The role of agrochemicals: Achieving the vision of a USD 5 trillion economy by 2025

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FICCI

Foreword



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The agriculture sector has played a pivotal role in shaping up the Indian economy and providing livelihood opportunities to more than half of the country's population. Agrochemicals are playing an increasingly important role in feeding a rising population by improving agricultural production amidst decreasing cultivated area, limited area under irrigation and increasing stress on cultivable land.

The agrochemical industry has been driven by an increasing domestic demand and exports to grow strongly. The industry is expected to grow further as agricultural production requires a much-needed boost to fulfil the food requirements of the country's growing population. The Government and the private sectors can collectively address the challenges faced by agriculture and pave the way towards the sector's long-term growth.

This paper highlights the important role of agriculture in the Indian economy, the significance of agrochemicals in Indian agriculture and the challenges faced by the agrochemicals industry. The paper also discusses the agriculture sector's potential growth in the next five years to achieve the vision of India becoming a USD 5 trillion economy by 2025 and presents a roadmap highlighting the role of the Government and the industry in achieving the required growth.

PwC would like to thank FICCI for providing an opportunity to develop this knowledge paper that is expected to play a crucial role in highlighting the importance of agrochemicals and the key imperatives for the Government and the industry to strengthen the agriculture sector.

Message from FICCI-Subcommittee on Crop Protection Chemicals



RG Aggarwal
Chairman
FICCI - Sub Committee on Crop Protection Chemicals &
Group Chairman - Dhanuka Agritech Ltd.

Agriculture has been a very crucial sector for India and the country has significant potential for high and sustained growth in agriculture and allied sectors, considering the huge untapped potential along the value chain.

Agrochemicals are one of the key inputs required for crop protection and better yield during both pre- and post-harvest stages. Judicious use of crop protection chemicals supports sustainable farm management and delivers socioeconomic benefits to meet the challenges of feeding India's increasing population.

The Government of India (GoI) has undertaken various reforms to improve the functioning of the agriculture sector and double farmers' income by 2022 by emphasising on agriculture marketing, providing farmers with access to institutional credit and freeing the sector from various restrictions by appropriately backing laws. Such reforms are expected to strengthen the rural economy and provide great support to the vision of building a new India.

I appreciate the GoI's work towards improving India's ranking in the ease of doing business index, believing in Sabka Saath Sabka Vikas Sabka Vishwas and emphasising on vocal for local to support its flagship programme Aatmanirbhar Bharat (self-reliant India), which will help boost the Indian economy. The GoI has declared pesticides as a champion sector and is looking to transform India into a hub for production.[1] The United Nations General Assembly has declared 2020 as the 'International Year of Plant Health', understanding the important role played by crop protection chemicals in achieving global food, nutrition, health, wealth and environmental security.[2]

It is my pleasure to announce that FICCI, with support from the Department of Chemicals and Petrochemicals, Government of India, is organising the 9th Agrochemicals Conference, 2020, on the theme 'The role of agrochemicals: Achieving the vision of a USD 5 trillion economy by 2025'.

I wish that this conference becomes very successful and hope that the deliberations from the conference will be very useful for the future of the agriculture sector.



1 https://www.financialexpress.com/economy/pesticides-to-play-crucial-role-of-crop-insurance-as-india-strives-boost-agriculture-farm-sector-economy/2107780/

2 https://www.unenvironment.org/news-and-stories/story/2020-international-year-plant-health

Message from PwC



Ajay Kakra
Executive Director
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The Indian economy has progressed significantly from being a ship-to-mouth economy in the post-independence era to becoming one of the largest economies in the world. Agriculture continues to be a dominant player in the Indian economy. Along with major economic reforms, Government programmes such as the Green Revolution have played a critical role in transforming the country's agriculture sector and supporting economic growth. The vision of transforming India into a USD 5 trillion economy by 2025 has provided a strategic direction to all the sectors in India, and they are engaged in designing their roadmaps for sustainable growth. However, achieving the intended target also requires significant developments in technology, infrastructure and skills, along with creating an enabling environment for policymaking.

The Indian agriculture sector faces some major challenges such as small landholdings, decreasing arable land area, low productivities, low awareness levels among farmers and low penetration of technology. A significant portion of farm productivity is lost to pests, diseases, lack of irrigation facilities and overdependence on traditional methods of farming.

The importance of agrochemicals needs to be viewed in the context of improving agricultural yields, as their proper use may lead to approximately 20–30%[3] improvement in productivity. Currently, usage of agrochemicals in the Indian agriculture sector is amongst the lowest in the world as only 0.6 kg of pesticides are used per hectare (ha) in India, compared to the global average of 2.3 kg/ha.[4] The usage of agrochemicals per ha is even higher in countries like China and the US. The Indian agrochemicals industry is the fourth largest in the world and India has the potential to become a global agrochemical production hub. The usage of agrochemicals in improving agricultural yields and increasing their production and exports will contribute significantly to the Indian economy. However, the industry currently faces major challenges in terms of low usage, low awareness, non-scientific usage, low levels of technology interventions, and a stringent and complex regulatory framework.

This knowledge paper provides an overview of the various challenges faced by the Indian agrochemicals industry and their impact on the Indian agriculture sector. It offers insights into agrochemical usage in India and its impact on Indian agriculture. It discusses the quantum of growth required by the agrochemicals and the agriculture sector to support the vision of a USD 5 trillion economy. It also elaborates on the growth drivers such as improving trade and marketing, increasing focus towards production of agrochemicals and shaping the policy environment to address the challenges currently faced by the agrochemicals sector. The paper also proposes potential solutions that could bridge some of the major gaps between the as-is and to-be scenarios in the agriculture sector.

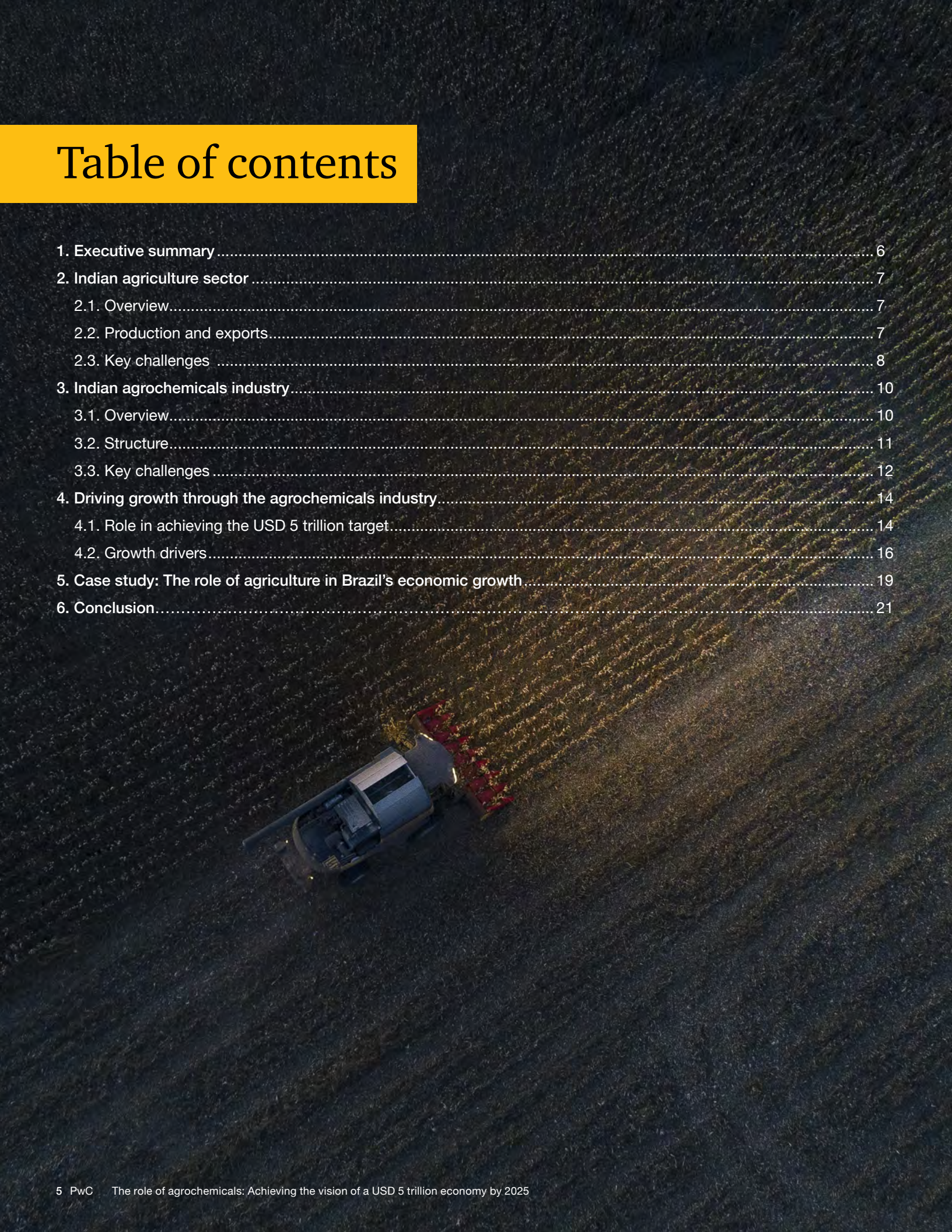
The agriculture sector has immense potential to steer the growth of the Indian economy through the value of increased output and rural income, and these may act as powerhouses for increasing consumption in major industries. Understanding the importance of the agrochemicals industry and the impact of the challenges it faces, and implementing the identified growth levers will ultimately enable the agriculture sector to fulfil its role in the country's growth story.

3 https://pesticidefacts.org/topics/necessity-of-pesticides/#_ftn3

4 http://www.fao.org/faostat/en/#data/RP

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1. Executive summary



The Indian agriculture sector plays an integral role in the Indian economy and is responsible for the livelihoods of more than half of India's population.[5] India is rich in agricultural resources, both in terms of size and diversity. The country is the largest producer of spices, pulses, milk, tea, cashew, jute and the second-largest producer of wheat, rice, fruits and vegetables.[6] The Green Revolution of the 1960s played a major role in initiating the shift from subsistence to commercialised agriculture. Various flagship Government programmes and policies like the National Food Security Mission and the Rashtriya Krishi Vikas Yojana further led to the growth of the sector. However, despite the vast scale of Indian agriculture and several efforts by Government and private institutions, the sector faces challenges like fragmented landholding, low productivity, lack of irrigation facilities and low awareness that limit its potential to grow further.

Agricultural inputs like seeds, fertilisers and agrochemicals play major roles in improving agricultural output. The agrochemicals industry plays a significant role in improving agriculture yields by preventing losses incurred due to pests and diseases. The Indian agrochemicals industry is the fourth largest in the world, with nearly equal contributions from domestic consumption and exports. It has flourished well with the rise in commercial agriculture. However, the industry faces challenges related to the agriculture sector as well as from awareness and regulatory framework perspectives.

The Government of India's (GoI) vision to transform India into a USD 5 trillion economy by 2025 is an ambitious goal and would require all sectors to grow at significantly higher rates. If the agriculture and allied sectors are to contribute the same proportion of the gross value added (GVA) in a USD 5 trillion economy as they do at present, they would need to grow at a compound annual growth rate (CAGR) of 9.3% till 2025, which is nearly two-and-a-half times the CAGR of 3.8% registered by these sectors between 2015–20.[7] Improvements in agricultural yields and quality of agricultural output are the two major means of achieving such growth. The agrochemicals industry will play a major role in terms of improving productivity through increased and scientific usage of agrochemicals while meeting the global standards of residue level required for agricultural exports. The industry also has the potential to directly contribute to the country's economic growth by becoming a global manufacturing and export hub.

This paper identifies three major growth levers that will contribute to the growth of the agrochemicals industry, the agriculture sector and subsequently, the economy. The first lever stresses on making improvements in trade and marketing of agrochemicals through promoting domestic consumption, exports and consumer awareness, and increasing technology interventions. The second lever highlights the need for focusing on increasing India's agrochemical production and improving the product offerings through research and development (R&D) in order to transform it into a global agrochemical hub. The third lever focuses on creating a favourable policy environment for the agrochemicals sector that would facilitate an increase in agrochemical exports, position India as an attractive destination for foreign investments and safeguard the interests of small and regional players operating in the industry. These three growth levers will have a synergistic effect on the industry and the performance of the agriculture sector as a whole, contributing significantly towards achieving the target of making India a USD 5 trillion economy by 2025.

5 https://www.ibef.org/industry/agriculture-india.aspx

6 Ibid.

7 https://www.rbi.org.in/scripts/AnnualPublications.aspx?head=Handbook%20of%20Statistics%20on%20Indian%20Economy

2. Indian agriculture sector

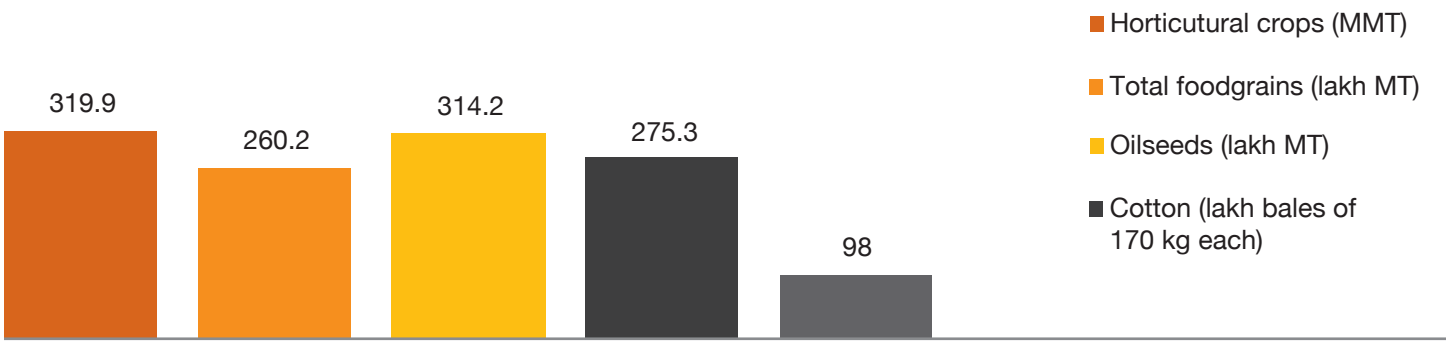
2.1. Overview

India has the tenth-largest arable land area in the world, along with 20 agro-climatic regions and 46 out of the 60 soil types found globally.[8] Although the contribution of the Indian agriculture sector to the country's GDP is around 13.8%, agriculture continues to be the backbone of Indian economy as it serves as the primary source of livelihood for approximately 58% of India's population.[9] The GVA by agriculture, forestry and fishing in FY 2019–20 was estimated to be INR 19.5 lakh crore. A growth of 4% was registered in the GVA by the agriculture and allied sectors in 2019–20.[10]

2.2. Production and exports

India is the world's largest producer of spices, pulses, milk, tea, cashew, jute, mango and banana, and is also the second-largest producer of wheat, rice, fruits and vegetables, sugarcane, cotton and oilseeds.[11] Out of India's total crop production in 2019–20, foodgrain production reportedly reached a record of 295.67 metric tonnes (MT). Moreover, the production of horticultural products (mainly fruits, vegetables and flowers) during 2018–19 reportedly reached a record of 313.9 MT. For FY 2020–21, the GoI plans to increase foodgrain production to 298 MT. The figure below represents the production of foodgrains, oilseeds, cotton and horticultural crops during FY 2019–20.

Production of major agricultural products (2018–19)



Source: Agriculture statistics, Third Advance Estimates, Ministry of Agriculture, Cooperation and Farmers Welfare



8 https://www.ibef.org/industry/agriculture-india.aspx

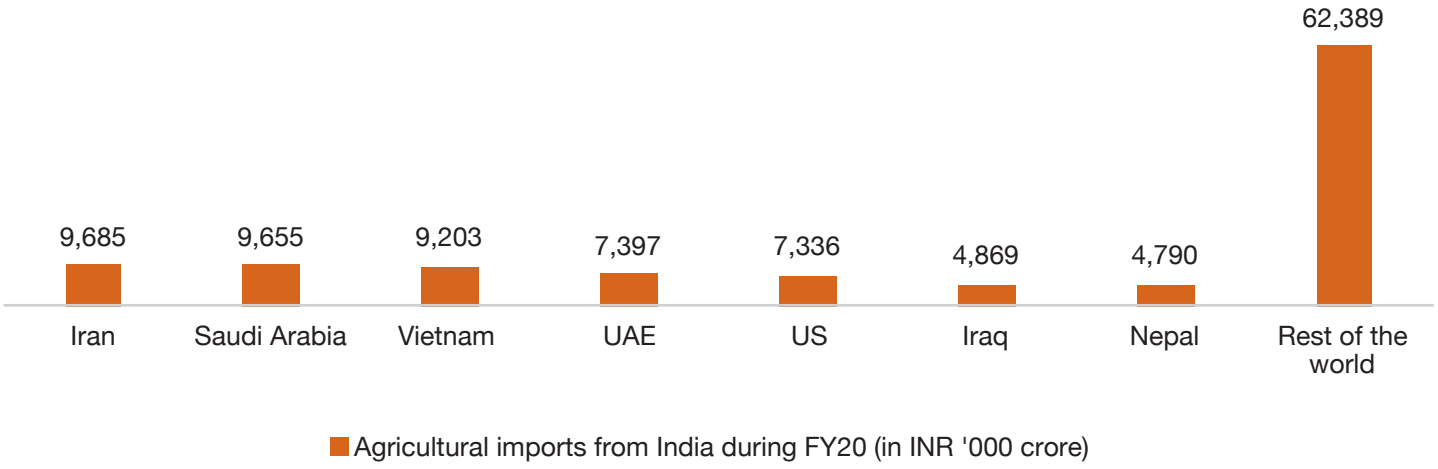
9 https://www.thehindubusinessline.com/economy/budget/article28281079.ece/binary/EconomicSurveyVolumeII.pdf

10 https://www.ibef.org/industry/agriculture-india.aspx

11 Ibid.

India is among the top 20 exporters of agricultural produce worldwide.[12] India's agriculture exports during FY20 were valued at INR 1.14 lakh crore. Among food crops, rice (basmati and non-basmati) alone comprised approximately 40%[13] of the total agricultural exports, followed by fresh fruits and groundnuts. The figure below represents the value of agricultural exports to major importing countries during FY20. The top seven importers import around 46% of agricultural exports from India.

Major importers of Indian agricultural products



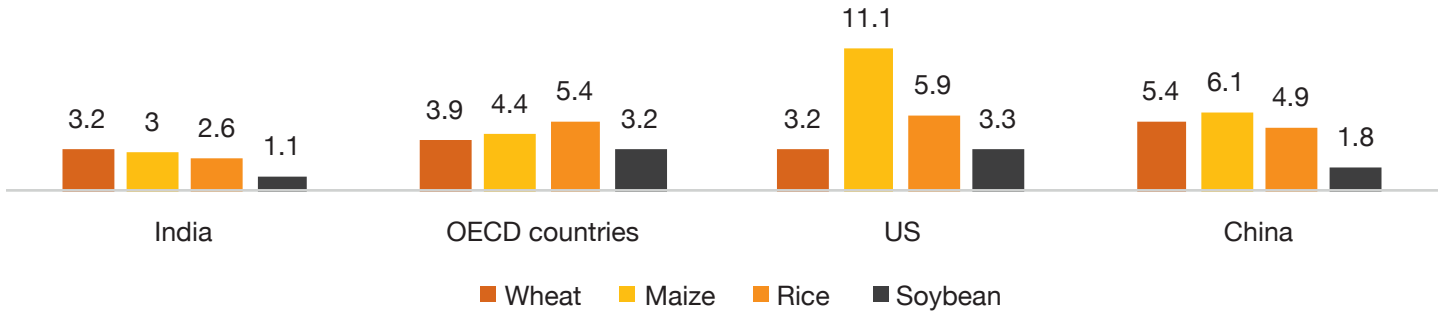
Source: Agriexchange

2.3. Key challenges

The Indian agriculture sector faces a set of inherent challenges that are limiting its potential. Some of the major challenges faced by the sector are:

- **Low productivity:** While the agricultural output data in the previous section establishes the large scale of the Indian agriculture sector, it must be noted that the production per unit area of land in India is significantly low compared to countries like the US and China. The figure below compares the productivity of major crops like wheat, maize, rice and soybean in India with other countries.

Yield comparison of major food crops in India with major producers for 2019 (MT/ha)



Source: Organisation for Economic Co-operation and Development

12 Food and Agriculture Organization Corporate Statistical Database (FAOSTAT)

13 Agricultural and Processed Food Products Export Development Authority



- **Harvest and post-harvest loss:** Loss of produce at harvest and post-harvest stages is a major problem in India's agriculture sector. In 2016, harvest and post-harvest losses in India were estimated to be worth INR 92,561 crore,[14,15] which was almost thrice that year's budget for the agriculture sector. Lack of market information, infrastructure, storage and transportation facilities, inadequate food processing and cold chain facilities lead to significant harvest and post-harvest losses.
- **Small landholding: T**he average farm size in India has been decreasing gradually. In 2015–16, the average farm size in India was reported to be 1.08 ha, which was 6% smaller than the average size in 2010–11. As per estimates, around 31% of farm households owned land smaller than 0.4 ha and another 30% owned land sized between 0.41–1 ha, in 2015–16. Only 13% farmers owned land sized bigger than 2 ha.[16] Small and fragmented landholdings limit the penetration of technology and risk-taking ability of farmers, and therefore limit returns from farming activities and overall growth of agriculture.
- **Climate risk:** Around 51.2% of 140 million ha[17] of arable land in India is rainfed. Rainfed agriculture exposes farmers to the vagaries of nature and limits them into practising low-value agriculture with limited yields and returns. Also, there have been many instances where natural calamities such as droughts, floods, hailstorms and cyclones have further led to partial or complete loss of crops.
- **Low investments in R&D:** The overall expenditure on agricultural research in India is low. In 2015, India spent only 0.62% of its GDP on agricultural research while countries like China and the US spent 2.06% and 2.74% of their GDP, respectively.[18] The amount spent on agricultural research in India is approximately 10–15 times lower than that in China and the US. Advancements in agricultural technology would result in better agricultural inputs and practices specific to the Indian context.

14 https://www.ibef.org/industry/agriculture-india.aspx

15 https://mofpi.nic.in/sites/default/files/english_annual_report_final-ilovepdf-compressed_1.pdf

16 https://www.nabard.org/auth/writereaddata/tender/1608180417NABARD-Repo-16_Web_P.pdf

17 http://agricoop.nic.in/

18 https://www.oecd-ilibrary.org/

3. Indian agrochemicals industry

3.1. Overview

India is the fourth-largest producer of agrochemicals in the world. The Indian agrochemicals industry was valued at around INR 42,000 crore in FY20,[19] out of which domestic consumption was worth around INR 20,000 crore, while exports during the same period were worth around INR 22,000 crore. The industry is expected to grow at a CAGR of 8–10%[20] till 2025 and will be driven by several growth levers like increasing population, decreasing arable land, increasing demand for high-value agricultural products and increasing efforts from the industry and the Government to promote awareness and technology penetration.

The industry is represented by large multinational companies, national- and regional-level domestic players, traders and exporters of agrochemicals. Larger firms with strong R&D infrastructure have been the pioneers in bringing better-performing and safer molecules to the Indian market. The smaller players in the industry have relied mainly on manufacturing of off-patented generic molecules.

Some of the major trends witnessed by the industry are:

- Agrochemical enterprises are increasingly focusing on digitisation to drive better analytics, decision making and traceability across the value chain. Digital tools such as farmer apps and dealer management systems (DMS) are helping companies in undertaking tailor-made approaches for different market segments. The COVID-19 outbreak has further pushed an already growing trend of technology and internet usage in rural areas, thus creating a favourable digital environment.
- On the regulatory front, the industry has witnessed some emerging trends such as aerial spraying of agrochemicals being allowed on interim basis for locust control and a proposed ban on 27 agrochemical molecules, amongst several others.
- Some of the evolving go-to-market models are being considered and adopted by the industry. These include directly selling to Farmer Producer Organisations (FPOs) as alternatives to traditional channels and physical/technology-based direct-to-consumer (D2C) platforms such as organised retail and e-commerce.
- Specialty products such as biofertilisers (mycorrhiza, nitrogen fixing bacteria, etc.), micronutrients, biostimulants (humic acid, amino acids, etc.), biopesticides and organic products are being increasingly produced by agrochemical companies to enhance their portfolio-based offerings.
- There is an increased focus by major agrochemical players on monetising farming-related services such as spraying of agrochemicals and selling agrochemical products on e-commerce platforms. Farmers have shown an increased interest towards solutions such as a product as a service, mobile app based farming advisory, access to market information and online purchase of agri-input.

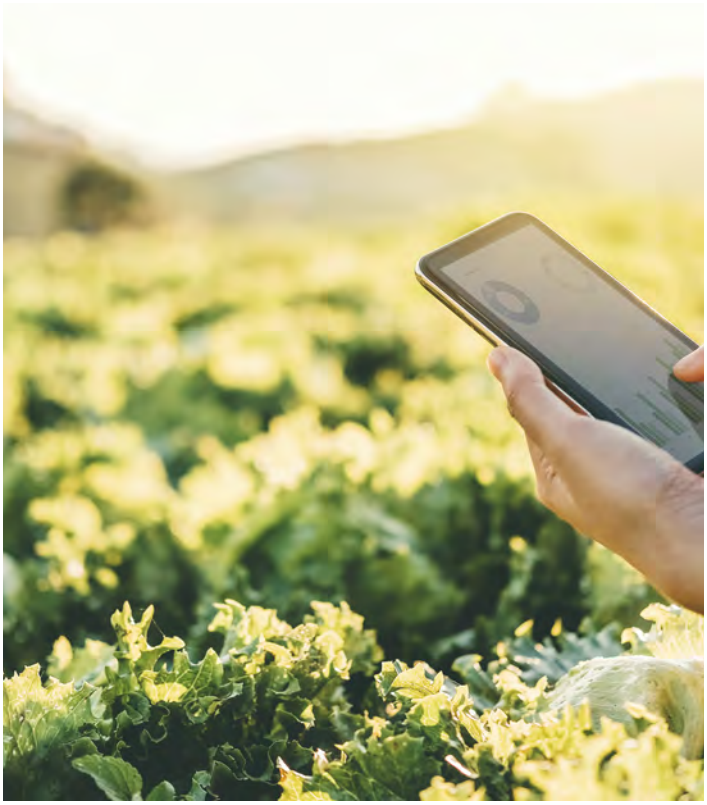


19 PwC analysis of data from internal research

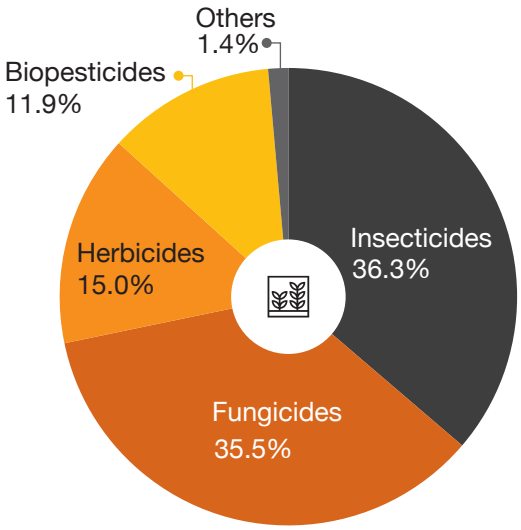
20 Ibid.

3.2. Structure

The major agrochemical products are herbicides (used for managing unwanted plants), insecticides (used for managing insects), fungicides (used for managing fungi), biopesticides (biological or biologically derived pesticides) and plant growth regulators (used for improving plant growth and yields). The following chart provides a break-up of these major agrochemical products by volume of usage in agricultural production. These products can be further divided into smaller products such as rodenticides, miticides and acaricides.



Share of different agrochemical products by volume of usage in 2018–19 (technical grade)



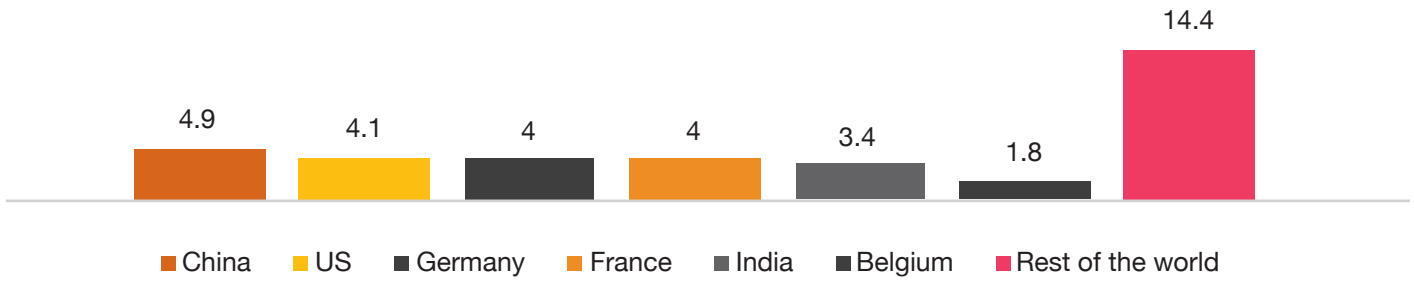
Source: Statistical database, Directorate of Plant Protection, Quarantine and Storage

As of 2018, the Indian agrochemicals industry had a production capacity of 325.1 thousand MT.[21]

The traditional distributor and retailer network is a major component of the agrochemicals industry. During FY20, there were 234,816[22] sales or distribution points for pesticides, of which 66,491 were distributors and 147,360 were dealers or retailers. The remaining sales or distribution points (around 21,000) comprised state departments of agriculture, cooperatives and other institutions.

In terms of trade, India is a major exporter and importer of agrochemicals. India was the fifth-largest exporter of agrochemicals in 2019 when it exported pesticides worth USD 3.4 billion (9.4% of global exports).[23]

Top agrochemical exporters by value in 2019 (in USD billion)



Source: World's Top Exports

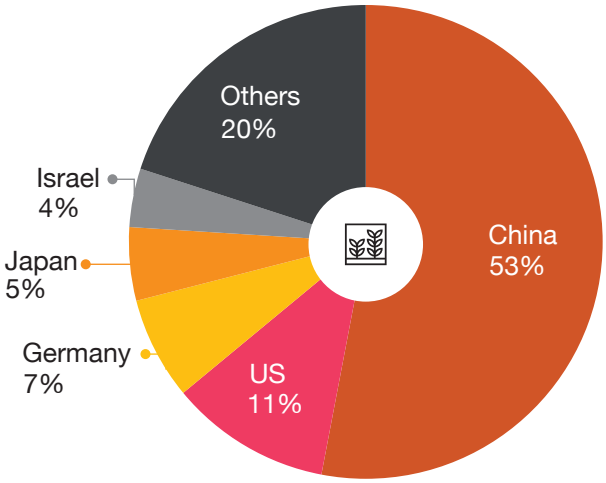
21 https://chemicals.nic.in/sites/default/files/English%20Annual%20Report%20date%2024-2-2020.....pdf

22 Statistical Database, Directorate of Plant Protection, Quarantine and Storage

23 http://www.worldstopexports.com/top-pesticides-exporters/#:~:text=Pesky%20locust%20Worldwide%20sales%20of,were%20valued%20at%20%2432%20billion

The Indian agrochemical industry is highly reliant on import of raw materials and technical intermediates. In FY20, China alone contributed to around 49% of India's total pesticide imports (valued at INR 9,096 crore).[24]

Share of major contributors to India's agrochemical imports in 2018–19



Source: Export Import Data Bank, Directorate General of Foreign Trade



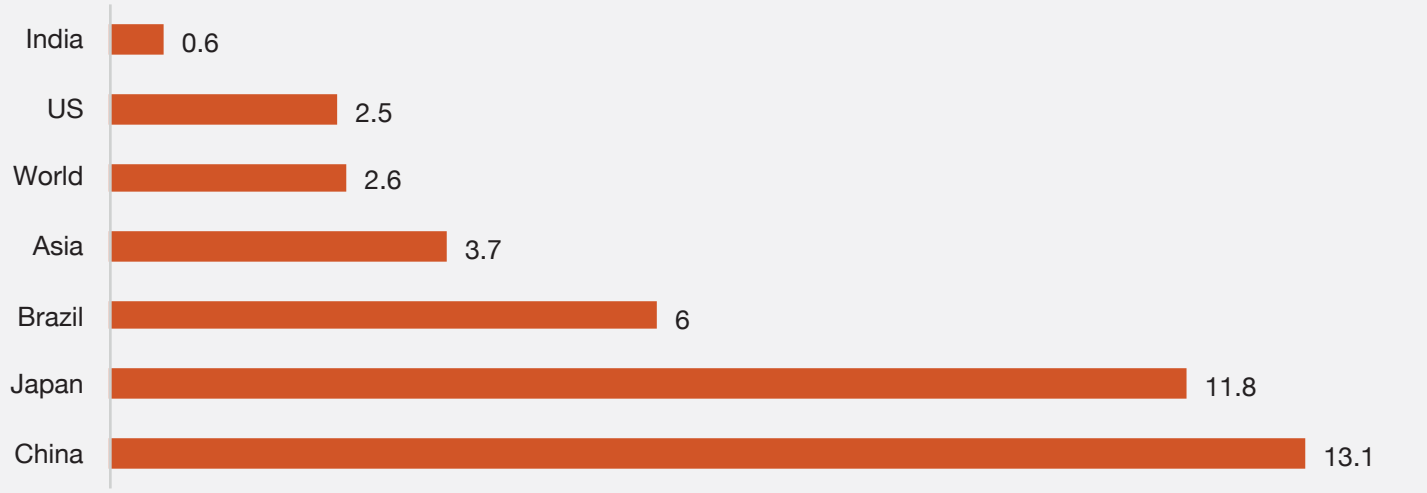
Key challenges

The success of the Green Revolution in India was largely due to the usage of high-yielding variety (HYV) seeds and chemical fertilisers, thereby boosting the agriculture and agri-input sectors with increased output and demand, respectively. The agri-input sector, including agrochemicals, has grown steadily and is supported by increasing commercialisation of agriculture, growing area of land under cultivation of high-value crops and increasing cropping intensity and farm mechanisation. However, the industry faces the following challenges:

- **Lack of awareness and non-scientific usage:** The average farmer in India lacks proper knowledge of agronomy and relies mostly on skills and knowledge gained with experience or from product recommendations at a point of sale, i.e. by an agri-input retailer. This lack of awareness and usage of agrochemicals based on habit and non-scientific recommendations may lead to over usage of a particular product (which might be required in a lesser quantity) or underusage of a product (which might have been required in a higher quantity), thus resulting in sub-optimal yields and returns for farmers.
- **High reliance on generic molecules:** Agrochemical consumption in India is represented by high usage of generic molecules, some of which have been continuously used for decades. The adoption of newer or better molecules, although increasing, is still low. This trend is prevalent in India for multiple reasons. The high R&D cost for agrochemicals, coupled with a complex registration procedure has deterred companies from introducing new molecules to the market. Premium-priced better molecules are unaffordable for a large segment of farmers. Farmers have also become dependent on off-patented generic molecules as they are affordable and being used for years.
- **Low usage of agrochemicals:** Agrochemical usage in India is low when compared to many agriculturally advanced nations and the global average. In 2017, agrochemical usage in India was 0.6 kg/ha. The figure below compares India's per hectare pesticide usage with other countries.

24 Export Import Data Bank, Directorate General of Foreign Trade

Pesticide consumption by country in 2017 (kg/ha)



Source: FAOSTAT

Compared to new-age agrochemical molecules, generic agrochemical molecules are bulky in nature and need to be applied in large quantities. Given the high usage of generic molecules in India, it can be inferred that there is a significant gap in the current and optimal application quantity of agrochemicals per hectare.

- **Current regulatory framework:** The Indian agrochemicals industry is regulated by the Directorate of Plant Protection, Quarantine and Storage which consists of bodies like the Central Bureau of Insecticides and Registration Committee (CBI&RC) and Central, regional and state pesticides testing laboratories. The Insecticides Act, 1968, and the Insecticide Rules, 1971, are the two major acts that regulate the industry. Although a system for regulating manufacturing, sale and usage of agrochemicals needs to have certain checks and stringencies in place to safeguard the interests of farmers, the environment and human and animal health, it should also act as an enabler for the agrochemical industry to thrive. Some of the challenges posed by the current regulatory framework are:
  - **Complex registration process:** The current process for registration of a new agrochemical molecule in India is governed by the CBI&RC and is often perceived as a time-consuming, costly and complex procedure by the industry. Only a few large multinational companies and leading domestic players can afford to invest in R&D to develop new molecules and get them registered for manufacturing and sale. As a result, as of 30 June 2020, only 273 molecules and 746 formulations (including combinations)[25] are registered in India. Compared to India, as of 31 October 2020, around 473 molecules are registered in the European Union (EU)[26] and 527 molecules are registered in Japan.[27]
  - **Pesticide Management Bill, 2020:** The recently proposed Pesticide Management Bill, 2020, covers themes like stringent control on quality of pesticides, mandatory printing of pesticide information, including in digital formats, and provision of compensation to farmers and re-registration of registration certificates and licences. Some of these measures would help farmers and also remove spurious or low-quality products from the market. However, the bill proposes limited interventions in areas like R&D of new molecules, the current registration process or expansion of current production capacities of pesticides manufacturing industries, which could have led to the industry's further growth.

25 Directorate of Plant Protection, Quarantine and Storage, Government of India

26 https://ec.europa.eu/food/plant/pesticides/eu-pesticides-database/public/?event=homepage&language=EN

27 http://www.famic.go.jp/english/

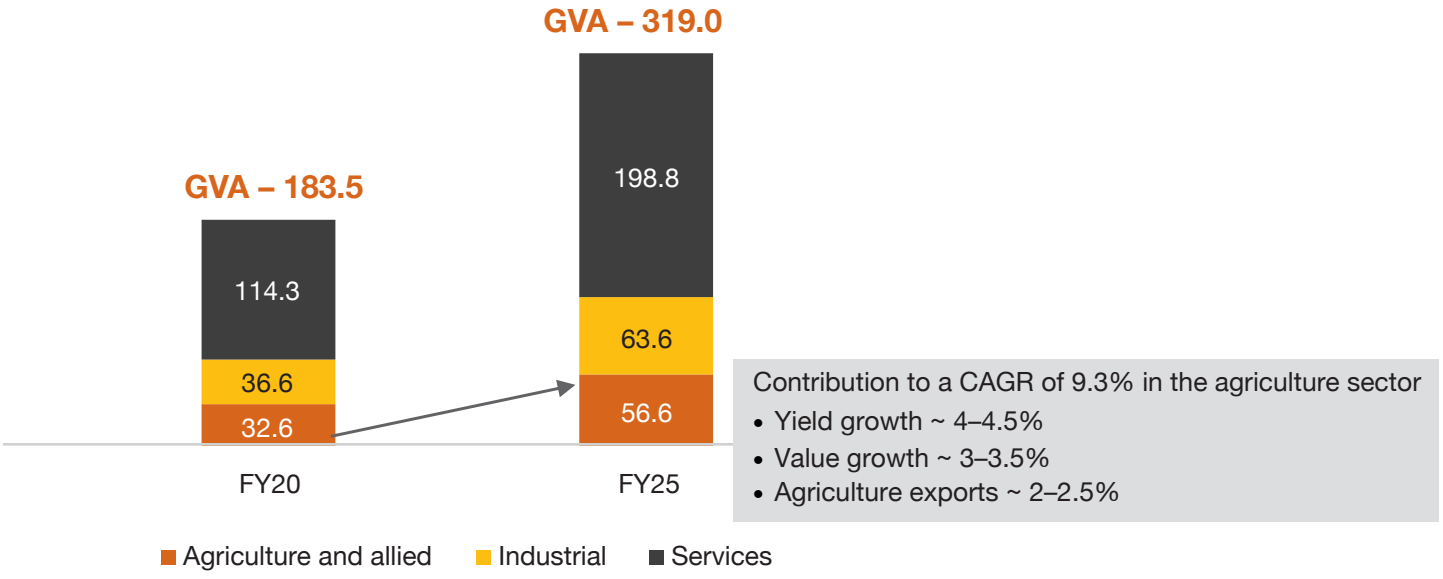
4. Driving economic growth through the agrochemicals industry

4.1. Role in achieving the USD 5 trillion target

The Indian economy is the fifth-largest in the world with a GDP of USD 2.875 trillion[28] or INR 203.4 lakh crore (current prices) in 2019–20. The Union Budget 2019–20 was announced with a vision of transforming India into a USD 5 trillion or approximately INR 352.7 lakh crore economy (current prices) by 2025 to position India as one of the world's leading economies. In order to achieve this target, the economy must grow at a CAGR of around 11.7%.[29] Agriculture, manufacturing and services sectors would also need to grow at a similar CAGR, assuming the share of agriculture, manufacturing and service sectors in the GDP remains the same till 2024–25.

In terms of GVA, the agriculture sector has contributed around INR 32.6 lakh crore or 16% to a total GVA of INR 183.4 lakh crore (GDP of INR 203.4 lakh crore at current prices) in 2019–20. The same proportion of GVA to GDP in a USD 5 trillion (INR 352 lakh crore at current prices) economy and proportion of GVA of agriculture to total GVA would require the agriculture sector to grow by INR 18.3 lakh crore to reach INR 50.9 lakh crore by 2025 (a CAGR of 9.3% in 2020–25). This would also mean that the agriculture and allied sectors would be required to grow at a rate of almost two-and-a-half times their present growth rate of 3.8% (CAGR during 2015–20).[30] The figure below provides a consolidated view of how the agrochemicals sector can contribute towards this required growth of 9.3%, either directly or through boosting the agriculture sector.

Role of agriculture in India's economic growth (INR lakh crore)



Source: PwC analysis of data from the Handbook of Statistics on the Economy 2019-20, Ministry of Statistics, Planning and Implementation

28 https://data.worldbank.org/country/india

29 PwC analysis of data from internal research

30 https://www.rbi.org.in/scripts/AnnualPublications.aspx?head=Handbook%20of%20Statistics%20on%20Indian%20Economy



The agrochemicals sector can contribute towards this growth, either directly or through boosting the agricultural sector by implementing the following:

1. **Improving agricultural output (7–8% growth):** Since arable land in India is limited and decreasing, agricultural output can be increased by either increasing the volume of output, i.e. increasing agricultural yields, or the value of output, i.e. increasing the production of high-value crops. Agrochemicals will play a major role in increasing both. In terms of improving the yields of major cereal crops, agrochemicals can improve the yields or prevent yield loss by 37.2% in rice, 25–30% in wheat, around 30% in maize and pulses, respectively.[31] Therefore, a CAGR of 4–4.5% can be expected from sustained yield growth in 2020–25. For high-value agricultural yields such as fruits and vegetables, fungicides alone can prevent 50–90% of yield loss in most of them.[32] Hence, a CAGR of around 3–3.5% can be expected from the growth of high-value agricultural products. Scientific application and usage of improved agrochemicals will not only result in improved yields but also optimise returns for farmers, thereby increasing their ability to shift towards practising high-value agriculture.
2. **Increasing agricultural exports (2–2.5% growth):** The export of agricultural and allied goods contributed around USD 35.1 billion (INR 2.48 lakh crore)[33] and accounted for 11.2% of the India's total exports during FY20. Some of the major exported food items are basmati rice (27.2% share in the value exported), buffalo meat (19.8%), non-basmati rice (12.6%) and fresh fruits (4.8%). The CAGR registered by agricultural exports in 2015–20 is around 1.4%.[34] Improvements in yield and high-value production will create a surplus of produce to be exported. Therefore, a CAGR of 2–2.5% is expected to be contributed by agricultural exports towards the growth of the sector. This would require a substantial level of change in agricultural output and the policy framework around agricultural exports.
3. **Increasing agrochemicals exports:** India's total exports in FY20 were valued at USD 313.4 billion (INR 22.2 lakh crore),[35] contributing around 10.9% to the GDP. The export of agrochemicals during the same period was valued at around USD 3.1 billion (approximately INR 0.22 lakh crore)[36], accounting for approximately 1% of the total exports and 0.09% of the GDP. Assuming that total exports grow linearly by 2025, the Indian agrochemical industry should export agrochemicals worth approximately INR 38,500 crore by 2025. Although minor in comparison to the quantum of growth expected from agricultural output, the growth in agrochemical exports would help in positioning India as a global manufacturing hub. Efforts by the GoI in promoting R&D, relaxing the registration process for new molecules and promoting the Make in India initiative for the agrochemicals industry will help in significantly improving India's agrochemicals exports. The next section on growth drivers will elaborate on the ways to achieve the intended growth for the industry.

Since agricultural income is the largest component of rural income, any increase in agricultural output would directly result in an increase in rural, disposable income. This increase would further result in growth of industries such as fast-moving consumer goods (FMCG), automobile, electronics, apparel, telecom and building materials.

31 https://www.ag.ndsu.edu/potatoextension/CAST_IP55_Contributions_of_Pesticid_4992B5674417F.pdf

32 http://croplifefoundation.files.wordpress.com/2012/07/completed-fungicide-report.pdf

33 https://www.ibef.org/industry/agriculture-india.aspx

34 Ibid.

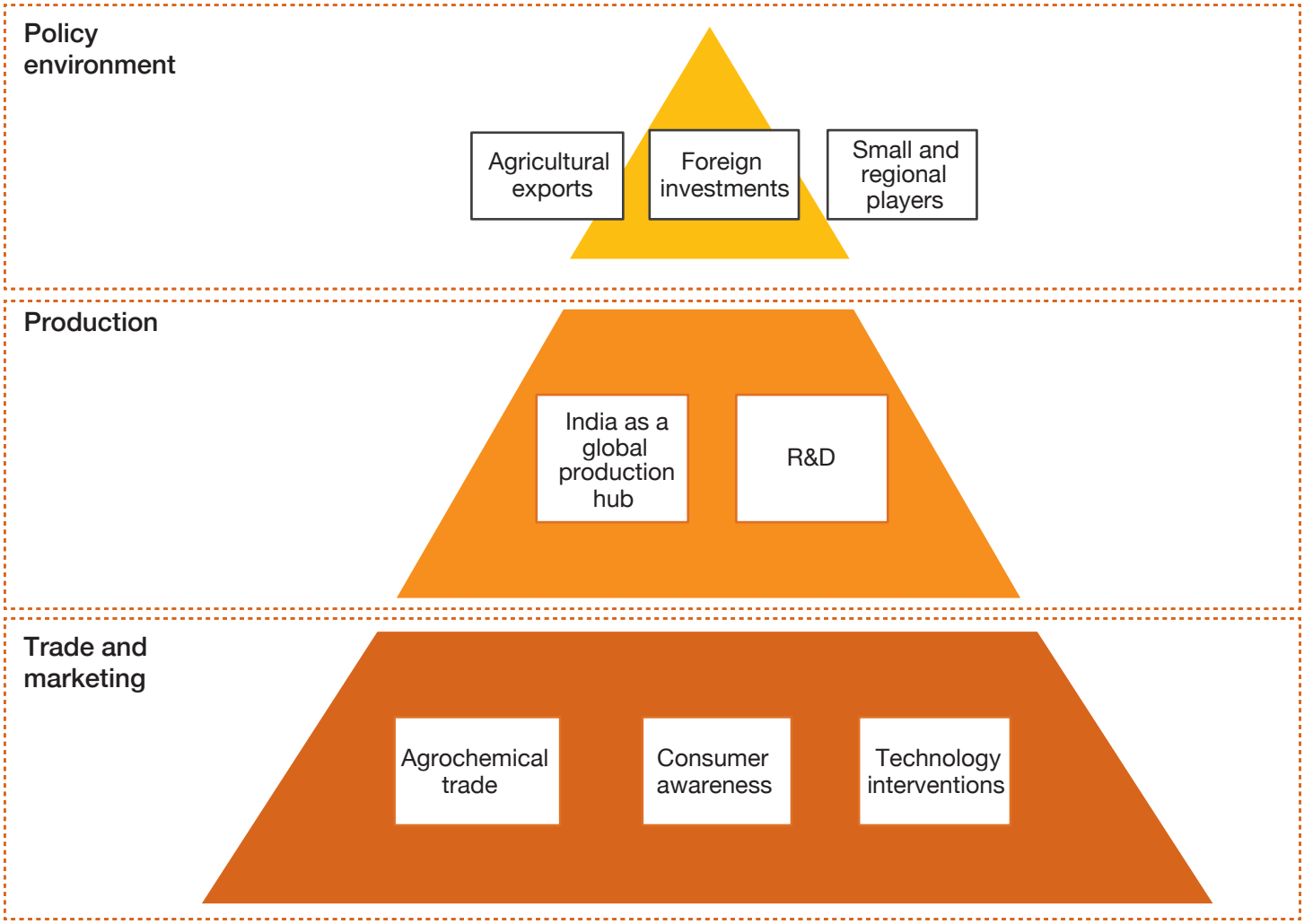
35 Ibid.

36 Export Import Data Bank, Directorate General of Foreign Trade, Government of India

4.2. Growth drivers

The previous sub-section detailed how the agrochemicals and the agriculture sectors can contribute to the overall growth of the Indian economy. This sub-section will elaborate on the ways to achieve the expected growth through identified growth levers and their sub-components, as represented in the figure below.

Growth drivers for the Indian agrochemicals industry



Source: PwC analysis of data from internal research

1. Improvements in trade and marketing

a. **Agrochemical trade:** The domestic trade of agrochemicals involves the network of storage warehouses, cleaning and forwarding (C&F) agencies, transporters and channel partners. The present regulatory framework requires a pesticide marketer to obtain sale and storage licences for operating in each state. Improvements in terms of creating a single window for obtaining licences and facilitation of better infrastructure and network may empower domestic traders. In terms of international trade, simplifying export registration and compliance processes, evaluating export manufacturing of certain banned or unapproved molecules and entering into strategic trade agreements with major importing nations are some of the initiatives that could help in boosting exports.

b. **Consumer awareness:** Consumer awareness in the context of agrochemicals is low, especially when it comes to selection and usage of right products at the right time. The industry plays a role in furthering their private extension services to enable farmers with advance agronomic knowledge. The Government should also strengthen its extension efforts through its network of Krishi Vigyan Kendras (KVKs) and extension bodies equipped with the latest best practices in crop production.

c. **Technology interventions:** Services such as spraying of agrochemicals are vastly dominated by manual operations, with only a few agrochemical/farm equipment players and start-ups trying to introduce technology interventions in these services. Improvements in agrochemical application related technology may improve usage and application efficiency while tackling issues such as scarce availability and increased costs of farm labour during peak requirements. Technological interventions in the area of digital dissemination of knowledge are even more relevant in the post-COVID scenario where farmers are increasingly using smartphones and mobile internet. Generating awareness related to right usage of agrochemicals and availability of pay per use or product-as-a-service type of solutions for agrochemical applications will not only optimise agricultural yields and returns, but also enable the industry to introduce and promote better molecules in the market.

2. Increasing focus on production

a. **India as a global production hub:** The US-China trade tension has created an uncertain environment for manufacturing in China, leading to many global players across industries considering moving their manufacturing facilities to other South Asian countries like India, Thailand, Malaysia and Vietnam.[37] India is amongst the largest producers and exporters of agrochemicals globally and can position itself as a global agrochemical production hub amidst this volatility. However, the policy environment should incentivise investments in India through initiatives similar to the Production Linked Incentives (PLI) Scheme introduced for the electronics sector. India could have an edge over other South Asian countries as there have been some major changes in the current pesticide registration procedure with the objective of creating a smooth, fast, cost-effective and simple registration procedure. Reviewing policies for intellectual property rights (IPR) protection may also encourage multinational companies in setting up their operations in India. Also, incentivisation of capacity building, capacity enhancement and export manufacturing, especially for small and medium enterprises (SMEs), would encourage entrepreneurship and lead to employment generation.

b. **Increasing focus on R&D:** R&D in agrochemicals involves a significant amount of investment and a timeframe of 5–10 years to develop a new molecule that is better, safer and commercially viable. This deters many small and regional players in engaging in R&D and limits them to manufacturing or trading of only generic molecules. The Government may encourage R&D activities through developing public-private partnership (PPP) models, sourcing superior manufacturing technologies and molecules from leading global players and countries or improving the public sector research. Also, considering the large amount of investments required for engaging in R&D, the Government may also consider PPP models where instead of individual companies, a pool of private sector investors may participate on a cost-sharing basis.

37 https://economics.rabobank.com/publications/2019/august/leaving-china-countries-might-benefit-from-relocation-production/

3. Improving the policy environment for a thriving agrochemicals sector

a. **Boosting agricultural exports:** Promoting agrochemical exports may require changes in production capacity, foreign trade agreements and the regulatory framework, and would directly lead to sectoral growth. On the other hand, improving agricultural exports would also indirectly lead to an increase in consumption of agrochemicals to produce high-value and high-quality output. For example, the basmati rice varieties cultivated in Punjab and Haryana consume approximately 10–20% higher agrochemicals than non-basmati rice. However, one of the major challenges faced by Indian agricultural exporters is the stringent rules related to pesticide residues in regions like the EU. A quick solution to comply with the maximum residue limits (MRLs) is to generate awareness on using the right dose at the right time. Registering molecules deemed safe by major importers to abide by MRL norms is a policy change that may boost agricultural exports in the longer term. MRL testing infrastructure may also be improved to provide increased access to testing at lower costs. As a first step towards increasing agricultural exports, the Government may also look at entering into trade relationships with countries with more relaxed MRL norms.

b. **Attracting foreign investments:** Attracting foreign investments in the agrochemicals sector would result in an improved ecosystem for agrochemical production and increased availability of better molecules for Indian farmers. Foreign investments in India may also be directed towards establishing operations for export manufacturing. The policy changes to enable this would require relaxations in registration and licensing processes, and incentivisation of capacity building and export manufacturing of agrochemicals.

c. **Supporting small and regional players:** Small and regional players usually have limited manufacturing and R&D capabilities, and rely mainly on trading of generic agrochemicals. In order to protect and promote small and regional players, the policy framework should ensure that any regulatory changes should be in their interests. For example, industrial policies in the states of Gujarat and Uttarakhand have special provisions to promote firms engaged in manufacturing of biofertilisers and biopesticides through subsidies, rebates and incentives. Policy initiatives like encouraging export manufacturing, enhancing capacity, building R&D infrastructure or creating special economic zones (SEZs) for agrochemicals may provide the required impetus to small and regional players in contributing towards the sector's growth.



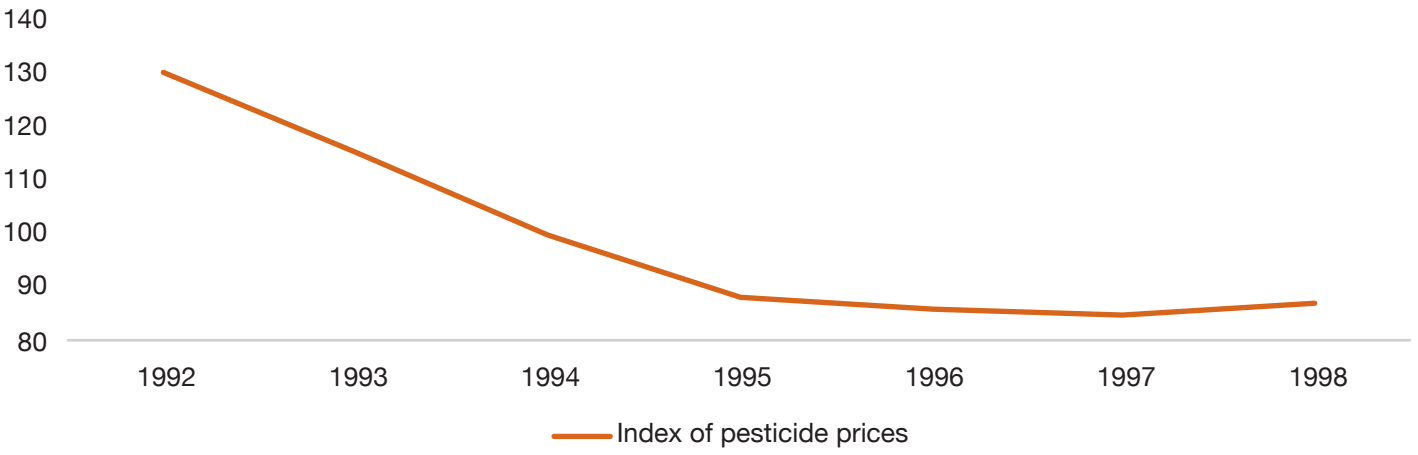
38 http://vibrantgujarat.com/writereaddata/images/pdf/project-profiles/Manufacturing-of-Biofertilizers-and-Biopesticides.pdf

39 https://investuttarakhand.com/themes/backend/investible/IP%20UK%20Manufacturing-of-Biofertilizers-and-Biopesticides.pdf

5. Case study: The role of agriculture in Brazil's economic growth

The industrialisation and globalisation of agriculture in Brazil is a good example to understand the correlation between pesticide usage and liberalisation of agriculture. In the 1990s, the Government of Brazil simplified its trade regime by eliminating and reducing many quota restrictions and export taxes, and reducing import taxes on farm inputs. The figure below represents the index of prices paid by farm producers for pesticides from 1992–98.

Index of pesticide prices in Brazil (1992–98)



Source: Pesticide Use in Brazil in the Era of Agroindustrialization and Globalization by S Dasgupta (2001)

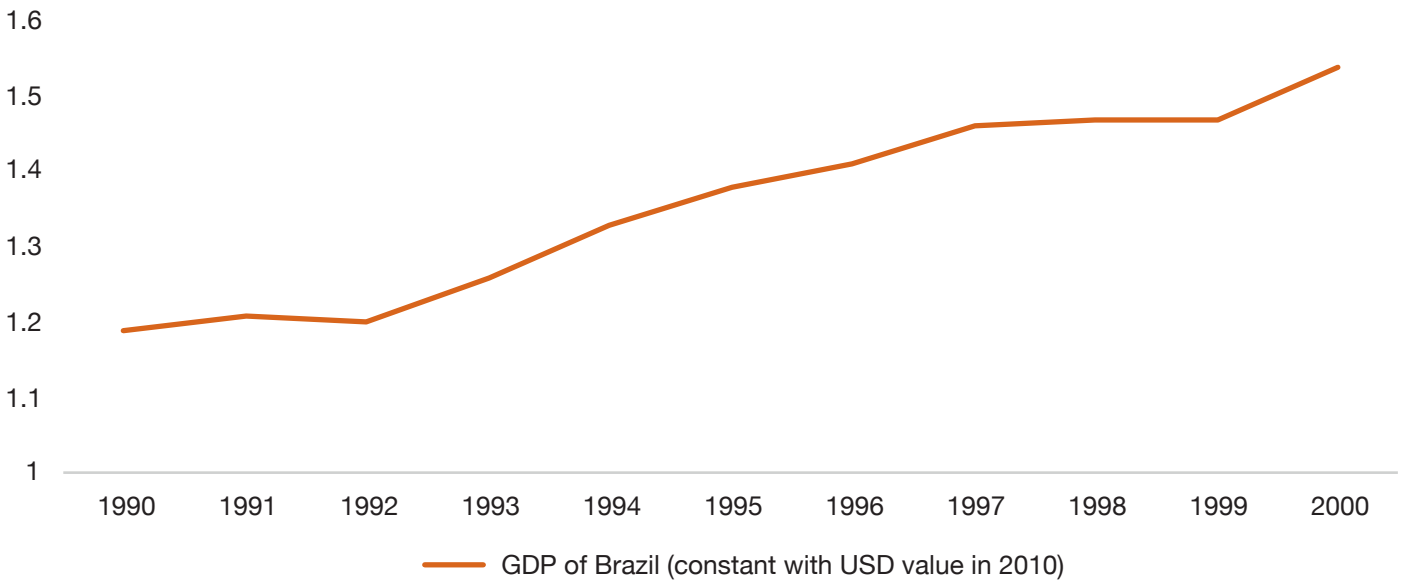
The Government of Brazil was already subsidising pesticides prior to this period and also promoted using pesticides for the cultivation of less favourable crops like soybean, sorghum, wheat, pulses, rice, maize and citrus. This led to an increase in pesticide usage from 61,820 tonnes of active ingredients in 1989 to 113,933 tonnes in 1997,[40] wherein the contribution of herbicides increased the most. Also, agrochemicals were used more on export crops (66%) than non-export crops (26%).[41] As a result, from 1990–97, the production of export crops increased by 29% and Brazilian agricultural exports nearly doubled in value as the country switched to exporting higher-value products. Soybean, sugar, coffee, cocoa and cotton were the major crops that were exported during this period.

40 https://www.cambridge.org/core/journals/environment-and-development-economics/article/abs/pesticide-use-in-brazil-in-the-era-of-agroindustrialization-and-globalization/C3A6F9C8F1A6F793B29896A66055D887

41 Ibid.

The figure below shows the economic growth of Brazil from 1990–2000.

GDP of Brazil from 1990–2000 (in USD trillion, constant dollar value in 2010)



Source: World Bank

The liberalisation of trade and incentivisation of agri-input usage during the 1990s in Brazil coincides with a period of higher economic growth. From 1991–2000, the economy of Brazil grew at a CAGR of 2.7%, compared to 2.3% from 1981–1990.

The case of Brazil implies that subsidisation or incentivisation of pesticide usage ensured better returns on agricultural crops and led to an increase in production. Incentivisation of pesticide usage also resulted in a shift towards cultivation and export of high-value crops. In the case of Indian agriculture, even marginal increases in agricultural productivity can bring about significant changes to agricultural output and boost the economy.



6. Conclusion

Development of the agriculture sector is a key focus area for India's economic growth. Both the public and the private sectors are taking multiple initiatives towards improving agricultural inputs, technological interventions and information and knowledge management systems to enhance agricultural productivity and increase farmers' income. The agriculture input industry has played a major role in improving overall production. However, certain challenges like small landholdings, low awareness and low input usage have limited agricultural productivity in India.

Achieving the target of making India a USD 5 trillion economy by 2025 requires all major sectors of the Indian economy to witness unparalleled growth. The agriculture and allied sectors can achieve the required growth by adopting three major measures. Firstly, increasing agricultural productivity would significantly increase the sector's overall production. Secondly, promoting high-value agriculture and improving the productivity of major crops would increase the value of agricultural output. Thirdly, increasing agricultural exports would enhance the sector's overall income. The combination of these components will also improve farmers' income and create growth opportunities for non-agricultural sectors dependent on rural consumers.

The agrochemicals industry has a key role to play in increasing the value and volume output of the agriculture sector. Agrochemicals play a major role in managing loss of productivity due to pests and diseases, and improving overall agricultural output. High-performance agrochemicals are also integral to high-value farming like horticulture and export-oriented agriculture. Indian agrochemicals industry is the fourth-largest in the world and India has the potential to become a global agrochemical manufacturing hub.

Unlocking the growth potential of the agrochemicals sector will be dependent on three major growth drivers. Firstly, improvements in trade and marketing of agrochemicals would increase scientific usage of agrochemicals. This can be achieved by improving agrochemical trade and empowering consumers through increased awareness and technology interventions. Secondly, increasing focus on production would further strengthen the agrochemicals sector. Increased efforts towards R&D and capacity building, along with policy interventions, would help in positioning India as a global agrochemicals hub. Thirdly, a favourable policy environment for the agrochemicals sector would help in increasing agrochemical exports, attracting foreign investments in the sector and ensuring equal opportunities for all players. Therefore, it is important for key stakeholders to understand the role agrochemicals will play in propelling India's economic growth and take necessary actions to enable the sector to achieve its potential.



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