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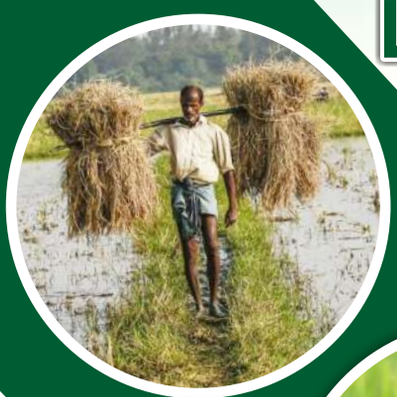
OVERVIEW OF THE INDIAN AGRICULTURE, LIVESTOCK AND FOOD PROCESSING SECTOR

Opportunities, Challenges & Way Forward



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ACKNOWLEDGEMENT

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FOREWORD

The agriculture sector has immense socio-economic significance in the Indian economy as it contributes to around ~18% of the country's GVA and employs around half of the country's working population. Though the contribution of the sector to the country's GDP has declined over the years due to higher output from services and manufacturing, the importance of the sector cannot be undermined given the significant dependence of rural India on agriculture and its potential for job creation. The sector is also a glowing example of resilience as it had been the only sector which managed to show green shoots even during the pandemic while many other sectors were severely affected. The sector has always been the priority for the Central and State Governments as several issues of national interest such as food security, food safety, health and nutrition, trade surplus, employment generation, economic growth among others are entwined with the sector. This is reflected in various policies and schemes which have been formulated and implemented for the holistic development of the sector.

Agriculture industry in India is at crossroads today. At one hand, there is a growing demand for food due to increase in population and consumption and on the other hand there is limited availability of resources such as availability of agricultural land, water sources, skilled labor which would put a limit on the quantum of production. The Indian farming landscape is highly fragmented with large majority of the farmers being small and marginal who have limited knowledge about Good Agricultural Practices and sustainable farming. Lack of scale, limited value addition, inadequate and outdated agri infrastructure, market access, access to knowledge and technology adoptions are some of the key constraints which adversely affect the sector. Given the non-remunerative nature of farming and also due to changing dietary consumption patterns of consumers, there has been focus on developing the livestock sector and encouraging farmers to take up such activities which would not only meet their own requirements but can supplement their incomes. More importantly, the country has a marketable surplus of various agriculture and horticulture products which have good export potential. However, India's share in global agriculture exports is miniscule compared to production. This requires focus on value addition, compliance with quality protocols, augmentation of processing levels and overall enhancement of the export competitiveness of the sector.

ASSOCHAM would like to thank NABARD for supporting to create this knowledge report and BDO India LLP for formulating this paper at an appropriate time when the sector is going through several supply and demand led disruptions. The paper not only brings out the challenges in agriculture, livestock and food processing sectors but also articulates the way forward to make the sectors more vibrant, sustainable and globally competitive.

Mr. Taranjit Singh
Chairman, Assocham, Eastern Region
Managing Director, JIS Group

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FOREWORD

The agriculture, livestock and the food processing sector plays an important role in the Indian economy- in terms of contribution to the country's GDP, employment generation, fulfilling the domestic consumption requirements, foreign exchange earning potential and most importantly rural development. The sectors have grown at a steady pace historically on the back of favorable drivers which can be attributed to favorable government policies related to production, processing, infrastructure development, R&D, market linkages among others as well as robust demand for consumers. Growing population, rise in middle income population, increase in disposable income will lead to increased consumption for various food products and this will necessitate a strong production base to meet this growing demand.

Inspite of the natural advantages these sectors are endowed with, there are structural issues across value chains which affect the overall competitiveness of the sectors. These primarily include limited scale due to fragmented nature of farming in India, inadequate infrastructure either at farmgate levels or those for storage, low levels of processing and value addition, quality of the products specially when it comes to exports such as conformity with the standards of the importing nations, issues related to market linkage and access which affect farmers' realisation, limited awareness of farmers about the current trends in agriculture, good agriculture practices (GAP) and technological disruptions and low adoption of such practices among others.

The report not only highlights the challenges that are affecting these value chains but also throws light on the key opportunities, trends, and growth potential of these sectors. More importantly, the report also analyses the policies that are currently implemented by the Government and provides suggestions on how to make these more effective and relevant in alignment to the needs of the industry. New intervention areas and refinement of the current policies have been suggested as part of way forward for a holistic development of these sectors.

ASSOCHAM would like to thank NABARD for their continued patronage to support such initiatives for the holistic development of the agriculture and allied sectors and BDO India LLP for formulating this insightful report which would benefit the stakeholders across each of the sectoral value chains. We sincerely hope the suggestions in the report would help in effective policy formulation and implementation of the same which in turn would help create sustainable, resilient, globally competitive food supply chains address issues of food security consumer health and nutrition and ensure remunerative prices to producers thereby ushering in a holistic development of people, planet and prosperity.

Ms. Perminder Jeet Kaur
Senior Director–East and Northeast
Assocham

BDO

FOREWORD FROM BDO INDIA LLP

The importance of the agriculture and allied sectors in the Indian economy cannot be undermined. Despite contributing to ~18.3% to the country's GDP, the sector employs more than 50% of the country's workforce and is the mainstay for a large percentage of the rural population. The country is endowed with diverse agro-climatic conditions which has helped India emerge as one of the largest producers of agriculture and horticulture products globally, contributing to around 25% of global agricultural production. Given the low levels of processing in the country as compared to the global standards, the Central and State Governments are promoting food processing to enable farmers move up the agri value chain and improve their realization. While agriculture sector has grown at a CAGR of 4.6%over the last decade, the food processing industry has grown at a faster rate of 8.5% in the same period and the growth momentum is expected to continue based on favorable policies introduced by the Government as well as robust demand from consumers both in domestic and exports markets.

The sectors have witnessed a paradigm shift over the years in terms of the supply as well as consumption trends. While the sector has fairly achieved self-sufficiency in most food crops and successfully addressed the issue of food security, it is now grappling with issues around sustainable development. With the growing population there will be an increase in demand for food and hence the need for intensification. However, with limited agricultural land it is difficult to improve productivity beyond limits through conventional farming. The Indian farming landscape largely comprises of small and marginal farmers who by and large have limited knowledge of Good Agriculture Practices (GAP), sustainable methods of cultivation, awareness about technology and end up over cultivating the plots which in the long run may not augur well for environmental sustainability. Climate changes have resulted in extremes which in turn have affected the production and productivity.

On the other hand, there had been noticeable changes in consumption patterns as consumers are increasing the percentage of protein and related foods in diets which earlier used to have a larger share of carbohydrates. Food safety, consumer health nutrition and need of convenience is on the rise and consumers are increasingly preferring foods which are sustainably sourced and manufactured. This has led to increased offtake of packet food and organized retailing. Such demand trends have been supplemented through supply side disruptions in terms of new product development, innovation, and emergence of various distribution models specially ecommerce and last mile logistics which has made accessibility and availability of products easier compared to the traditional models.

While the favorable demand and opportunities globally are good indicators of the future potential of the sectors, it is pertinent to focus on the structural challenges that affect thesesectors. As the country aims to become the 3rd largest economy by 2027-28, it is important to reflect upon those, refine the current policies to make them industry friendly and relevant and formulate forward looking policies which can unlock the true potential of these sectors and make them globally competitive.

BDO India LLP would like to thank ASSOCHAM & NABARD for their support in creating this platform for publishing this report agro, livestock and food processing and way forward at this right time. The report not only brings out the opportunities in the subsectors across the above sectors but also analyses the critical challenges and accordingly comes up with suggestions for a holistic development of the sectors.

Mr. Soumyak Biswas
Partner – Management Consulting
BDO India LLP

ACRONYMS AND ABBREVIATIONS

AI	Artificial Intelligence
AIF	Agriculture Infrastructure Fund
APMC	Agriculture Produce Marketing Committee
BAHS	Basic Animal Husbandry Statistics
CAGR	Compounded Annual Growth Rate
CBBOs	Cluster Based Business Organizations
CHC	Custom Hiring Centre
CSO	Civil Society Organization
DAHD	Department of Animal Husbandry & Dairying
DoF	Department of Fisheries
e-NAM	Electronic National Agriculture Market
FPO	Farmer Producer Organization
FY	Financial Year
GAP	Good Agricultural Practice
GDP	Gross Domestic Product
GSDP	Gross State Domestic Product
GI	Geographical Indication
GIS	Geographic Information Systems
GoI	Government of India
GVA	Gross Value Added
Ha	Hectares
IA	Implementing Agency
ICT	Information & Communication Technology
IDEA	India Digital Ecosystem of Agriculture
IoT	Internet of Things
KCC	Kisan Credit Card
KVKs	Krishi Vigyan Kendras
ML	Machine Learning
MMT	Million Metric Tonne
MOAFW	Ministry of Agriculture and Farmers'Welfare
MOFPI	Ministry of Food Processing Industries
MSME	Micro Small and Medium Enterprises
NeGP-A	National e-Governance Plan in Agriculture
NGO	Non – Governmental Organization
NRF	National Research Foundation
ODOP	One District One Product
PM PRANAM	Prime Minister Programme for Restoration, Awareness, Nourishment and Amelioration of Mother Earth
PMKSY	Pradhan Mantri Kisan Sampad Yojana
R & D	Research & Development
USD	US Dollars
WTO	World Trade Organization

Contents

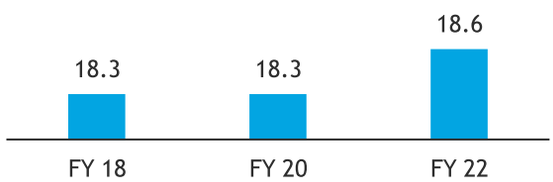
OVERVIEW OF THE AGRICULTURE SECTOR

1. AGRICULTURE SECTOR

1.1 OVERVIEW

The agriculture sector plays a significant role in the Indian economy, with approximately 54.6%[1] of the total workforce being engaged in activities related to the agriculture and allied sectors. The sector on an average contributes to around 18% to the country's gross value added (GVA). Endowed with 15 agro-climatic zones, ~160 million hectares of arable land (2nd largest in the world after the United States) and 8 major soil types, the country has the necessary conducive factors for growth of the agriculture sector. Aided by favourable government policies, the sector has come up in a big way in not only ensuring food security to the world's largest population but also playing a significant role in exports. **India is the largest producer of spices, pulses, milk, cashew, mango, banana and jute, and the second-largest producer of wheat, rice, fruits and vegetables, sugarcane, cotton and oilseeds.** Because of the sizeable marketable surplus in several crops, India has emerged as a leading agricultural exporter globally. Agriculture exports from India witnessed a significant jump of around 22% in FY 2022 (Agri exports of INR 3.76 Lakh crores[2]) over the previous year due to the pro-active initiatives undertaken by the Central and various State Governments, supported by favourable policies.

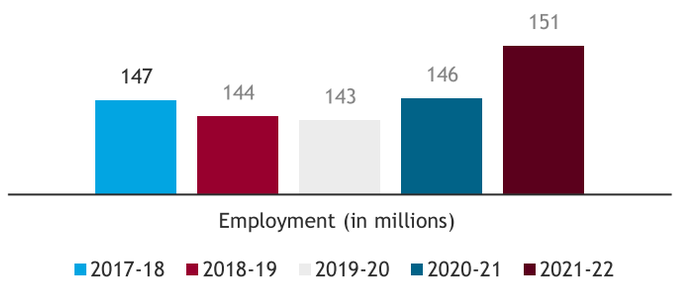
Figure 1: GVA - Indian Agriculture Sector



Source: Ministry of Agriculture and Farmers' Welfare, GOI

The sector has been the lifeline of the Indian economy. Even when all the other sectors were adversely impacted during the pandemic, this is the only sector which recorded growth and this growth is expected to continue in future, mainly driven by the various favourable supply and demand side factors which have been discussed subsequently.

Figure 2: Employment Generation in Agriculture Sector (in millions)



Source: Ministry of Agriculture and Farmers' Welfare, GOI

Agriculture in India is a labour-intensive sector which is evident from the sheer number of people involved in agriculture. Currently as per the latest data (FY 2021-22), over 150 million people directly involved in the sector.

However, the sectoral contribution to overall economic output is low (compared to services and manufacturing), in spite of employing such a high percentage of population. This points to the relatively low remuneration in the sector as compared to services and manufacturing and is one of the major reasons for migration of workforce from agriculture to other relatively high remunerable sectors. A trend for the last few decades has been depicted in Table 1.

Table 1: Share of agriculture and allied sectors in national income and employment 1950-51 to 2020-21

Year	Agriculture shares in workforce %	Ratio of income of agriculture to non-agriculture worker
1950-51	69.2	0.51
1970-71	69.7	0.33
1990-91	59.0	0.29
2010-11	54.6	0.19
2020-21	46.5	0.29[3]

[1] Ministry of Agriculture, Government of India
[2] Agricultural Statistics at a Glance, 2022 by Ministry of Agriculture & Farmers Welfare, Department of Economics & Statistics Division
[3] Green Revolution to AmritKal Report – Niti Aayog

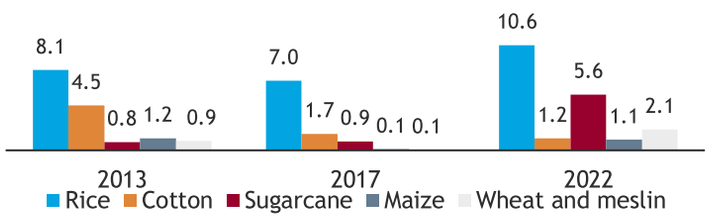
Agri-Exports Scenario

Despite India being a significant producer of various agricultural and horticultural products as mentioned above, there is a significant potential to improve the country's global positioning when it comes to exports of products from agriculture and allied sectors.

According to the World Trade Organization data, India's agriculture exports touched USD 50.2 billion in 2022 as compared to USD 23.1 billion in 2010. The compounded annual growth rate (CAGR) of India's agricultural exports in last decade is 6.68% whereas global agricultural export growth in last decade is approximately 3.1%. India's share in global production is 25%; but share in agriculture exports is approximately two percent pointing to large domestic consumption market and potential to improve exports from the country. Even though the share in agriculture exports has seen improvement over the last decade, India still ranks 9th globally in agriculture exports according to the WTO.

Given the potential of this sector, the Government of India has identified this sector to be a major growth engine for the economy and set a target USD 100 billion of agricultural exports by 2026-27. Despite the various challenges ranging from structural issues in the value chain, operational and logistics constraints during the pandemic, the sector has demonstrated exemplary resilience which is reflected in the recent export performance. An analysis of export basket reveals that rice (basmati and non-basmati), wheat, other cereals are the top exported commodities which contributes to around 60%-65% of agro exports from India.

Figure 3: Agriculture export basket of India (in USD million)

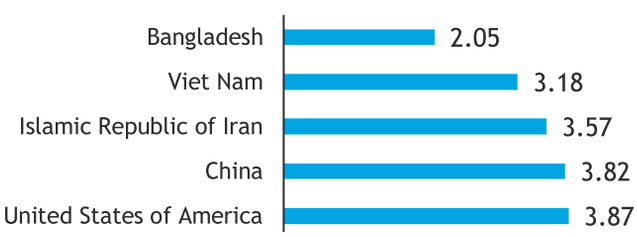


Source: ITC TradeMap

A decadal trend analysis reveals that there had been a limited change in export basket which indicates the growing population and demand of these products in the importing countries. However, it also points to the fact that there is potential to explore market diversification for existing products and new products also.

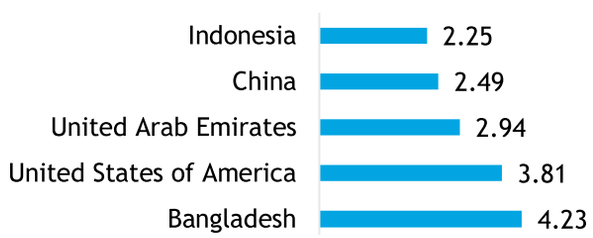
Also, while looking at the major export destinations for the Indian agricultural products over the years, it is evident that the export markets have remained largely same. This indicates that India needs to diversify its agriculture export market.

Figure 4 : Export of agricultural products in 2013 (in billion USD)



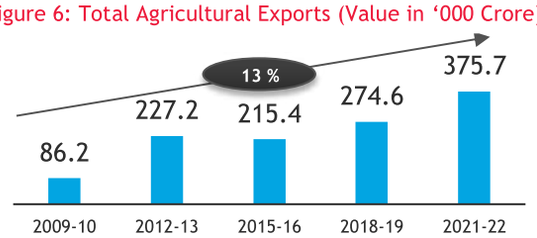
Source: ITC TradeMap

Figure 5: Export of agricultural products in 2021 (in USD billion)



Source: ITC TradeMap

Figure 6: Total Agricultural Exports (Value in '000 Crore)



The growing importance of this sector as a major forex earner cannot be undermined. The exports grew at over 13% CAGR[4] over the last decade as highlighted in the chart beside.

[4] Agriculture Statistics of India 2022

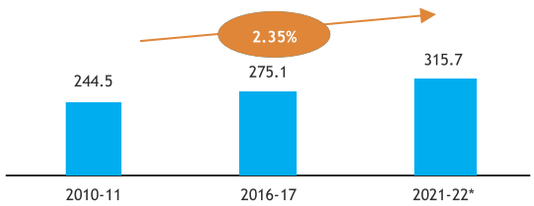
1.2 KEY SUB-SECTORS AND GROWTH DRIVERS

Given the significance of agriculture for the overall growth of the Indian economy, it is crucial to examine the subsectors and analyse the salient trends in production. The food grains, oilseeds, horticultural crops, as well as a few cash crops are some of the primary subsectors that are classified under the agriculture sector.

Foodgrains

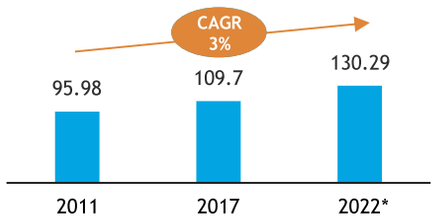
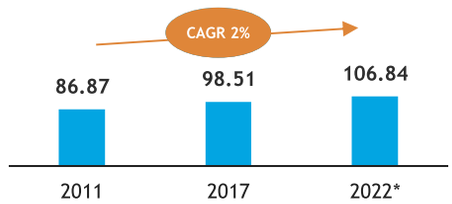
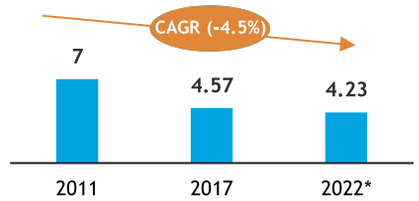
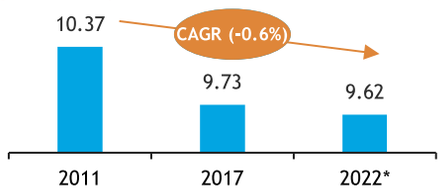
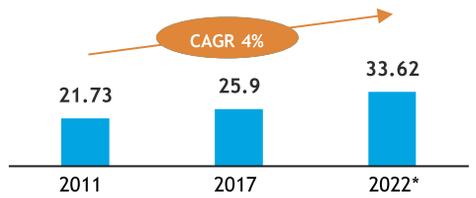
India is the second largest producer of foodgrains in the world, next to China. Major foodgrains include rice, wheat, maize, jowar, bajra, pulses and grams. The production of foodgrains in India recorded an all-time high in 2022 with an output of 315.72 million tonnes (as per 4th advance estimates). It has grown at a CAGR of approximately 2.3% over the last 12 years as illustrated. While the area under foodgrain production has almost remained static with a CAGR of around 0.27%, the yield has grown significantly rat a CAGR of 2.07% for the same period. The major states producing foodgrains are Uttar Pradesh with 18% of total production of foodgrains in India, Madhya Pradesh with 11%, and Punjab with 10% contribution in 2020-2021[5]. A snapshot of the trends in production of a few major foodgrains has been highlighted below.[6]

Figure 7: Foodgrain Production in India (in million tonnes)



Source: Agri Stat 2022, GOI

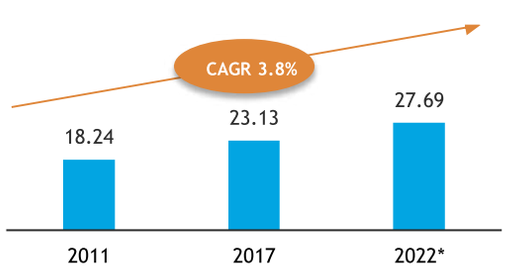
[5]Agricultural Statistics at a Glance, 2022 by Ministry of Agriculture & Farmers Welfare Department of Economics & Statistics Division
* As per 4th Advance estimates
[6] Agricultural Statistics at a Glance, 2022 by Ministry of Agriculture & Farmers Welfare Department of Economics & Statistics Division
* As per 4th advance estimates

Production Trend	Observations
Figure 8: Rice Production (in million tonnes) 	• India ranks 1st in terms of rice production globally. • Rice production grew at a CAGR of 3% from 2010-11 to 2021-22. • The area under rice production grew at a CAGR of only 0.72% during the same time. • Government interventions and efforts have increased the yield from 2239 kg/hectare in 2010-11 to 2809 kg/hectare in 2021-22. • More than 50% of the rice in India is produced by West Bengal, Uttar Pradesh, Punjab and Telangana.
Figure 9: Wheat Production (in million tonnes) 	• India ranks 2nd in terms of wheat production globally. • Area under wheat cultivation grew at a CAGR of 0.4% while the production increased at a CAGR of 2% from 2010-11 to 2021-22. • Successful efforts to increase the yield and has shown a CAGR of 1.5%. • 70% of the wheat production in India is carried out Uttar Pradesh, Madhya Pradesh and Punjab.
Figure 10: Jowar Production (in million tonnes) 	• Production of Jowar has been on the decline and has decreased to around 4.23 million tonnes in 2021-22 from 7 million tonnes in 2010-11. • Similarly, the area under jowar cultivation has also decreased at a CAGR of approximately 6%. However, yield has increased from 949 kg/hectare in 2010-11 to 1110 kg/hectare in 2021-22 at a CAGR of 1.4%. • Maharashtra, Karnataka and Rajasthan constitute around 60% of jowar production in India.
Figure 11: Bajra Production (in million tonnes) 	• Bajra production and area under its production both decreased at a CAGR of 0.68% and 3% respectively from 2010-11 to 2021-22. • The yield increased at a CAGR of 2.63%, from 1079 kg/hectare to 1436 kg/hectare. • More than 70% of the total bajra production is produced by Rajasthan, Uttar Pradesh and Haryana combined.
Figure 12: Maize Production (in million tonnes)  *Source: Agri Stat 2022, GOI*	• The area under maize production has increased at CAGR of 1.47%. • The production of maize recorded a CAGR of 4% and yield a CAGR of 2.54%. The production of maize increased from 21.73 million tonnes in 2010-11 to 33.62 million tonnes in 2021-22. • Maize is largely cultivated in Karnataka, Madhya Pradesh and Maharashtra in 2021-22.

Pulses

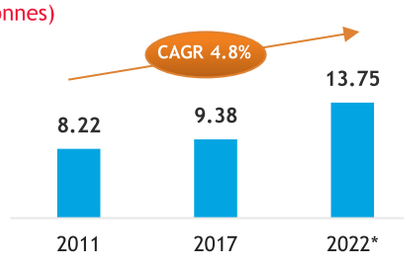
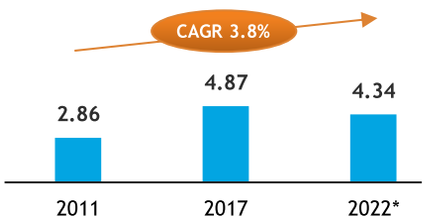
Pulses are the primary sources of protein in the diet. India is the world leader in the production (25% of global production), consumption (27% of world consumption) and import (14%) of pulses. Pulses occupy around 20 per cent of the area under foodgrains and account for around 7-9 per cent of the total foodgrains output in the country. Even though the productivity of pulses has gone up to 892 kg/ha (2021-22), it is way below that in some of the leading pulse producing countries. Pulses offer multiple advantages for human health and the environment. Apart from being a rich source of, it is well known for its fibre, iron, folate and zinc contents, and for its antioxidant properties. Pulses also have a low carbon and water footprint compared to other crops. They can fix atmospheric nitrogen in the soil and improve its fertility. They are also the potential to enhance crop

Figure 13: Pulses Production in India (in million tonnes)



Source: Agri Stat 2022, GOI

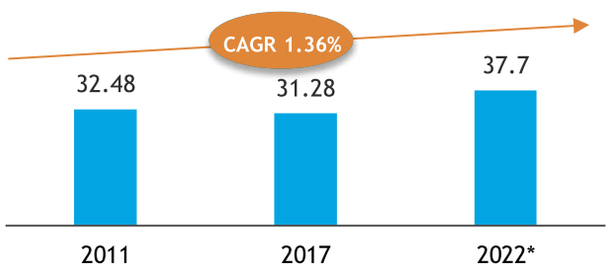
diversity and show resilience to climate change. Pulses production recorded a an all-time high of 27.69 million tonnes in 2021-22. The production of pulses has grown at a CAGR of 3.8% over the last 12 years and yield grew at a CAGR of 2.35%.[7]

Production trend	Observations
Figure 14: Gram Production (in million tonnes) 	• The CAGR of the area under gram production is 1.57% for the period from 2010-11 to 2021-22. • The production of gram grew at a CAGR of 4.8% over the last decade while the productivity increased at CAGR of 3.17% for the same period. • The production has increased from 8.22 million tonnes in 2010-11 to 13.75 million tonnes in 2021-22. • Around 80% of the gram production takes place in Maharashtra, Madhya Pradesh, Rajasthan, and Gujrat.
Figure 15: Tur Production (in million tonnes) 	• The area under Tur production grew at CAGR of 1.32% from 2010-11 to 2021-22. It recorded a yield of 859 kg/hectares in 2021-22 higher from 654 kg/hectare in 2010-11. • The overall area under tur production also increased at CAGR of 3.9%. • Maharashtra, Karnataka, Uttar Pradesh produce on an average 60% of the total tur production in India.

Oilseeds

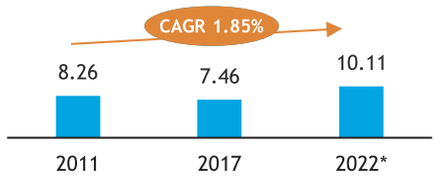
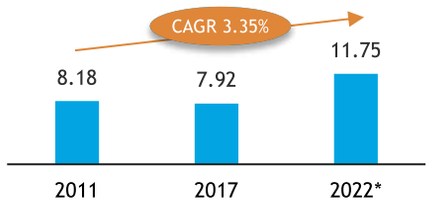
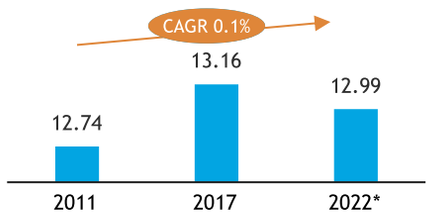
India is a major producer of oilseeds - fourth (4th) largest in the world and contributes to about 10% of the global production. The main oilseeds cultivated in India are soybean, groundnut, rapeseed-mustard, sunflower, sesame, safflower, niger, castor and linseed. Out of these, soybean, groundnut and rapeseed-mustard make up more than 80% of the total oilseed output. The oilseed cultivation in India is mainly done in a few states, especially in the central and western regions. The top oilseed producing states are Rajasthan, Maharashtra, Madhya Pradesh, Gujarat, Haryana, Uttar Pradesh, Karnataka and West Bengal. These states have suitable soil types and agro-climatic conditions for growing oilseeds. Oilseeds production recorded an all-time high of 37.7 million tonnes in India in 2021-22 and has been growing at a CAGR of 1.36%[8].

Figure 16: Oilseeds Production (in million tonnes)



Source: Agri Stat 2022, GOI

[7] Agricultural Statistics at a Glance, 2022 by Ministry of Agriculture & Farmers Welfare Department of Economics & Statistics Division
* As per 4th Advance estimates
[8] Agricultural Statistics at a Glance, 2022 by Ministry of Agriculture & Farmers Welfare Department of Economics & Statistics Division
* As per 4th advance estimates

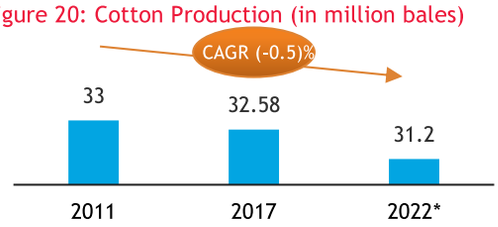
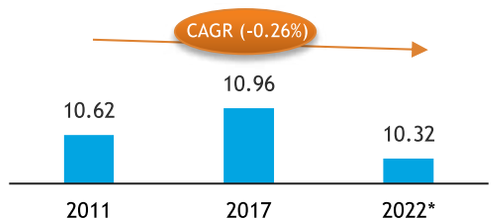
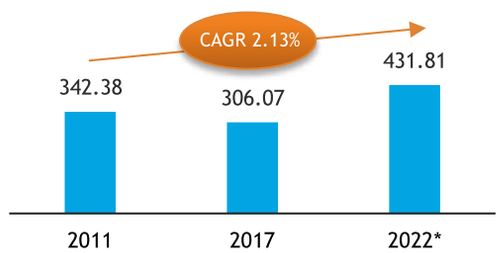
Production trend	Observations
Figure 17: Groundnut Production (million tonnes) 	• India's position globally is 1st in groundnut production. • The area under groundnut production area at a CAGR to 0.17% for the years shown. • Production and yield grew at a CAGR of 1.85% and 2.02% respectively. • In India, more than 60% of the groundnut produce is produced by Gujrat, Rajasthan and Tamil Nadu.
Figure 18: Rapeseed and Mustard Production (million tonnes) 	• India ranks 3rd in rapeseed production in the world. • The production of Rapeseeds and Mustard has recorded a CAGR of 3.35% for the period shown. • The area under rapeseed production also increased at CAGR of 1.42%. • The productivity of rapeseed and mustard also increased from 1185kgs/hectare to 1458 kg/hectare with a CAGR of 1.90%. • Rajasthan, Uttar Pradesh, Madhya Pradesh and Haryana constitute around 70% of the mustard production in India.
Figure 19: Soyabean Production (million tonnes 	• The production of soyabean has almost been constant over the years, with a CAGR of 0.1%. • Soyabean productivity has declined over the said period at a CAGR of 2.0% while the area under production recorded a CAGR of 2.2%. • Major soyabean producing states are Maharashtra and Madhya Pradesh. Around 80% o the produce comes from these states.

Other Cash Crops

India grows cotton, jute and sugarcane as some of its major cash crops, which are sold both in the domestic and foreign markets. These crops are also cultivated along with food crops in various agro-climatic zones to preserve soil health and crop diversity. India is a top producer of these cash crops in the world, ranking second in cotton, first in jute, and second in sugarcane output. These crops are important for the Indian economy, as they supply raw materials for different industries such as textiles, paper, sugar, ethanol, etc.[9]



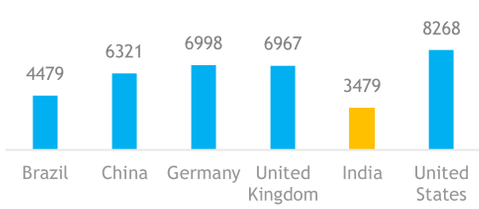

[9] Agricultural Statistics at a Glance, 2022 by Ministry of Agriculture & Farmers Welfare Department of Agriculture & Farmers Welfare Economics & Statistics Division
* As per 4th Advance estimates

Production trend	Observations
Figure 20: Cotton Production (in million bales) 	• The production of cotton has shown a decreasing trend with a VAGR of 0.51% over the years. • Though the area under cotton production increased at a CAGR of 0.5%, the yield has declined from 499 kgs/hectare in 2010-11 to 445 kg/hectare in 2021-22. • 60% of the cotton in India comes from Gujarat, Maharashtra and Telangana.
Figure 21: Jute Production (in million bales) 	• Jute also showed declining trend in production and area under production at a CAGR of 0.26% and 2.09% respectively. • The yield has increased from 2197 kg/hectare to 2709 kg/hectare at a CAGR of 1.92% for the period. • The major jute producing state in India is West Bengal that alone produces around 75% of the total jute production in India.
Figure 22: Sugarcane Production (million tonnes)  *Source: Agri Stat 2022, GOI*	• Sugarcane production recorded a CAGR of 2.13% from 2010-11 to 2021-22. • The area under sugarcane production also increased slightly at a CAGR of 0.13%. • Sugarcane productivity increased from 70091 kgs/hectare in 2010-11 to 83887kgs/hectare in 2021-22. • Around 90% production comes from Uttar Pradesh, Maharashtra and Karnataka.

The above analysis indicates that despite the limited increment in arable land under cultivation, the agricultural output and productivity have increased due to the government interventions and thrust on R&D and extension services which gave a boost to agricultural yields. Natural resources are scarce and overused globally. While there has been sustained growth in Indian agriculture production, there is a significant headroom for growth due to a host of favourable factors.

Supply Driven: Despite the positive trend in the productivity of almost all the crops discussed in the above section, the productivity of Indian crops is much lower than global standards. Comparing the cereal yield of India with major countries of the world as shown below, it can be seen that India has significantly lower productivity. Government focus on R&D in improving productivity and bringing new area under cultivation for pulses, oilseeds and other crops are expected to lead to enhanced production.

Figure 23: Country wise: Cereal Yield (in kg/hectare)



Source: Agri Stat 2022, GOI

Demand Driven: Rapid urbanization, growth in middle-income group, participation of youth in the workforce and rise in disposable incomes, are expected to result in increased food demand in future. The projected demand for foodgrains in the next decade (2033-34) is expected to be around 355 million tonnes[10]. This requires an average annual growth of ~10% in foodgrains production to satisfy the domestic demand and have surplus for exports.

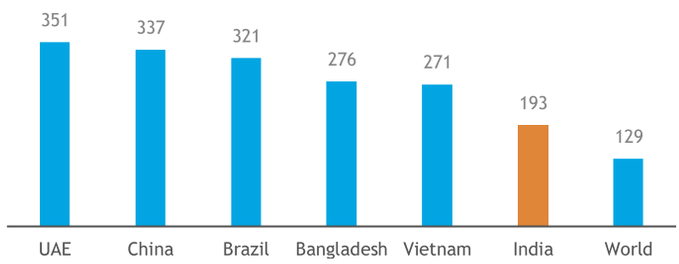
[10] Chapter I to III (niti.gov.in)

On one hand, there is a growing demand for food due to increase in population and consumption and at the same time there is a severe pressure on natural resources along with varying and unprecedented climate conditions which has put a question mark on environmental sustainability. It is thus important to look at the trends and critical challenges which can help in formulating action paths for sustainable development of this sector.

1.3 KEY CHALLENGES

As highlighted in above section, sustainable development of agriculture and allied sectors is a critical issue as on one hand there is a growing demand for food and on the other hand there is limitation on resources such as arable land, labour and productivity. During Green Revolution there has been marked improvement in agricultural productivity due to usage of chemicals, application of fertilizers and various inputs, adoption of new methodologies and technologies- all of which were aided by favorable Government policies in order to optimize productivity and ensure self-sufficiency and food security. In-spite of the success of green revolution and the country attaining self-sufficiency the continued subsidization of chemical fertilizers of Government of India to boost productivity has led to increased usage by the farmers.

Figure 24: Fertilizers use per hectare (in kg/ha)



Source: FAOSTAT

While per hectare usage of fertilizers in India is lower than that of many other agriculture powerhouses it is still higher than global average. It is pertinent to note that more than 86% of the farming community in India comprises small and marginal farmers who have landholdings typically 1 Ha of land. These farmers have fragmented land holdings, lack scale and have limited knowledge about good agricultural practices (GAP) and access technology and limited awareness about recent developments in agriculture. These have exacerbated the usage of inputs in order to improve production thereby putting environmental sustainability at stake.

Though the country is witnessing industrialization there is going to be continued dependency on agriculture as major source of livelihood for a large section of Indian population. It is thus crucial to address the primary challenges of feeding a growing population, protecting the environment and ensuring a decent living for the farmers together in order to ensure sustainable progress in any of these. However, trying to address any of these through specific initiatives can lead to unintended consequences on another which plays a big deterrent in successful implementation of the same. Some of the key issues have been highlighted below.

- **Climate change, safeguarding environment and biodiversity**
  Crop development, water use efficiency and crop yields are largely influenced by climate change and weather. Changes of climatic conditions and weather pattern can adversely affect productivity and production. India is witnessing increased frequency of extreme events such as flood and droughts. Availability of water is another integral factor for agriculture as most of the cultivable land has limited irrigation facilities specially this is pronounced in arid regions where soil moisture scarcity limits agricultural production. Most importantly there is a severe threat to soil health conditions as most farmers in India adopt conventional farming and use of inputs without having proper knowledge and awareness about good agricultural practices (GAP). This not only affects quality of produce but also affects the ecological balance.

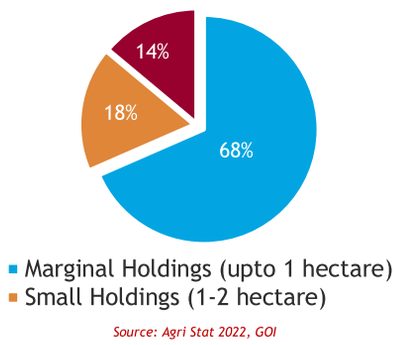
- **Growing population and depletion of natural resources**
  With a growing population there is a severe pressure on the resources on the resource base especially availability of land for agriculture activities and water. For cultivation industrialization is going to pose as a serious threat related to availing of land while increasing population will necessitate higher demand for water which will result in depletion of natural water resources leaving little time for recharging of water tables. This does not auger well for the agriculture sector. In order to address such issues, the

concept of vertical farming is being tried out in several parts of the country. However, there is a still long way to go in terms of making it commercially viable and affordable to the large section of farming community.

- **Lack of scale due to fragmented land holdings**

As highlighted, a large section of Indian farming community comprises of small and marginal farmers having landholding between 0-2 Ha. Due to this, most farmers lack scale and largely lack bargaining power in terms of getting remunerative price from buyers or even during procurement of inputs. This coupled with productivity issues and limited value addition and limited access to market impacts their ability for a fair price discovery. In order to improve their productivity, the farmers over cultivate their plots or use excessive inputs in order to optimize the yields which poses threat to environmental sustainability as explained earlier.

Figure 25: Type of Land Holdings in India

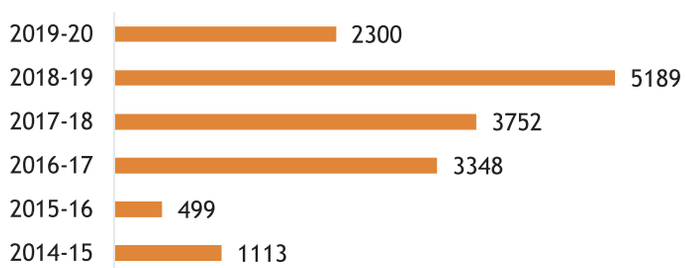


Source: Agri Stat 2022, GOI

- **Productivity issues including limited adoption of mechanization**

There had been sustained efforts by the Government in improving the productivity of the sector through focus on R&D related to development of high yielding seeds and clonal varieties of various agricultural and horticultural crops, proper training of farmers across the country regarding extension services and package of practices, technology adoption, awareness campaigns related to GAP and sustainable farming. Most importantly, due to low remunerative nature of agriculture in India, there is a gradual shift from farming and agriculture towards more remunerative services and manufacturing which has accentuated the need for state-wise mechanization in agriculture and allied activities.

Figure 26: No of CHC Established (FY 2014-15 to FY 2019-20)



Source: Press Information Bureau on March 2023, GOI

However, accessibility and availability of such machinery is a roadblock for large sections of small and marginal farmers. To address this Government of India has introduced Custom Hiring Centers with an objective of democratizing mechanization, providing farmers access to advanced tools. However, the levels of mechanization in India are significantly lower (40%-45%) compared to countries such as the USA (95%), Brazil (75%), China (57%). Even within the country mechanization levels vary significantly between States. While states such as UP, Haryana, Punjab have high levels of mechanization, it is significantly lower in the north-eastern and eastern parts of the country.

- **Limited adoption of technology and knowledge dissemination**

Majority of Indian farmers still depend on traditional resource intensive farming techniques which affect the output, productivity, and quality of production. Digital interventions have potential to unlock value across agriculture value chain. However, the adoption of technology by farmers is limited due to multiple issues related to affordability of smart phones, internet connectivity, and lack of operational knowledge. The Government of India has taken cognizance of the rapid digital disruption across sectors including agriculture has launched National Digital Mission. By integrating cutting edge technologies such as artificial intelligence, blockchain, remote sensing etc, this mission is aimed towards optimizing agriculture practices, thereby boosting overall production and productivity levels through advanced and data-driven technologies. However, it is still in its early stages.

In food and agriculture products, a good traceability system ensures that every step of the supply chain has the necessary information for complete transparency about the product. The need for food safety has arisen because of increasing awareness of consumers and concerns of the regulators regarding quality, hygiene and authenticity of food supplies. However, the major challenges to implement effective traceability systems in food and agri supply chains is the complexity of the supply chains themselves. Food and Agriculture produce can pass through multiple intermediaries, including producers, processors, distributors, and retailers, before reaching the end consumer. This makes it difficult to track the movement of food and agricultural products and identify the source of any contamination or quality issues.

- **Post harvest losses and limited infrastructure**

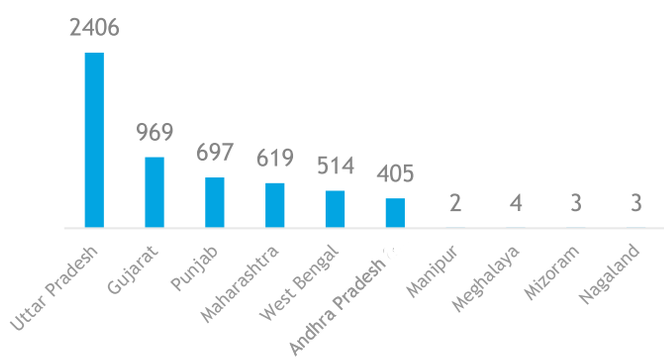
It has been observed that there are significant post-harvest losses across different agriculture and horticulture products in India. This is very much pronounced in the case of fruits and vegetables where post-harvest losses run high up to 12%-15%.

Table 2: Post Harvest Losses in India[11]

Agriculture produces	Post Harvest Losses
Cereals	4%-6%
Pulses	5.7%-6.7%
Oilseeds	3%-7.5%
Fruits	6%-15%
Vegetables	5%-11.6%

Analysis of losses reveals that significant losses occur at the farm operation stage as compared to that during movement through storage channels. It is pertinent to note that while there is significant progress in production of various agriculture and horticulture products the reduction in post-harvest losses has been insignificant. A big challenge is the adequate post-harvest infrastructure, such as proper packaging material and climate control storage environments. For example, in cold storage, the cumulative capacity is around 32 Mn MT against the requirement of 38 Mn MT[12]. Even within these many are not operational, which further worsens the situation. Government has schemes such as Pradhan Mantri Kishan Sampada Yojana (PMKSY) that aims to finance a portion of the cost of developing the infrastructure, it has not benefitted the large majority of Indian farmers, who are small and marginal. The chart depicted alongside is showcasing the state-wise uneven distribution of cold storage in India.

Figure 27: Distribution of Cold Storage Across States



Source: Annual Cold Storage Capacity Report, NABCONs

- **Limited market access and price discovery**

The Agri-marketing system in India has evolved over the years. There are 6,630[13] regulated wholesale markets in the country with an average density of 496 square Km. per market. However, there is a large difference regionally. In Assam, a wholesale market covers about 6,442 sq. km (45 km radius), whereas in Punjab market covers 116 sq. km of area (6 km radius). There are about 22,491 rural haats in the country of which about 11,811 rural haats are under Rural Local Bodies (Panchayats) and about 1274 rural haats are under APMC, Cooperatives and other government agencies and approximately 9856 rural haats are under

[11] NABCONs Study 2022
[12] All India Cold-chain Infrastructure Capacity Report by NABCON
[13] NABARD Status Report 21-22

private sectors including individuals, trusts, waqf boards, etc. Due to lack of market infrastructure, the share of farmer in consumer's price is very low. Particularly for the perishable products, due to lack of market infrastructure, number of intermediaries, poor holding capacity, Farmers in most cases do not get remunerative price for the production.

Government of India has introduced e-NAM and collectivization of farmers with a goal of creating 10,000 FPOs and subsequently onboarding of FPOs to the e-NAM Platform to enable better market linkage for the farmers.

However, there are several issues which affect the efficient functioning of e-NAM portal. While in India we have 2473 principal regulated markets (APMCs), 4843 submarket yards regulated by repulsive APMCs, around 1361 [14]APMCs have been connected to e-NAM so far. As on 03rd July 2023, more than 1.75 Crore Farmers & 2.45 Lakh traders have been registered on e-NAM portal. Only, 10 -12 % of India's total farmer is registered with E-NAM. [15]

There have been various issues related to integration with e-NAM. One critical issue is the reluctance of several states to come onboard as market fees are a major source of revenue for the states. Moreover, the trade intermediaries play a crucial role in this trade process ranging from collection of farm produce, providing support in logistics, informal credit to farmers, making timely payments and carrying out activities such as sorting, packing, branding etc. Smooth functioning of such an online system is largely affected due to limited availability of adequate support infrastructure such as covered and open auction platforms, common drying yards, facilities for grading sorting etc, electronic weigh bridges, adequate market information system among others.

1.4 POLICY INTERVENTIONS AND WAY FORWARD

Given the structural issues, that affect the sector it is important to deliberate on key policy interventions and the way forward to make the agriculture sector in India more productive, globally competitive and sustainable so that the farmers can get a remunerative price which in turn may lead to increased investments and development in the sector. The Government of India implements several schemes for development of the sector- ranging from providing support around agri inputs, agriculture production (such as Fasal Bima Yojana, Pradhan Mantri Krishi Sinchayee Yojana, National Mission on Soil Health and Fertility , Paramparagat Krishi Vikas Yojana, support around agriculture mechanization), infrastructure creation and upgradation (Agri Infrastructure Fund, PM Kisan Sampada Yojan), market linkages (e-NAM, Agri Export Policy), providing support around stabilizing income to the farmers (Pradhan Mantri Kisan Samman Nidhi Yojana, Pradhan Mantri Man Dhan Yojana), credit support (Kisan Credit Card Scheme) and adoption of digital technologies under the framework of India Digital Ecosystem of Agriculture (IDEA) through National e-Governance Plan in Agriculture (NeGP-A) .

While some of these schemes have contributed significantly to the overall production, improvement of productivity there are still a few intervention areas where some of these policies need to be refined so as to enable effective implementation of the same and meeting the desired outcomes. A few suggestions in this regard have been highlighted below:

- **Encourage sustainable farming**
  Given that a large section of the farming community in India being small and marginal farmers who are overly reliant on the conventional farming methods it is important to encourage them to adopt sustainable agricultural practices.

[14] PIB on 5th July 2023
[15] PIB on 5th July 2023

- **Expedite the implementation of the PM PRANAM Scheme -** To promote the usage of alternate nutrients and natural farming methods - This scheme is expected to reduce the increasing burden of fertilizer subsidy and promote sustainable agriculture through discouraging usage of chemical inputs in disproportionate amounts.
- **Focus more on training around good agricultural practices (GAP)-** PPP models can be explored with private training partners / NGOs/ CSOs who can effectively demonstrate the good package of practices to the farmers. The convergence between the current schemes may be explored to drive synergy and benefit the farmers.
- **Promote regenerative agriculture -** While the Paramparagat Krishi Vikas Yojana Scheme has been designed to promote organic cultivation, currently 4% of net sown area (5.91 mHa) [16]in India is under organic cultivation. There is a wide scope for improvement in organic cultivation. Limited knowledge about proper practices, certification procedures and high cost of certification and market linkages are the primary roadblocks for the development of organic cultivation. It is important to introduce new policies to support regenerative agriculture- covering assistance for conversion to regenerative agriculture, support around carbon sequestration and trading of carbon credit which can provide supplemental sources of income to the farmers.
- **Formulate Policies for Vertical Farming -** With a rapidly growing population and consumption, sustainable food production is going to emerge as a pressing challenge for India. Especially, due to availability of agriculture land and limitations to improve productivity beyond a certain limit, it is pertinent to look for alternate methods of sustainable production. Vertical farming, which can be done in a controlled environment may not only ease the pressure on land but also offer an alternative to pesticide- and fertilizer-dependent farming with significantly low water intake as compared to conventional farming. This is coming up in a big way in several countries globally including USA, Japan, China, Singapore, South Korea, several countries in Europe and Middle East. Given the requirement of a large initial investment and high cost of operations, it may be prudent to formulate a separate policy to adopt such practices – where in assistance can be given in terms of moratorium on loans for investment or credit linked subsidy and reduced power tariffs to offset the high operating costs during the initial years of operations.

- **Focus on collectivization to build scale**

  The Government has promoted the scheme for formation & promotion of 10000 FPOs where Cluster Based Business Organizations (CBBOs) are engaged by the Implementing Agencies (IA) to aggregate, register and provide handholding support to each FPO for a period of 5 years. The objective of this scheme to increase farmer's income, give them better bargaining power, create employment opportunities in rural India. While there has been considerable traction, a few challenges which may be addressed for better outcomes include creating greater awareness regarding the potential benefits of forming a FPO, and effective market linkage programmes. The Government run marketing outlets may provide the right platform for marketing the FPO products at right price to the customers. Suitable revenue sharing mechanisms may be implemented to ensure that producer companies get a remunerative price.

  Benefits of Agri Export Policy for promotion of FPO products in export markets may be extended. In this regard, quality checking of the products is of paramount importance. The export consignment from FPOs may be sent for mandatory testing in the nearest quality testing laboratories.

- **Promote Mechanization through setting up more Custom Hiring Centers (CHCs) and Encourage Rural Entrepreneurship**

  Given the shortage of skilled labour, it is important to promote farm mechanization in order to improve productivity in the agricultural sector. The sub-mission of agricultural mechanization launched by the Government of India was arrived at promoting Custom Hiring Centre (CHC) and hi-tech hubs for high value machines so as to benefit the small and marginal farmers who otherwise would not have access to such machineries. Through the initiative has seen significant success, the level of mechanization in India is

[16] https://www.downtoearth.org.in/blog/agriculture/union-budget-2023-24-india-s-farmers-can-take-to-organic-agriculture-with-proper-support-87485

significantly lower compared to other leading countries. Even there is wide divergence in terms of mechanization across the Indian states. It is thus pertinent to increase the number of CHCs across the Indian States. PPP models may be explored where agri-equipment manufacturers/agri-input players and Government can co-establish such facilities and the Operation and Maintenance can be done by the private players. This can be a potential enabler for rural job creation as well, while helping the farmers reduce their cost of operation and enhance their productivity. Special schemes may be designed to encourage women take up entrepreneurship- in availing credit at subsidized rates, conducting awareness campaigns and programmes around training and skill development.

- **Thrust on developing and modernizing infrastructure**

  Pradhan Mantri Kisan Sampada Yojana was an umbrella scheme launched by the Government of India with an objective of creating modern infrastructure to bring efficiency in the supply chain management from farm gate to retail through reduction in wastage of agricultural produce, post-harvest losses and presenting the quality of the produce. Given that these schemes do not cover single or standalone facilities, large section of farmers who are small and marginal in nature and lack the capabilities to invest in such infrastructure do not stand to benefit from such schemes.

  Another initiative which was aimed at developing post-harvest infrastructure is the launch of INR 1 lakh Crore Agriculture Infrastructure Fund (AIF), a special package under the AtmaNirbhar Bharat Initiative. As per the data, only around 15% of the total fund has been disbursed in the first three years, clearly pointing out the low utilisation. In order to make this effective, awareness campaign may be conducted across districts and procedure for obtaining such assistance needs to be streamlined. There has to be a concerted mechanism where in different stakeholders are consulted regarding the requirements before any infrastructure project is undertaken.

- **Promote Agri exports from India and reduce dependence on imports**

  There are several policies which have been launched to promote agriculture exports from India such as Cluster Development Program, which was designed as part of the Agriculture Export Policy (2018). One District One Product (ODOP) Scheme, upgradation of individual micro food processing units, support to Farmer Producer Organizations (FPOs), backward and forward linkages scheme etc. While these initiatives have helped in improving the agricultural exports from India, it commands a meager ~ 2% share in the global agriculture exports, inspite of a large production base and varied agro climatic conditions conducive for agriculture.

  A few suggestions which may help boost agricultural exports and reduce import dependence may include:

  - **Penetrating more into the existing markets with the dominant export items** (such as Basmati, non-Basmati Rice, wheat, sugar, other cereals, cotton etc.). Dedicated promotions in those countries may be conducted through regular trade fairs and close collaboration with Indian embassies in these countries.
  - **Leveraging G20 Membership** to promote traditional as well as new products among member countries.
  - **Focus on value addition -** Maintaining consistency in quality as per the requirements in the importing countries. Specific suggestions around value addition have been highlighted in the section on food processing.
  - **Diversification into new products and promoting exotic products-** Ginger and turmeric from different states in North-East, Khashi mandarin, pineapple from Meghalaya, red rice from Assam, organically certified moringa leaf powder etc. There is also good potential to market GI Products. Proper quality checks may be ensured to comply with the norms of the importing countries.
  - **Promote increased production of pulses-** Pulses are rich sources of proteins for a large majority of Indians. As per research by International Food Policy Research Institute (IFPRS) the average Indian diet has excess consumption of cereals but deficient in proteins. The rural India on an average consumed 194 g of proteins per day against recommended 459 grams while urban India consumes 242 grams on an average. Inspite of Government interventions there is a significant dependence on imports of pulses. As per NITI Aayog's estimates the demand for pulses is expected to be around 32.64 MMT by 2029-30. For increasing the production to meet the growing requirement diversification of area from rice needs to be explored. Area expansion may be considered in irrigated areas. Productivity of pulses production is significantly low compared to global standards. Focus on developing new high yielding varieties may help address the problems of low yield and reduce import dependence.

- **Encourage Adoption of technology**

  Technology is disrupting all sectors across the world and agriculture is no exception. Currently, agriculture in India faces a plethora of challenges such as low yields, poor access to credit, non-remunerative farmer incomes, shortage of labour, among others. Technology is a potential enabler in addressing these challenges and hence adoption of technology has become pertinent for driving efficiency across the agriculture value chain.

  Smart agriculture, also known as digital farming, is the application of cutting-edge technology and data-driven methodologies to improve agricultural production, efficiency, and sustainability. It involves the adoption of technologies such as Internet of Things (IoT), drones, sensors, satellite imagery, analysis of data using Artificial Intelligence (AI) and Machine learning (ML), among others for making better, more informed decisions to unlock value across agriculture value chains. It would also help in promoting rural entrepreneurship, thereby fostering economic growth.

  Smart Agriculture has seen a lot of traction globally with many countries successfully implementing the same and reaping its dividends. Developed countries such as the USA, Japan, South Korea have established national policies to digitally transform the agricultural sector. Moreover, a significant allocation of the agriculture budget goes towards R&D. For example, Israel spends around 5.4%[17] of its GDP on research and development – the most by any country globally; 20% of Israel's total agricultural budget is allocated to R&D.

  Government of India is also in the process of chalking out the framework for the Digital Agriculture Mission where they are currently finetuning the India Digital Ecosystem of Agriculture (IDEA) report based on the inputs from various stakeholders and integrating the same with various databases related to schemes implemented by the Government. While these government initiatives are commendable, certain issues need to be addressed to increase the adoption of smart agriculture. A few suggestions in this regard have been highlighted below:

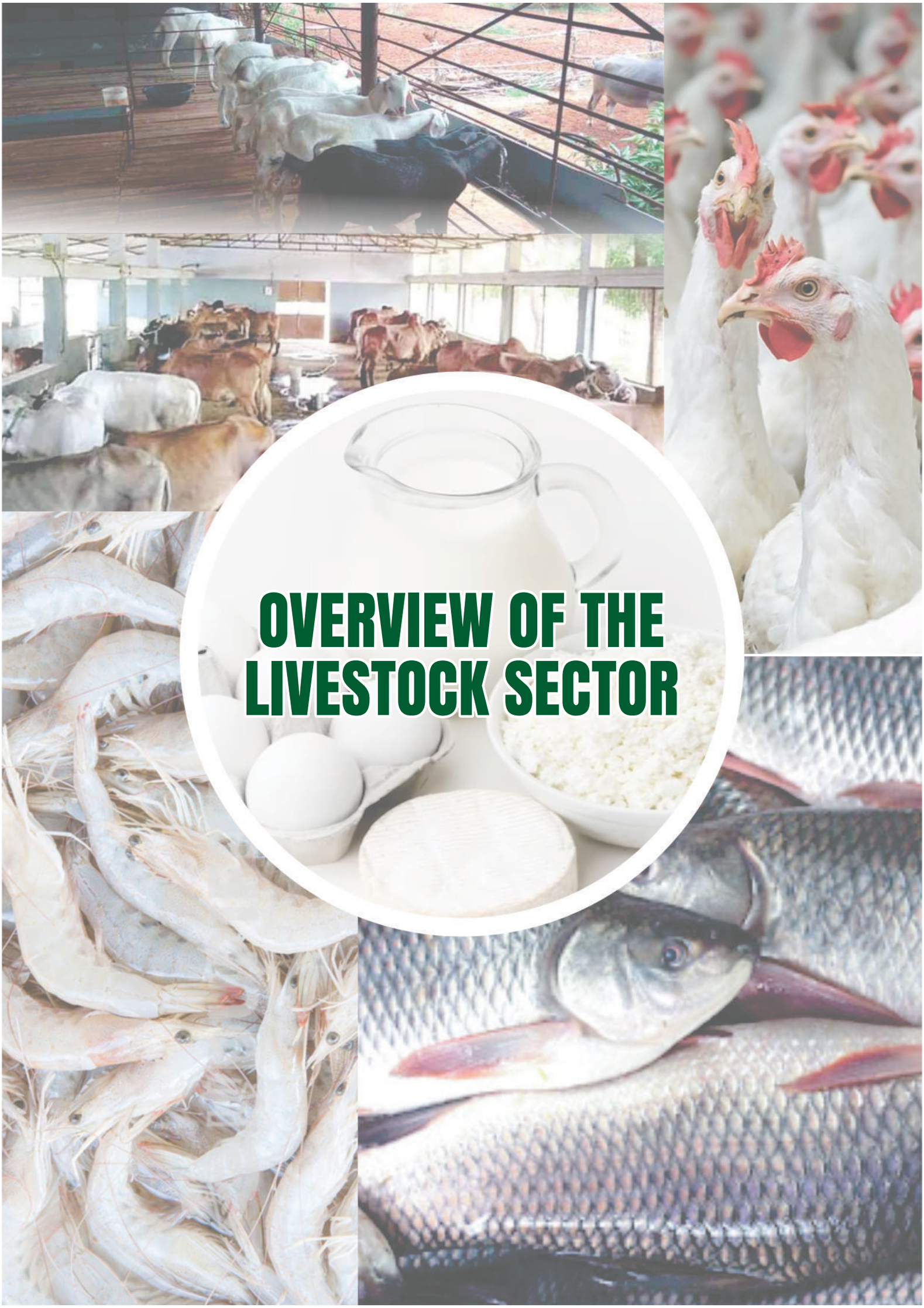
  - **Increase awareness about potential benefits of smart agriculture:** A large majority of the farmers are not aware of the benefits of smart farming, such as reduced cost of production, better productivity, better realisations and sustainable farming practices. Once these get demonstrated through pilot programmes, frequent awareness programmes and workshops at the village level, more farmers may join the bandwagon. Krishi Vigyan Kendras (KVKs) and various State Agriculture Universities may be mandated in this regard to raise the awareness of farmers.
  - **Address infrastructure issues around connectivity:** Stable internet connection is the backbone for successful implementation of smart agriculture practices. While internet penetration in rural India has improved over the years, (around 40 crore rural Indians are active internet users[18]), there is significant headroom for further penetration. The BharatNet project, currently implemented by the Government, needs to be fast-tracked to implement the requisite infrastructure for better connectivity. Also, tariff rates need to be rationalised to ensure more farmers leverage this as a tool to adopt smart farming.
  - **Incentivise accessibility of smartphones:** While adoption of smartphones has increased across the country including in rural India, a sizeable percentage of the farming population does not use/ lacks access to these devices. Back-ended financial assistance through Kisan Credit Card (KCC) Scheme may be allowed to incentivise farmers who buy such devices. Also, applications for various Central and State Government Schemes, and subsequent approval and disbursal of such schemes may be introduced, leading to greater adoption and usage of smartphones.
  - **Digitising farm and related data:** Currently, most of the farm-related data such as ownership and land records are stored in the physical format. It is very important to digitise this data so that policies can be implemented. Recently, the Government of Telangana and the Indian Institute of Science signed an agreement to create India's first Agricultural Data Exchange. Since agriculture is a state subject, it is important to give a nudge to the states to fast-track digitisation of farm data records. A part of support and other related assistance pertaining to the sector can be linked to the

[17] OECD
[18] National Internet Exchange of India (NIXI)

performance of the states. This may lead to healthy competition among the states in undertaking and completing such initiatives in a time-bound manner.

- **Promote 'Indigenisation' through the National Research Foundation (NRF) Bill 2023:** The Bill is aimed to establish NRF that will seed, grow and promote R&D and foster a culture of research and innovation in colleges, universities, research institutions, and R&D laboratories across India. Most farmers, especially small and marginal, find it difficult to avail machinery since a large part of farm equipment and machinery in India are imported. It is important to dedicate a certain percentage of this fund to promoting research around farm equipment and machinery, given the imminent issues of labour shortage and the growing importance of mechanisation.
- **Encourage startups in Ag-tech space:** It is important to provide a level playing field to startups to encourage innovation in the smart agriculture space. The Government has already funded nearly 1,138 start-ups [19] through the Innovation and Agri-entrepreneurship Development Programme under the Rashtriya Krishi Vikas Yojana (RKVY) to promote innovation and application of AI, IoT, remote sensing, information and communication technology (ICT), GIS and blockchain in the agriculture sector. In the last budget, the Agriculture Accelerator Fund was announced to boost startups and increase digital infrastructure in rural areas to support ag-tech adoption. Modalities of the programmes need to be designed and quickly rolled out to encourage startups. Further, the current tax exemption of three years for startups can be increased for agri-tech focused startups, given the long-term requirement to promote the adoption of such technology in India.

[19] Press Information Bureau April 2023



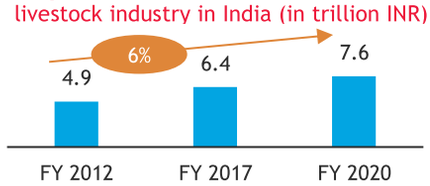
OVERVIEW OF THE LIVESTOCK SECTOR

2. LIVESTOCK SECTOR

2.1 OVERVIEW

India's livestock resources exhibit vast diversity, encompassing cattle, poultry, sheep, goats, and more. This diversity provides a robust foundation for both subsistence and commercial activities. Integrated seamlessly into agricultural practices, transportation, and various domains, the livestock sector becomes an intrinsic part of Indian society. India has the world's largest populations of livestock (535.8 million) and poultry (851.8 million), livestock comprising cattle (37.3%), buffalo (21.2%), goats (26.4%), and sheep (12.2%).[20]

Figure 28: Gross value added from the livestock industry in India (in trillion INR)



Source: Statista, Market Insights

The livestock sector in India holds a pivotal role, acting as a cornerstone of the economy, supporting livelihoods of 20.5 million population, and significantly contributing to the GDP. The contributions of the livestock sector to India's GDP is noteworthy, accounting around 4% of the GDP in 2021[21]. This substantial contribution underlines its pivotal role in driving economic growth, diversification, and stability in all its sub-sectors namely Poultry, Fisheries & Aquaculture, Meat and Dairy contributing 1%, 1% and 5% respectively to the country's GDP[22] in 2022.

Over the years, the sector has witnessed a steady growth at a CAGR of 7.9% during 2014-15 to 2020- 21 (at constant prices)[23], reflecting its adaptability and ability to harness evolving market dynamics. Its contribution to total agricultural Gross Value Added (GVA) has risen at a CAGR of ~6% from 2012 to 2020, enabling the sector to emerge as a significant enabler for enhancing farmer's income and economic growth in rural areas.

In the global context of poultry, milk, dairy, meat, and fisheries industries, India has emerged as a prominent player in the livestock sector. In 2022, all its sub-sectors depict India's substantial influence on the global stage.

- **Poultry:** Sector produces approximately 122.1 billion eggs, securing the 2nd position globally in egg production
- **Fisheries:** India ranks 3rd with a production of 16.2 million metric tons (MMT)
- **Dairy:** India holds the top rank in milk and dairy production, churning out an impressive 221.06 MMT, reinforcing its global leadership position.
- **Meat:** India's output reached 9.3 million metric tons (MMT), making it the 8th largest producer.

Developments made in each sub-sector have deep impact from a social, economic and environmental sustainability standpoint such as:

- Empowering rural women and youth,
- Enhancing the efficiency of natural resource utilization, and
- Augmenting households' ability to withstand climatic disturbances.

Though India has successfully traversed an impressive journey on production front and been competing with leading global producers, the story has not been vibrant from consumption perspective. As per data shown in adjacent table, per capita availability of some products is significantly lower compared to the minimum consumption recommended by International Council of Medical Research (ICMR).

Table 3: Commodity wise per capita availability and recommendations by ICMR

Commodity	Per Capita Availability in India in 2022	ICMR Recommendations
Milk	444 grams/ day	280 grams/ day
Eggs	95 eggs/ year	182 eggs/ year
Meat	6.82 Kg/ year	11 Kg/ year

[20] https://agrilinks.org/post/improving-feed-and-fodder-availability-enhancing-livestock-productivity#:~:text=The%20unavailability%20of%20balanced%20rations,the%20economy%20and%20the%20environment.
[21] https://vikaspedia.in/agriculture/livestock/role-of-livestock-in-indian-economy
[22] https://www.pashudhanpraharee.com/role-of-poultry-in-nation-building/
[23] Economic Survey 2022-23

Parameters like rising disposable incomes, changing dietary habits, and growing urbanization are potential enablers to boost demand, but rural and peri-urban population of India are still not proactive enough to respond to the fast-changing demand trends for livestock products. Accordingly, a plethora of interventions to enhance infrastructure, improve productivity, and control diseases have been taken up. Initiatives such as the Animal Husbandry Infrastructure Development Fund (AHIDF) and the National Livestock Mission (NLM) focusing on entrepreneurship, breed improvement, and disease control, have played instrumental role in the development of the sector.

2.2 KEY SUB-SECTORS AND GROWTH DRIVERS

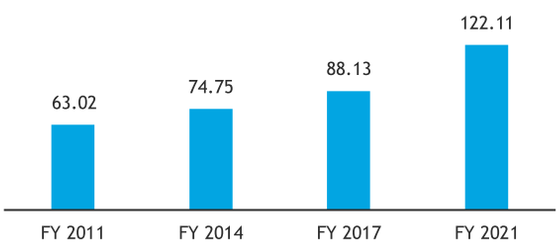
POULTRY

Historical Growth of Poultry Sector

India's poultry industry has witnessed substantial growth in demand for both broiler (meat) and layer (egg) over the years, which is, attributed to rising incomes, urbanization, and changing dietary preferences of Indian population. This has gradually transformed the poultry sector and it has become an important contributor to the Indian economy, with the sector's contribution to the GDP accounting around 1% of national GDP and 14% of GDP contribution from livestock.[24] In terms of contribution from its two sub-sectors, namely, broiler (meat) and layer (egg), 3/4th (75.23%) contribution comes from poultry meat sector while the rest (24.67%) being contributed by the poultry egg sector[25].

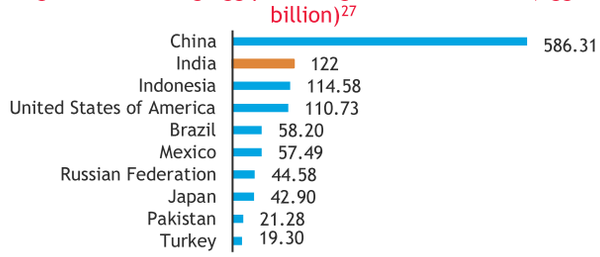
As per FAOSTAT-2021, India ranks 2nd in production of eggs globally, with egg production increasing from 78.48 billion in 2014-15 to 122.11 billion in 2020-21 which has sharply increased the per capita availability of eggs to 95 in 2021-22 from 55 in 2014-15[26].

Figure 29: Egg Production in India (in billions)



Source: BAHS, 2022, GoI

Figure 30: Leading egg producing countries in 2021(eggs in billion)[27]



Source: Market Insights, Statista

The top 5 egg producing States are Andhra Pradesh (20.41%), Tamil Nadu (16.08%), Telangana (12.86%), West Bengal (8.84%), Karnataka (6.38%), together contributing around 65% of total egg production in the country in 2021-22. This is supplemented by increase in productivity of the poultry sector in India with;

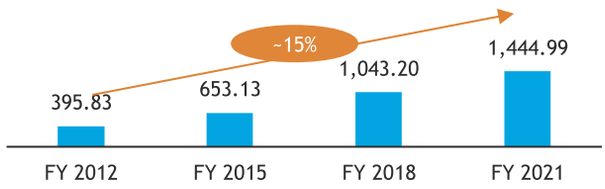
- Average egg production per hen has increased from 150 eggs per year in 2000 to 250 eggs per year in 2023 and,
- Average broiler chicken weight increasing from 1.5 kg per bird in 2000 to 2.5 kg per bird in 2023[28].

India ranks eighth in production of poultry meat globally, with meat production increasing from 6.69 MMT in 2014-15 to 8.80 MMT in 2020-21[29] and presently, making poultry meat production as major segment of India's total meat production as it accounts 50% of the total meat production of the nation. Likewise, in

[24] https://www.pashudhanpraharee.com/role-of-poultry-in-nation-building/
[25] DAHD
[26] FAOSTAT, 2021
[27] Worldwide; FAO; 2021
[28] National Action plan for Egg & Poultry, DAHD
[29] https://pib.gov.in/PressReleasePage.aspx?PRID=1894899#:~:text=The%20dairy%20sector%20which%20employs%20more%20than%20eight,meat%20production%20in%20the%20world%20points%20the%20Survey.

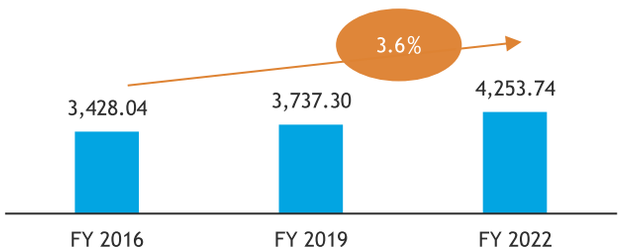
terms of gross value addition, the gross value added from poultry meat amounted to over INR 1.44 trillion in 2021[30]. In India, poultry meat consumption has been steadily rising at a rate of 3.6% over the years, from 3,438 MT in 2016 to 4,253 MT in 2022, reflecting shifting dietary preferences and urbanization. Poultry, particularly chicken, has become a popular and affordable source of animal protein for a growing population. This surge in demand has led to the expansion of the poultry industry.

Figure 31: Gross value added from poultry meat in India from financial year 2012 to 2021 (in billion INR)



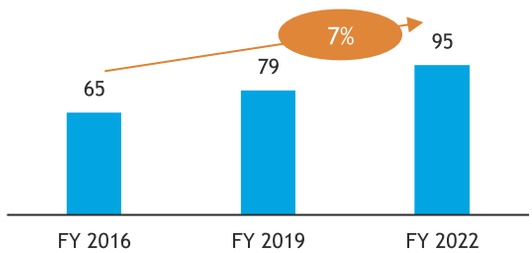
Source: Market Insights, Statista

Figure 32: Consumption of poultry meat in India (in 1,000 MT)



Source: Market Insights, Statista

Figure 33: Per capita availability of eggs in India



Source: BAHS, 2022, GoI

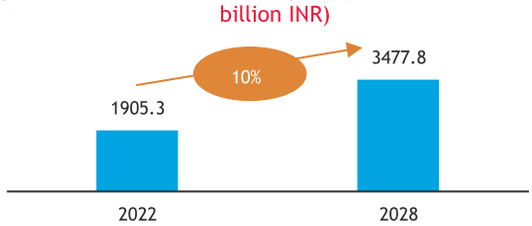
The poultry sector in India is a major employer, providing jobs to millions of people. According to the Indian Council of Agricultural Research (ICAR), the poultry sector employs about 123,000 poultry farmers directly, and another 500,000 people indirectly.[31] The indirect employment includes jobs in the poultry feed industry, the poultry processing industry, and the poultry marketing industry. The poultry sector is a major source of employment for women and rural people. Women make up about 40% of the workforce in the poultry sector, and many poultry farmers are small-scale farmers who operate their farms on a part-time basis. The poultry sector also provides employment opportunities for people with disabilities, as many of the jobs in the sector do not require a high level of physical strength or education.

The export of poultry products from India has almost doubled between 2018-19 and 2022-23, increasing from USD 71 million to USD 137 million.[32] a growth of 100%. The major export items of poultry products from India include Egg powder, Frozen chicken, Poultry meat pies, Poultry sausages etc. whereas the major export destinations of poultry products include Vietnam, Malaysia, Indonesia, Saudi Arabia, Egypt etc.

Potential for future growth and drivers of Poultry Sector

The poultry sector in India is well-positioned for growth in the coming years, despite it has regularly come across some economic and infrastructure bottlenecks there is vast potential for this sector in the coming years. India poultry market size holds immense potential, as it is expected to increase from INR 1,905.3 billion in 2022 to INR 3,477.8 billion by 2028, exhibiting a growth rate of 10.18% CAGR during 2023-2028.33. This can be attributed to various Demand and Supply drivers as explained subsequently

Figure 34: Potential increase in poultry market in India (in billion INR)



Source: IMARC, Indian poultry market report

[30] https://www.statista.com/statistics/1358419/india-economic-contribution-of-poultry-meat/#statisticContainer
[31] ICRA research report, 2021
[32] https://agriexchange.apeda.gov.in/MarketReport/Reports/Indias_Poultry_Market-A_Snapshot_of_2020-21_New_Delhi_India_09-01-2021.pdf
[33] IMARC, Indian poultry market report

- **Demand Drivers**
  - **Increasing per capita consumption:** The recommended protein dietary requirement for an average Indian adult (0.8 to 1 gm per kg body weight) is way higher than actual consumption, which is around 0.6 gm per kg body weight.34 This is evidently reflected in average protein consumption of India which has the lowest average protein consumption (47 grams per person per day) among Asian and developed countries, despite the nation being one of the largest producers of poultry meat. With relatively higher global average protein intake of 68 grams per person per day and multiplier effect of increasing propensity of protein intake owing to growing population affordability, meat quality, and changing dietary trends, substantial increase in demand for poultry products is on the cards.
  - **Increasing demand for poultry products in rural areas:** With people becoming more health conscious and looking for protein-rich foods that are also low in fat and sustainable, poultry products have emerged as a viable source, though that is majorly restricted in the urban areas. But there is a growing demand for the same in the rural and semi-urban areas, which if tapped could unlock the potential of the poultry sector.
  - **Export Potential:** India possesses comparative advantages that make it a competitive exporter of poultry products, in respect of:
    - Cost of production which is attributed to the availability of cheap labour and feed.
    - India being world's one of largest producer of poultry products, gives the country a large production base to export from.
    - Emerging regions like Africa, Southeast Asia, and Latin America are experiencing rising middle-class populations and changing dietary preferences majorly towards processed value-added and Halal products. The poultry industry in India can further boost the export of poultry products utilizing these growing markets.
  - **Government interventions to drive demand:** The government of India has launched several campaigns to increase the awareness about the nutritional benefits of poultry products and to promote the consumption of poultry products. Some of the key campaigns launched include:
    - **Mid-Day Meal Scheme, National Nutrition Mission (POSHAN Abhiyaan), Integrated Child Development Services (ICDS):** include eggs to improve the nutritional intake of children. This serves as a way to promote poultry products and address malnutrition.
    - **Poultry Meat for Good Health:** aims to increase the awareness about the nutritional benefits of poultry meat, such as its high protein content and its low-fat content.
    - **Eggs for A Healthy Nation:** aims to increase the awareness about the nutritional benefits of eggs, such as their high protein content and their low cholesterol content. The campaign also promotes the consumption of eggs by highlighting their delicious taste and their versatility in cooking.

- **Supply Drivers**
  - **Penetration of modern retail channels:** Although traditional retail channels still dominate the poultry market in India, but there is a growing trend of consumers buying poultry products from modern retail channels such as supermarkets and hypermarkets. The modern retail channel has become a major distribution channel for poultry products in India due to the convenience and hygiene offered by these channels. Studies show the modern trade will grow at 15% CAGR to reach 18% of the total retail share by 2025—largely led by a growth in e-commerce, whose share in total retail stood at 4.3% in FY 20 but will touch 7.6% by 2025[35], likely to be impacting the growth of processed and value-added poultry sales in the coming years.
  - **Convergence of intake pattern of Poultry Products across States:** Consumption of poultry products in India varies across different states based on factors like cultural preferences, income levels, and

[34] https://www.theindustryoutlook.com/services-and-consulting/industry-experts/shaping-the-future-of-the-indian-poultry-industry-in-the-new-decade-nwid-4096.html#:~:text=In%202022%2C%20the%20Indian%20poultry,USD%2044.97%20billion%20by%202028.
[35] Technopak Advisors report

urbanization. However, driven by evolving dietary habits, population growth, and economic developments, states consuming lower poultry products vis-à-vis to the poultry meat consuming states like Maharashtra (11.8 kg. per capita per year), West Bengal (8.5 Kg. per capital per year), Tamil Nadu (7.5 Kg per capital per year) etc. will be even in the years to come.

- **Adoption of new technologies:** The poultry industry in India is adopting new technologies, such as automation and biosecurity to monitor the health and limit the spread of diseases thereby, helping to improve productivity and efficiency. This is also likely to contributing to the growth of the market.

Policies for Poultry Sector

Poultry sector in India is subject to various policies and regulations that govern different aspects of poultry farming, processing, and trade. These policies aim to ensure food safety, animal welfare, disease control, and sustainable growth of the sector. Some major policies include National Livestock Mission for holistic development of the sector comprising of sub-missions on Breed Development of Livestock & Poultry, Feed and Fodder development, Extension and Innovation, National Action Plan for Egg & Poultry-2022 aimed to increase the production of eggs and poultry meat, Livestock Health and Disease Control (LH&DC) Scheme to enhance the animal health sector by carrying out preventive vaccination programmes for various livestock and poultry diseases, Animal Husbandry & Infrastructure Development Fund (AHIDF) to provide support and incentives to individual entrepreneurs, private companies, MSME, FPOs to establish infrastructure for meat processing and value addition infrastructure and Animal Feed Plant and National Animal Disease Control Program (NADCP) for control of Foot & Mouth Disease and Brucellosis, among others.

FISHERIES AND AQUACULTURE

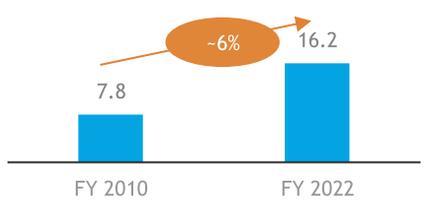
Historical Growth of Fisheries & Aquaculture

The fisheries sector being an important part of the Indian economy, provides food and employment to millions of people of India. The sector plays a pivotal role in generation of Gross Domestic Product (GDP) of India, with its contribution constituting around 1% to India's Gross Domestic Product (GDP) and over 5% to the agricultural GDP[36] in 2021-22 (at constant prices). The sector comprising two major sub-sectors, namely, a) Fisheries, that is, catching of fish in the wild and b) Aquaculture in the form of farming of fish in ponds, tanks, or cages; have their respective contribution to total GDP of India recording around 0.7% and 0.3% respectively. India is the 3rd largest fish producing and 2nd largest aquaculture nation in the world after China.

Driven by the long coastline of India measuring over 7,500 km, together with presence of skilled workforce and abundant resources, the sector has been the major source of employment to over 28 million fishers and fish farmers[37] thereby, providing livelihoods, particularly in coastal and rural areas. As per records, the sector generates employment, both direct and indirect, engaged through various activities along the value chain, including fishing, aquaculture, processing, trading, and related support services. Though employment generation has been prominent and promising in the fishing and aquaculture sector, which is direct employment, indirect employment in the supporting industries, such as fish processing, marketing, and transportation is catching up fast.

India's fish production has shown a consistent upward trend over the years, with total fish production increasing from 7.8 MMT in 2009-10 to 16.2 MMT in 2021-22 and recording an impressive average annual growth rate of ~6% in the last 12 years. With regards to the growth of its sub-sectors, records reveal that the aquaculture sector has grown more rapidly than the marine fisheries sector with aquaculture sector

Figure 35: Fish Production in India (in MMT)



Source: Annual Report 2022-23, DoF

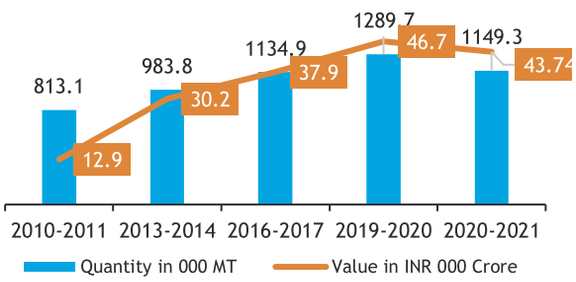
[36] PIB
[37] https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=1936017

presently accounting for 75% of the total fish production while the marine fisheries sector constituted remaining 25%[38].

Such a notable growth and development has gradually managed to position India among the world's largest fish producers, both from marine and inland sources. The thriving impact is strongly reflected in terms of India's increasingly stronger footprint in global market, enabling India to export a wide range of seafood products to various international markets.

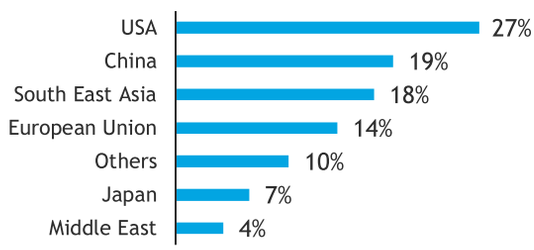
As per records, India is ranked 5th in the world in terms of fish export[39], with total export value increasing from INR 12,900 crores in 2010-11 to INR 43,717 crores in 2020-21, registering an annual growth rate of 13%[40]. The major export items from India have primarily been frozen shrimp (black tiger shrimp and vannamei shrimp) contributing around 68% of the total export value, followed by others including Frozen fish (around 11% of total export value) and canned fish (around 7% of total export value) etc. The major export destinations for fish and fishery products has been United States accounting for around 27% of total exports in 2021-22, followed by China (19%), South East Asia (18%), European Union (14%) and other countries.

Figure 36: Export of Marine products from India



Source: Indiastat, CIER

Figure 37: Country wise percentage of Fish exported from India (2021-22)

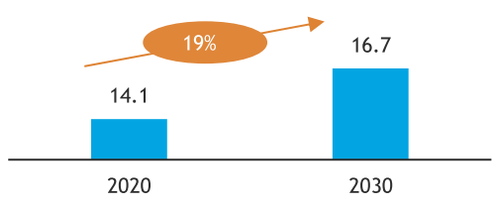


Source: Statista, Market Insights

Potential For Future Growth

India has acknowledged the necessity to balance economic growth with conservation efforts for ensuring sustainable development of the fisheries sector, which, as Government has envisaged, holds a significant potential for future growth due to various factors, including rising demand for seafood, technological advancements, Government support, and sustainable practices. This can be seen in the estimated projection of growth of fisheries and aquaculture sector in India which is expected to grow at a CAGR of 19% to reach 16.7 MMT in 2030 from 14.1 MMT in 2022. This push is expected from various demand and supply drivers in this sector in India, some of which are explained below:

Figure 38: Projected growth in Production of Fisheries & Aquaculture Production (in MMT) of India



Source: FAO, The State of World Fisheries and Aquaculture 2020

Demand Drivers

- **Increasing per capita consumption:** The per capita consumption of fish in India in 2022 is still low at 6.76 Kg. vis-à-vis developed countries like China (38.49 Kg), USA (22.13 Kg), Japan (46.06 Kg), South Korea (57.05 Kg.[41]) etc. owing to cultural preferences (Fish not staple food in India), and cost economics (expensive for low-income households) prevalent in India. However, it is increasing steadily backed by factors including increase in disposable income, changing dietary preferences toward healthy food; Improved supply chain and Government initiatives. This is expected to drive per capita consumption to increase to 9 kilograms by 2025.

[38] Annual Report 2022-23, DoF
[39] Top 4 global leaders are 1. China, 2. Norway, 3. Vietnam and 4. Thailand
[40] Indiastat, Centre for Industrial and Economic Research (CIER)
[41] https://www.weforum.org/agenda/2022/11/chart-shows-countries-consume-fish-food-security/

- **Export Potential:** India is a major exporter of fish and seafood. The export market is expected to grow in the coming years due to the increasing demand for fish and seafood in other countries and India is well-positioned to meet this demand leveraging its long coastline and a vast Exclusive Economic Zone (EEZ), which provides abundant resources for fish production.
- **Rising Demand for Seafood:** with the steady population growth, the demand for protein-rich food sources like seafood is rising. Fish and seafood, carrying rich sources of high-quality protein, omega-3 fatty acids, vitamins, and minerals, possess various health benefits, including heart health, brain development, and reducing the risk of chronic diseases. This is increasingly leading to a preferential shift of people towards more health-conscious diets and change in dietary patterns, making fish a potential food item for growing number of Indians boosting the demand for these products in the future.

- **Supply Drivers**
  - **Growing aquaculture sector:** In continuation to historical growth trend of aquaculture sector, which was increasing rapidly vis-à-vis other sub-sectors, it is envisaged that enablers like Government support, technological advancement will further propel the growth of this sector because it is a more sustainable way to produce fish than wild fishing. The aquaculture sector is expected to account for more than 80% of the total fish production in India by 2025, with the Government setting a target of producing 22 MMT of fish by 2024-25. According to the State of World Fisheries & Aquaculture report by FAO, the production of fisheries & Aquaculture is set to increase at a growth rate of ~19% from 2020 to 2030[42]. This increase in production is expected to push the domestic consumption and increase in export from India, thereby expansion of the sector as a whole.
  - **Government support:** The government is providing a lot of support to the fisheries sector, such as financial assistance, infrastructure development, and marketing assistance. This is expected to boost the growth of the sector.
  - **Technological Advancements:** The technological enablement in the fisheries sector holds immense potential to improve the efficiency, productivity, and sustainability of the fisheries sector and help India meet its food security goals. Innovations like remote sensing for fish detection, advanced aquaculture systems, Fish aggregating devices (FADs), Genetic engineering, fish tagging, efficient cold chain logistics etc. can play a crucial role in sector growth. The adoption of new technologies has the potential to transform the fisheries sector in India.

- **Policies**

  The Government of India has several policies and regulations in place to promote the sustainable development of the fisheries sector. These policies and regulations are designed to ensure the long-term availability of fish stocks, manage the environmental impact of fishing, and improve the quality of fish products. The Pradhan Mantri Matsya Sampada Yojana (PMMSY) was intended to support the people involved in this sector as a part of Covid relief package and it has been extended to FY 2025. The Fisheries and Aquaculture Infrastructure Development Fund (FIDF) is aimed towards upgrading the infrastructure for capture and upgrade culture fisheries, marine aquaculture, for inland fisheries, lowering the post-harvest losses and enhancing the domestic marketing facilities with infrastructure support, filling the resource gap and enable the completion of ongoing infrastructure projects.

[42] State of World Fisheries & Aquaculture 2022, FAO

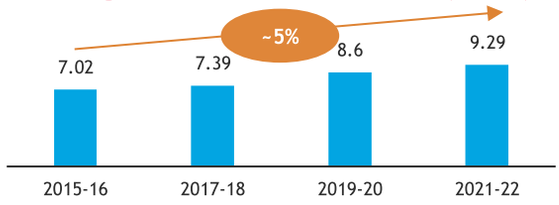
MEAT

Historical Growth of meat

The meat industry in India has experienced a substantial evolution and expansion in recent years, with noteworthy indicators highlighting its significance. The country's total meat production has surged to 9.29 MMT in 2021-22 at a CAGR at 5% recorded between 2015-16 and 2021-22, positioning India as the 8th largest meat producer globally. In terms of animal slaughter 2.73 million cattle, 12.94 million buffalo, 69.56 million sheep, 111.32 million goats, 8.88 million pigs, and a substantial 306 million poultry were slaughtered for meat in 2021-22. In terms of percentage of animal species slaughtered for meat in 2019, poultry has the highest percentage of ~50%, followed by Buffalo (19%), Goat (14%) and others.

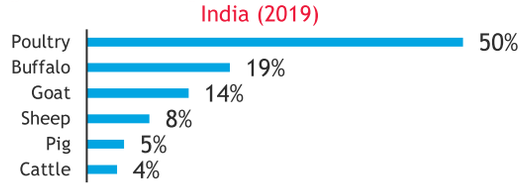
The emergence of certain states as key players in meat production underscores regional dynamics. Maharashtra, Uttar Pradesh, West Bengal, Andhra Pradesh, and Telangana collectively contribute 57.86% to the national meat production, exemplifying the importance of regional contributions.

Figure 39: Meat Production in India (in MMT)



Source: Annual Report, FY 2022-23, DAHD

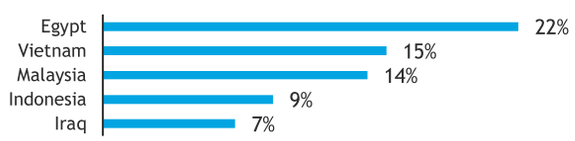
Figure 40: Percentage of different meats produced in India (2019)



Source: Annual Report, FY 2022-23, DAHD

Examining the export landscape, the value of Buffalo Meat exports in 2019-20 stood at USD 3.1 billion, with buffalo meat constituting over 89.08% of India's animal meat exports. This supplements the industry's global reach and its contribution to the country's export earnings. Egypt was the biggest importer of Buffalo meat from India (22%), followed by Vietnam (15%), Malaysia (14%) and others[43].

Figure 41: Country wise Export share (%) of buffalo meat from India (2022)



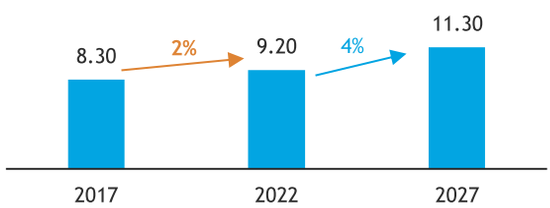
Source: Statista, Market Insights

Potential for future growth and drivers

The meat sector in India is expected to witness a substantial growth, due to a number of favourable factors such as evolving consumer preferences, increasing urbanization, rising disposable incomes, and a growing awareness of the nutritional value of meat products.

According to Euromonitor International, the growth in sales of meat sector in India from 2017 to 2022 was at a CAGR of 2%, while the growth forecast from 2022 to 2027 is double (4% CAGR) of its growth in last five years. This portrays the importance and potential of meat sector of India.

Figure 42: Estimated growth in sales of meat (in MMT)

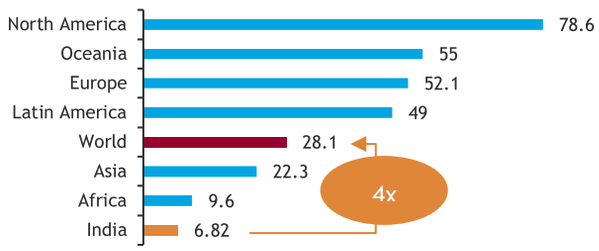


Source: Euromonitor International, Market Insights

[43] Statista, Market Insights

- **Demand Drivers**
  - **Low per capita consumption:** The per capita consumption of meat in India, at 6.82 kg, is significantly lower than the global average of 28.1 kg and lags behind other regions such as Asia, Europe, and North America. As the Indian population continues to urbanize, incomes rise, and dietary preferences evolve, there is room for substantial expansion in meat consumption. By focusing on factors like consumer education, diversification of products, addressing cultural sensitivities, and ensuring affordability, the Indian meat industry can tap into this growth potential, both in terms of quantity and variety of meat products, contributing to economic development and industry advancement.

Figure 43: Per capita consumption of meat (in Kg.) in India in comparison with World average and other leading countries (2023)



Source: Statista, Market Insights

  - **Export Potential:** By tapping into international markets with competitive pricing, quality assurance, and adherence to global standards, the Indian meat industry can leverage its vast livestock resources and not limited to Buffalo meat for exports to bolster economic growth. This strategic focus on exports can diversify revenue streams, create employment opportunities, and elevate the reputation of Indian meat products globally, positioning the industry for sustainable growth and contributing to the overall economic landscape of the country.
  - **Dietary Discrepancies and Nutritional Concerns pushing way for meat products:** Cereals and millets were found to contribute more to the daily energy intake than recommended, while protein-rich sources like pulses, legumes, meat, poultry, and fish fell short of the recommended intake levels (refer gaps from ICMR standard). This imbalance raises concerns about meeting nutritional requirements, particularly protein intake, which is essential for maintaining health. This has resulted in shifting to more protein-based diet with meat being a significant part of it.
  - **Market Dynamics and Consumer Trends:** The meat market in India has been undergoing a noticeable transformation, fuelled by increasing disposable incomes and evolving dietary habits. Urban consumers, in particular, have been driving the demand for processed meat products like sausages and salami. This reflects a growing appetite for convenient, ready-to-eat options. Furthermore, the market has witnessed a surge in demand for organic and grass-fed meat due to heightened health and environmental awareness among consumers.

- **Supply Drivers**
  - **Penetration of modern retail channels and Hyperlocal delivery platforms:** The increasing penetration of modern retail channels, such as supermarkets and online grocery platforms, holds great growth potential for the meat industry in India. These outlets offer broader market access, encourage adherence to quality standards, provide consumer convenience, and drive innovation in product diversity and packaging. Furthermore, they enable effective branding, marketing, and engagement with consumers while promoting transparency and traceability in supply chains.
  - **Evolving infrastructure facilities:** The evolving infrastructure facilities, encompassing advancements in farm automation, modern slaughterhouses, efficient logistics, cold storage etc, present a significant growth opportunity for the meat sector in India. As Indian consumers increasingly prioritize clean, safe, and hygienic meat products, these infrastructure enhancements can not only meet stringent quality and hygiene standards but also cater to their evolving preferences, thereby fostering the expansion of the meat industry in India.

- **Policies**

Government policies play a pivotal role in shaping the trajectory of the meat sector in India. The formulation and implementation of the policies, along with targeted financial assistance, have been instrumental not only for addressing challenges but also to harness the sector's opportunities. Pradhan Mantri Kisan SAMPADA Yojana (PMKSY) aimed to creation of modern infrastructure for food processing mega food parks/ clusters and individual units, effective backward and forward linkages - linking farmers, processors and markets and robust supply chain infrastructure for perishables. Other umbrella schemes such as National Livestock Mission, National Animal Disease Control Program and Animal

Husbandry Infrastructure Fund mentioned above in Poultry Section also provide support in form of better livestock and animal disease control.

MILK AND DAIRY PRODUCTS

Historical Growth

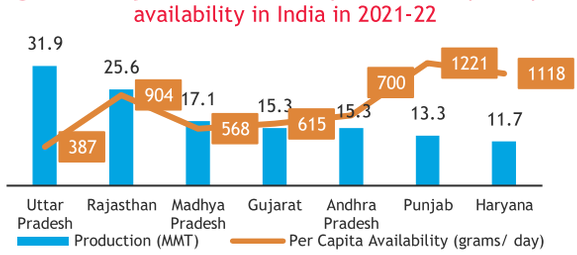
Dairy is the single largest agricultural commodity contributing 5% of the GDP and employing more than 80 million farmers directly.44 India is the highest milk producer and ranks first in the world contributing 24% of global milk production in the year 2021-22. The production of milk has grown at a ~5.5% CAGR from 116.4 MMT in FY 2010 to 221.06 MMT in FY 2022. The top 5 milk-producing states are: Uttar Pradesh, Rajasthan, Madhya Pradesh and Gujarat. The states such as Punjab & Haryana have very high per capita availability of milk though relatively lower production.

In India, milk production is carried out by a diverse range of milk farmers, each specializing in different types of dairy animals and dairy farming practices. Smallholder farmers being the most common type of milk farmer in India, account for 95% of India's milk producers (having herd sizes of 1-5 animals) and contribute over 80% of milk production[45].Other being commercial farmers, employ specialized breeds of high yielding dairy animals and engage in specialised dairy management practices at their farms having around 50 or more animals. However, types of milk farmers vary from state to state, as, in Gujarat, smallholder farmers account for over 90% of milk production, while commercial farmers dominate the milk production in Punjab.

Roughly 46% of the milk produced is consumed either at the producer level or sold to non-producers in rural areas, while 54% of milk production is marketed through dairy cooperatives or unorganised contractors[46]. 46% of the milk is utilized as consumption in form of liquid milk, while 33% is used for making butter and ghee, followed by Curd (7%), Khoa (7%) and others.

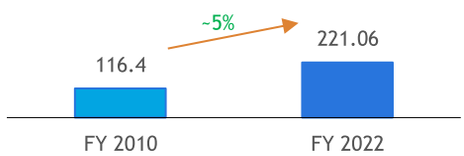
With regards to milk consumption, the per capita consumption of milk in India (444 grams/ day) is way higher than the global average of 322 grams/ day[47] in 2021-22. This is attributed to historical, cultural, economic, and nutritional factors, though it's important to note that per capita milk consumption vary significantly within India, with some regions (Northern states) having higher consumption rates than others.

Figure 44: Major State wise milk production & per capita availability in India in 2021-22



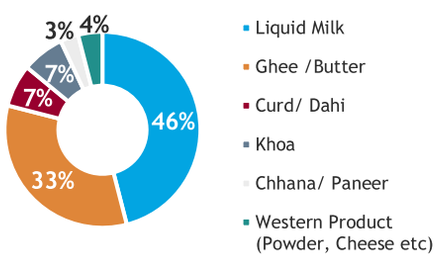
Source: BAHS, 2022, GoI

Figure 45: Volume of milk production in India (in MMT)



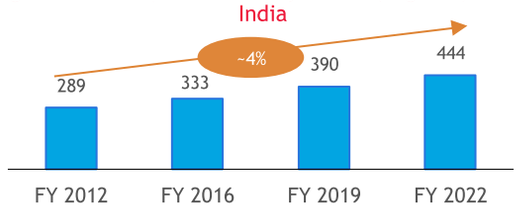
Source: BAHS, 2022, GoI

Figure 46: Milk utilization pattern



Source: Industry Reports

Figure 47: Per capita availability of milk (in grams) in India

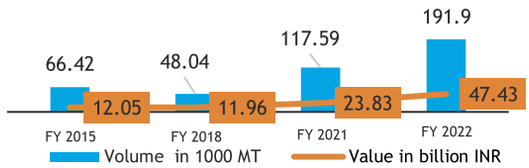


Source: BAHS. 2022. GoI

[44] Industry Reports
[45] DAHD, GoI
[46] https://www.dairyglobal.net/world-of-dairy/country-focus/india-2023-dairy-outlook-and-developments/#Buffalo%20Milk
[47] Basic Animal Husbandry Statistics, 2022

While India is the largest milk producer globally, it was ranked 34th in the world in the export of milk in 2021, and 12th in the export of value-added dairy products in 201948. Export of milk and dairy products have registered a steady growth at a CAGR of 22%. The COVID-19 pandemic had a notable impact, causing a temporary dip, but the subsequent recovery indicates adaptability and resilience within the sector. As the demand for dairy products continues to rise globally, India's milk product export industry seems poised for growth.

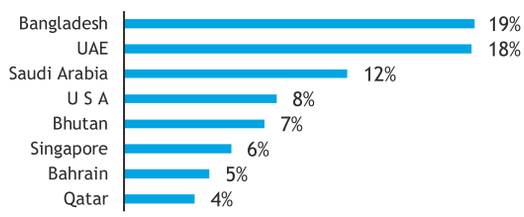
Figure 48: Volume (in 000 MT) and Value (in billion INR) of dairy products exported from India



India's primarily exports dairy products to Bangladesh (19%), the United Arab Emirates (18%), Saudi Arabia (12%), and the USA (8%). This demonstrates India's pivotal role as a key contributor to international dairy trade.

Milk and dairy products in India is expected to grow at a accelerated pace as the consumption pattern sees a shift. Expected growth in the market has been shown in the subsequent chart.

Figure 49: Percentage of exports (value) of dairy products to countries by India (2022-23)[1]

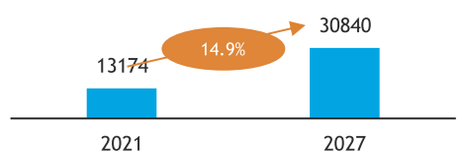


Source: Industry report

Potential for future growth and drivers

According to Industry estimates, the dairy market in India is expected to grow at a CAGR of ~14.9% from INR 13,174 billion INR in 2021 to INR 30,840 billion INR in 2027 on the back of favourable demand and supply drivers such as:

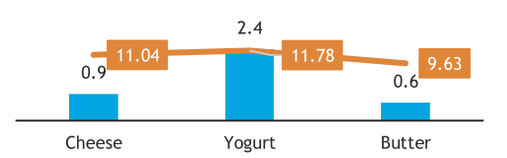
Figure 50: Projected growth of Indian Dairy Market (in billion INR)



Source: Industry report

- **Demand Drivers**
  - **Value Added Products expected to drive growth:** Shift in income patterns are driving demand for more value added products in dairy. Value added segment is expected to see increase across categories as depicted in the figure alongside.

Figure 51: Revenue and Growth of dairy products in India



Source: Industry report

  - **Untapped Export Potential:** India's export potential in the dairy sector remains considerably untapped. Realizing this potential necessitates enhancing the efficiency of dairy value chains and upgrading export infrastructure, particularly in the key milk-producing states. Noteworthy, milk and dairy exporters like New Zealand, the Netherlands, Germany, Belgium, France and others have established their prominence through robust exportable surpluses, streamlined dairy value chains, and well-established dairy export infrastructure.

- **Supply Drivers**
  - **Increasing per cattle milk productivity:** According to the Integrated Sample Survey, the average yield per animal in India is 1.5 times lower than the global average. In 2019-20, the average annual productivity of Indian cattle stood at 1,777 kg per animal as against the world average of 2,699 kg per animal[49]. According to OECD, between 2017 to 2019, the average

[49] PIB

yield per in-milk animal in the US was 8X higher than that in India. Further, New Zealand, the largest exporter of milk and milk products, recorded 3X higher average yield compared to India. The average yield per animal per day for exotic/ crossbred is 8.52 Kg per day and for indigenous/ non-descript is 3.36 Kg per day. The milk production from exotic/crossbred cattle has increased by 6.16% and indigenous/ non-descript cattle has increased by 6.13% as compared to previous year. The milk production from buffaloes also increased by 4.44% as compared to previous year.[50]This increase in productivity of milk is expected to boost the supply of milk for domestic consumption and export.

- **Rise of Digital and Organized retail market:** The rapid digitization, especially emergence of e-commerce platforms and increase in players engaged in organized retail of milk and dairy products, has expanded consumer access to a wide array of dairy products. Online platforms enable consumers to explore and purchase products that may not be readily available in local markets, thus broadening the demand base. Of the total liquid milk market, the share of organised sector has increased from 32 % to 41 % in last 3 years. It is estimated that the share of organised sector would reach to 54 % by 2026[51].
- **Increasing Rural and Semi-Urban Penetration:** Brands are increasingly recognizing the untapped potential for growth in semi-urban and rural regions. Aggressive marketing of smaller packs in dairy products caters to these markets, deepening brand penetration and driving volume growth.
- **Innovative Promotional activities:** Various campaigns in India have promoted milk consumption. Notable ones include Operation Flood for increased production, Amul's creative "Mooch Nahi Toh Kuch Nahi" emphasizing children's health, and National Milk Day's "Gift Milk, Gift Nutrition" initiative. School milk programs, "Doodh Ki Shakti" by Mother Dairy, fitness-focused campaigns, and digital efforts have also contributed to highlighting milk's nutritional value and benefits.

- **Policies**

  Rashtriya Gokul Mission to enhance productivity of bovines and increasing milk production in a sustainable manner using advance technologies. Dairy Processing Infrastructure Development Fund (DIDF) focuses on building an efficient milk procurement system by setting up of processing and chilling infrastructure & installation of electronic milk adulteration testing equipment at village level. The National Program on Dairy Development for enhancement of infrastructure to ensure the production of high-quality milk, efficient procurement, processing, and effective marketing of milk and its derived products. Supporting Dairy Cooperatives and Farmer Producer Organizations engaged in dairy activities formed to assist the State Dairy Cooperative Federations by providing soft working capital loan to tide over the crisis on account severely adverse market conditions or natural calamities and provide stable market access to the dairy farmers.

[50] Basic Animal Husbandry Statistics-2022
[51] Annual Report, FY 22-23, DoAH&D

2.3 KEY CHALLENGES

The animal husbandry sector in India faces a range of issues and challenges that impact its growth and sustainability. These challenges impact multiple aspects such as production, quality, infrastructure, value addition and marketing as tabulated below:

<table>
<tr><th>Category</th><th>Poultry & Meat</th><th>Dairy</th><th>Fisheries & Aquaculture</th></tr>
<tr><td rowspan="2">Production</td><td colspan="2">Indian livestock sector has lower in general productivity compared to global standards. As per Integrated Sample Survey average annual productivity of cattle in India during 2019-20 was 1,777 kg per animal per year as against the world average of 2,699[52] due to:
Traditional breeding: Modern breeding techniques that focus on traits like growth rate, feed efficiency, and disease resistance have not been extensively adopted in India. Many farmers still use traditional methods of breeding, lead to the selection of livestock breeds having lower genetic potential.
Shortage of feed fodder: There is deficit of 23.4 % in the availability of dry fodder, 11.24% in that of green fodder, and 28.9% for concentrates leading to 20-60% decrease in milk productivity.[53]
Lack of access to extension services : While the role of extension services in enhancing crop production and productivity is widely recognized, livestock extension has not received the attention required, and this has been one of the reasons for impeding productivity.
Research and development infrastructure: Limited research and development infrastructure for animal husbandry takes a toll on introduction of new technologies and practices that can improve the productivity and sustainability.</td><td rowspan="2">Low catch size: India ranks third globally in overall sea fish production but falls to fourth place in wild fish catch size. In 2020, while China led with 12.4 million metric tons, India's catch size was only 5.5 million metric tons, indicating untapped production potential.
Overfishing and resource exploitation are exacerbated by practices such as deep-sea fishing, motorized fishing, and trawling, depleting marine fish populations and prompting concerns.
Stagnation of shrimp culture area and productivity: ~1.58 lakh Ha area is used for shrimp farming with an average productivity of 5 MT/ha/year. MPEDA has identified additional 5 lakh Ha which can be brought under it. Further, adoption of Better Management Practices (BMPs), biosecurity measures and advanced technologies can propel the unit area production to 7 MT/ha/year across India</td></tr>
<tr><td>Limited breeding for meat only - The animals in India are not reared or bred entirely with the purpose of their meat. The animals used for the meat are generally culled, nonproductive dairy animal.</td><td>Milk Productivity: Despite being the world's largest milk producer, India's productivity per animal is very low, at 987 kg per lactation, compared with the global average of 2 038 kg per lactation.54</td></tr>
<tr><td rowspan="2">Quality</td><td colspan="2">Lack of training & skill services:There is limited availability of training on skill development needed for efficient and standardized production of poultry and dairy in India which leads to low quality, adulterated and non-standardized products.</td><td rowspan="2">Issues in maintaining quality standards and certifications for fish and fish products to meet both domestic and international market requirements.
Ensuring transparency and traceability along the fish supply chain, from catch to consumption, remains a significant issue.</td></tr>
<tr><td>High incidence of diseases: Many livestock farmers in India do not practice good biosecurity measures, such as</td><td>High adulteration: ~ 70%[55] of milk sold in India is “adulterated,” as it does not match the standards laid down by the Food</td></tr>
</table>

[52] FAOSTATs
[53] https://theprint.in/india/fodder-shortage-in-india-major-reason-behind-rise-in-milk-costs-says-govt-institute/347883/#:~:text=According%20to%20the%20report%2C%20there,and%2028.9%20kg%20of%20concentrates.
[54] Considering that about 1 kg of corn is required to produce 1 kg of broiler (based on FCR = 1.65 and 60% corn in feed)

Category	Poultry & Meat	Dairy	Fisheries & Aquaculture
	vaccination and quarantine. They do not have the knowledge or skills to manage their animals properly. This has led frequent occurrence of animal diseases a common and major problem in India, causing significant economic losses to farmers and posing a threat to public health. • **Anthrax:** major problem for the livestock sector, with an estimated 50,000 animals infected each year in India. • **Avian influenza** outbreak in 2020 killed 1 million poultry in India	Safety and Standards Authority of India (FSSAI). This poses a serious risk for the development of dairy industry in India and export potential of its products.	• **Inadequate solid waste management** results in the ingress of marine debris into coastal waters, contaminating marine organisms and impacting the marine food chain. Plastics ingestion by fish, including micro and macro plastics, is a growing concern
Infrastructure	• **Limited Veterinary services:** Facilities for veterinary treatment are scattered throughout remote areas. • **Lack of infrastructure:** The animal husbandry sector in India lacks adequate infrastructure, such as cold storage facilities, transportation facilities, and marketing channels. While some areas have well-equipped facilities, many rural areas still lack access to proper veterinary care. Many small-scale farmers rely on traditional housing methods, which might not provide optimal conditions for animals.		• **Traditional and informal system:** The fish market system in India operates within a traditional and informal framework, lacking sufficient nationwide infrastructural support. • **Inadequate cold-chain connectivity:** - The domestic fish market primarily relies on fisherfolks and private traders, with hinterland demand remaining unexplored due to inadequate cold-chain connectivity. - Perishable nature of fish and the time required to transport fresh catches from fish landing centers to interior markets, exacerbated by the absence of refrigerated transportation, has led to uneven distribution. • **Lack of monitoring throughout the value chain:** compromises the quantity and type of ice used in refrigerated transport, posing risks to hygiene and food safety. • **Handling facilities are subpar:** with inadequate provisions for potable water, quality ice,
	• **Informal Market-unclassified livestock leading to higher costs:** According to the ICAR, about 50% of the livestock breeds in India are yet to be classified because their genetic makeup, production potential, and other characteristics are not well understood. Hence, they don't fit into standard international breed classifications. These informal markets are complex and traditional where farmers often don't get fair price and mostly animals are not properly vaccinated or inspected. • **Logistic & Cold Chain:** The poultry industry's most significant challenge likely lies in the absence or insufficient provision of	• **Limited Infrastructure:** There is a chilling infrastructure deficit of roughly 120-130 MMT[56] in the dairy sector, and if the demand of the milk consumption is to be met, the infrastructure has to increase in line with the production. • **Wide demand supply gap in the country:** there is wide inter-state variability in the production and demand for milk in India necessitating better infrastructure.	

[55] FAO
[56] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7232977/#:~:text=According%20to%20a%20report%20by,are%20harmful%20to%20human%20health.

Category	Poultry & Meat	Dairy	Fisheries & Aquaculture
	refrigeration and logistics of live birds. As majority of poultry production takes place in 4-5 states of India, their transportation proves to be costly and increases quality risks.		electricity, and waste disposal systems
Value Addition	• **Dominant Wet Market:** in India people prefer fresh meat to packaged meat. There are few chicken meat processing facilities. Processing often takes place at the sales stalls along the road. The demand for processed meat is relatively low.	• **Limited value addition:** Most of the milk is consumed in liquid form and non-value-added form. Value added products such as yogurt, cheese etc., have higher margins, than the 3-5% margin for liquid milk products[57] impeding profit realization.	• **Low value addition:** While countries like Vietnam (26%), China (38%), and Thailand (66%) have made substantial advancements in exporting value-added marine products by processing their own raw materials and reprocessing imported ones, India's exports primarily consist of non-value-added products, comprising only 10% of the total volume.
Marketing	• **High Price fluctuation:** The most significant obstacle to price stability in the egg and meat industry is the seasonal fluctuations in consumption and demand.	• **High presence of informal market:** Majority share of milk ~54% of marketable surplus goes through informal channel without proper checks and labelling information, making quality a big concern in the sector.	• **Inadequate cold chain infrastructure within fishing vessels** and at harbours/landing centers leading to wastage of catch. • **Indian seafood is primarily exported in raw frozen form**, require a branding effort to promote it on the international stage. • **Several market regulations (e.g. antibiotic residue) pose** obstacles to seamless seafood trade and export. • **Non-tariff measures** such as the ban on exporting wild shrimp, and restrictions on exporting dry fish to various nations.

[57] https://www.biovoicenews.com/indias-inspiring-dairy-sector-makes-a-mark-globally/

2.4 POLICY INTERVENTIONS AND WAY FORWARD

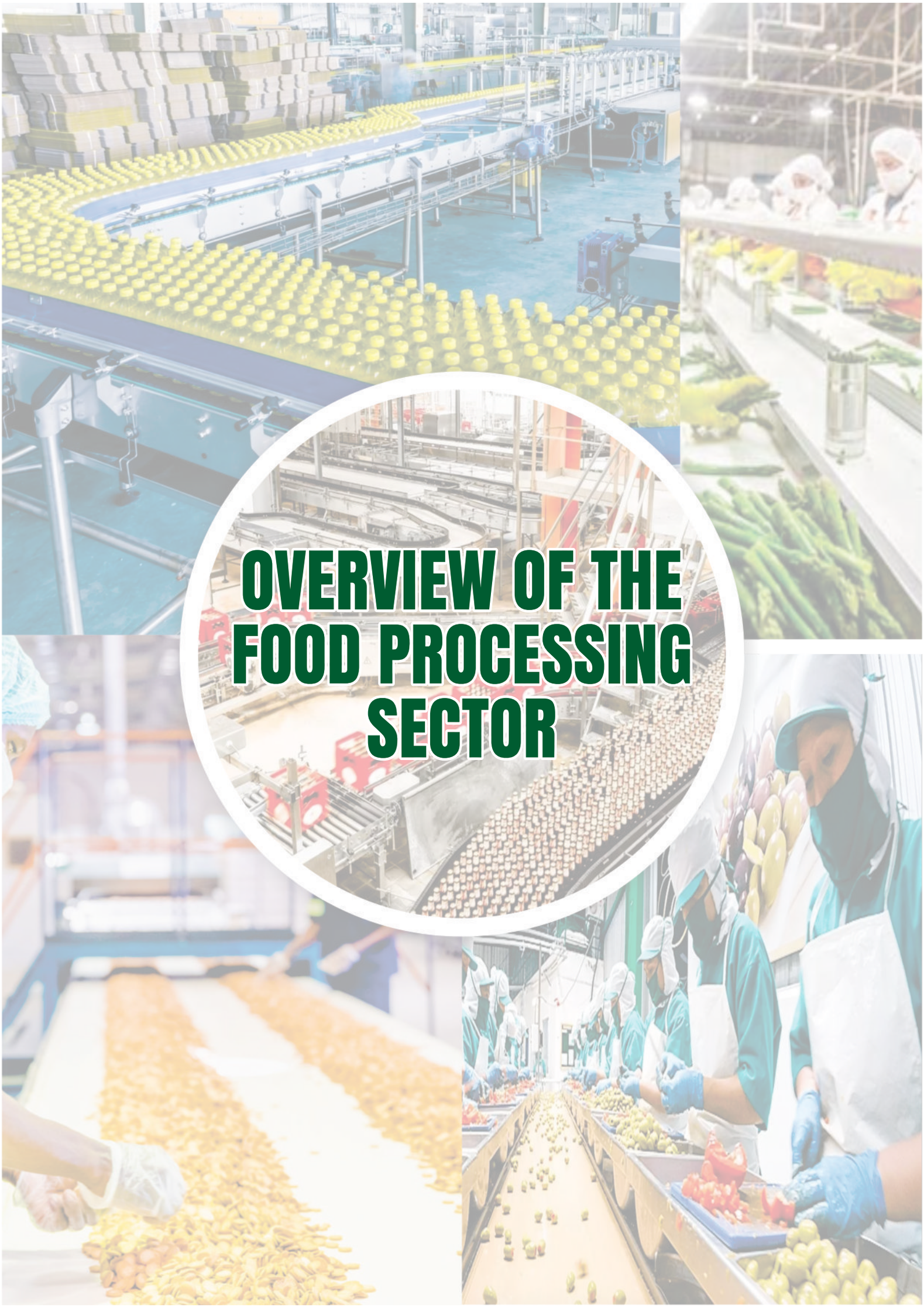
To undertake holistic and inclusive growth of the animal husbandry sector, adoption of a comprehensive and multi-faceted approach in implementation is requested so that it addresses various challenges and leverages opportunities.

Although Government has already taken up several initiatives and program level interventions which have steadily driven animal husbandry and fishery sectors in India, more needs to be done to address the challenges facing the sector and ensure a holistic and sustainable development. A few suggestion around policy intervention and way forward have been highlighted below:

- **Genetic Improvement:** Promote the breeding of high-yielding, disease-resistant livestock breeds by
  - **Setting up of national and state-level breeding and breed conservation** programs to i) prevent the loss of valuable genetic resources and ii) promote breeds with traits that align with the preferences and needs of local farmers and markets.
  - **Expanding the use of artificial insemination** to introduce superior genetics into local population and promoting the adoption of advanced reproductive technologies.
  - **Providing financial assistance** to farmers for genetic improvement
  - **Promoting research and development** in genetic improvement by investing in research to identify genes responsible for traits like disease resistance and tolerance to stress.
  - **Raising awareness** about genetic improvement among farmers
- **Nutrition Enhancement:** Establish policies to encourage the production of quality animal feed and fodder by establishing of feed resources management system highlighting following key aspects:
  - **Providing subsidies** on feed and supplements to make them more affordable for farmers.
  - **Promoting research and development** in livestock nutrition to develop new and improved feeding practices.
  - **Raising awareness** about the importance of improved fodder management practices, including harvesting, preservation, and storage in livestock farming among farmers and other stakeholders.
- **Veterinary Ambulance Service and Compulsory Livestock Vaccination:**
  - **Conduct a comprehensive assessment** of the areas with the highest demand for veterinary services, especially in remote and rural regions and secure investment in enabling infrastructure development for i) immediate primary treatment for injured animals, ii) ambulance services in veterinary hospitals. If required, collaboration with local veterinary clinics, NGOs, and government agencies may be explored to ensure seamless integration of the ambulance service.
  - **Develop communication networks and digital platforms** to efficiently receive emergency calls, dispatch ambulances, and track their movements.
  - **Launch awareness campaigns** to educate livestock farmers about the importance of vaccination, disease prevention, and the benefits of compulsory vaccination.
- **Encouraging the adoption of biosecurity measures:** Encourage the adoption of biosecurity measures, such as:
  - **Development and implementation** of farm-specific biosecurity plans that outline practices for disease prevention, quarantine protocols, and waste management.
  - **Training farmers and workers** in biosecurity practices, including entry controls, clothing changes, and hand hygiene.
  - **Dividing poultry farms** into distinct biosecurity zones to prevent the spread of diseases between different sections.
  - **Implementation of proper pond management** practices to maintain water quality and reduce stress on fish populations.
  - **Launching of media campaigns** to raise awareness about biosecurity through posters, radio, and television to reach a wide audience.
  - **Supporting community-based initiatives** on biosecurity involving farmers working together to implement biosecurity measures.
- **Promoting value addition:** Promote value addition in the animal and fishery sectors to increase the income of farmers and create more jobs by
  - **Formulating enabling policy** provisions that incentivize value addition, such as tax breaks or preferential treatment for value-added product enterprises.
  - **Providing grants, subsidies, and low-interest loans** to encourage the establishment and growth of value-added product ventures.

- **Providing training programs** for farmers, processors, and entrepreneurs to learn about value addition techniques, quality control, and market trends.
- **Offering mentorship, incubation, and financial support** to farmers and entrepreneurs interested in setting up value-added product businesses.
- **Introducing certification systems** that indicate the authenticity, quality, and production practices of value-added products.
- **Fostering collaboration** between farmers, processors, research institutions, and industry associations to facilitate knowledge sharing and innovation.
- **Promoting branding of livestock products** to create a unique identity for them.

- **Enforcing quality standards:** Enforce quality standards for animal and fishery products to ensure that consumers have access to safe and high-quality products through:
  - **Continuous updation and strengthening existing laws and regulations** related to livestock product quality standards to ensure that regulations are in line with international best practices.
  - **Conducting regular inspections -** Government and other authorized agencies to establish a robust system to conduct regular inspections of livestock farms, processing plants, and retail outlets to ensure that they are complying with quality standards.
  - **Accreditation of new Laboratories -** Set up accredited testing laboratories equipped with modern equipment and staffed by trained professionals to carry out quality tests and analyses on livestock products.
  - **Adoption of Traceability Systems -** Implement traceability systems for the tracking and tracing of livestock products from farm to fork, to help identify the source of contamination or quality issues quickly.
  - **Encouraging through Incentives for Compliance -** Provide incentives, such as tax benefits or subsidies, to encourage livestock producers and processors to invest in infrastructure and practices that comply with quality standard.
  - **Promoting public awareness -** The government and other organizations to promote public awareness of quality standards through education and outreach programs. This will help consumers to make informed choices about the livestock products that they buy.
- **Encouraging exports:** Encourage exports of animal and fishery products to increase the demand for these products and improve the income of farmers by taking up following key initiatives.
  - **Market Research and Identification -** Conduct thorough market research to identify countries and regions with strong demand for Indian livestock products.
  - **Diversification of Product Range -** Expand the range of livestock products for export beyond traditional items and consider exporting processed and value-added products such as frozen meat, cheese, and pet foods which have demands in emerging markets.
  - **Setting up of Export Assistance Centers** - Set up export assistance centres that offer guidance and support to livestock product exporters, including assistance with documentation, logistics, and export-related procedures. Collaborate with government agencies and trade promotion bodies to implement export promotion programs, access international markets, and address trade-related challenges.
  - **Formulation of Trade Agreements and Bilateral Deals -** Negotiate and enter into trade agreements and bilateral deals with importing countries to facilitate the export of livestock products under simplified trade barriers and tariff regime.
  - **Developing Cold Chain Infrastructure -** Invest in cold chain infrastructure to maintain the quality and freshness of perishable livestock products during transportation.
  - **Market Promotion and Trade Shows -** Participate in international trade fairs and exhibitions to connect with potential buyers and distributors for showcasing Indian livestock products.
  - **Focus on Capacity Building -** Provide training and capacity-building programs for livestock farmers, processors, and exporters to improve their knowledge of international standards, trade regulations, and market trends.



OVERVIEW OF THE FOOD PROCESSING SECTOR

3. FOOD PROCESSING SECTOR

3.1 OVERVIEW

Importance of the Sector in India's Economy

India is the world's second largest agriculture producer (after China) and commands the leading position in production of major agriculture products. Invariably, food processing sector in the country has traditionally been an important sector and over the past five years it has grown fast, with an average annual growth of ~8.3% almost double the growth in agriculture sector[59].

The food processing industry (FPI) is a key sector for the economy being the 5th largest[60] industry in terms of production, consumption, and exports. The sector also has wide socio-economic ramifications as it accounts for 10.5% of the gross value added (GVA) in manufacturing sector and 11.6% of GVA in agriculture sector in India. With 1.98 lakh registered factories in food processing, the sector employs 12.2% of overall registered employment in manufacturing sector in India (20.3 lakh people) [61].

The importance of the food processing industry stems from the fact that it creates higher value when compared with agriculture. In FY2019, the Gross Value Added (GVA) per employee in the food processing industry was INR 3.17 Lakhs[62] which was 4x-4.5x the GVA per employee in the agriculture sector which was ~INR 70,000 during the same period[63].

Given the importance of the sector, the Government of India is promoting the food processing sector by introducing various schemes and initiatives. Under Pradhan Mantri Kisan SAMPADA Yojana, 41 Mega Food Parks, 356 Cold Chain Projects, 60 Agro-Processing Clusters, 317 proposals under the Creation/Expansion of Food Processing and Preservation Capacities, 61 Creation of Backward and Forward Linkages Projects, and 6 Operation Green projects have been approved across the country.[64]

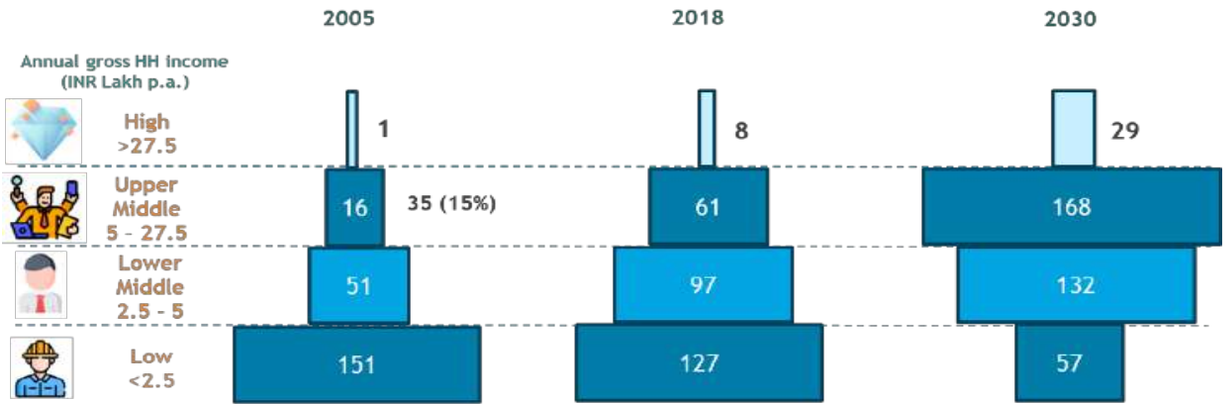
100% Foreign Direct Investment (FDI) is also allowed under the automatic route in the sector, and it is the 13th largest recipient of Foreign Direct Investment (FDI) in India with an inflow of USD 709.72 million in FY2021-22 and cumulative FDI inflow of USD 5.72 billion from FY2014 onwards.[65]

Potential for Growth

India has recently overtaken China as the most populous country with a base of 142.86 crore people and is expected to add nearly 273 million people to its population between 2019 and 2050. The expanding demographic base of the country coupled with growth in the economy is expected to drive the food industry in the country due to (i) youth population base which is expected to drive demand (27.3% of total population in India)[66] (ii) expanding middle class population base which is expected to create opportunities across food segments and (iii) increasing focus on health, nutrition and food safety.

[59] MOFPI Annual Report 2022
[60] Invest India: Budget 2022 – Food Processing Industry gets a Major Thrust
[61] Annual Survey of Industries (ASI) for 2019- 20
[62] MoFPI Annual Report FY 2022.
[63] SDG National Indicator Framework Progress Report - MoFPI (2022).
[64] FDI India Website
[65] Foreign Investment Facilitator Report
[66] National Statistical Office, MOSPI (2022)

Figure 52: Income Level Shift Expected in India



The food processing industry has a market size of USD 866 billion as of 2022, the food industry is poised to assume a pivotal role in the nation's economic trajectory. Projections indicate a robust growth trajectory for the domestic food market, with an estimated growth of over 47% between 2022 and 2027, reaching a substantial USD 1,274[67] billion. It is important to note that the growth in the food industry is expected to have more focus on conscious consumption as compared to earlier given the above demographic changes.

Low processing levels pose a challenge

India, despite its high agriculture production base and policy impetus by the Government across areas, continues to experience low food processing levels, especially in the secondary and tertiary segment. Presently, it processes less than 10 percent of its agricultural output and apart from cereals, processing levels are much lower across categories compared to countries globally.

Table 4: Summary of Comparative Levels of Processing at Global Level[68]

Commodity	India	United States of America	Brazil	Thailand	Italy	China
Paddy	92%	-	95%	93%	85%	88%
Wheat	73%	33%	88%	69%		41%
Oilseeds	49%	46%	-	54%	84%	72%
Fruits	4%	20%	38%	46%	42%	7%
Vegetables	3%	11%	-	32%	38%	3%
Meat	34%	87%	56%	14%	55%	
Milk	21%	65%	28%	29%	89%	-

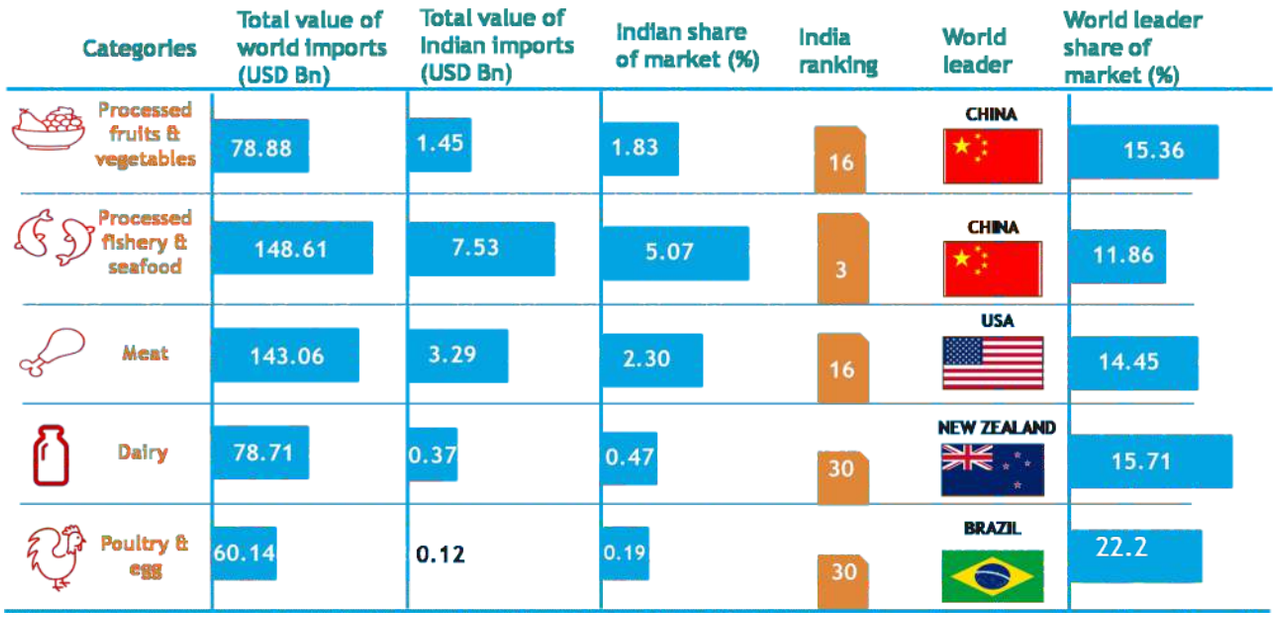
The low processing levels also indicate limited value addition in agriculture products in India when compared to other leading countries and high level of wastage in the value chain (as highlighted in the agriculture section).

[67] IBEF
[68] FAO Stat for USA, Brazil, Thailand, Italy, China, ASI and NSS Data for India, Processing Level Study conducted by MOSPI

- **Relatively Untapped Export Potential**

India is the 2nd largest producer of agricultural products with 11% share (USD 46.1 bn in 2021) of global agriculture production, however, its share in food processing exports is a meagre ~1% (processed food exports comprising 22.6% share in the overall food exports from India at USD 10.4 bn in 2021). This indicates the wide gap that exists and also the opportunity that is present. While India occupies leading production position in major product categories, overall exports in such categories are low as shown below[69]

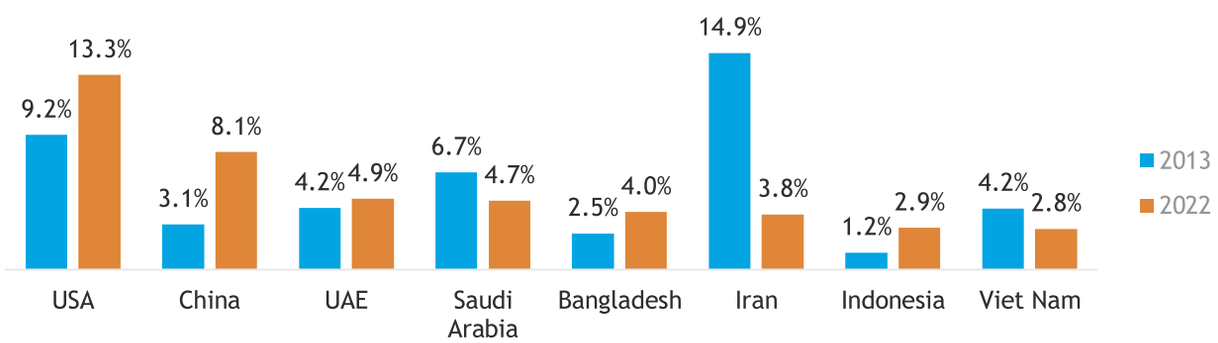
Figure 53: Category-wise export of processed food from India and comparative with global leading countries (2020)[70]



Source: WITS UM Comtrade, EXIM Bank Research (2022), BDO Analysis

Initiatives by the GoI has assisted in promoting exports of processed foods from India, however, more needs to be done given the size of the global pie. Further, it is important to note that export of processed foods from India is concentrated in select nations like Unites States of America, China, Middle Eastern countries and Southeast Asian countries.

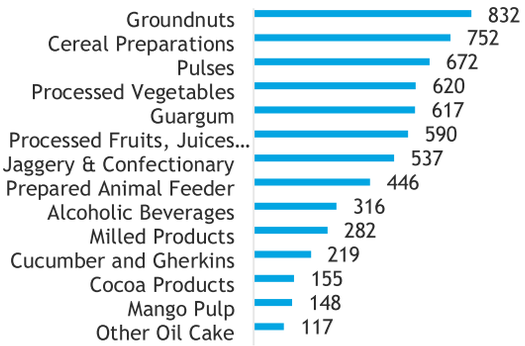
Figure 54: Importing Countries for Processed Food and Agro Based Products from India (2013-2022)[71]



[69] DGCIS
[70] International Trade Center Geneva; Exim Bank Research, Export-Import Bank of India, XV Finance Commission Report by HPG
[71] ITC Trade Map, BDO Analysis

India's exports to European countries require more focus, as they import a large share (>25%) of the global processed food and agro based product market - Germany (~5%), UK (~4%), France (~4%), Netherlands (~4%), Italy (3%), Spain (~3%), Belgium (~3%).[72]

Figure 55: Exports of Key processed foods from India (in USD Mn) for 2022[73]



Food processing sector in India has several strategic advantages driven by high agricultural production base in the country and potential in both domestic and export markets to grow fast in the coming years, however, low levels of value addition due to limited processing and wastage has impacted the sector from realizing its true potential. While the Government has taken multiple initiatives to promote the sector, it is important to analyze the trends and challenges so as to identify suitable measures for an effective action plan.

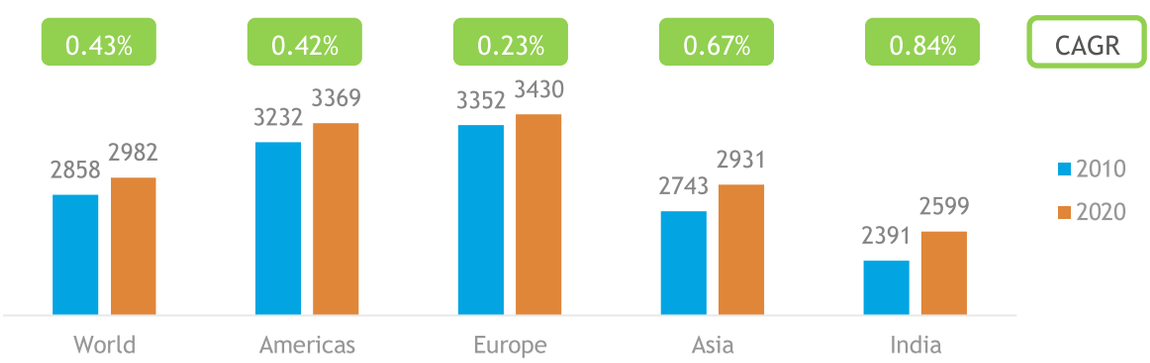
3.2 KEY TRENDS

Indian food processing industry is poised to grow sharply in the coming years driven by multiple strategic advantages which are catalysed by the strong government reforms to support the sector. As the industry grows, it is expected to be impacted by variety of factors such as evolving customer behaviour, changes in supply chain, growth in the organized retail segment and technology enablement.

- **Demand Side Shifts Led by Evolving Consumption Behaviour:**
  - **Rising disposable income driving premiumization:** Growth in India's economy has given rise to the middle-class population, which is widely considered as the largest contributor to spending in the economy, accounting for 48% of the total spend in the economy. The middle-class base which forms ~31% of the total population in 2020-21, is expected to grow to 61% of India's population by 2047[74].

    As a result, in the household consumption pattern, expenditure on Food and Non-alcoholic beverages which forms a major part (~30%) of the total expenditure is expected to grow to 35.3% of the total expenditure by 2025 itself[75]. India's per capita calorie intake has already increased rapidly over the last decade; however, it is still at 87% of the global average representing possibility of further growth which would lead to changes in food consumption patterns.

Figure 56: Dietary Energy Supply (Kcal Per Capita Per Day)[76]



[72] ITC Trade Map, BDO Analysis
[73] MOFPI, Please note miscellaneous items ~1107 has not been included in above chart
[74] People Research on India's Consumer Economy (PRICE) and India's Citizen Environment 2021
[75] Fitch Report
[76] FAOSTAT and BDO Analysis

This shift is expected to transform the food consumption landscape with consumers no longer limited to basic staples and are exploring a wider array of food products, protein-based products, fruits and vegetables as is evident from the change taking place already.

Figure 57: Evolving consumption habits in India[77]

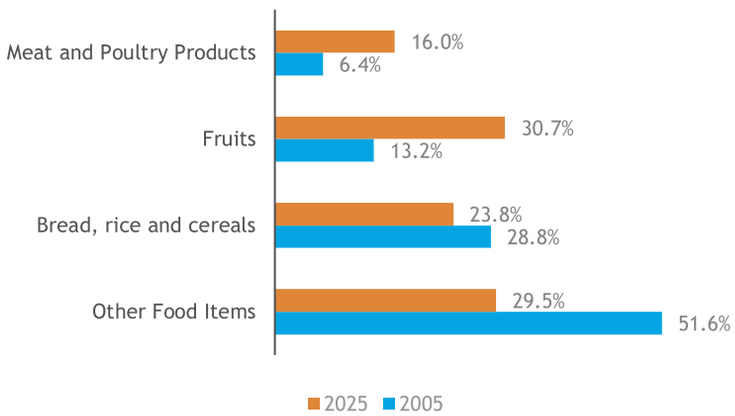
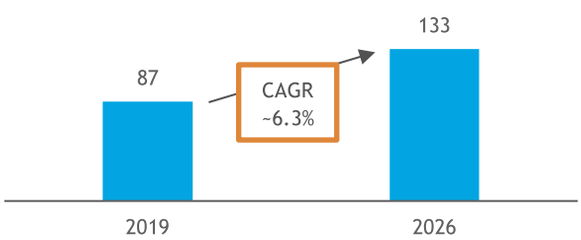
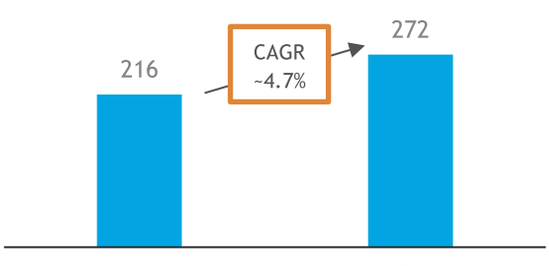


Figure 58: Growth of Herbal/ Traditional Market in India (in INR bn)



Source: Consumer Health in India, Euromonitor

Figure 59: Market size of the packaged food sector in India in 2022, with estimates until 2027 (in INR bn)



Source: Source - iMARC

- **Proclivity for healthier alternatives:** Health consciousness has taken center stage as consumers become more aware of the impact of diet on their overall well-being. This has prompted a shift in preference towards healthier food choices. Consumers are seeking foods that are nutrient-dense, low in unhealthy fats, and free from artificial additives. The rise of lifestyle-related diseases has fuelled interest in functional foods and nutraceuticals, which offer specific health benefits beyond basic nutrition.
- **Shift from loose to branded packaged products:** With rising concerns about hygiene, safety, and quality, consumers are transitioning from purchasing loose, unpackaged foods to branded packaged products. Branded products provide a level of trust and assurance in terms of quality, standardization, and compliance with food safety regulations. This shift has led to an increased demand for packaged snacks, ready-to-eat meals, and convenience foods. It is evident from the fact that the packaged food sector in the country is expected to grow from INR 216 bn in 2022 to INR 272 bn by 2027.
- **Responsible Consumption:** Environmental sustainability and ethical considerations have become significant drivers of consumer choices. As consumers become more aware, conscious and inquisitive they are looking beyond hygiene and are prioritizing companies that focus on sustainability in their sourcing, production, and packaging.
- **Demand for convenience led options:** Urbanization, changing dynamics of the workforce and family structures have led to a surge in demand for convenience led products, especially food products that require minimal preparation. Ready-to-eat meals, frozen foods, and pre-cut vegetables are catering to the fast-paced lifestyles of urban consumers. Snack-sized portions and on-the-go packaging are also gaining popularity.

[77] Fitch Forecasts

- **Supply Side Shifts Leading to Evolution in the Supply Chain:**

  - **Emergence of Direct to Consumer (D2C) models:** Traditional food supply chains starting from production to consumers which were more linear have started to undergo a change driven by reformative models being implemented by startups in the food value chain. In D2C segment, food businesses were the fastest growing category with an investment of 24.8% in 2019, increasing from 12.5% in 2015. These models remove the complexity and additive nature of the value chain. It also allows consumers to directly connect with the brand. These startups are playing a key role as a supply chain enabler.

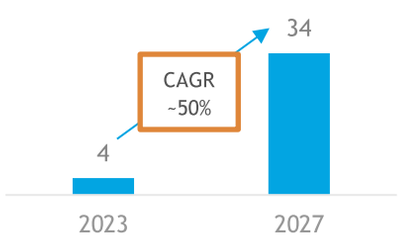
  - **Impact of COVID-19 and Russia-Ukraine war:** COVID-19 pandemic highlighted vulnerabilities in global food supply chains, disrupting the flow of goods and exposing the risks of relying heavily on international suppliers. This has further been accentuated due to the Russia-Ukraine conflict, which has further emphasized the need for resilient and diversified sourcing strategies.

    — Both Ukraine and Russia are important producers and exporters of key agriculture products globally. In 2021, either the Russian Federation or Ukraine, or both, ranked among the top three global exporters of wheat, barley, maize, rapeseed and rapeseed oil, sunflower seed and sunflower oil.[78] Several countries in the Middle East and North Africa (MENA) region import more than 50% of their cereal needs, especially wheat, from Ukraine and Russia.[79] As a response, there has been a renewed focus on strengthening domestic production capabilities, fostering local partnerships, and reducing dependence on single suppliers or regions.

    — These disruptions also provide an opportunity for India to relook at food exports to nations in MENA region specifically which have been impacted and also share a strong export base for Indian food products.

  - **Technology led shifts in supply chain:** Technology is playing a pivotal role in optimizing supply chain operations. Industry players are adopting a range of methods to support reduction in food wastage, improve product life and meet consumer demand on traceability. This has been driven by the emergence of agri-tech startup ecosystem. Startups are targeting niche areas and problems which have plagued the supply chain.

Figure 60: Gross merchandise value in Agri-tech Startup in India (USD bn)



Source: Inclusive Finance India Report

IoT sensors are being deployed to monitor the temperature, humidity, and condition of products during transportation, ensuring that perishable items remain fresh. Advanced data analytics and AI-driven tools are being used to forecast demand, optimize inventory management, and enhance supply chain efficiency. This has resulted in limiting the wastage during logistics and maintaining the overall quality & standards of the products.

To address demand for transparency, blockchain technology is being employed to create an unalterable record of each step in the supply chain. This digital trail allows consumers to verify the authenticity, safety, and origin of their food products.

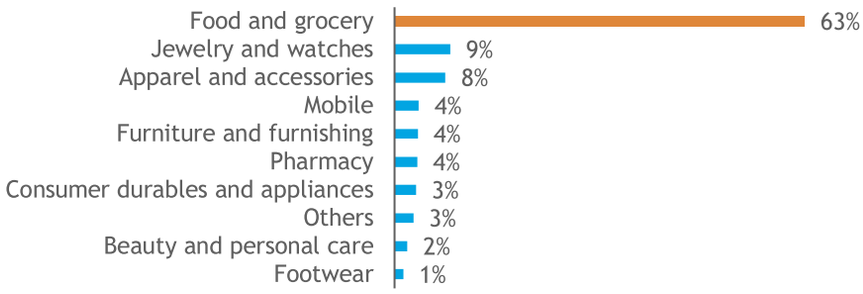
  - **Growth in the Organized Food Retail Sector:** The organized food retail sector is experiencing significant growth as consumer preferences evolve and modern retail formats expand. Supermarkets and hypermarkets are offering a wide range of food products, from fresh produce to packaged goods, all under one roof. This shift is contributing to the demand for standardized, shelf-stable, and convenient food items that cater to busy urban lifestyles.

The retail market size of food and grocery (in terms of value) in India is ~63% of the total retail markets. Keeping this in view many new startups and companies have forayed into the business of organized retail markets making it accessible and time saving for the consumers.

[78] FAO
[79] National Center for Biotechnology Information

Figure 61: India - Retail Market Size by Category for FY2022 (as a percentage of total value)[80]

Above demand and supply side changes are expected to impact the food processing sector in India in a big way. However, there are multiple challenges which affected the sector adversely.

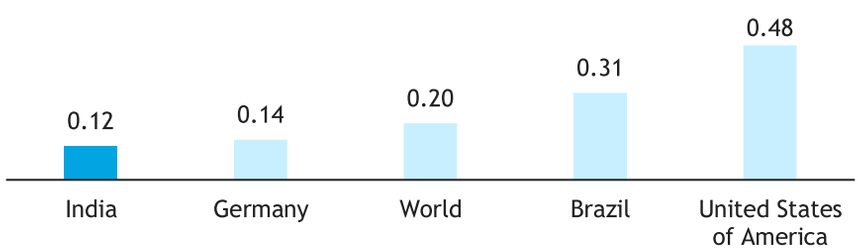


3.3 KEY CHALLENGES

To achieve the potential of the Indian food processing industry, there are select key aspects that need to be addressed. Despite known strategic advantages and opportunity available, the industry has lagged with processed food exports from India ~1% of the global food exports only.[81] Key factor from a supply and demand perspective that need attention have been discussed subsequently.

- **Supply Side Factors:**
  - **Availability of Scale:** Despite the large agriculture production in India majority of the farmers in India are of small and marginal holding in nature. A predominant share, exceeding 85% of agricultural lands have small and marginal holdings. Low landholding size poses issues in achieving scale which lead to issues in aggregation, procurement and cost in-efficiencies. The predicaments are multi-fold:
    - Small and fragmented landholdings indicate low scale and that coupled with low financial capacity of the farmers impact their ability to invest in upgradation and adoption of good agri practices.

Figure 62: Cropland Area Per Capita by Country (ha/pc)[82] for 2022



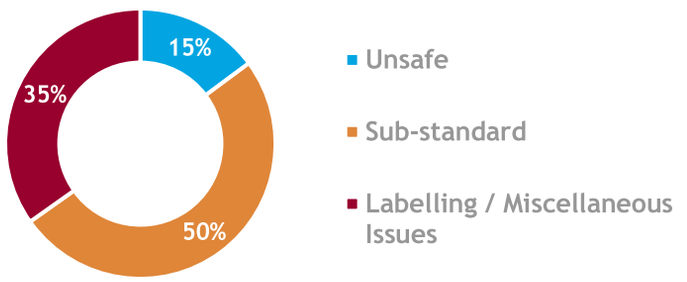
    - Aggregation of produce becomes a challenge due to limited farm holdings and output. This impacts ability to process foods leading to high primary processing levels and ability to source on competitive rates, leading to higher overall costs. Direct contracting becomes a challenge with need to manage multiple stakeholders. Hence, despite low labour and other associated costs in India, overall competitiveness is impacted.
    - Low scale also has led to concentration of MSMEs (98.4 %) in the Indian food processing industry, with little ability to invest in plant and machinery, resulting in low levels of processing and output (12.5 percent in value terms)[83]. Around 15% of large and medium-sized enterprises import machinery, equipment, and advanced technology
  - **Consistency in quality:** A critical problem plaguing the quality of agricultural products stem from the nature of the produce itself, resulting from several key factors. Quality of processed foods is

[80] Statista, Unicommerce; Wazir
[81] MOFPI Annual Report 2022
[82] FAOSTAT
[83] MOFPI Annual Report, 2021

largely dependent on the raw materials. Given a large majority of the Indian farmers belong to small and marginal category, they have limited understanding on good agriculture practices. They end up excessive inputs, which impacts the crops. As there are limited soil testing facilities the issue is further exacerbated.

Another critical factor is the limited awareness about need for maintaining safety standards and compliance, without which export of food products get impacted as most leading nations have stringent norms. This knowledge gap adversely impacts farmers' ability to market their produce effectively in both domestic and global markets. Quality and compliance issues are evident from FSSAI test results in FY2022, wherein 1 in every 5 samples tested where found non-confirming to standards.[84]

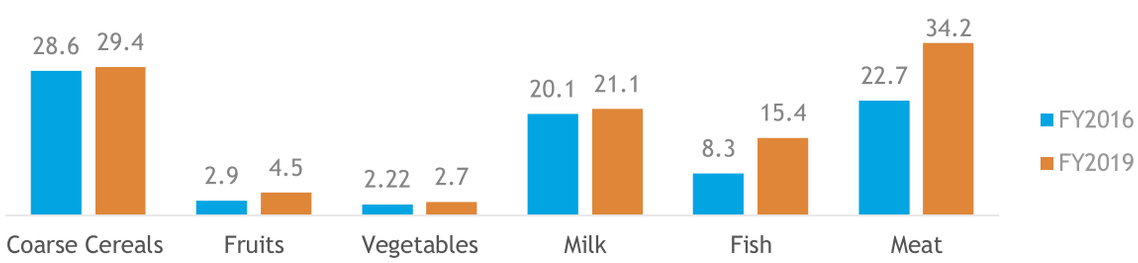
Figure 63: Non-compliance Categorization of Samples Tested by FSSAI in FY2022[85]



Insufficient availability of quality assessment facilities in India further compounds the quality challenge. Even if farmers acquire knowledge of requisite quality certifications, shortage of adequate testing establishments persists across the nation. India's unit rejection rate (URR) which indicates the number of rejections per USD 1 mn exported to a country is especially high for food and agri products and specifically when it is to developed nations (e.g. Australia, Europe, USA) which have stringent norms.[86]

- **Inadequate infrastructure across all key aspects in food value chain:** A critical challenge in India's food processing sector is limited availability of the infrastructure for processing, storage, and logistics infrastructure.
  - **Low levels of processing**: While efforts have assisted in improving processing, it continues to be low at an aggregate level and in many products like cereals, fruits, vegetables, fisheries and dairy there is hardly any improvement in processing levels

Figure 64: Processing Levels for Key Products in India (in %)[87]



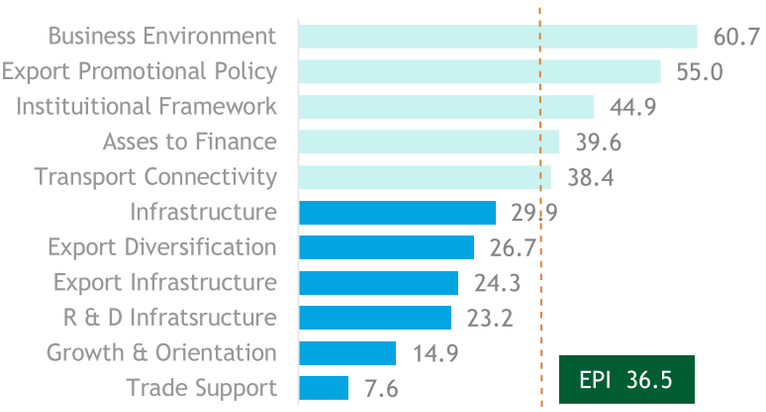
  - **Wide gap in storage and warehouse facilities:** At present, India has a foodgrain storage capacity of 145 million metric tonnes (MMT) against the total food production of 311 MMT—leaving a gap of 166 MMT. While storage capacity has expanded, its distribution remains uneven, with 70% of cold storage concentrated in five states, leaving others with limited facilities. This imbalance impacts perishable goods producers who lack on-farm storage, compelling them to sell at low prices while urban markets command higher rates. Investments are needed to expand and modernize storage capacity. This infrastructure gap results in varied setbacks: uncertain harvest timelines, degradation of quality at the farm gate, limited integration downstream,

[84] FSSAI Annual Report 2022. Samples tested in current year pertaining to last year which have been found non-compliant have been excluded from this calculation.
[85] FSSAI Annual Report 2022
[86] UNIDO
[87] Processing Study by Deloitte

insufficient automation in handling and packaging, and a scarcity of dedicated cold chain facilities, mainly due to their focus on fruits and vegetables.

— **Overall logistics infrastructure for exports**: In a recent study by Niti Aayog on Export Preparedness Index for India it was found that India scores high on the export promotion policy and business environment but most states fared low on infrastructure required for business and export ecosystem.

Figure 65: India - Export Preparedness Index (2022)[88]



It is important to note that 15 states have Multi Modal Logistics Hubs (MMLH) and 17 states have ICDs in India. However, holistic facilities in terms of testing centers, certifications, common packaging centers and dedicated product based value-add centers to meet country specific norms need to be augmented.

- **Demand Side Factors:**
  - **Few globally renowned champion brands from India :** Consumers increasingly demand branded products both in domestic and global markets. This has led to a shift towards organized segment in most categories. Branded products are associated with a general perception of having better quality. Marketing and branding also becomes integral from export perspective as specific countries focus on product specific targeted campaigns to create brand value and recall.

Case: American Pistachios in India

The American Pistachios Growers (APG) wanted to improve the exports of the product to India. For the same, it focused on a dedicated marketing campaigns by American Pistachio Growers in the country. The campaign focused on the health benefits of the product - antioxidant, plant-based diet, etc. and its protein content (as much as eggs), given 40% of India's population is vegetarian. Furthermore, they also tied-up with domestic influencers like Luke Coutinho and others to promote it is a lifestyle product.

The pistachio trade between India and Iran has a long history that spans centuries. Nevertheless, the campaign assisted the U.S. pistachio industry in achieving a remarkable growth of 23.47[89] percent in its market share in India during 2019-20.

Government of India under the Production Linked Incentive (PLI) scheme has recently allocated significant amount towards promotion of domestic food processing brands to emerge as global leading brands by providing assistance towards marketing spend on meeting targeted revenue levels.

- **Poor Perception Around Processed Products in Domestic Market:** The perceptual hurdle looms large, especially within semi-urban and rural segments, driven by concerns about the perceived decline in nutritional quality and freshness of processed foods. This apprehension curbs the domestic appetite for processed offerings, as consumers have doubts about the benefits these products can offer. Traditional practices of crafting value-added food items at home further contribute to the challenge, as consumers opt for self-prepared alternatives, believing that processed foods entail a compromise in nutritional and sensory attributes. Due

[88] Export Preparedness Report 2022 by Niti Aayog
[89] U.S. Census Bureau Trade Data - BICO HS-10

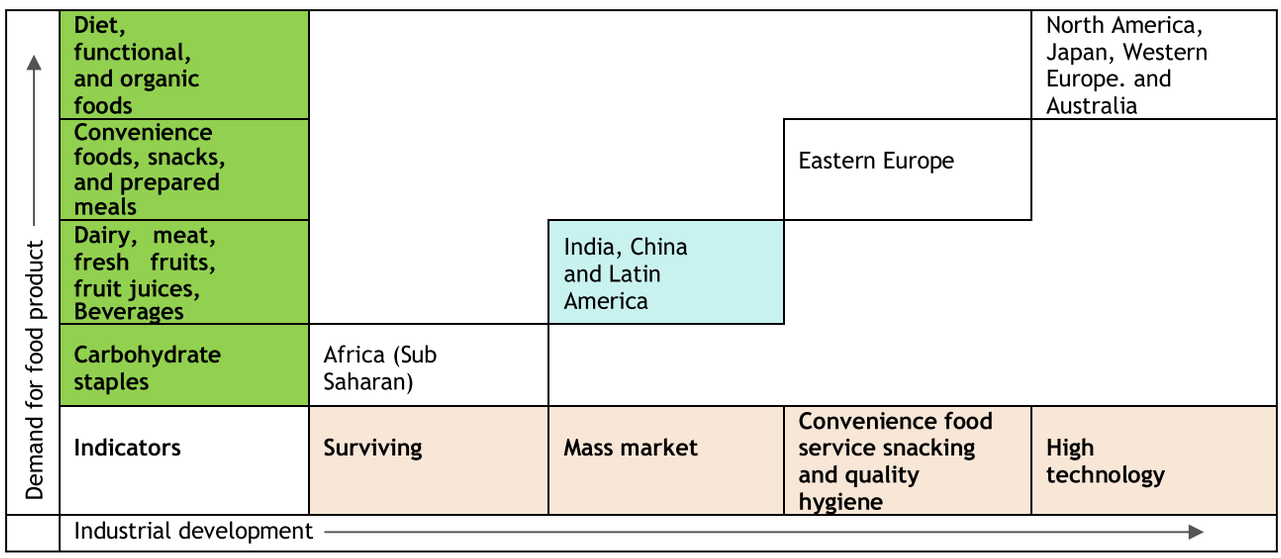
to this trend there has been a rise in home-grown food brands in India which are offering traditional products, however, additional support is required for success of such brands.

- **Low innovation and limited focus on R&D**: Relatively low emphasis on R&D and new technology, with prominent Indian businesses spending only ~0.5 percent of their expenses on R&D activities impacts new product development. Innovation in food industry moves beyond technology upgradation and towards need to meet evolving demands of consumers through ability to meet diverse dietary patterns, fortified foods, plant-based alternatives, organic, allergy free choices and more. With the growing importance of exports, there has been a recent shift in emphasis toward high-quality packaging. Packaging Consumption per capita in India is only 4.7kgs while in Germany it is around 42kgs.[90] However, more focus on product led innovation needs to take place to meet demands of evolving customer both in domestic and export markets.

  In terms of processed food manufacturing technology as well, players in the category have difficulties in building up automated high-volume manufacturing lines to produce ethnic Indian food products that adhere to the necessary hygienic standards and give a consistent taste profile.

  Limited innovation level is also represented in the below matrix, which compares the position of India's food processing sector in a global context. The matrix demonstrates how the evolution of food industry is driven by industrial development through the position of various countries/ regions with regards to their food processing basket. India's food processing industry is in the same category as that of China, and Latin American countries. Developed countries which are at a higher level of food processing such as Eastern Europe and North America has been focusing on convenience food, functional food and organic food.

Figure 66: Evolution of Global Food Demand[91]

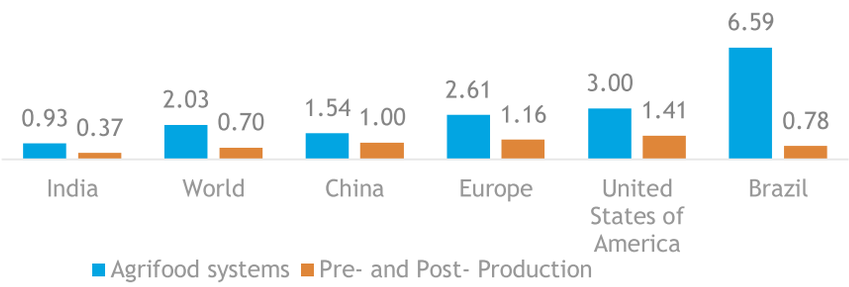


- **Sustainability concerns:** Consumers globally has become more concerned about sustainability as indicated in the trends section. As a result both the producers and processors are aligning their supply chains to such parameters. The trend has also found way into new trade agreements between countries wherein importing nations are demanding ethical and sustainable product compliance from exporting nations. For instance, in palm oil which is a key import product by developed countries, the European Countries have introduced a cap on the overall consumption of palm oil and are promoting imports of sustainable palm oil. This has led to 70% of the sourcing shifting towards sustainable palm oil. Similar trends are expected in other food products as well,

[90] WEDC
[91] Reserve Bank of India, Food Processing Industry in India: Challenges and Potential, 2019

wherein driven by environmental concerns and evolving customer demand, sustainable and ethical sourcing and production are expected to take center stage.

Figure 67: Per Capital Emission Levels (2020)[92]



At a per-capita level the emissions from Indian food processing industries are low compared to global standards, however, same needs to be certified by agencies and marketed better. Given the fragmented farming system, complex supply chains fraught with intermediaries where traceability is difficult to implement, this becomes a serious challenge.

3.4 POLICY INTERVENTIONS AND WAY FORWARD

Unlocking the potential in the food processing industry and assisting India emerge as a leading global player requires a call to action. Government of India has set an ambitious target of achieving USD 2 trillion of merchandise and services exports by 2030 of which 50% is attributable towards merchandise exports. Food products forms ~8% of total merchandise exports and needs to play a larger role to assist in achieving this target. GoI has introduced numerous schemes to support the sector such as: Pradhan Mantri Kisan Sampada Yojna (PMKSY) to boost to the growth of food processing sector in the country and also help in providing better returns to farmers by creating huge employment opportunities especially in the rural areas, reducing wastage of agricultural produce, increasing the processing level and enhancing the export of the processed foods. The PM Formalisation of Micro Food Processing Enterprises Scheme (PMFME) aimed to enhance the competitiveness of existing individual microenterprises in the unorganized segment of the food processing industry and promote formalization of the sector. Similarly, the Production Linked Incentive Scheme for Food Processing Industry (PLISFPI) that envisages to support food manufacturing entities and value addition. The Mission for Integrated Development of Horticulture (MIDH) is a Centrally Sponsored Scheme for the holistic growth of the horticulture sector covering fruits, vegetables, root & tuber crops, mushrooms, spices, flowers, aromatic plants, coconut, cashew, cocoa and bamboo and their subsequent processing & value addition. select interventions required to support there policies are discussed below.

- **Accelerate Development of Select Value Chains**

  Cluster development approach has seen strong success for many nations globally and similar approach needs to be adopted in food processing industries. Accelerated development can be achieved in the food processing sector through focus on these specific value chains only.

  The XV Finance Commission constituted a High-Level Expert Group (HLEG), which identified 20 crop value chains which have the potential to double exports from USD 40 bn today to USD 70 bn in a few years of implementation, with an increase in share of processed and other forms of value added from the current 15% to as much as 40%.

  Targeted program which provided proactive support to such identified value chain can be initiated to provide support around:

  - **Develop these value chains end to end for scale and competitiveness** covering inputs, logistics, infrastructure and processing to markets
  - **Identify demand centers for items in export markets** and undertake targeted marketing in such countries for these products focused on quality and premiumization. Such items can be included in the FTAs which India has with or is in the process of executing
  - **Empower State Governments** where such value chains are concentrated to support in seamless operations, decision-making and information flow
  - **Outbound infrastructure to be augmented** to meet country specific requirements for such products

[92] FAOSTAT

- **Establish Incentive mechanism** and awards for players operating in these categories

Case: Chilli in Andhra Pradesh - Private-sector-led cluster

In 2016-17, a leading consumer goods company and the Horticulture Department of the Government of Andhra Pradesh[93] entered into a public-private partnership (PPP) to jointly develop the chilli value chain in the state by disseminating best agricultural practices and providing advice to farmers on sustainably improving crop productivity, quality, sustainability, price realisation and farmer incomes

In 2019-20, the project was deemed such a success that the scale and scope of the programme expanded, covering 12,000 acres in 4 key chilli-producing districts (Guntur, Kurnool, Prakasam and Krishna), with the larger objective to reach 100,000 acres in the near future and to make Andhra Pradesh the global hub for food-safe chilli sourcing

- **Augment Infrastructure Through Collaborative Models**

  Infrastructure gap in food processing is wide and at all multiple levels. Government of India through its policies such as the PMKSY scheme is trying to address these infrastructure problems with effective supply chain management from the farm gate to the retail outlet. In August 2022, a Special Food Processing Fund of INR. 2,000 crore (US$ 242.72 million) was set up with National Bank for Agriculture and Rural Development (NABARD) to provide affordable credit for investments in setting up Mega Food Parks (MFP) as well as processing units. However, despite the same, a loss of ~INR 1 lakh crore is incurred annually along the postharvest value chain - with lack of proper logistics and storage facility in the country acting as a significant contributor to the same. Therefore, it is critical that adequate infrastructure facilities are in place to avoid huge losses.

  - **Promote PPP models for infrastructure augmentation** - Given the size of investment required, it is important for Government to design remunerative PPP models to promote investment from private players in this space. Dedicated aspects such as secondary and tertiary level processing, warehousing and export led infrastructure can be promoted in this regard.
  - **Promote Common Centers and Pay Per Use models** - Promotion of shared infrastructure at rural levels and custom hiring centers can assist small and marginalized farmers to make use of the facilities. Rural entrepreneurs can be promoted to establish such infrastructure with support to create employment and boost incomes levels
  - **Encourage Startups in Niche Areas** - Accelerate startup investment towards export led infrastructure as most food startups are focused on the domestic market at present. Dedicated benefits for establishing linkage and infrastructure with global markets can be provided. Further, startups can be promoted to invest in new age infrastructure such as smart warehouses.
  - **Improve Policy Support and Fastrack Implementation** GoI has recently announced scheme to establish world's largest grain storage plan and same needs to be accelerated with inclusion of models beyond co-operatives. The mega food park scheme faced concerns in terms of land allocation, ancillary support and others. Same needs to be resolved through dedicated efforts to ensure the waste minimization and value addition objective with which it was established is met.

- **Enhance Compliance and Certifications to Meet Evolving Customer and Global Demands**

  - **Align Compliance with Global Standards** - As discussed earlier, there is high rejection rate of food products exported from India to Australia, Europe and America. FSSAI and MRL norms can be aligned with requirements of US FDA and EMA. Quality checks at key export points should be enhanced and made more stringent to reduce outflow of any sub-standards item
  - **Explore India Specific Standards for Specific Items** - Recently there was high rejection of basmati rice exported from India. India can explore establishing sustainability and certification norms which are industry leading and provide a signalling to global countries. For instance, Indonesia and Malaysia introduced ISPO and MSPO norms respectively for palm oil produced in the country to improve local adherence to global standards and also to market their products better

[93] Report by XV Finance Commission High-Level Expert Group (HLEG)

- **Improve Number of Certification Agencies and Reduce Costs** – Promote private sector participation and collaboration in establishing certification agencies in India so that there are more accredited labs to reduce costs and time involved
- **Promote Sustainable and Ethical Norms** - Educate the players on need for sustainable and ethical production given its impacts. Clearly define norms basis food categories which any player would need to comply with to meet sustainability and ethical requirements. Players meeting high percentage of such items can be provided incentives.

Case: Indian Grapes by APEDA

The website, GRAPENET by APEDA[94], integrates all stakeholders in the supply chain of grape exports. The ability to trace the product right up to the plot level along with strict requirements helps in quality assurance. This further enables the sale of the produce at premium prices.

Outcome: Improvements in exports through a focus on traceability and compliance with global standards.

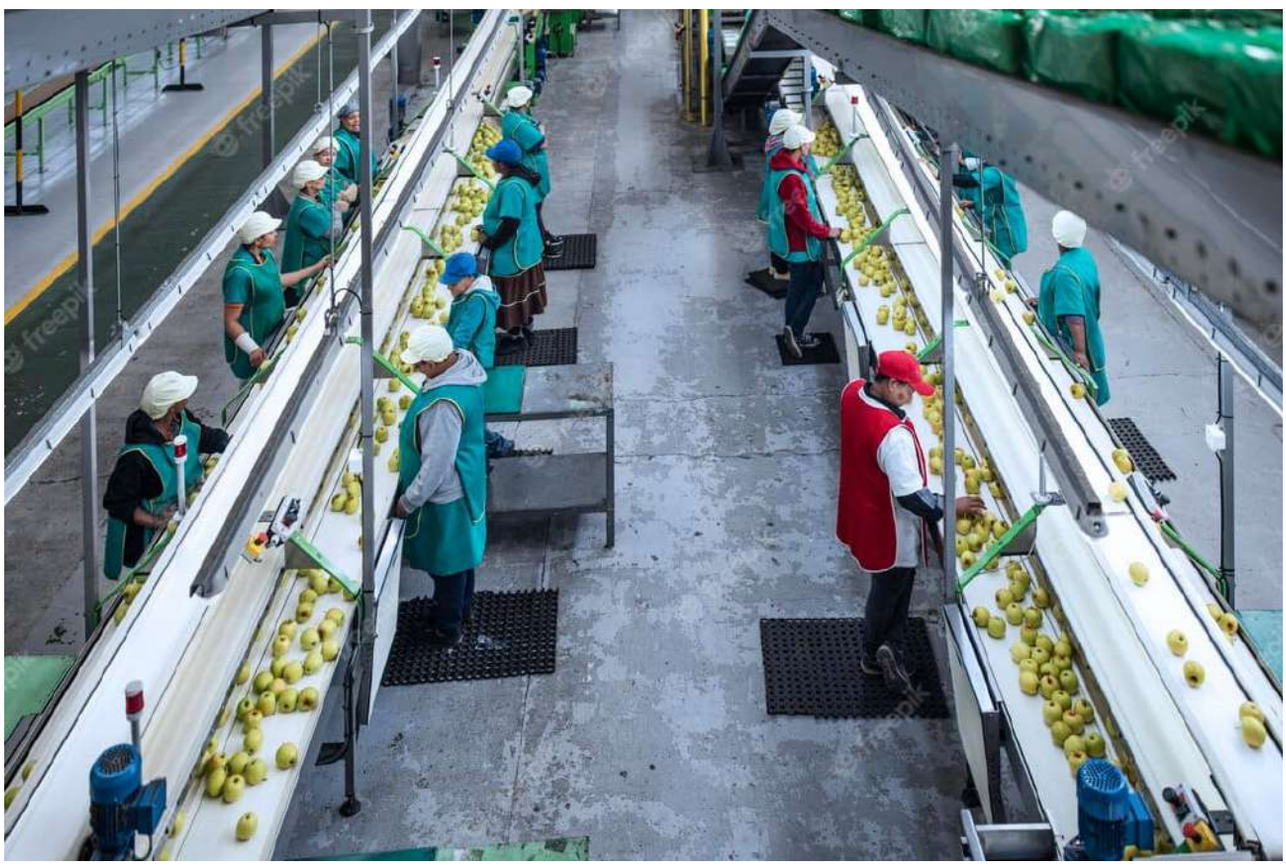
- **Promote Indian Products Globally**
  - **Conduct generic campaign - P**romotion of Indian sourced food products globally based on origin, quality, freshness, sustainability and other aspects needs to be conducted. While there are many products specific campaigns and GI that India already has, a unified generic export promotion campaign is required for Indian food products
  - **Improve FTA utilization -** India has recently entered in 19 agreements with global nations - 13 free trade agreements. (FTA) and 6 preferential trade agreements (PTA). These agreements are a shift from earlier agreements towards Europe, UK, UAE and Eurasia. Focus on food products available under such FTAs need to be communicated more to stakeholders to drive utilization and overall focus on food products in such collaborations need to improve
  - **Expand Ambit of PLI Scheme -** the food processing industry has made an investment of INR 7,427 crores under the scheme as of FY 2023[95]. It currently covers ready to cook/ ready to eat foods, processed fruits & vegetables, marine products, and mozzarella cheese. Ambit of the scheme can be expanded to include other products such as complete dairy products, tea, and other items where India has strong production base.
- **Encourage Technology Adoption**
  - **Indigenize equipment production -** Key issue in food processing is requirement of technology to cater to Indian traditional food processing and dependencies on imports for machineries. It was estimated in 2019, that in the Indian food processing equipment and machinery industry mostly comprises small and marginal player with ~85% of the market share belongs to the small players while 8-9 % for the medium and only 5% is with large players.[96] Further, only around 10% of food processing equipment are exported out of total domestic production, while 35% of agro-food processing equipment is imported.[97] It is important to support production of such equipment in India as per the "Atmanirbhar Bharat" initiative to improve competitiveness of the sector.
  - **Collaboration between industry and academia**- Industry and Academia linkages are essential for the growth of research and development in the application areas as well as in new product development. Industry and academia collaborations can assist in driving R&D in the right direction and provide necessary technology to support the industry. For instance, the Council of Scientific and Industrial Research (CSIR)–Central Food Technological Research Institute (CFTRI), Mysuru is one such institute that is actively working on alternative packaging materials for food,

[94] APEDA
[95] MOFPI
[96] KPMG Report on Food Processing
[97] Technology Export Development Organization (TEDO)

food fortification, increasing the shelf life of millets, and retaining the nutritional value of cut fruits and vegetables. GoI may focus on creating more Centre of Excellence(CoE) in proximity to production clusters, which can promote holistic development of these value chains.

- **Support Skilling -** In a recent study by MOFPI it was estimated that the net expected number of skilled human resource requirement in the 11 key sub-sectors of Food Processing during 2021-30 would be around 13.4 Lakh.[98] This necessitates skilling agencies to augment capacity and design curriculum based on industry requirements to support the anticipated growth. Training focused on MSMEs in food processing industry can be designed and centers established to support workforce in such industries. For workforce trained under government training schemes can be provided access to online job portals. Given the high penetration of internet and mobile phone, ready-made courses on mobile devices can be provided to accelerate skilling in the sector. While the schemes such as PM-Kaushal Vikash Yojana (PMKVY) has achieved fairly good outcomes, it is important to address some issues such as encouraging more training providers to come onboard through streamlining the criteria, conducting a proper assessment of job markets and ensuring the right skills and trainers are provided to meet the shortage of workers.

The above interventions are potential enablers for holistic development of the food processing industry which can benefit the stakeholders associated with the industry and economy at large. Focused and timebound implementation on suggested initiatives can help the industry to not only emerge as a globally competitive one but also an engine for India's export growth story, as the country aims to become the 3rd largest economy by 2027-28.



[98] Study to assess Human Resource and Skill Requirements in Indian Food Processing Sector during 2021-2030

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