



Making India the Global Food Hub

Key Imperatives











FOREWORD



The socio-economic and demographic landscape of India has undergone profound changes, catalysed by rapid urbanisation, robust economic growth, and evolving societal dynamics. These changes have significantly influenced dietary preferences and food consumption patterns across the country. India's spend on food is reflected in MOSPI's Monthly Per Capita Expenditure data, revealing that Indian rural and urban households allocate 46% and 39% of their overall budget to food respectively. Out of this food related expenditure, the maximum spend is towards high value food items such as -beverages and processed food (including purchased cooked meals); fruits and vegetables; and milk and dairy products.

On the supply side, while India is amongst the largest producers of agricultural produce, challenges persist across the agricultural value chain, affecting efficiency, sustainability, and overall economic resilience of the sector. Factors such as low farm-level productivity, inadequate post-harvest handling infrastructure, high logistics cost, low levels of food processing and lack of alignment with international market requirements hinder India's true potential to serve as a global food hub. There is an imminent need for strategic interventions to enhance efficiencies, reduce wastage, and ensure equitable distribution of benefits across the agricultural value chain.

Keenly aware of the existing challenges and imperatives to overcome them, the Government of India has taken up significant initiatives to boost the growth of food and agriculture sector in the country. Significant efforts have been put in for developing an end-to-end support system that supports enhancement of farm productivity and farmer incomes, link farmers to markets, promote value addition and exports, foster sustainability and climate action; and enable ease of doing business.

The role of the private sector in boosting growth and development of the food and agriculture sector has been pivotal. Through investments in research, technology, infrastructure, and sustainable practices, private enterprises are not just contributing to sectoral growth but also aligning their strategies with changing consumer demand and global sustainability benchmarks. Efforts are needed to further boost private sector interventions in the sector, through promoting private investment in agriculture research and extension services, supporting introduction of innovative technologies, promoting farmer-level sustainability initiatives, incentivising investment in agri infrastructure, and creating an enabling policy environment including for exports.

YES BANK is sincerely committed to playing a catalytic role in the development of Indian food and agriculture ecosystem, not just by serving as a trusted banking partner but also by working alongside private sector, multilateral institutions, government and industry associations for assimilation and propagation of knowledge that contributes to sustainable growth of this ecosystem. Towards this endeavor, YES BANK is pleased to partner with AMCHAM to release this Knowledge Report titled "Making India the Global Food Hub – Key Imperatives". This report provides an overview of the evolving food demand trends in India and the agriculture sector's response to these evolving demand trends. It highlights India's innate potential to become the global food hub, identifies specific bottlenecks hindering growth, and suggests select interventions that, if implemented will significantly boost sustainable growth and development of the Indian food and agriculture sector. I sincerely hope that this report will serve as a reference document to inspire actions and pave the way for transformative changes that will position India as the Global Food Hub.

Prashant Kumar

Managing Director & CEO YES BANK

FOREWORD



As India embarks on the journey to become a \$5 trillion economy, the role of agriculture and food production emerges as a cornerstone of this journey. With a population exceeding 1.4 billion, India's agricultural sector not only sustains millions but also presents a vast opportunity to contribute significantly to the global food supply chain.

India is in her Amrit Kaal phase, and under the leadership of the Hon'ble Prime Minister, the vision of Viksit Bharat aims to propel India to greater heights on the global stage. The agriculture and food sectors serve as prime pillars of the Indian economy and fundamental in ensuring food and nutritional security of the nation. The sectors are presently undergoing a technological revolution which is elevating the entire food supply chain. U.S. companies in India have always established themselves as strategic partners and contributors to the Indian agriculture and food processing sector. The two nations can collaborate to promote win-win agriculture that could address global food challenges. Tremendous opportunities are available for mutual collaboration in the field of AgTech, science and technology, R&D, information exchange, trade and sustainable climate solutions. U.S. industry has the technology and resources to convert potential into tangible outcomes.

With evolving consumer preferences and increased use of technology, the imperative to exploit India's vast potential in the twin sectors of agriculture and food processing has catapulted. With diverse climatic conditions across the country, a substantial work force, emerging technologies and the ever-evolving policy environment, India is on track to enhance the country's global market presence in agriculture. New cutting-edge digital practices and models that effectively link farmers to markets are just a couple ways industry has championed the focus on sustainability in the sector.

Some challenges remain, such as inadequate feed and fodder availability that prevent more growth across the agricultural supply chain. Pre-harvest infrastructure deficiencies which lead to substantial food wastage impacts farmers, as well as the ability for India to climb even higher in exports. There is a need to harmonize food quality benchmarks with international standards.

The Government of India has taken a number of initiatives that aid towards productivity and enhancing farmers' income, linking farmers to markets, boosting exports, fostering innovation and technology, among others. U.S. companies have been significant partners in the growth of these sectors and are committed to bring the best technology while continuing to gainful employment. U.S. industry in the agriculture and food processing sector will continue to collaborate with agri-tech start-ups, use technology to map challenging weather, provide apps with training for farmers, reduce water usage across the supply chain and use AI and machine learning to increase crop yields, among other initiatives, that all contribute to making India the global food hub.

Ms. Ranjana Khanna Director General CEO AMCHAM India

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Executive Summary

India's Agricultural landscape is diverse and complex, shaped by a variety of factors including geography, climate, culture and technology. The sector is one of the prime pillars of Indian economy and fundamental to ensuring food and nutritional security of the nation.

In recent decades, Indian agriculture has witnessed notable progress propelled by various private & public initiatives and policy measures. This positive momentum is multifaceted and spans across production, productivity, diversification, value addition and exports, showcasing a comprehensive uplift of the sector.

India has also witnessed significant evolution in its socio-economic and demographic profile. Rapid urbanization, economic growth and social transformations have played key roles in shaping this. This evolution has had a significant impact on the food consumption basket of India. Over the last two decades (2002-22), India's population increased by about 30%, driving food demand significantly. During



Source: PIB, Department of Agriculture and Farmers welfare, United Nations

the same period, proportion of urban population to total population increased from 28% to 36% and the per capita net national income witnessed an increase of over 139% (between 2001-02 and 2022-23), impacting and shaping the way people eat and spend on food.

According to the FAO-OECD estimates, India is set to surpass China as the primary driver of global food demand over the next decade. While China contributed to 28% of the demand increase over the past ten years (until 2023), this figure is projected to fall to 11% in the coming decade. Conversely, India's share is expected to rise from 13% to 20%. This forecast is based on anticipated population decline and stagnating incomes in China, compared to population growth and improving living standards in India.

A review of the Monthly Per Capita Expenditure (MPCE) data (2022-23) published by the Ministry of Statistics and Program Implementation (MoSPI) indicates that Indian rural and urban households spent 46% and 39% of their overall budget on food respectively. Interestingly, out of this total food expenditure done by both, urban and rural consumers, the maximum spend is on beverages and processed foods (including purchased cooked meals), followed by fruits & vegetables, and milk & milk products. For the first time, the share of beverages and processed food (including purchased cooked meals) in the total spending of rural Indian households has crossed that of cereals.





The MPCE trend analysis (2011-12 and 2022-23) also reflects a notable growth in the per capita spend on high value products such as beverages and processed food, fruits & vegetables, milk & milk products, outpacing the growth of cereals and pulses, in both urban and rural areas. In line with these dynamic shifts in consumer preferences, Indian agriculture as well as the food processing industry have responded well by reshaping production, embracing diversification and offering a wide array of food choices to consumers. Chapter 1 of this report captures these food transformations and the role and response of agriculture and food processing sectors therein. This chapter captures an analysis of the Gross Value of Output (GVO) of various agricultural sub-sectors (2022-23), which indicates that the GVO of animal products has surpassed that of food grains and sugar crops, growing at a rate of 12% (CAGR from 2012-13 to 2022-23), as compared to 8% growth in foodgrains & sugar crops, during the same period. Spices and condiments witnessed the highest growth (17%), followed by fisheries & aquaculture (15%) and fruits and vegetables (10%). This increase in output has been driven by increase in production, productivity, area under cultivation and irrigation across key sub sectors. The surplus production has not only helped meet the demand of growing population and changing dietary preferences, but has also contributed to increased food processing and global trade.

The food processing industry has also dynamically responded to consumer demand and expenditure trends by continuously innovating to offer meals, snacks, beverages and convenience foods that save time and cater to the busy lifestyles of consumers. There has also been a clear emphasis on healthier processed foods and safety standards for which the food processing companies have been investing in advanced processing technologies and quality control measures. This has not only increased processing levels in India, but also enhanced the country's global market presence. While India's agri exports reached USD 53 Bn in 2022-23, contribution of processed food accounted for an impressive 25% of this total.

The future, however, will demand more. A diverse set of macrotrends are redefining the ask from Indian agriculture. Chapter 2 of this report captures these macrotrends and highlights India's strengths and factors that collectively contribute to making India one of the world's leading agricultural nations. On the consumption front, food demand is intensifying, and the changing demographics are impacting buying and consumption patterns, driving demand for convenience food, healthier alternatives, sustainably grown products and aspirational food choices. As per the latest United Nations' estimates, India's population surpassed that of China, reaching 142.86 crores in 2023 and is projected to reach 166.8 crores by 2050. Urbanization is expected to increase from the present 36% to nearly 52% by 2050. To meet this growing demand, food production will need to increase significantly. Food grain production will need to increase from current levels of 309 Mn MT (2022-23) to 400 Mn MT by 2050. For a food secure future, a transformational jump in productivity, bringing efficiencies in food chain and value addition will remain critical.

While India's productivity for major categories has shown marked improvement in the past decades, the opportunity for further improvement is immense. India's productivity of various food categories when compared to other countries stands much lower, indicating a wide gap that can be filled with improved technology and good agricultural practices.

This chapter of the report also highlights India's strengths and factors that collectively contribute to making India one of the world's leading agricultural nations. India currently produces more than 1 billion MT of crops and is the second largest producer of crops in the world. India also possesses the largest livestock population making it the largest milk producer globally. Diverse climatic conditions, substantial labour force, emerging technological advancements and conducive policy environment are some of the key aspects that are collectively contributing to building a robust agricultural sector in India. This chapter captures key factors that are propelling sustainable growth of the agricultural sector- including growing demand for nutritious food, adoption of new technologies & digital practices, evolving farmer-market linkage models, proactive & supportive policy ecosystem, growing private sector participation and increasing focus on sustainability.





Chapter 3 of the report delves into various bottlenecks impeding growth across the agricultural supply chain, encompassing challenges from farm level, to post harvest management, processing, value addition and exports. At the farm level, challenges include low productivity and poor financial viability of farms, inadequate access to highquality seeds and genetic stock, crop loss due to pests, limited adoption of advanced agricultural technologies and lack of awareness and access to effective natural resource management practices amongst others. Like crops, dairy sector also suffers from low productivity levels, largely on account of inadequate feed and fodder availability, limited reach of modern veterinary care and low Artificial Insemination coverage. For poultry, the ground level challenge remains on the availability and high cost of feed, improper breeding conditions, lack of awareness on usage of unwarranted substances in feed and frequent disease outbreaks.

Post-harvest infrastructure deficiencies contribute significantly to inefficiencies in the agricultural supply chain. Inefficient post-harvest handling practices exacerbate losses. From improper sorting and packaging to inadequate storage facilities, these shortcomings lead to a substantial percentage of the harvested crops being wasted or degraded before reaching consumers. This not only impacts farmers' incomes but also contributes to global food loss and wastage. On the processing front, processing levels remain low, that stem from various challenges, including the absence of economically processable varieties and underutilized processing capacities. Also, inadequate testing capabilities complicate quality assurance and compliance with standards.

For exports, tariff and non-tariff barriers, combined with a lack of alignment with international market needs, pose significant challenges. Logistics cost in India is 30-40% higher than global benchmark, adding to overall costs and impacting competitiveness. Regulatory challenges with respect to technology registrations, product approvals, ad hoc bans and differential taxation also impact efficiency and overall profitability of the agricultural and food processing sector.

To overcome these challenges, it is essential that public and private sector stakeholders focus on certain key imperatives that can boost sustainable growth of the Indian agriculture. Chapter 4 of this report captures these key imperatives, which include:

- Productivity & farmer income enhancement The interplay between enhanced productivity, increased income, and sustainability drives long-term growth in the agricultural sector. It not only benefits farmers directly but also has ripple effects on broader economic, social, and environmental aspects, making it a key imperative for sustainable development.
- Linking farmers to markets Efficient market linkages contribute to a more streamlined supply chain, resulting in reduced post-harvest losses, ensuring that more produce reaches consumers, reducing wastage, and enhancing overall sustainability. Farmers, when linked to markets, also align their crop planning with market demand. Direct market access also provides opportunities for value addition to agricultural products.
- Value addition & Exports Value addition and exports play crucial roles in boosting sustainable growth of Indian agriculture. India aims to take its agricultural exports to USD 100 Bn by 2030. The growing production base, diversification, increasing focus on sustainability, regulatory ease and policy thrust is expected to enable India achieve its ambitious agri export target. This will also warrant a strategic shift towards exporting value added products including organic food products, ready to eat products, Indian traditional food products, superfoods, millet based processed products, nutraceuticals among others.
- Technology and Innovation Technology and innovation are fundamental for transforming Indian agriculture into a sustainable and resilient sector. Technological advancements, such as precision farming, automated machinery, new chemistries and improved irrigation systems, significantly increase agricultural productivity.





Innovations in agriculture technology enable more precise resource management. This leads to reduced wastage, conserving water, minimizing environmental impact, and making agricultural practices more sustainable in the long run.

- Sustainability & Climate Action Integrating sustainability and climate action into agriculture is essential for mitigating climate risks, preserving resources, ensuring food security, and fostering the long-term growth and resilience of the agricultural sector.
- **Ease of Doing Business** A progressive, predictable and science-based policy and regulatory environment facilitates ease of doing business and is essential for driving growth, fostering innovation, and ensuring the sustainability of the sector. It empowers farmers and agribusinesses to navigate challenges more effectively and seize opportunities for development and prosperity.

This chapter also highlights various initiatives taken by the Government towards productivity and farmer income enhancement (through schemes like Pradhan Mantri Krishi Sinchai Yojana, Pradhan Mantri Fasal Bima Yojana), linking framers to markets (E-nam, Agri Infrastructure Fund), boosting value addition and exports (PLI, AHIDF, Agri export Policy), fostering technology and innovation (Atal Innovation Mission), focusing on sustainability and climate change (National Mission for Sustainable Agriculture, Green Credits Program) and propelling ease of doing business (Make in India, direct beneficiary transfers, Digital India).

Private players are also playing an active role in sustainable growth and development of Indian agriculture by working towards technology introductions, farmer extension services, market linkage initiatives and investments in post-harvest handling and processing infrastructure. This work has direct impact on at least 12 of the 17 Sustainability Development Goals if not more. A brief on activities that are being undertaken by the corporates and SDGs impacted have also been captured.

The concluding chapter puts forth various interventions that can boost private sector contribution to Indian agriculture. These include:

Promoting private investment in agriculture research & extension

The Government may evaluate tax incentives, grants, and subsidies to encourage private companies to invest in agricultural R&D and extension services. Simplifying regulatory processes for obtaining approvals related to agricultural research and extension activities, reducing bureaucratic hurdles for private entities and ensuring transparency and clarity in regulations to boost confidence among private investors in the food and agriculture sector. There is also a requirement to create knowledge sharing platform for information exchange and collaboration between private and public stakeholders including collaboration with research institutions. This may also include facilitating inter country (Indo-US) collaboration on topical issues including climate smart agriculture.

Supporting introduction of innovative technologies and products

A streamlined and digitized approach with a focus on protecting intellectual property rights (IPRs) may be implemented. Simplifying and expediting the licensing, registration, and approval process for introducing new agricultural technologies, single window system for submitting and processing licensing and registration applications can be a great step towards promoting efficiency and accessibility.





Promoting farmer level sustainability initiatives

Promoting farmer-level sustainability initiatives requires a dexterous approach. Incentivizing regenerative agricultural practices, building a carbon credit ecosystem that can reward farmers for sequestering carbon, reducing greenhouse gas emissions, and encouraging farmers to participate in recognized sustainability certification programs are some of the key initiatives toward promoting farmer-level sustainability initiatives.

Incentivizing investment in storage, logistics and processing infrastructure and providing an enabling policy environment

Extending successful Public Private Partnership models, incentivizing the establishment of cold chain and processing infrastructure to reduce post-harvest losses and streamlining the process of land allocation and land conversion for processing facilities are some of the measures that may attract significant private investments in this sector. An approach of providing customized incentives and support mechanism for different commodities can help mitigate the commodity specific challenges. A re-evaluation of the taxation slabs and inclusion of important sectors under key schemes like PLI can help boost food processing industry significantly. Collaborating with academic institutions and private sector partners to explore innovative solutions can enhance efficiency and reduce costs in the storage and processing of agricultural commodities.

Facilitating exports

To facilitate exports, there is a need to harmonize the food quality benchmarks with international standards. Government-to-Government (G2G) equivalence agreements, preferential rates and non-tariff barriers need to be continuously negotiated upon. Strengthening laboratories and testing facilities, conducting training programs for exporters, providing guidance on compliance with international standards and regulations can help exporters in taking informed decisions. Other approaches like developing targeted branding campaigns for Indian-produced products in specific destination markets and investing in market intelligence capabilities to understand the specific requirements and preferences of target destination markets can be very helpful to exporters.

Food transformation and response of agriculture



1.1 Food demand trends in India: The transformation

Over the past few decades, India has undergone profound changes in its socio-economic and demographic landscape. Besides growth in population and urbanization, the country has experienced significant GDP growth, fueled by reforms, investments, and a burgeoning middle class. Over the last two decades (2002-2022), India's population increased by about 30%, driving the food demand significantly. During the same period, proportion of urban population to total population increased from 28% to 36%¹. The per capita net national income witnessed an increase of over 139% (between 2001-02 and 2022-23)². Social transformations have accompanied these changes, influencing various aspects of Indian society. Education levels have risen, leading to greater awareness and aspirations among the population. Technological advancements have facilitated connectivity and access to information, transforming communication and lifestyle patterns. Demographically, India has experienced shifts in its population dynamics as well. India remains a youthful nation with a large proportion of its population under the age of 35. India's evolving socio-economic and demographic profile, is impacting and shaping the way people eat and spend on food.

Factors impacting food demand



Population, urbanization and increasing per capita income

Urban lifestyles, characterized by hectic schedules and changing work dynamics, have contributed to an increased reliance on ready-to-eat and fast-food options.



Rising health consciousness has prompted a greater emphasis on food safety, nutrition and wellness. This is reflected in increased consumption of organic and healthier food choices like millet based products, low/no sugar beverages, high protein/low crab products etc. Moreover, clean labelling and true claims have become important for consumers.



Mindful sourcing, sustainability and traceability have increasingly become an important consideration during food purchase for many consumers.



Exposure to global cuisines, either through travel or media, has broadened culinary preferences. This



Population, urbanization and increasing per capita income



is seen in the growing popularity of international cuisines and fusion food.

Changes in agricultural practices and supply chain dynamics also impact the availability and affordability of food items, influencing consumption patterns.



While traditional diets still hold significance, there is a coexistence of traditional and modern dietary elements, showcasing a blend of cultural heritage and contemporary influences.

¹ Censusindia.gov.in, UN data (2021 population)

² Per capita net national income at constant prices as per NSSO





According to the FAO, India is set to surpass China as the primary driver of global food demand over the next decade. While China contributed to 28% of the demand increase over the past ten years until 2023, this figure is projected to fall to 11% in the coming decade. Conversely, India's share is expected to rise from 13% to 20%. Forecasts for staple food consumption illustrate this shift. China's wheat consumption is projected to reach 147 Mn MT by 2033, a modest increase of 2.6% from the 2021-2023 average. In contrast, India's wheat consumption is anticipated to grow by 27.7% to 137 Mn MT, nearly matching upto China's consumption. A similar trend is observed with rice, where Chinese consumption is expected to remain stable while Indian demand is expected to rise significantly. This forecast is based on anticipated population decline and stagnating incomes in China, compared to population growth and improving living standards in India. This scenario necessitates prompt and decisive actions to optimize all value chains.

Source: FAO, OECD



Source: censusindia.gov.in, data.worldbank.org, economic survey 2022-23,

*Per capita net national income at constant prices as per NSSO & 2022-23 data is 1st Adv. est.

A review of the Monthly Per Capita Expenditure (MPCE) (2022-23) published by the Ministry of Statistics and Program Implementation indicates that Indian rural households spent 46%, while urban households spent 39% of their overall budget on food. Interestingly, out of the total food expenditure done by both the urban and rural consumers, the maximum spend is on beverages and processed foods (including purchased cooked meals), followed by fruits and vegetables, and milk & milk products. For the first time, the share of beverages and processed food (including purchased cooked meals) in the total spending of rural Indian households has crossed that of cereals.

The trend analysis (2011-12 and 2022-23) also puts forth a notable growth in the per capita spend on high value produce such as beverages and processed foods, fruits & vegetables, milk and milk products, outpacing the growth of cereals and pulses, in both urban and rural areas.

Exhibit 2 captures the share of food categories in the monthly per capita consumer expenditure on total food items and % change in contribution to food wallet.







Exhibit 2: Monthly per capita consumer expenditure- share of food categories in overall food basket and growth

Source: NSSO (2022-23)

1.2 Response of agriculture to the changing demand

In response to the evolving consumer preferences, Indian agriculture has effectively adapted by remaining in tune with consumer trends and adjusting production accordingly. Crop diversification has been adopted to cater to the dynamic demand, ensuring more adaptable and resilient production systems.

An analysis of the Gross Value of Output (GVO) of various agricultural sub sectors (2022-23), indicated that the GVO of animal products has surpassed that of food grains and sugar crops, growing at a significantly higher rate of 12% (CAGR from 2012-13 to 2022-23), as compared to 8% growth in foodgrains & sugar crops, during the same period. Spices and condiments witnessed the highest growth (17%), followed by fisheries & aquaculture (15%) and fruits and vegetables (10%).

GVO of various agricultural sub-sectors at current prices is captured in Exhibit 3.





Exhibit 3: GVO of agricultural sub-sectors at current prices



GVO¹ of agricultural sub-sectors at current prices

Source: Ministry of Statistics and Program Implementation, Gol;

All output numbers are based on current prices, F&S crops include food grains and sugar

This growth in output value has been driven by increase in production across key agricultural commodities. Over the last two decades, production of food grains has increased by about 77%, that of horticultural crops has increased by more than 147% and milk by more than 169% (refer exhibit 4).



Source: MoA&FW, MoFAh&D, NHB, MPEDA, DAHD





The underlying increase in production has been on account of increase in area under cultivation, increased area under irrigation, as well as increase in productivity across categories. The gross cropped area increased from 185 Mn Ha in 2000-01 to 211 Mn Ha in 2019-20. During the same period gross irrigated area increased significantly from 76 Mn Ha to 112 Mn Ha³.

Area under foodgrains increased by 16% and horticulture crops by 75% during 2002-03 and 2022-23. Poultry and bovine population has also increased by 74% and 7% respectively between 2003 and 2019. Productivity gains have also been significant across various food categories, especially in shrimp with 336% productivity enhancement, 167% in milk, 53% in foodgrains, 33% in horticultural crops and 64% in eggs productivity⁴.

Exhibit 5 and 6 capture the growth in area/population and productivity respectively for key food categories during 2002-03 and 2022-23.



Source: MoA&FW, NHB, MPEDA, DAHD (Poultry and bovine population are as per 20th Livestock Census)



Exhibit 6: Productivity growth in various food categories (MT/Ha)

Source: MoA&FW, NHB, MPEDA, DAHD

3 Land Use Statistics, Directorate of Economics & Statistics

4 MoA&FW NHB, MPEDA, DAHD





While India's productivity for major categories has shown marked improvement in the past decade, the opportunity for further improvement is immense. India's productivity of various food categories when compared to other countries stands much lower, marking a wide gap that can be filled with improved technology and good agricultural practices. For instance, in case of cereals, India's average productivity stands at 3.6 MT/Ha, while that of US is more than double at 8.1 MT/Ha and that of China (the largest producer) is 6.5 MT/Ha⁵. Exhibit 7 shares a comparison of productivity across key food categories/products for India, US, highest producer and the global average.



Source: FAOSTAT 2022

The increased production across food categories has ensured reliable and consistent supply across key commodities. Over the last two decades, the per capita production of foodgrains has increase by about 38%, that of F&V by more than 90% and for milk by more than 100% (refer exhibit 8). Furthermore, this enhanced production capacity has not only helped meet the demands of growing population and changing dietary preferences, within India, but has also significantly contributed to food processing and global trade.



Source: MoA&FW, MOSPI, DAHD, YES BANK Analysis





1.3 Role of food processing industry

India's diverse climate and fertile land makes it conducive for cultivation of a wide variety of crops and for animal husbandry, offering abundant opportunities for both farmers as well as processors. To manage this large and diversified product basket, the processing industry becomes a strong frontier, linking the harvest to consumers, managing wastages and enhancing shelf life of products for the domestic as well as global markets.

The food processing industry has been a strong pillar of the Indian Agricultural as well as manufacturing ecosystem, contributing 11.57% to GVA Agriculture, Forestry and Fishing and 10.54% to GVA manufacturing in 2020-21. The Gross Value Added (GVA at constant prices) in food processing sector reached 2.09 lakh crores in 2022-23⁶.

Furthermore, the industry contributed about 12.22% to the employment generated in all Registered Factory sector, engaging approximately 2.03 Mn people. Unregistered food processing sector supported employment of 5.1 Mn workers (as per the NSSO 73rd Round report 2015-16) and constituted 14.18% of employment in the unregistered manufacturing sector.⁷



Source: MoFPI, Invest India, PIB

The food processing industry in India has dynamically responded to consumer demand and expenditure trends by continuously innovating to offer meals, snacks, beverages and convenience foods that save time and cater to the busy lifestyles of consumers. There has also been a clear emphasis on healthier processed foods and safety standards for which the food processing companies have been investing in advanced processing technologies and quality control measures. This has not only increased processing levels in India, but also enhanced the country's global market presence. This is evident from the fact that the contribution of processed food exports in agriexports increased substantially, reaching 25.6% in 2022-23, from 13.7% in 2014-15⁸. The sector has also attracted significant foreign investment (FDI), with cumulative inflows reaching USD 12.58 Bn between April 2000 and

⁶ MoFPI annual report 2022-23, PIB

⁷ Invest India

⁸ PIB





March 2024. This accounted for 1.8% of the total FDI equity inflow into the country⁹. The food processing industry, thus remains a crucial link in adding value to agricultural produce, making it accessible to Indian consumers, and playing a pivotal role in global agricultural trade.

1.4 India's contribution to global trade

Over the last two decades, there has been a remarkable surge in India's agri-exports, experiencing a nine-fold increase from USD 6 Bn in 2000-01 to an impressive USD 53 Bn in 2022-23¹⁰. This surge can be attributed to various factors including advancements in agricultural practices, technology adoption, and improved productivity. Moreover, globalization and changing consumer preferences worldwide have created opportunities for Indian agricultural products in the international market. The country has capitalized on this by strategically aligning its production with global demands, and increasing its competitiveness, leading to a substantial increase in exports. India further aims to reach USD 100 Bn in agri exports by 2030¹¹. The growing production base, diversification, increasing focus on sustainability and policy thrust shall enabling India achieve its ambitious agri exports target.

India will need to pace up its export strategy and policy reforms as China is steadfast on its transformational journey of intensifying its production capacities, enhancing exports and pioneering in agricultural innovations during and beyond the Year of Dragon (2024). China not only aims to play a pivotal role in the arena of global food security but also to become self -sufficient in foodgrains and oilseeds aiming to grow about 90% of its grain requirement by 2032. China's agricultural outlook report for 2023-32 also outlines a plan to increase rice exports from China by 24% in the next 10 years.



Source: Indiastat, MoA&FW, FAOSTAT, ITC Trademap

India's export data has been converted to USD basis the average dollar price for the respective year

India has already emerged as a leading exporter of a number of agri commodities – including Rice, Spices, Shrimp, Groundnut, Sugar and Cotton among others (refer exhibit 10). Looking ahead, there is a strategic shift towards exporting value added products including organic food products, ready to eat products, Indian traditional food products, superfoods, millet based processed products and nutraceuticals among others.

⁹ Invest India

¹⁰ PIB

¹¹ agriexchange.apeda.gov.in







Source: DGFT, ITC Trademap, India's export data has been converted to USD basis the average dollar price for the respective year, commodity exports for the year 2022* spices export from spices board of India for 2021-22

India's innate potential to serve as a global food hub



2.1 India's strengths in agriculture

India's strength in agriculture lies in its agroclimatic diversity, extensive arable land & production base, a substantial labor force, supportive policy environment and ongoing technological advancements. These factors collectively contribute to the nation's robust agricultural sector making it one of the world's leading agricultural nations.

India boasts of diverse climatic zones, allowing for the cultivation of a wide variety of crops throughout the year. This diversity supports the growth of crops ranging from a wide variety of staples like rice, wheat, oilseeds, sugarcane, pulses to a myriad of fruits, vegetables and spices. Additionally, India possesses the largest livestock population globally. This abundance contributes to the food and nutritional security and contributes to the livelihoods of millions engaged in agriculture and its allied sectors. Agriculture in India is also supported by a large and diverse labor force. The government's policies, have consistently aimed at promoting agricultural growth and rural development. Schemes such as PM Krishi Sinchai Yojana, National Mission for Sustainable Agriculture, and PM Fasal Bima Yojana focus on water management, sustainable agriculture, and crop insurance, creating a supportive environment for farmers.

A snapshot of India's strengths in Agriculture is captured in Exhibit 11.









Source: FAOSTAT, MoA&FW, NDDB,PIB

Looking into the future, a diverse set of macrotrends are redefining India's potential to serve as a global food hub

On the consumption front, factors such as increasing population, increasing urbanization and shifting dietary
patterns are resulting in increased demand of agricultural produce

Increasing population From 1.4 Bn to 1.7 Bn by 2050
Increasing urbanization From present 36% to nearly 52% by 2050
Shifting dietary pattern Meat consumption to be 3 times higher by 2050, Milk demand projected at 401 Mn MT

On the supply side, factors such as declining water resources, higher land fragmentation and decreasing labour availability/increasing labor prices are impacting farm level production efficiencies

Declining water resources

Receding groundwater tables Agriculture water requirement to reach 1072 BCM (1.6 times increase) by 2050



Land Fragmentation

Average land holding estimated to drop to 0.30 ha by 2050



Decreasing labor availability

Labor force employed in agriculture in India is expected to decrease from 54.6% in 2011 to 25.7% by 2050





 Compounding this dynamic is the risk of climate change. Factors such as raising temperatures and erratic weather patterns are having a negative impact on yields



Sources: https://population.un.org/wpp/Publications/; https://population.un.org/wup/publications/Files/WUP2018-Report.pdf; https://nrcmeat.icar.gov.in/ docs/Vision-2050.pdf; https://krishi.icar.gov.in/jspui/bitstream/123456789/1093/1/ciae_vision_2050.pdf; https://www.nabard.org/auth/writereaddata/ tender/2010165456All_India_Projected_Water_Demand.pdf; https://wotr.org/2022/06/17/action-points-india-global-land-outlook-report; IFPRI: Global Food Policy Report 2022; https://unfccc.int

2.2 Factors driving sustainable growth of indian agriculture

Indian agriculture is undergoing a transformative phase driven by convergence of several factors, propelling sustainable growth in the sector these include:



2.2.1 Growing demand for nutritious food

The growing demand for nutritious food in India is influenced by various factors including health awareness, rising income levels, changing lifestyles patterns, government initiatives to promote nutri-cereals, rise in lifestyle related diseases and accessibility to healthier food options. This increasing demand presents a significant opportunity for farmers to diversify their income by focusing on practices that align with this demand. As consumers prioritize healthier and diversified options, farmers are adapting their cultivation priorities and methods to enter into newer segments like horticulture, dairying, poultry and fisheries. Farmers are also exploring sustainable and organic farming practices as well, to meet the growing demand for healthier and

Hatching Hope Initiative by Cargill

Empowering 30,000 women farmers at grassroots, through poultry production

The Hatching Hope initiative was launched in India in 2018 by Cargill and Heifer International. This initiative aims to improve the nutrition and economic livelihoods of 100 million people globally by 2030 through the production, promotion, and consumption of poultry. Although almost 80% of rural households in developing nations keep chickens, the majority of farmers lack the knowledge, technical support and market access necessary to make poultry farming a dependable source of revenue and nutrition. The bold initiative aims to improve the nutrition and economic livelihoods of 60 million people in India by 2030 through the production, promotion and consumption of poultry

Source: Cargill

Cargill also promotes economic development by working with women from underserved communities to start their own small businesses, through initiative like Samriddhi & Societymaker, Cargill has trained more than 1000 women to become self-reliant, earn livelihoods and lead meaningful lives.







sustainable food options. Private sector is also promoting diversification as an avenue of additional income for their farmers, and helping the producers with adequate technologies and market access.

2.2.2 Adoption of new technologies & digital practices

The adoption of new technologies and digital practices is playing a pivotal role in driving sustainable growth within the agriculture sector. Various advancements contribute to increased productivity, environmental sustainability, and overall efficiency of agricultural value chains. Development and propagation of high yielding varieties, green chemistries and farm mechanization has enhanced productivity and helped minimize on-field crop damage.



Advances in genetic research contribute to the development of crops with increased resilience to climate fluctuations. These resilient varieties help farmers adapt to changing environmental conditions and mitigate the impact of climate-related challenges.

The application of Satellite Imagery and Remote Sensing in agriculture has enabled collection and analytics of valuable data for monitoring crop health, identifying potential issues, and optimizing land use. IoT devices, such as soil moisture sensors and weather stations, allow stakeholders to gather data in real-time which helps in making data-driven decisions, optimizing irrigation, and improving overall farm management.

The integration of digital technologies into agricultural value chains facilitates better communication and coordination among stakeholders. From production to distribution, digitalization has enhanced transparency, reduced wastage and helped building a more efficient supply chain.

2.2.3 Evolving farmer-market linkage models

The evolving farmer-market linkage models in India is playing a crucial role in boosting agricultural growth. Supported by government initiatives, digitalization, and infrastructure development, these models are fostering a more efficient and inclusive agricultural ecosystem. These efforts aim to empower farmers, reduce post-harvest losses, and enhance the overall competitiveness of Indian agriculture in both domestic and international markets.



The formation of farmer collectives or cooperatives has also gained momentum. These groups enable farmers to pool resources, share knowledge, and collectively negotiate better prices in the market. This model enhances the bargaining power of small and marginal farmers, ensuring more equitable returns for their produce. The government aims to create 10,000 more FPOs to leverage their collective power to boost agricultural growth.

The government's emphasis on the E-NAM (Electronic National Agriculture Market) platform facilitates online trading of agricultural commodities. This digital marketplace connects various agricultural produce market committees (APMCs) across states, promoting transparency, fair pricing, and efficient distribution. Farmers gain access to a broader market, fostering competition and improving overall market dynamics.

The private sector has also been working on Farm-to-Fork Initiatives which involves the direct supply of produce from farmers to consumers. This shortens the supply chain, reducing intermediaries and ensuring that farmers receive a higher share of the consumer's expenditure. It also provides consumers with traceability and the assurance of fresh, locally sourced products.







Source: PepsiCo

2.2.4 Proactive & supportive policy ecosystem

Various government initiatives, including subsidies, credit facilities, subventions and market linkage support have been provided by the government for boosting agricultural growth. These policies aim to empower farmers economically, enhance productivity, and create a conducive environment for agriculture and agribusinesses. These interventions and policy measures have a strong intent and focus towards farmers' welfare.

Strong impetus has also been laid on boosting private sector investment in infrastructure development and incentives have been offered through various schemes like AIF, AHIDF, PMKSAMPADA etc. at the central level and many states offer further benefits under agribusiness/ food processing or industrial policies.

2.2.5 Growing private sector participation

The increasing involvement of private sector in the agricultural value chain has played a pivotal role in fostering sustainable growth in agriculture. Private sector has actively contributed towards various aspects including:



Research-Based Technology Introduction: Private sector investment in research and development has led to the introduction of advanced agricultural technologies. This includes improved seeds, precision farming techniques, and innovative cultivation practices, enhancing overall productivity and sustainability.

Extension Services: Private companies have been instrumental in providing extension services to farmers. These services encompass training programs, advisory support, and dissemination of best practices, empowering farmers with knowledge and skills to optimize their practices.

Linking Farmers to Markets: Private sector participation has facilitated the creation of robust supply chain networks. By connecting farmers directly to markets, agribusinesses have streamlined distribution channels, reducing post-harvest losses, facilitating better returns for farmers.





Investment in Post-Harvest Infrastructure and value addition: Private investment in post-harvest infrastructure, such as cold storage facilities, processing units, and transportation systems, has significantly improved the efficiency of the agricultural supply chain.

The collaboration between private sector and other stakeholders of the agriculture value chain has been instrumental in modernizing the sector, making it more resilient, sustainable, and economically viable.

For more than two decades, ADM has been supporting smallholder farmers in India in developing a more sustainable value chain. The programme (Shashwat Sheti Upakram) provides small growers with sustainability resources, technology, best conservation practices and market connections. Since 2021, ADM has ramped up its sustainability efforts through strategic partnerships with Bayer and Coromandel International Limited, aiming to provide trainings to 25,500 soybean farmers in sustainable practices like seed treatments, integrated pest management, and nutrient management. As the bridge between growers and consumer-facing brands, ADM's global capabilities allow them to help scale these sustainable practices across the value chain and farming ecosystem in the region.



Source: ADM

2.2.6 Growing focus on sustainability

The heightened focus on sustainability has also been a catalyst for agricultural growth, with both government and private sector initiatives contributing significantly. The government has rolled out various schemes and

incentives for adoption of sustainable agricultural practices like micro irrigation, organic farming, conservation of biodiversity, and climate-resilient agricultural strategies amongst others, aligning with the goal of long-term environmental and economic sustainability.



Private sector's commitment to net zero aspirations further bolsters sustainability efforts. Companies are increasingly investing in eco-friendly farming practices, reducing carbon footprints, and adopting technologies that minimize environmental impact.

Bottlenecks across agricultural supply chain challenging growth



The agricultural supply chain faces various bottlenecks that impact the overall agricultural supply chain efficiencies. These bottlenecks impact each leg of the value chain right from the farm level to domestic and export consumption. The repercussions of these bottlenecks are profound. Farmers grappling with reduced efficiency and increased uncertainties often experience diminished incomes which impacts the ability to invest in better agricultural practices, perpetuating a cycle of underdevelopment. Compromised efficiency of the agricultural supply chain contributes to food wastage leading to global food security concerns. The sector's sustainable growth is also at stake as these bottlenecks impede the adoption of environmental friendly practices and innovations. From precision farming to sustainable irrigation methods, many advancements remain underutilized due to challenges within the supply chain. Some of the key challenges impacting the agricultural supply chain are captured in the section below.

3.1 Farm level

 At farm level low productivity and poor farm viability remains a key challenge. Small and fragmented farm holding is a primary factor, as limited land size restricts economies of scale, impacts ability to adopt modern farming techniques/ technologies and limits the risk-taking ability of farmers. This constraint often results in subsistence farming, where farmers struggle to generate sufficient income.



- Inadequate access to quality seeds and genetic stock further exacerbates the problem. Farmers relying on outdated or low-quality seeds experience lower yields, as these seeds may lack resistance to pests and diseases or fail to thrive in changing climatic conditions. Limited access to improved genetic varieties impedes the development of resilient crops. The low seed replacement ratio (SRR) is also a key concern that has been impacting crop productivity. Currently, only around 15% of India's total cropped area is planted with freshly obtained quality seeds every year. A huge 85% area is sown with farm saved seeds. This ratio varies from crop to crop between 7% in staple crops to maximum 70% in some vegetables and fruits. For wheat and rice, the SRR is in the range of 9-18%. Without achieving the optimal seed replacement ratio, efforts to enhance yields may fall short of expectations¹².
- In India, 35-45% of crop yield is lost to diseases, insects and weeds. Estimates suggest that this total loss amounts to USD 30 Bn¹³, which is comparable to the GDP of countries like Combodia, Zambia and Cyprus. Moreover, the usage of agricultural inputs in India is low largely on account of awareness, availability and affordability issues. Despite being the second largest producer of agricultural commodities after China, the nation ranks 11th in terms of total pesticide usage. Also, the pesticide use per unit of cropland in India was estimated to be 0.37 kg/Ha (2021) which is amongst the lowest globally; way below countries like USA (11 kg/ha), Japan (11.24 kg/ha), Brazil (5.7 kg/ha), France (3.7kg/ha), UK (2.8 30 kg/ha), Indonesia (5.7 kg/ha) and Vietnam (5.7 kg/ha)¹⁴.

¹² National Institution for Transforming India (NITI) Aayog, Government of India

¹³ Herbicides Vis-à-vis other pesticides: Trend analysis and economic impact. Technical Bulletin No. 23, ICAR- Directorate of Weed Research, Jabalpur. ¹⁴ FAOSTAT



- The limited adoption of advanced agricultural technologies is a notable bottleneck. From precision farming and mechanization to data-driven decision-making, many farmers lack access or awareness of these tools. This hinders efficiency improvements and sustainable farming practices.
- Moreover, a lack of awareness and inadequate access to Natural Resource Management (NRM) and climate-resilient technologies compounds the challenges. Farmers may not have the necessary knowledge or resources to implement practices that conserve soil, water, and biodiversity. As climate change impacts become more pronounced, the absence of climate-resilient technologies further exposes farmers to risks, affecting both productivity and viability.
- Like crops, dairy sector also suffers from low productivity levels, largely on account of inadequate feed and fodder availability, limited reach of modern veterinary care and low Artificial Insemination coverage. For poultry, the ground level challenge remains on the availability and high cost of feed, improper breeding conditions, lack of awareness on usage of unwarranted substances such as baking soda and ammonium chloride in feed and frequent disease outbreaks.

3.2 Post-harvest handling

 Post-harvest infrastructure deficiencies contribute significantly to inefficiencies in the agricultural supply chain. Inefficient post-harvest handling practices exacerbate losses. From improper sorting and packaging to inadequate storage facilities, these shortcomings lead to a substantial percentage of the harvested crops being wasted or degraded before reaching consumers. This not only impacts farmers' incomes but also contributes to global food loss and waste.



YES BANK

The Economic Survey 2022-23 indicates that logistics costs in India range from 14-18% of GDP, higher than the global benchmark of 8%.

- Sub-optimal transportation protocols further impede the smooth flow of agricultural goods. Inadequate
 infrastructure and outdated transportation systems contribute to delays, damage, and increased costs
 during the transit of perishable produce. Timely and reliable transportation is crucial to ensuring that the
 harvested crops reach markets in optimal condition.
- The high cost of storage is a significant barrier, especially for small-scale farmers. Limited access to affordable and efficient storage facilities results in post-harvest losses due to spoilage and deterioration. This financial burden further reduces farmers' profitability and overall competitiveness in the market.
- Saturated exit point infrastructure, such as ports and distribution centers and limited berths for perishable agricultural produce exacerbates congestion and delays in the final stages of the supply chain.
- Poor market linkages for farmers represent a crucial challenge as it limits their ability to connect with buyers, resulting in delayed sales and often, unfavorable prices for their produce. This lack of direct market access can leave farmers vulnerable to intermediaries who may take a significant share of the profits.

3.3 Manufacturing/ processing and value addition

The low levels of food processing in the agricultural sector stem from various challenges, including the absence of economically processable varieties and underutilized processing capacities.



Many crops lack varieties that are well-suited for processing. Some agricultural products
may not have been developed or selected with processing in mind, limiting the options for value addition.
This constraint hampers the potential for diversifying products and adding value to raw agricultural produce.





- Existing processing facilities often operate at below-optimal capacity. Factors such as outdated machinery, inadequate maintenance, and insufficient technical know-how contribute to underutilization. Seasonality and variability in raw material availability also remains a concern. This not only results in economic inefficiencies but also discourages further investments in processing infrastructure.
- The lack of awareness or access to modern processing techniques, especially in the MSME segment, further hinders the industry's ability to compete in the global market.
- Market Demand and Consumer Preferences also need to be understood adequately. If there is insufficient
 demand for processed agricultural products or if consumer preferences are not aligned with processed
 offerings, it can lead to lower levels of processing.
- Testing infrastructure remains a challenge at the farm level as testing labs are available in main cities, far away from the production zones. In case of dairy, inadequate quality testing infrastructure at milk collection centers and lack of trained manpower to undertake quality testing remains a serious challenge.
- Limited availability of fillers and additives, especially for processed poultry products poses a challenge to boost value addition in the segment and subsequent export.
- By-product utilization of agricultural and allied product categories remains abysmally low in India. While their utilizations can be adequately rewarding, the know-how, technology availability and capacity to invest in by-product processing remains limited at present.
- In case of plant protection chemicals manufacturing, active ingredients and adjuvants play a crucial role in enhancing the performance, stability, and coverage on target plants. At present, many adjuvants need to be imported due to absence of the manufacturers in India or non-competitive pricing. Imports put forth challenges related to supply chain disruptions, heavy reliance on foreign vendors, cost fluctuations, regulatory compliances, and vulnerability to geopolitical situations.

3.4 Exports -

Tariff and non-tariff barriers, combined with a lack of alignment with international market needs, pose significant challenges for agricultural exports from India.



- High tariffs imposed by importing countries can make Indian agricultural products less competitive in the global market. This can limit market access and impact the price competitiveness of Indian goods. Negotiating favorable trade agreements and advocating for tariff reductions becomes crucial for expanding export opportunities.
- Non-tariff barriers, such as stringent quality standards, sanitary and phytosanitary regulations, and certification requirements, can impede the entry of Indian agricultural products into international markets. Adhering to these standards demands investments in quality control measures and compliance infrastructure, which may be a challenge for some producers.
- Poor understanding of international market demand and consumer preferences can result in the production
 of goods that may not find ready acceptance abroad. This misalignment hampers the competitiveness of
 Indian agricultural products in terms of quality, packaging, and meeting specific market requirements.
- Inefficient transportation, storage, and distribution infrastructure can lead to delays and increased costs, affecting the overall competitiveness of agricultural exports. Improving these logistics is essential for timely delivery and maintaining the quality of perishable goods.





3.5 Regulatory

 Registration process for a new product in India is stringent and complex, involving multiple government agencies. In India, sometimes it takes more than 3 years for registration of a molecule (for plant protection chemicals) against the prescribed duration of about 18 months, which may be due to involvement of multiple departments, limitation on resources,



infrastructure, skills etc. Also, while companies are innovating towards greener chemistries and looking at a larger share of green portfolio, there is no separate pathway for these sustainable products that can give time bound registration, leading to an unpredictable environment in introducing innovative products.

- Product approval for food products at FSSAI also takes a long time for the scientific panel to approve.
 Faster and regular meetings of the panels may be conducted by FSSAI for quick turn arounds on approval applications, so latest food technologies can be introduced in India.
- Inconsistent and unpredictable policy and regulatory regime including ad hoc bans (specifically at the onset
 of cropping season) or restriction on usage of specific agricultural inputs or adjuvants restrains ease of
 doing business. Similarly, inconsistent or unclear policies related to agricultural and food exports can create
 uncertainty for exporters. A stable and supportive policy environment is crucial for fostering confidence
 among exporters and encouraging long-term investments in the sector. Ad hoc bans and restrictions on
 exports, disincentivizes exports and can lead to a significant loss in market share, sometimes permanently.
- Differential incentives for processed products disincentivizes processing in segments that remain out of the purview of such incentives.

3.6 Others

 One of the primary obstacles encountered by the crop protection industry and to some extend the food processing industry in India pertains to the myths and misconceptions that revolve around them, causing disruption to the substantial industry endeavors aimed at the development of the agriculture sector.





Key imperatives to boost sustainable growth



4.1 Key imperatives

There are six key imperatives that agricultural value chain stakeholders could focus on to ensure sustainable growth of Indian agriculture.



4.1.1 Productivity & farmer income enhancement

By 2050, India will need to meet the food and nutritional requirements of 1.7 Bn people. In addition, India will have a critical role to play in fulfilling the food and nutritional security of resource-constrained nations globally, as well as bridging the demand-supply gap for high value and value-added products in growing economies. For a food secure future, a transformational jump in agricultural productivity remains critical for India. Productivity levels will need to increase to over 7 MT/Ha by 2050 from the current levels of 4.28 MT/Ha (2021-22), warranting a 64% growth.

The interplay between enhanced productivity, increased income, and sustainability drives long-term growth in the agricultural sector. It not only benefits farmers directly but also have ripple effects on broader economic, social, and environmental aspects, making it a key imperative for sustainable development. A more efficient agricultural cycle ensures a more reliable and sufficient food supply contributing to national and global food security. Growth in agricultural sector also stimulates rural development. It creates opportunities for improved infrastructure, education, and healthcare in rural areas, fostering a more balanced and sustainable development model.

4.1.2 Linking farmers to markets

Linking farmers to markets is a key driver of sustainable growth in Indian agriculture, promoting economic empowerment, technological adoption, and market-driven practices. This connectivity not only benefits individual farmers but also contributes to the resilience of the entire agricultural ecosystem.





Connecting farmers directly to markets minimizes reliance on intermediaries, ensuring a more equitable distribution of profits, empowering farmers economically. Efficient market linkages contribute to a more streamlined supply chain, resulting in reduced post-harvest losses, ensuring that more of the produce reaches consumers, reducing waste, and enhancing overall sustainability. Farmers, when linked to markets, also align their crop planning with market demand. An understanding of markets and access to diverse markets encourages farmers to explore different crops and products, fostering crop diversification. This reduces the risks associated with mono-cropping and enhances the resilience of the agricultural sector. A diversified and well-connected market network helps mitigate risks associated with fluctuations in commodity prices. Direct market access also provides opportunities for value addition to agricultural products. Farmers can explore processing and packaging options, adding value to their produce and increasing profitability.

4.1.3 Value addition & exports

Value addition and exports play crucial roles in boosting the sustainable growth of Indian agriculture. India aims to take its agricultural exports to USD 100 Bn by 2030. The growing production base, diversification, increasing focus on sustainability and traceability and policy thrust shall enable India is achieving its ambitious target. This will also warrant a strategic shift towards exporting value added products including organic food products, ready to eat products, Indian traditional food products, superfoods, millet based processed products, nutraceuticals etc.

Emphasizing on value addition and boosting exports in Indian agriculture not only enhances income of farmers but also contributes to economic development, job creation, and the overall sustainability of the agricultural sector. It positions India as a competitive player in the global market, fostering long-term growth and resilience. Increased agricultural exports bring in foreign exchange, strengthening the country's economic position.

4.1.4 Technology and innovation

Technology and innovation are fundamental for transforming Indian agriculture into a sustainable and resilient sector. Embracing these imperatives not only addresses current challenges but also prepares the industry for future demands, ensuring long-term growth and environmental stewardship.

Technological advancements, such as precision farming, automated machinery, new chemistries and improved irrigation systems, significantly increase agricultural productivity. Innovations in agriculture technology enable more precise resource management. This leads to reduced wastage, conserving water, minimizing environmental impact, and making agricultural practices more sustainable in the long run.

The use of data analytics and sensor technologies provides farmers with valuable insights into crop health, soil conditions, and weather patterns helping stakeholders in taking more informed decisions.

Technology also facilitates financial inclusion for farmers through digital platforms, enabling access to credit, insurance, and market information. This financial support is crucial for investment in modern farming techniques and infrastructure.

Digital platforms and e-commerce solutions connect farmers directly to markets, reducing dependency on intermediaries. This direct access ensures fair pricing and efficient distribution, contributing to sustainable agricultural practices.





4.1.5 Sustainability & climate action

Agriculture is highly vulnerable to climate change, which manifests through shifts in temperature, precipitation patterns, and the frequency of extreme weather events. Sustainable practices help farmers adapt to these changes and build resilience in their farming systems.

According to International Panel on Climate Change (IPCC) report, the predicted temperature rise for India is in the range of 0.88–3.16°C by 2050 and 1.56–5.44°C by the year 2080. Studies show significant negative impacts of climate change, predicting yield reduction by 4.5% to 9.0%, depending on the magnitude and distribution of warming. An Indian Agricultural Research Institute (IARI) study suggests that for every one-degree celsius temperature rise in the month of march, will lead to reduction in yield of wheat by 8%¹⁵ under sodic soil conditions. Depending on the modeling techniques, it has been estimated that rice yields can be impacted by up to 40% while that of wheat could be up to 52%.

Many countries, including India, are committed to international agreements like the Paris Agreement, which emphasizes climate action and sustainable practices. Adhering to these commitments is essential for global collaboration in addressing climate-related challenges. Integrating sustainability and climate action into agriculture is essential for mitigating climate risks, preserving resources, ensuring food security, and fostering the long-term growth and resilience of the agricultural sector.

4.1.6 Ease of doing business

A progressive, predictable and science-based policy and regulatory environment facilitates ease of doing business and is essential for driving growth, fostering innovation, and ensuring the sustainability of the sector. It empowers farmers and agribusinesses to navigate challenges more effectively and seize opportunities for development and prosperity.

A business-friendly environment encourages both domestic and foreign investments in the agricultural sector, which leads to adoption of modern technologies, improved infrastructure, and increased productivity. Simplified business processes and reduced bureaucratic hurdles enhance market access for farmers and agribusinesses. This facilitates the smooth flow of agricultural products from farm to market, ensuring fair prices and reducing post-harvest losses. EODB also plays an important role in the context of international trade, where streamlined processes can make Indian agricultural products more attractive in global markets.

Moreover, a conducive business environment encourages the development of innovative solutions, agri-tech initiatives, and value-added enterprises within the sector. Clear and transparent legal frameworks create certainty for businesses, which is essential for making informed decisions, entering into contracts, and resolving disputes efficiently.

¹⁵ https://www.iari.res.in/files/Publication/important-publications/ClimateChange.pdf





4.2 Select Government initiatives to address the imperatives



Productivity & farmer income enhancement

- Pradhan Mantri Krishi Sinchai Yojana (PMKSY)
- National Food Security Mission
- Mission for Integrated Development of Horticulture
- Pradhan Mantri Fasal Bima Yojana (PMFBY)
- PM Kisan Samman Nidhi Yojana
- Kisan Credit Card (KCC)



Linking farmers to markets

- Electronic National Agriculture Market (e-NAM)
- Integrated Cold chain scheme
- Agri Infrastructure Fund
- The Agricultural Produce and Livestock Marketing (Promotion & Facilitation) Act



Value addition & exports

- Pradhan Mantri Kisan SAMPADA Yojana
- Production Linked Incentives (PLI)
- Pradhan Mantri Formalisation of Micro food processing Enterprises (PMFME)
- Animal Husbandry Infrastructure Development Fund (AHIDF)
- Food Processing Fund –NABARD
- Agri-Export Policy
- APEDA/MPEDA/Spice Board Schemes

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Technology and innovation

- Startup India, LEAP (Launching Entrepreneurial Driven Affordable Products Fund for Start-ups, Credit Guarantee Scheme for Start-Ups
- NIDHI program (National Initiative for Developing and Harnessing Innovations)
- Atal Innovation Mission (AIM)



Sustainability & climate action

- National Mission of Sustainable Agriculture
- National Action Plan on Climate Change (NAPCC)
- National Cyclone Risk Mitigation Project (NCRMP)
- The Green Credits Programme
- Net Zero Commitment



Ease of doing business

- Make in India
- National Single Window System
- India Industrial Landbank
- Direct Benefit Transfer
- Digital India





4.3 Role of private sector in sustainable growth of agriculture

The private sector is playing an active role in sustainable growth and development of Indian agriculture. Their initiatives such as technology introductions, farmer extension services, market linkage initiatives and investments in post-harvest handling and processing infrastructure are resulting in increased productivity and farmer income enhancement. They are also working on various natural resource conservation initiatives such as encouraging regenerative agriculture, water conservation programs and soil care programs. Many forward-looking private companies are focusing intensively on climate action, waste reduction and mindful consumption. The work being done by the corporates in the agriculture sector has direct impact on at least 12 of the 17 Sustainability Development Goals if not more. A snapshot of select activities undertaken by private companies and the SDGs impacted is captured in exhibit 12.

Imperatives	Activities	SDGs Impacted	
Productivity improvement & Farmer income enhancement	 Research backed innovative technology introductions Farmer extension and advisory services Linking farmers to markets for better price realization Investing in post-harvest handling and processing infrastructure 	1 NO POVERTY Image: Constant of the constant of	
Conservation of natural resources	 Encouraging conservative and regenerative agriculture practices Soil care programs Water conservation 	6 CLEAN WATER CONSIDE CONSIS	
Climate action –focused on climate resilience and reduced carbon emissions	 Encouraging climate smart farming practices Utilizing renewable sourcing of energy Introducing climate resilient seed varieties / climate smart solutions 	7 AFFORDABLE AND CLAM DREAT ••••••••••••••••••••••••••••••••••••	
Wastage reduction and mindful consumption Promoting quality of life	 Promoting healthy and nutritious food Post harvest solutions for reducing wastage Safe, & healthy working environment Reducing and recycling of plastic waste 	3 GOOD HEALTH AND WELL-BEING AND WELL-BEING 5 GENDER 5 GENDER CONDITION CONDITION 8 DECENT WORK AND CONDITION CO	

Exhibit 12: A snapshot of activities being undertaken by the corporates and SDGs impacted





Exhibit 13 captures select initiatives taken up by US companies in India towards farmer income enhancement, climate action and other Sustainability themes

Exhibit 13: Select initiatives being taken up by the US companies in India



An Agricultural Sciences Company

Project SAFAL

- Safeguarding Agriculture & Farmers Against Fall Armyworm
- Promoting IPM
- > 3,00,000 farmers reached/impacted



Shashwat Sheti Upakram

- Sustainable agriculture program with 25,500 soybean farmers covering almost 90,000 acres
- Support small holder farmers to improve sustainable practices and access non-GMO markets



Project Unnati

- To uplift livelihoods of S&M fruit farmers in India
- Covered >10,000 Acres & 2,00,000 Farmers
- GAP, Introduce new varieties



Quality Animal Nutrition

- Animal nutrition solutions for dairy, poultry and aquaculture
- Invests significantly into R&D for development of animal husbandry products



Millet Hybridisation

- High yielding climate resilient bajra seeds introduced
- Educating farmers on GAP.
- Facilitating Bajra Mahotsav programs with state governments



Helping the world thrive

Srishti Initiative

- Regenerative agriculture program in Maize in Karnataka
- > 25,000 acres, > 10,000 farmers



Krishi Jyoti Program

- Educating farmers on how to increase yields and improve farmland management
- > 7500 farm families reached
- > 1,24,000 people benefited



360° Farmer Connect

- Supplies high quality potato seeds and provides training for on-field agronomy
- Assured buyback (Potato)
- >24,000 farmers impacted







Cocoa Life Program

- Global investments of \$1 billion, with substantial investments in India
- Working with agricultural universities to promote cocoa cultivation, GAP etc.
- > 100,000 farmers reached



Samruddhi Program

- Uplift socio-economic condition of farmers through crop diversification & GAP
- >14,000 farmers and 23,000 youth impacted



Regenerative Agriculture

- Aim Regenerative agriculture in 1 Mn acres farmland by 2030
- Project Malavdhara –soil and water management conservation programme in 10 villages of MP

Nutrition Education programme for 6000 kids in Nashik, Maharashtra

Nutrition to 400+ kids in urban slums of Mumbai from last 10 years

Amway

Nutricert Certification program

- Sourcing of agri produce ensuring it comletely traceable, socially responsible and ecologically sustainable.
- Train suppliers on Nutricert standards and ensure that farmers receive proper training on cultivation aspects and technical knowledge of farming practices.



Cold Chain Solutions

Providing sustainable cold chain solutions to reduce post harvest food wastage

Kellanova

Bright Start Initiative

- 'Bright Start' feeding programme serving Breakfast to 16,000 needy children on a weekly basis, in four states of Maharashtra, Karnataka, Andhra Pradesh & Gujarat.
- Kellanova is nurturing farmers, including women, smallholders and workers by training them with climate-smart practices for better yield.
- 12,000 smallholder farmers in MP & 12,500 farmers in UP have already participated in the initiative. Currently, looking at empowering 700 more corn farmers in Maharashtra and Karntaka on similar practices.



Green Energy

- Converting coal based boilers to agriwaste based rice husk boilers
- Energy efficiency as a core consideration



Climate Resilience

- Disseminating agro-ecological practices including sustainable water management (Guargum)
- Provide farmers with remunerative and stable prices

Source: Respective company websites, details shared by company representatives.

Interventions for boosting private sector contribution



In the evolving landscape of global agriculture, private sector plays a pivotal role in driving innovation, efficiency, and sustainability. Increasing the involvement of private sector in agriculture is essential for driving comprehensive growth. Strategic interventions designed to enhance this engagement include- promoting private investment in critical areas such as agriculture research and extension services, which are essential for advancing agricultural productivity and resilience. Additionally, supporting introduction of innovative technologies, promoting farmer-level sustainability initiatives, incentivizing investment in agri infrastructure, coupled with the creation of an enabling policy environment and export facilitation are crucial for achieving long-term agricultural growth and sustainability.

5.1 Promoting private investment in agriculture research & extension



To promote private investment in agricultural research and extension the following may be considered

- Tax incentives, grants, or subsidies to encourage private companies to invest in agricultural R&D and extension services.
- Incentivizing production/manufacturing of newer technologies by way of production linked incentives
- Creating a conducive regulatory environment that supports innovation and protects intellectual property rights, encouraging private entities to engage in research activities. The requisite policies for example the National Seed Policy should have a clear focus on this, as it will lead to adequate access of quality inputs to the farmers.
- Simplifying regulatory processes for obtaining approvals related to agricultural research and extension
 activities, reducing bureaucratic hurdles for private entities and ensuring transparency and clarity in
 regulations to boost confidence among private investors in the food and agriculture sector.
- Establishing frameworks for collaboration between private companies and public research institutions to leverage existing expertise and resources.
- Fostering joint research projects, allowing private enterprises to benefit from the knowledge base of public research organizations. Also, developing partnerships between private entities and government extension services to enhance outreach and dissemination of agricultural innovations will be helpful.
- Creating funding mechanisms or grants specifically for joint extension programs that involve both public and private stakeholders.
- Creating Knowledge sharing platforms for information exchange and collaboration between private and public stakeholders, fostering a culture of shared learning. This may also include facilitating inter country (Indo-US) collaboration on topical issues including climate smart agriculture.





5.2 Supporting introduction of innovative technologies and products

To support the introduction of innovative technologies and products in agriculture, a streamlined and digitized approach with a focus on protecting intellectual property rights (IPRs) can be implemented. Moreover, a progressive, predictable and science-based policy and regulatory environment towards new innovations and research can play a catalytic role in enabling farmers to avail improved and efficient technologies. Actionable may include:



- Simplifying and fast tracking the licensing, registration and approval process for introducing new agricultural technologies and establishing clear and efficient regulatory pathways may help bring technologies at a faster pace to India.
- Developing guidelines that provide a framework for assessing the safety, efficacy, and environmental impact of innovative agricultural products.
- Strengthening legal frameworks to protect intellectual property rights, encouraging companies to invest in R&D and bring innovative products for the sector. Also, establishing mechanisms for the fair and timely resolution of intellectual property disputes, providing a secure environment for innovators will be beneficial.
- Initiatives towards concepts like Recycling and Reusage should be policy driven and incentivized, rather than being made mandatory, so that businesses with the capacity and intent are encouraged to invest in these areas and find solutions to serve all stages and scales of business.
- Digitization will be critical, especially towards
 - o Single window system for submitting and processing licensing and registration of applications will promote efficiency and accessibility. Center-State harmonization towards the same also remains essential for efficiently driving processes.
 - o Documentation and application processes to reduce paperwork, minimize errors, and accelerate the review and approval of new technologies.
 - o For communication between regulatory authorities, applicants, and stakeholders, enhancing transparency and accountability.
 - o Minimizing manual intervention in the approval process by leveraging technology for data analysis, risk assessment, and decision-making.
 - o Automated systems for routine tasks, allowing regulatory authorities to focus on more complex and strategic aspects of technology evaluation.
 - o Knowledge sharing and coordination with stakeholders and experts of the agri value chain. Easy and free digital availability of knowledge in regional languages facilitate easy understanding of cropping pattern, common problems, use of pesticides etc.
 - o Supply chain digitization for making available quality inputs for farmers and connecting farmers with market / aggregators, thereby increasing quality of production as well as realisation of higher price of produce.
- Establishing a centralized database or platform for transparently sharing information on approved agricultural technologies, allowing stakeholders to access up-to-date information easily.





- Incentivizing farmers for modern-day technology usage like:
 - o Usage of crops originating from genetic research with increased resilience to climate fluctuations.
 - o Satellite Imagery and Remote Sensing in agriculture –to collect real time data to help in making datadriven decisions and improving overall farm management.
- Providing training programs for regulatory personnel to enhance their skills in evaluating and approving innovative agricultural technologies. Fostering collaboration with international organizations and experts to share best practices in regulatory frameworks for technology introduction.
- Conducting public awareness campaigns along with private sector to inform farmers, consumers, and other stakeholders about the benefits and safety of newly introduced agricultural technologies.
- Encouraging public participation in the regulatory process to build trust and confidence in the introduced innovations.

5.3 Promoting farmer level sustainability initiatives



To promote farmer-level sustainability initiatives, a multifaceted approach can be implemented. Select actionable proposed include:

- Incentivize Regenerative Agricultural Practices: Introduction of differentiated Minimum Support Prices (MSPs) that reward farmers practicing regenerative agriculture, considering the environmental and social benefits. Providing financial incentives, subsidies, or tax credits to farmers adopting sustainable practices, encouraging widespread adoption.
- Building a Carbon Credit Ecosystem: Establishing a robust carbon credit system that acknowledges and rewards farmers for sequestering carbon and reducing greenhouse gas emissions through sustainable farming practices. Dairy being a critical sector in this context, needs efforts towards ensuring nutritional efficiency along with breed improvement to enhance productivity and minimize its contribution to carbon emissions.
- Encouraging farmers to participate in recognized sustainability certification programs, providing them with market access and premium prices for certified products. Collaboration with certification bodies to simplify the certification process and reduce associated costs for farmers.
- Establishing demonstration farms or learning centers to showcase the benefits of sustainable farming methods and provide hands-on training.
- Leveraging farmer collectives to collectively implement and benefit from sustainability initiatives. Enable
 collectives to access resources, knowledge, and markets, amplifying the impact of sustainability efforts at
 the grassroots level.
- Ensuring that farmers have easy access to sustainable and eco-friendly inputs, such as organic fertilizers and biopesticides. Provide subsidies or financial support for the adoption of eco-friendly agricultural inputs. With respect to animal husbandry, awareness creation on improved breeding methods & management and non-usage of antibiotics will be essential.





5.4 Continue incentivizing investment in storage, logistics and processing infrastructure and providing an enabling policy environment



- Public-Private Partnerships (PPP) for Integrated Bulk Storage- Extending successful PPP models, similar to those implemented for wheat, to other commodities like maize. Collaborating with private entities to develop large-scale integrated bulk storage facilities. Providing technical support, financial incentives, tax breaks, or revenue-sharing mechanisms to attract private investment in the construction and management of these storage facilities.
- Incentivizing the establishment of cold chain infrastructure and processing infrastructure to reduce postharvest losses and ensure the quality of perishable goods. Offering subsidies, grants, or low-interest loans to encourage private investment in processing infrastructure, refrigerated storage, transportation and distribution facilities.
- Streamlining and expediting the process of land allocation and land conversion for processing facilities.
 Creating dedicated teams or offices to facilitate the smooth and efficient allocation of land, reducing bureaucratic delays and ensuring a more investor-friendly environment will be supportive.
- Customized Support for Different Commodities: Tailorize incentives and support mechanisms to the specific needs and characteristics of each commodity, recognizing the diversity of storage and processing requirements. Engaging with industry stakeholders to understand and address the unique challenges associated with different agricultural products.
- Collaborating with academic institutions and private sector partners to explore innovative solutions that enhance efficiency and reduce costs in the storage and processing of agricultural commodities.
- Rationalization of taxes (GST) for processed foods may be looked at to make it more consistent and aligned with global standards, wherein processed food is kept at lower tax bracket to keep them affordable. Tax rationalization shall encourage growth of the food processing industry, leading to higher investments, innovations, job creation and more competitiveness globally, fostering exports.
- Re-evaluating incentivization under various schemes (like PLI) on the basis of impact created at the ground level, off take of high value/volume produce, nutritional value etc., instead of it being based on type of end consumption. Schemes like PLI may thus, be extended to cereals/ grain processing and may also consider Amino acids and Vitamin production which are inherent components of animal feed and essential for the critical sectors of dairy and poultry which provide diversified income opportunity for farmers.
- Licensing requirements for food processing plants / edible oil refineries may be re-evaluated such that licenses are provided on a long term/life-time basis, through a single window system at the stage of plant design approval itself.
- Using feedback mechanisms to continuously refine policies and address any challenges faced by stakeholders in the storage, logistics, and processing sectors.

- 5.5 Facilitating exports
- **Harmonizing Food Quality Standards:** Aligning domestic food quality benchmarks, with international standards. Ensuring that regulatory standards are in harmony with global norms, make it easier for Indian products to meet the requirements of international markets.





- Government-to-Government (G2G) Equivalence Agreements: Negotiating and establishing equivalence agreements with other countries, focusing on mutual recognition of food safety standards.
- Government to Government negotiations for Preferential rates with countries which are offered preferential rates by India – eg. India offers 0% duty to Srilanka on Breakfast cereals, while Srilanka imposes high custom duties along with some other additional duties taking the impact on price to a level as high as 70%. While countries like Pakistan etc. are offered 0% duty.
- Similar negotiations may be undertaken towards Non-Tarff barriers for exports from specific countries. For example, with Bangladesh, wherein they enforce Non Tariff Barriers in form of complex, cost intensive testing protocols like testing for radioactivity in every food consignment being sent to Bangladesh. This is an expensive test and has no scientific basis to mandate testing of every consignment. Moreover all South East Asian countries are exempted from this requirement while India has not been considered for exemption.
- Investing in infrastructure and technology for quality testing and assurance in line with international best practices. Strengthening laboratories and testing facilities to ensure that Indian exports consistently meet the stringent quality standards of global markets.
- Conducting training programs for exporters, providing guidance on compliance with international standards and regulations. Supporting educational initiatives to raise awareness among producers and exporters about the importance of adhering to high-quality standards.
- Facilitating the accreditation of Indian certification bodies to international standards, ensuring their recognition by global counterparts. Assisting exporters in obtaining internationally recognized certifications, this enhances the credibility of Indian products in foreign markets.
- Simplifying and digitizing export documentation processes to reduce paperwork, enhancing efficiency, and minimizing errors. Providing training and support to exporters to navigate documentation requirements for different destination markets.
- Developing targeted branding campaigns for Indian-produced products in specific destination markets.
 Leveraging digital marketing and promotional activities to create awareness about the quality and uniqueness of Indian products, enhancing their market appeal.
- Investing in market intelligence capabilities to understand the specific requirements and preferences of target destination markets. Tailor export strategies based on market research to ensure products are positioned effectively and meeting the demands of consumers in different regions. Collaborating with industry associations and trade bodies to collectively promote the "Brand India" image abroad.
- Enabling a strategic shift towards exporting value added products including organic food products, ready to eat products, cereal based product like those of millet like high fibre raw materials, fortified foods etc.
- Establishing mechanisms for continuous review and adaptation of export facilitation policies based on changing international standards and market dynamics. Engaging in regular dialogues with industry stakeholders to understand challenges and proactively address emerging issues.



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5.6 Others



- Harmonization of food regulations/ laws, specially while framing new ones remains critical for the industry, as compliance of changing regulations many a times leads to large scale changes in operation processes and high costs. Introduction of new regulations and harmonization of existing regulations may be based on stakeholder consultations, inter-departmental discussions to avoid overlaps and an overall impact assessment.
- Devising a regulatory implementation framework under FSSAI to check adulteration of milk may be looked at. This may evolve as a positive framework where a higher rating of milk gets higher price from consumers. Cooperatives may be empowered to rate milk brought in for further distribution. This shall help farmers get higher price for their produce and ensure quality produce to consumers.
- Compliance to Bureau of Indian Standards (BIS) norms for animal/cattle feed being sold in the market may be made mandatory, with strict enforcement. This will help farmers have access to quality feed which in turn impacts milk quality. Also, implementing stringent ban on Antibiotic Growth Promoters will positively impact the poultry industry and help in exports.



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- Food and Agriculture Organization
- United Nations
- Indian Council of Agricultural Research
- National Bank for Agriculture and Rural Development
- Ministry of Food Processing Industries
- The United Nations Framework Convention on Climate Change
- Agricultural and Processed Food Products Export Development Authority
- Indian Agricultural Research Institute

7

Abbreviations



AAGR	Average Annual Growth Rate
ADM	Archer Daniels Midland
Adv.	Advance
AHIDF	Animal Husbandry Infrastructure Development Fund
AIF	Agriculture Infrastructure Fund
AIM	Atal Innovation Mission
APMCs	Agricultural Produce Market Committee
BCM	Billion Cubic Meters
BIS	Bureau of Indian Standards
Bn	Billion
Bvrg.	Beverages
CAGR	Compound Annual Growth Rate
Cr	Crore
DAHD	Department of Animal Husbandry & Dairying
DGFT	Directorate General of Foreign Trade
E-NAM	Electronic National Agriculture Market
EODB	Ease of Doing Business
etc.	Et cetera
F&S	Food grains & Sugar
F&V	Fruits & Vegetables
FAO	Food and Agriculture Organization
FAOSTAT	Food and Agriculture Organization Corporate Statistical Database
FDI	Foreign Direct Investment
FPOs	Farmer Producers Organizations
FSSAI	Food Safety and Standards Authority of India
G2G	Government-to-Government
GAP	Good Agricultural Practices
GDP	Gross Domestic Product
GDP	Gross Domestic Product
GMO	Genetically Modified Organism
Gol	Government of India
GST	Goods and Services Tax
GVA	Gross Value Added
GVO	Gross Value of Output
Ha	Hectare
IARI	Indian Agricultural Research Institute
IoT	Internet of Things





IPCC	International Panel on Climate Change
IPM	Integrated Pest Management
IPRs	Intellectual Property Rights
IPRs	Intellectual Property Rights
КСС	Kisan Credit Card
Кg	Kilograms
LEAP	Launching Entrepreneurial Driven Affordable Products Fund
Mn	Million
MoA&FW	Ministry Of Agriculture & Farmers Welfare
MoFAh&D	Ministry of Fisheries, Animal Husbandry and Dairying
MoSPI	Ministry of Statistics and Program Implementation
MP	Madhya Pradesh
MPCE	Monthly Per Capita Expenditure
MPEDA	Marine Products Export Development Authority
MSME	Micro, Small & Medium Enterprises
MSPs	Minimum Support Prices
MT	Metric Tons
NAPCC	National Action Plan on Climate Change
NCRMP	National Cyclone Risk Mitigation Project
NHB	National Horticulture Board
NITI	National Institution for Transforming India
No.s	Numbers
NRM	Natural Resource Management
NSSO	National Sample Survey Office
OECD	The Organization for Economic Cooperation and Development
PIB	Press Information Bureau
PLI	Production Linked Incentive
PMFBY	Pradhan Mantri Fasal Bima Yojana
PMFME	Pradhan Mantri Formalisation of Micro food processing Enterprises
PMKSAMPADA	Pradhan Mantri Kisan Sampada Yojana
PMKSY	Pradhan Mantri Krishi Sinchai Yojana
PPP	Public-Private Partnerships
Prod	Products
R&D	Research & Development
S&M	Small & Marginal
SDGs	Sustainable Development Goals
SRR	Seed Replacement Ratio
UP	Uttar Pradesh
USA	Unites States of America
USD	United States Dollar





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