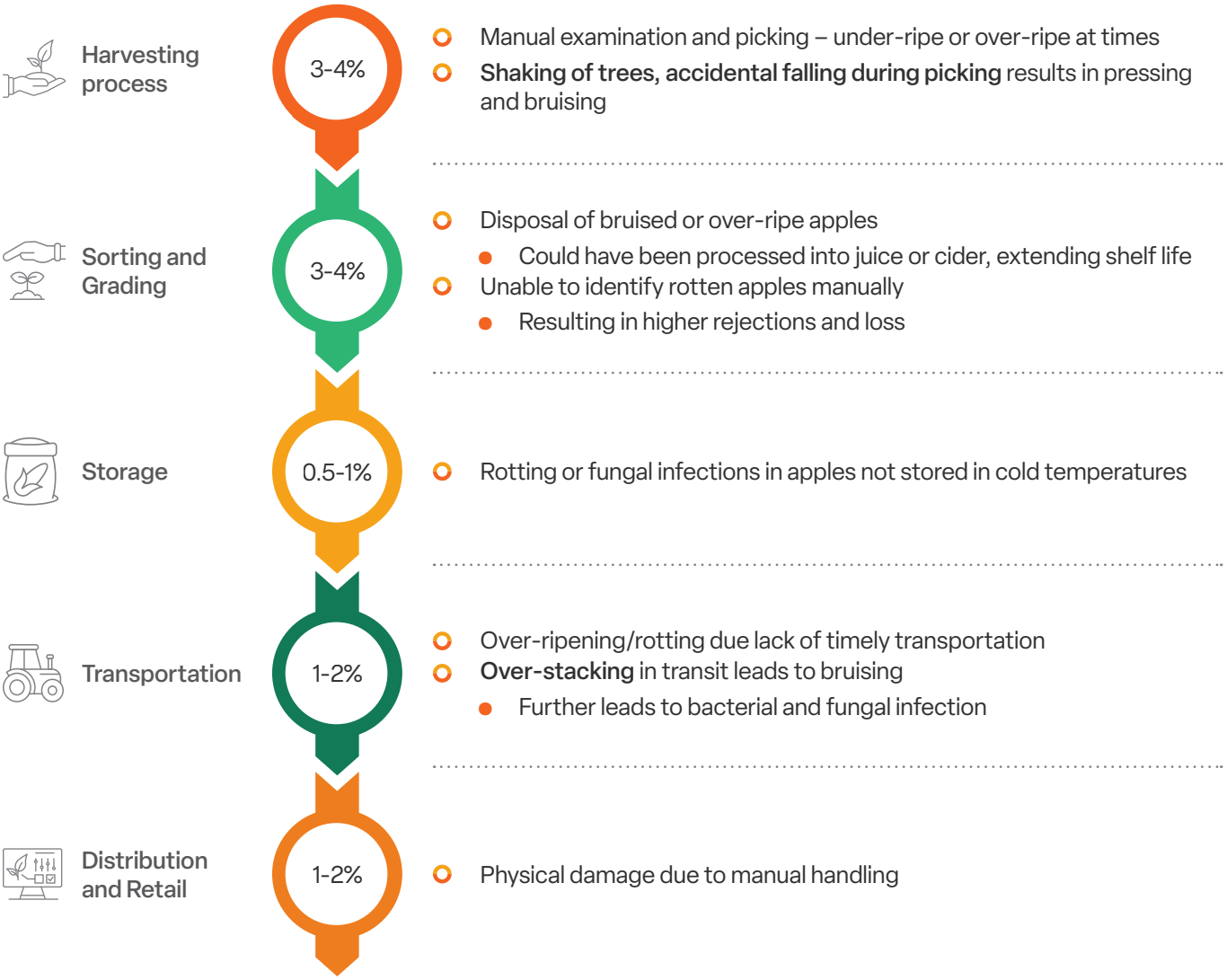
Low penetration of mechanization for harvesting: This leads to improper and rough handling, resulting in physical damage to the produce. For example, in cereals, manual harvesting causes splitting and shattering of grains. In the case of fruits and vegetables, damage happens due to hand pressing, the use of improper tools, or incorrect plucking methods.

Inadequate infrastructure for storage and transportation: There is limited access to adequate storage facilities, including cold storage, near the farm gate. Furthermore, insufficient transportation infrastructure results in delays, over-stacking, and, in some instances, the use of substandard transport methods. These issues collectively contribute to significant losses within the supply chain.

Absence of processing units close to the farmers: Timely processing of produce significantly extends its shelf life, preventing losses. This plays a key role especially for the lower grade produce that the farmer tends to discard (e.g., over-ripe fruits). With adequate processing facilities, even this produce could be salvaged and utilized effectively, reducing loss and maximizing returns for farmers.

An illustrative example of the apple supply chain is shared below to highlight the various challenges encountered across different stages of the supply chain.

10% of apples produced are lost on their way from farm to consumer



Source: "Study to determine post-harvest losses of agri produces in India", 2022 by Ministry of Food Processing Industries and NABCONs

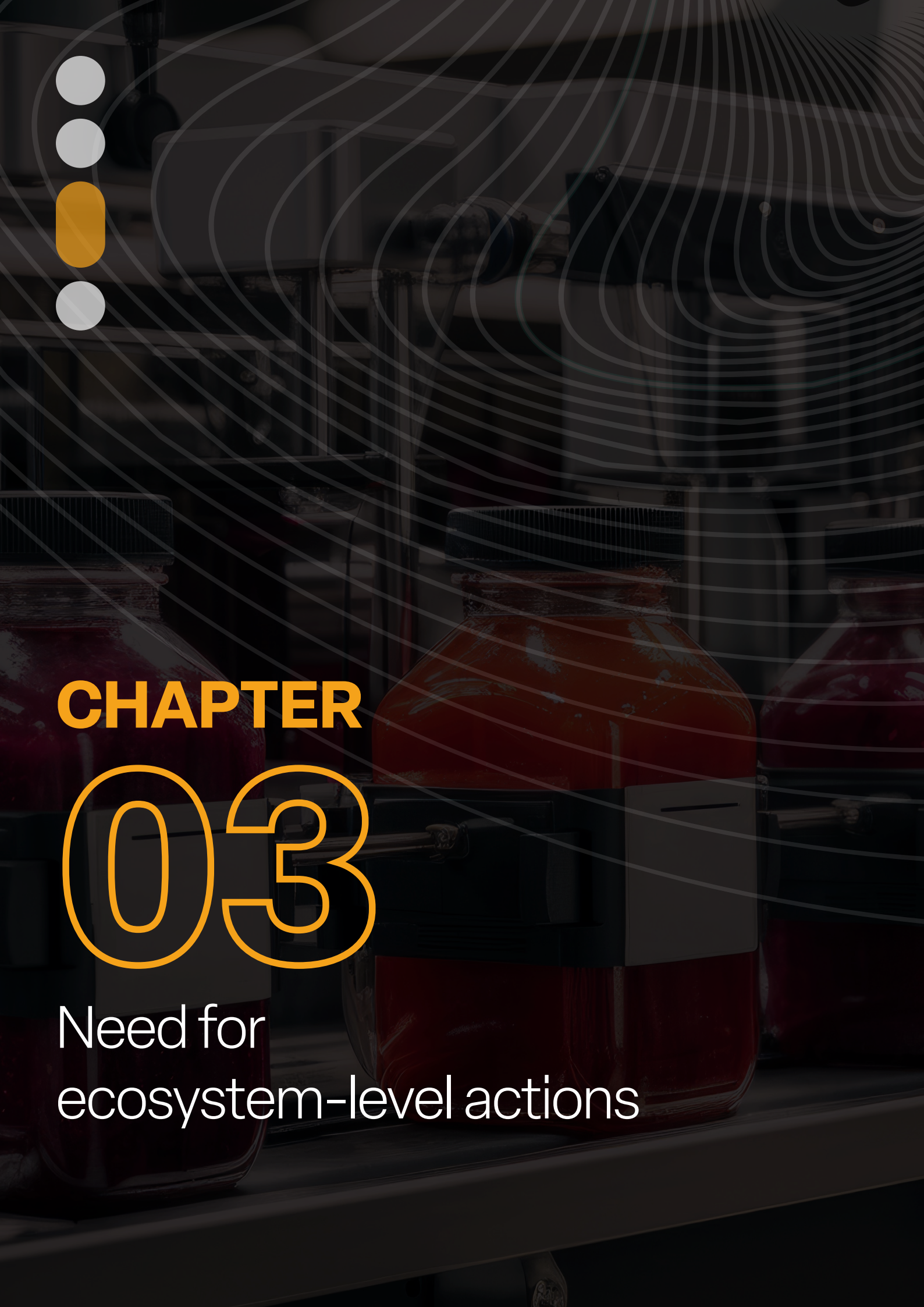
4 Limited economic viability for individual stakeholders to transition to new practices

The journey towards transformation—whether it involves innovating product formulations, adopting sustainable agricultural methods, or diversifying crops—often lacks short-term economic viability for individual stakeholders such as farmers or companies.

Additionally, while the costs may be borne by one stakeholder, benefits may accrue to another or to the ecosystem as a whole, further diluting the business case. Transitioning to sustainable agricultural practices involves substantial costs spanning (1) sustainable agri-inputs, (2) farm equipment, (3) certification cost, (4) last-mile field force for farmer capability development, and (5) compensations to farmers for potential yield losses during the transition period, for both farmers and companies. These costs can amount to approximately INR 50,000 per acre over the transition period of 3 to 5 years[12].

The initial financial investment, coupled with uncertain returns, acts as a deterrent to adopting new practices essential for the transformation of food systems.

12. Indicative example for transition to sustainable agriculture practices for rice.
Assuming a yield loss of 20% in year 1, 15% in year 2, 10% in year 3, and 5% in year 4, along with an increase in farm management and equipment costs by INR 600 per acre per year and additional expenses of INR 1000 per acre per year for advisory, training, auditing, and certifications.



CHAPTER 03

Need for ecosystem-level actions



Need for ecosystem-level actions

Each of the challenges highlighted requires a holistic ecosystem-level solution to ensure scalable and sustained transformation of the food systems. While various stakeholders may be addressing specific challenges individually, synergizing these efforts would unlock considerable value collectively and accelerate the transformation of food systems. This chapter discusses three key actions necessary to drive this transformation.

Ecosystem-level actions

Innovation	Develop Food Innovation Clusters to foster collaborative research & development, delivering people and planet positive nutrition
Landscape-Level Coalitions	Unite food ecosystem players into a 'Landscape-level Coalition' to enable coordinated efforts and access to shared extension cadre and infrastructure at the last-mile
Finance	Set up 'Food Systems Transformation Catalytic Fund' to systematically pool funds across organizations with aligned objectives

Action 1: Develop Food Innovation Clusters to foster collaborative research & development, delivering people and planet positive nutrition

As mentioned earlier, food companies encounter challenges in balancing health, taste, and affordability stemming from limited R&D infrastructure, the elaborate process of obtaining necessary approvals and subsequent market launch, and limited consumer awareness of new or alternative products and ingredients.

Though certain companies have managed to achieve this trifecta in isolated cases, achieving it on a large scale necessitates a comprehensive ecosystem-level initiative. Such an initiative would entail collaboration among various stakeholders across the food ecosystem, including the private sector, government, regulatory bodies, startups, and academia.

This can be enabled by establishing Food Innovation Clusters that bring together ecosystem players in a structured manner, facilitating the translation of research into commercially viable business opportunities.

Roles of Key Stakeholders in Food Innovation Clusters



The Food System Innovation Clusters can be orchestrated as a unique PPP model enabled by requisite policy frameworks developed by the government and spearheaded by the private sector allowing for synergies amongst all the stakeholders, capitalizing on their respective strengths.

Multiple clusters can be set-up basis diverse food-clusters, spread strategically across geographies in partnership with food research institutes and academic bodies, which can also provide state-of-the-art infrastructure as a common production facility.

Key stakeholders including food research institutes, academic bodies, corporates, and startups, can collaborate on extensive research and development, sharing their knowledge and expertise. This collaborative initiative, supported by the government, can also facilitate cross-border technology sharing. With integrated labs and certification bodies, the cluster can seamlessly translate research into the launch and commercialization of innovative products. Consumer education campaigns led by civil society and governments can also build awareness and trust in new products with market access programs enabling companies to finally bring innovations to market.

By uniting these efforts, a powerful ecosystem can be created, fueling innovation and transforming the food systems of India.

Action 2: Unite food ecosystem players into a 'Landscape-level Coalition' to enable coordinated efforts and access to shared extension cadre and infrastructure at the last-mile

Last-mile action at farm-level is crucial for achieving transformation in food systems. However, farmers cannot make this transition alone. Multiple stakeholders including the government, private sector, civil society, and NGOs are driving action on this front, but they often operate in silos.

A Landscape-level Coalition could be formed as a strategic alliance aimed at introducing transformational agriculture practices within a defined region, which could vary from a collection of villages or district level to larger territorial units with similar cropping patterns such as fruit and vegetable landscapes in certain hilly areas, the wheat-rice landscape in Punjab and Haryana, spice cultivation in Andhra Pradesh and Telangana, or maize farming in Karnataka and Andhra Pradesh.

The Landscape-level Coalitions could create significant synergies among the various stakeholders driving different farm-level interventions such as crop diversification, productivity enhancement, adoption of climate-resilient seeds, sustainable agriculture practices, mechanization for harvesting and sorting/grading, and processing. It could enable different stakeholders to exchange learnings, conduct data-backed research, share on-ground resources, and synchronize strategies to achieve economies of scale, thereby amplifying the impact on farmers.

Role of different stakeholders in Landscape-level Coalitions

Enhancing supply chain - logistics, storage, processing, market linkages

1. Consumer goods (food and beverages)
2. Processors
3. Traders
4. Logistics

Facilitating access to specialized inputs (bio-inputs, specialized equipment)

1. Agri inputs
2. Mechanization
3. Last mile institutions / agri entrepreneurs (input dealers, custom hiring centers, etc.)



Engagement, monitoring, and capacity building

1. NGOs/CSOs
2. Digital advisory solutions
3. FPOs/FPCs
4. Private players
5. KVK centers

Enabling access to affordable finance, grants and carbon credits

1. Government
2. Carbon credits marketplace
3. MDBs/DFIs/ Foundations
4. FIs/Banks

Advancing research, innovation, and impact evaluation

1. MRV platforms
2. Academic institutions
3. Precision Ag.
4. Govt. and Private sector R&D institutions

Roles to be played by various ecosystem stakeholders

Together, the multiple ecosystem stakeholders could play a crucial role in transforming food systems within the Landscape-level Coalition. Examples of value added at each stakeholder level are shared below:

- Food companies, processors, and traders could facilitate efficient supply chain movement, ensuring fair prices and reducing waste to enhance profitability.
- Agricultural input suppliers and mechanization companies could provide high-quality bio-inputs and tools to support farmers in their transition.
- Government agencies could shape policies and offer subsidies to promote farm-level initiatives.
- Financial institutions could provide access to funds to mitigate the economic losses involved in the adoption of any food transformation initiative.
- NGOs and community-based organizations could implement initiatives at the grassroots level through continuous education and training.
- Educational and research institutions could drive innovation and disseminate advanced technologies and practices.

The Landscape-level Coalitions could unlock synergies for the combined ecosystem in several ways. Some examples are shared below:



Shared last-mile cadre of farmer support workers: A shared pool of local skilled extension workers could be established, accessible to coalition members, to foster trust and promote long-term change among farmers. They could be equipped with digital tools that would enhance their ability to provide timely and tailored advice.



Unified farmer communication with customized practices: Research-backed package of agricultural practices could be developed, tailored to requirements, to ensure consistent and clear communication with farmers, preventing any confusion or mistrust.



Common storage and processing infrastructure: Resources could be gathered to set up shared infrastructure, reducing costs, promoting advanced technologies, enhancing product quality, and boosting local economies by increasing value addition and reducing post-harvest losses.



Enhanced credit access: Coalition could act as a central coordinator with banks and financial institutions to streamline and accelerate access to credit for coalition-related projects.

A robust anchor is essential for translating these ideas into action within the Landscape-level Coalition. Private sector entities, working in tandem with development organizations, could serve as effective anchors, facilitating integration with stakeholders along the value chain as well as local governmental and non-governmental organizations.

Action 3: Set up 'Food Systems Transformation Catalytic Fund' to systematically pool funds across organizations with aligned objectives

As previously outlined, there is limited economic viability at individual level to transition to new practices. While it is encouraging to see that multiple stakeholders are deploying funds to initiate the transition; however they are operating in silos.

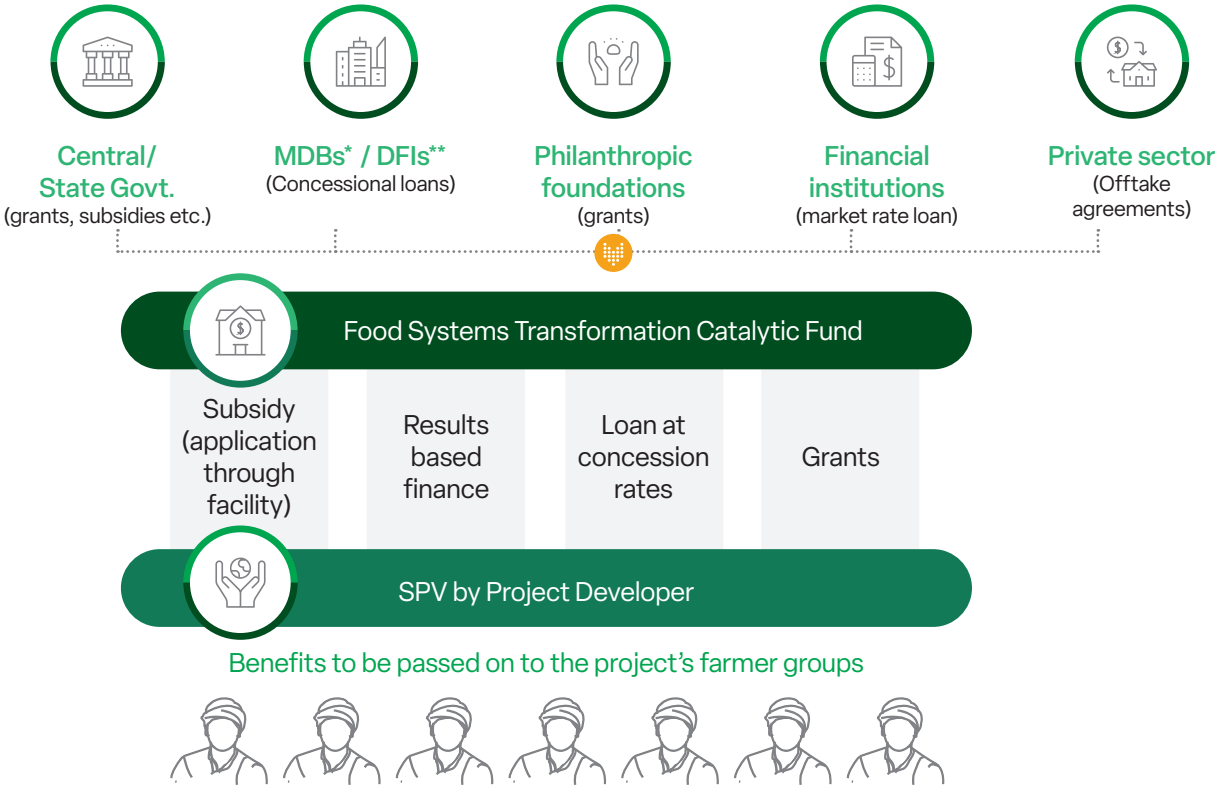
For example, sustainable agriculture is a key priority for multiple ecosystem players – such as the government, private sector, development financial institutions, and civil society organizations – but each of them is deploying their capital in disparate ways.

- Central Government's National Mission for Natural Farming provides financial assistance of INR 15,000 per hectare to farmers, among many more schemes
- Leading private players driving sustainable agriculture efforts in the country
- Multiple development organizations are providing concessional debts and grants

A systematic pooling of funds across organizations with aligned objectives within the Food Systems Transformation Agenda (innovation, crop diversification, sustainable agriculture, etc.), can help unlock economic viability for the stakeholders involved. A Food Systems Transformation Catalytic Fund could be established to enable this movement.

A Catalytic Fund would serve as an integrated financial mechanism designed to aggregate and coordinate multiple streams of funding including government schemes, subsidized loans, concessional loans, philanthropic grants, market debt from private institutions, and CSR contributions. By pooling these resources, the fund can provide a more substantial and cohesive financial package to support comprehensive and large-scale projects aimed at food systems transformation.

Framework of Food Systems Transformation Catalytic Fund



*Multilateral Development Banks, **Development Financial Institutions

Combining the aforementioned disparate sources of financing can result in a significant pooling of funds, enabling a 10-20x leverage on public funds committed to transformation projects. Project developers, could present their business cases and apply to this fund to secure low-cost funding for their transformation initiatives, without the need to approach multiple players in the ecosystem. The fund could also provide access to Technical Assistance via intermediaries for last mile assistance and execution of the transformation projects.

Setting up of such a fund could provide multiple benefits to projects aimed at food systems transformation:

- A streamlined, one-stop shop for funding, eliminating the need to approach multiple entities.
- A signal of project viability to potential private sector investors, increasing leverage possibilities.
- Access to technical assistance through partnerships with various intermediaries and stakeholders. This support is crucial for the successful on-ground implementation of projects, ensuring that they meet their defined goals.

This Food Systems Transformation Catalytic Fund can be set up as an Alternative Investment Fund to crowd in capital from multiple sources and could be housed under an existing government institution or could be set up as a separate government company.

By structuring it in this manner, the fund can effectively coordinate and leverage various financing sources, ensuring a streamlined and impactful approach to achieving food systems transformation.

Summary and conclusion

India is on the brink of a major transformation in its food systems, fueled by rising affluence and shifting consumer preferences. This dynamic environment offers a substantial opportunity for India's food systems to lead the charge in providing sustainable, healthy, and nutritious food to the population.

But there are critical challenges in the agri-food value chain that concern industry stakeholders in this regard. While stakeholders tackle individual issues, integrating these efforts to holistic, ecosystem-level solutions is key to unlocking significant value and accelerating progress towards a scalable and sustained food system transformation.

The creation of food innovation clusters and a coordinated landscape-level coalition, supported by a transformation catalytic fund, will foster a resilient food system capable of sustainably meeting the demands of a growing population.

It's important to remember that these are initial steps and will require a strategically coordinated effort from both the industry and the Government.



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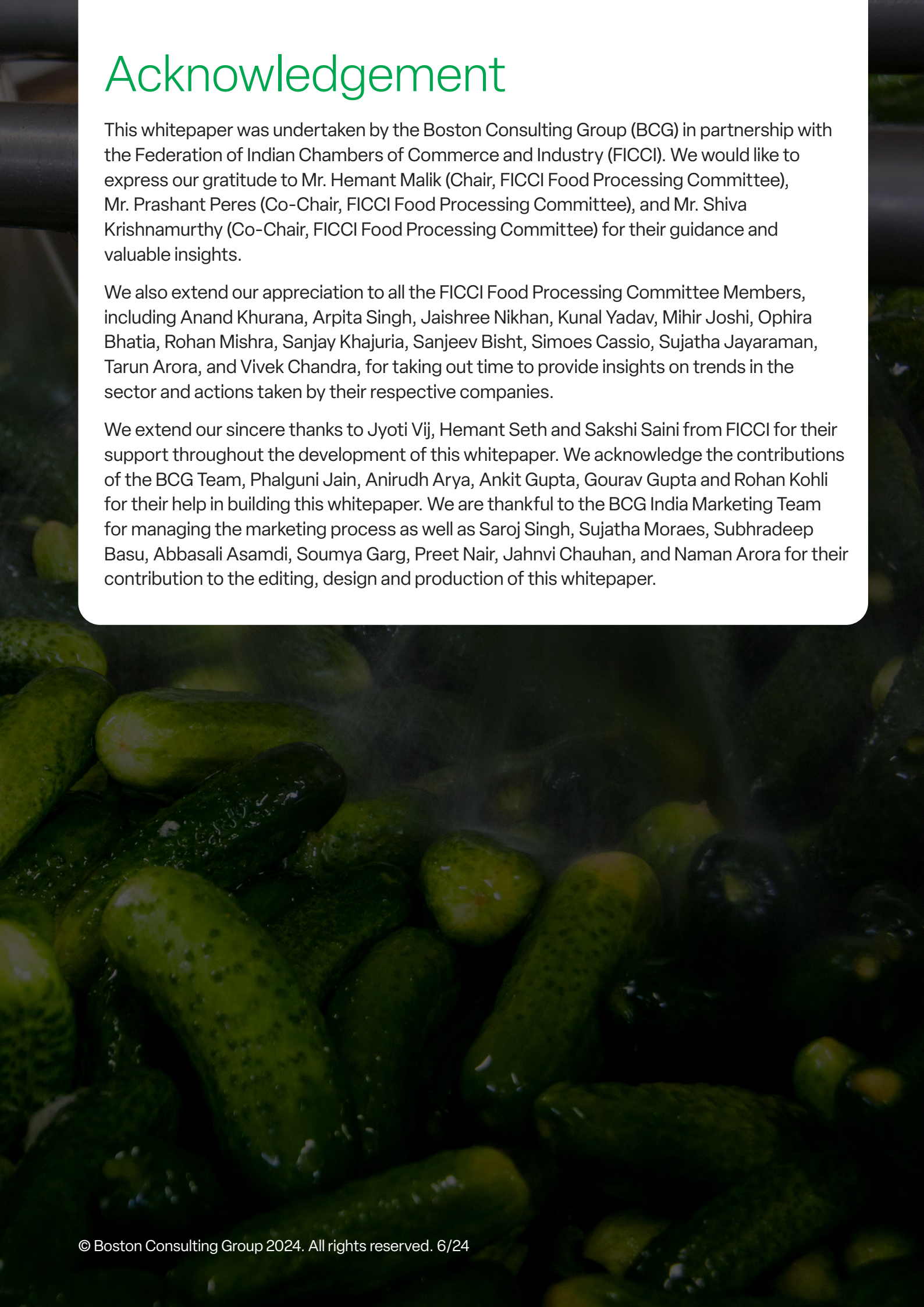
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