

Expediting the Sustainable Growth of Agrochemicals Industry for Self-Reliant India

10th Agrochemicals Conference

Knowledge Report on Agrochemicals Industry
September 2021

Table of Content

1. Executive Summary 6
2. Role of agrochemicals in the agriculture sector of India 7
3. Case Study- Enhancing economic growth through agriculture in Nigeria 16
4. Towards sustainability in Agriculture 18
5. Conclusion 23
6. About FICCI 24

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



Message

Agrochemicals industry has always been an integral part of mainstream farming, which not only facilitates sustainable development, but also plays an important role with its noticeable share in a healthy economy.

Food, nutrition, health, wealth and environment security are the main pillars of a developing nation. India, one of the fastest emerging countries, has a huge potential as 58% of its total population is directly or indirectly involved in agriculture and its allied industry sectors. India is a net forex earner from this sector.

Agrochemical industry acts as a backbone to our farmers and assures them a high yield with better quality with an insurance of mitigating crop losses. Judicious usage of crop protection chemicals provides them an extra edge in the competitive world, and this also leads to economic benefits to our farmers.

Government of India's (referred to as 'Government' hereafter) futuristic vision under the leadership of Shri Narendra Modi ji towards doubling the farmers' income shows commitment and promises a better future for all the stakeholders. Various revolutionary reforms and initiatives are taken by the Government with an aim of world-class agricultural productivity. Government in alignment with the United Nations' goals of sustainable development, is turning every possible stone in the form of 'Make in India' reforms in law, benefits to marginal farmers and crop-based bases subsidies, with a vision of achieving an '*Atmanirbhar Bharat*'.

With emphasis on agriculture, we request leadership to make more policies which focus on benefits to small and marginal farmers, reduction in taxes on crop protection chemicals and reforms in laws, which help to attract more foreign investment in the agrochemical sector. We request the Government to support national-level institutes for starting work in this sector, as the Government of India has recognised agrochemicals as one of the 24 'Champion' sectors, and FICCI is coordinating with the Government of India.

We appreciate the Government's policies of 'Ease of doing business' and 'Less Government, More Governance'.

I am glad to know that FICCI with the support of the Department of Chemicals and Petrochemicals, Govt. of India has taken an initiative to organise the 10th Agrochemicals Conference, 2021 with the theme of 'India@75: Expediting the Sustainable Growth of Agrochemicals Industry for Self-Reliant India'.

I hope that the deliberations in the conference will be very useful, and I wish this conference grand success.

RG Aggarwal

Dilip Chenoy
Secretary General



Message

The population of India along with its rising affluence is seeing a shift in the consumption pattern. There is a need to not just increase production to meet the additional demand but also to ensure that the nutritional needs of an increasing population are met. For this, the country will not only have to raise its agriculture production but also productivity as land availability will always be limited.
Agrochemicals are an important agricultural support industry which boosts agricultural yield by controlling the pests and diseases in the farmland. The industry has the potential to directly contribute to the country's economic growth by becoming a global manufacturing and export hub and can also fulfil the vision of 'AatmaNirbhar Bharat'.

While we celebrate the 75th independence of India, Azadi Ka Amrit Mahotsav, we realize that over the years, the growth of this sector has been manifold. During the tough time of Covid 19 Pandemic, Government of India has recognized the Crop protection sector as a champion sector. I am glad to share that FICCI jointly with Department of Chemicals & Petrochemicals, Government of India is organizing the10th Agrochemicals Conference with the theme "India@75: Expediting the Sustainable Growth of Agrochemicals Industry for Self-Reliant India" on 23rd September 2021 at New Delhi. I'm sure that all the issues and the solutions will be well deliberated upon in the Conference and wishing the event all success.

Dilip Chenoy

Message from PwC



Ajay Kakra
Executive Director
Agri & Social
(Management Consulting)
ajay.kakra@pwc.com

The Indian economy has transformed substantially, from being a ship-to-mouth economy since its independence to become oming one of the largest economies in the world. Agriculture continues to be a dominant element 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 paved a way towards economic growth of the country. The Indian agriculture sector however, faces some major challenges, such as small landholdings, decreasing arable land area, low productivity, low awareness levels amongst 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.
Agrochemicals specifically have played an important role in preventing crop losses to pests and improving overall productivity. Proper and scientific usage of agrochemicals may lead to approximately **20–30%**[1] improvement in productivity. Currently, usage of agrochemicals in the Indian agriculture sector is amongst the lowest in the **world**[2].

Although correct levels of agrochemical usage will enhance agricultural productivity, importance must be given on ways towards achieving that sustainably. Sustainability in the context of the agriculture and agrochemicals industry can be interpreted in terms of improvements in agricultural yields, while keeping the environment safe and ensuring social and economic development of the stakeholders involved throughout the value chain with the right corporate governance and business ethics.
This report provides an overview of the progress that Indian agriculture has made since the post-independence era and factors that have helped in achieving the same. The paper also details the current challenges related to sustainability in agriculture and the role that each stakeholder plays for ensuring sustainability across the value chain. Environment, society and governance (ESG) is playing an important role in interpreting sustainability across sectors and industries. Leading organisations, globally, have adapted ESG-based sustainable goal setting and have been reporting the impact of their business on sustainability metrics. Indian agrochemicals industry, with its virtue of working with millions of farmers across India and being an integral part of the lab to land and farm to fork value chains, has an important role to play in ensuring sustainable development of agriculture.

[1]https://pesticidefacts.org/topics/necessity-of-pesticides/#_ftn3

[2]http://www.fao.org/faostat/en/#data/RP

1. Executive Summary

Agriculture has been playing and will continue to play an integral role in the Indian economy. The sector has inherent strengths in terms of varied agro-climatic zones across a vast land and more than half of the population practising agriculture as the major occupation. The Indian agriculture sector is gigantic and complex at the same time. India is the largest producer and exporter of many agricultural products and the overall production is poised to grow in future. Government institutions, research organisations, farmers and other stakeholders involved in the production value chain, are continuously working towards strengthening the sector through policy support, infrastructure, technology, agri-inputs and information. On the other hand, the sector is face-to-face with widespread and often interdependent challenges, such as reliance on weather conditions, small and shrinking landholdings, increasing input costs and labour wages and limited penetration of mechanisation and digital technology in the farmland.

Agrochemicals have been a crucial element in preserving and improving the value of the agricultural output by means of controlling pests and improving productivity. However, the per hectare usage of agrochemicals has been very low when compared to developed nations like the USA and China. Although commercial crops like paddy, cotton and many fruits and vegetables have significant usage of agrochemicals, a large part of the agricultural land still witnesses limited usage. This can be attributed to lack of substantial commercial opportunities of certain crops, limited availability of irrigation water, difficult terrain and exposure to vulnerable climatic conditions.

With the Government and private sector working towards intensification of agriculture, the usage of agrochemicals is expected to increase, especially in areas where the penetration of agrochemicals is less. The industry with the right support from the Government, can also move towards dominating the global production and exports of agrochemicals. However, the increased usage and planned growth should factor in sustainability. By virtue of its sheer scale, involvement of more than 260 million people and two most important natural resources, soil and water, the agriculture sector has a high stake when it comes to sustainability.

Any unsustainable activities will have adverse ripple effects on the environment and society, which may become irreversible given the scale of the sector. The Agrochemicals industry has a crucial part when it comes to sustainable agricultural growth. The role can be interpreted by its impact across the environment, society and governance (ESG). On the environment front, the agrochemicals industry needs to analyse the current usage of agrochemicals and its impact on the environment in terms of water usage, waste generation, emissions and pollution.



When it comes to social impact, some of the areas relevant to the industry include human safety, economic and social equity, inclusion, corporate responsibility and empowering consumers. Corporate governance plays a big role in ensuring action and impact across sustainability by means of realigning of the vision and purpose of organisations, ethical business decision making and embedding sustainability in the work culture and business designs.

ESG-based goal setting impacts measurement and reporting, and it is rapidly gaining acceptance and support across the globe, with many Indian giants contributing towards it. Although there will be complex challenges in the initial stages of ESG-based reporting, the long-term value that it tends to create, will help in making the individual companies and the entire agrochemicals sector as a whole, more valuable, resilient and future proof. The Indian agrochemicals industry should plan on creating sustainability goals, create the required sustainability strategies and action plan and report their sustainability impact. This will help in creating long-term value for the industry, while making it more resilient and growth-ready.

2. Role of agrochemicals in the agriculture sector of India

2.1. Overview of the agriculture sector in India

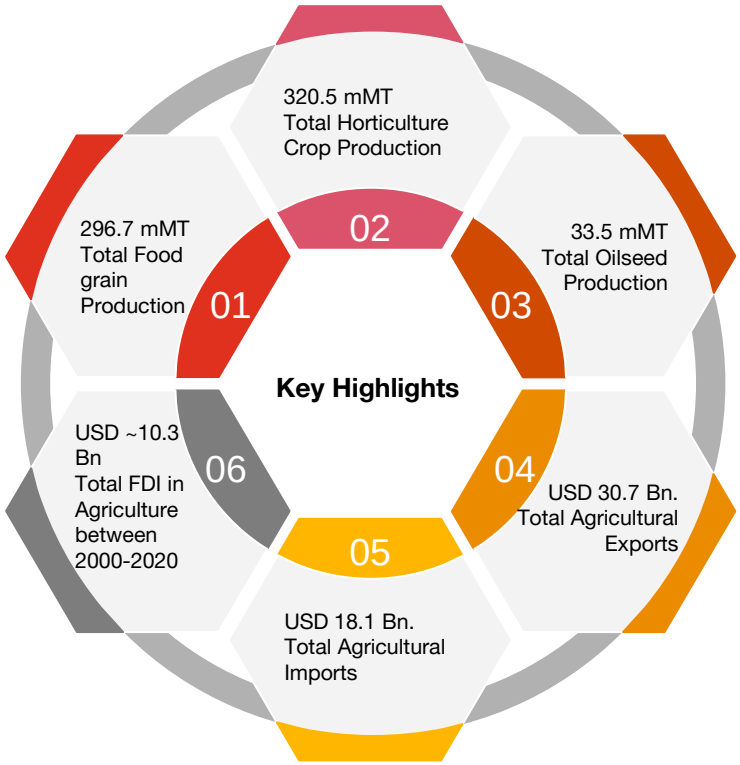
Agriculture (along with its allied sectors) has remained the largest sector as it has employed close to 58% of Indian **population**[3]. This percentage goes to as high as 70% in the rural **areas**[4], as the population is mainly dependent on agriculture with close to 80% of farmers being small and marginal.

Fig 1: Highlights of Indian agriculture sector

- Agriculture and its allied activities are primary source of livelihood for more than half of the Indian population
- 263 million people are engaged in agriculture. It is the country's largest private enterprise.
- At present, in terms of agricultural production, the country holds the **second position** all over the world
- Gross Value Added (GVA) by agriculture, forestry and fishing was estimated at Rs. 19.48 lakh crore (US$ 276.37 billion) in FY20 (PE).
- Growth in GVA in agriculture and allied sectors stood at 4% in FY20
- Huge biodiversity : 46,000 species of plants & 86,000 species of animals

Source: EMIS, PwC Analysis

India is one of the leading producers in the world. Be it food grains, horticulture crops, oilseed production, Agricultural exports or FDI in the domain, all have flourished over past few decades. Some of the highlights of the sector is illustrated below:



Source: EMIS, APEDA, PIB, Dept. of Commerce & Industry, Ministry of Stats & Programme Implementation

[3] IBEF

[4] FAO

Due to consistent efforts of the farming community, Government support and a structured approach towards achieving and maintaining record production levels, India has become one of the leading producers in the world. It is the world's largest producer of milk, pulses and jute, and ranks as the second largest producer of rice, wheat, sugarcane, groundnut, vegetables, fruit and cotton. It is also one of the leading producers of spices, fish, poultry, livestock and plantation crops. Following table represents FY 20 production of major crops in India:

Table 1 - Production of major crops in India in FY 20

Crop	Production in million metric tonnes
Rice	118
Wheat	109
Coarse cereals	47
Pulses	23
Oilseeds	33
Sugarcane	37

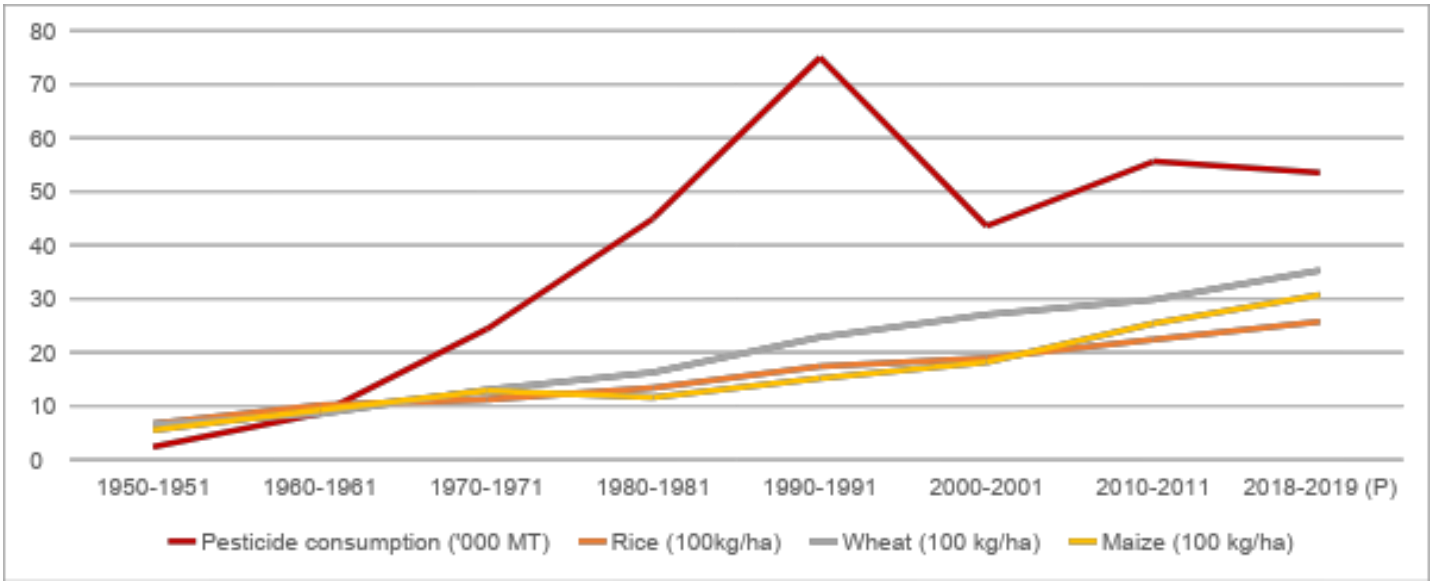
Source: Press Information Bureau Release

2.2. Growth journey of Indian agriculture in the last 75 years

Since independence, Indian agriculture has witnessed various phases of growth due to changing economic scenarios, agricultural practices, Government policies, private sector participation, technical advancement etc. Initially, subsistence agriculture and overdependence on monsoon led to low and stagnant growth rates in agricultural production.

Post independence, India was a ship-to-mouth economy and was majorly reliant on import of large quantities of food grains, edible oils and certain fruits and vegetables. This was mainly due to the sustenance form of agriculture practised largely across India, where the production was done primarily for consumption and only the surplus was sold in the open market. It was characterised by low usage of agri-input and thereby poor yields. During the initial two decades post independence, the green revolution drove the growth in the sector through large-scale adoption of high-yielding varieties of seeds and farm inputs. In later years, the sector was driven by economic reforms introduced in the early nineties. Sector gained momentum due to rising competition and India emerged as a net exporter of agricultural products. In the last two decades, India has strengthened its footprint as a quality producer as well as exporter of agricultural produce. This can also be attributed to the Government's financial assistance, subsidies in agri-inputs, development of drip irrigation technologies etc. In a nutshell, it seems that India has created a major success story in terms of food production, transforming itself from a net importer of produce to achieving one of the largest food productions in the world. Following graph illustrates the improvements in yields of paddy, wheat and maize since 1950.

Fig 2: Pesticide consumption (thousand tonnes) and yields of wheat, rice and cotton (100kg/ha) from 1950–2019 in India



Source: Ministry of Agriculture, Govt. of India

There is still a long way to achieving higher profitability at a farm level and enhancing yields across the spectrum of crops. Following infographic gives an overview of the transformation of India's agriculture sector over the last 75 years:

1950-60

- Low and Stagnant Agriculture Production
- Limited growth in crop and grain production (0.4 and 0.1 per cent p.a.)
- Food grain production of 59.2 mMT in 1952-53 with a yield of 579.8 Kg/Ha

1960-80

- Advent of Green revolution
- Adoption of High Yielding Varieties of seeds, increase in the usage of fertilizer and irrigation resulted in a significant spike in production
- Achieved food security and reduced import of food grains

1980-2000

- Economic reforms introduced, greater encouragement to export
- Surplus production of agriculture commodities over domestic demand
- India emerges as a net exporter of agricultural products
- Increase in population and strong income growth

2000 onwards

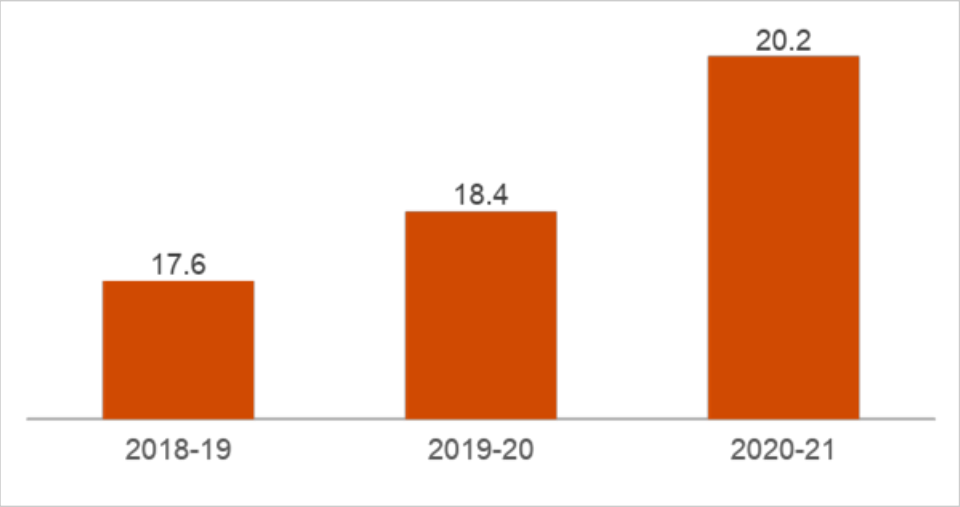
- 50 per cent increase in seed subsidy
- Additional financial assistance for horticulture crops
- Creation of price stabilization fund (PSF) by department of Agriculture and Cooperation as a price control measure to dampen the impact on consumer
- Development of micro irrigation, watershed through Pradhan Mantri Krishi Sinchai Yojna for water security
- FDI inflows from April 2014 to September 2020 amounted to USD 4.41 billion
- Total food grain production in 2019-20 was 296.7 mMT with a yield of 2563 Kg/Ha

Source: PIB, The Hindu, Ministry of Stats & Programme Implementation, PwC Analysis

Agriculture is an important sector for the Indian economy, and it can be well established by the fact that it contributed close to 18.3% to India's GDP in **2020**[5] . It should also be noted that over the past three years, the percentage share of agriculture and allied sectors in the Gross Value Added (GVA) metric of the country at current prices, has consistently increased. Below graph represents the same:

[5] Statista

Fig 3: Percentage share of GVA of agriculture and allied sectors to total economy



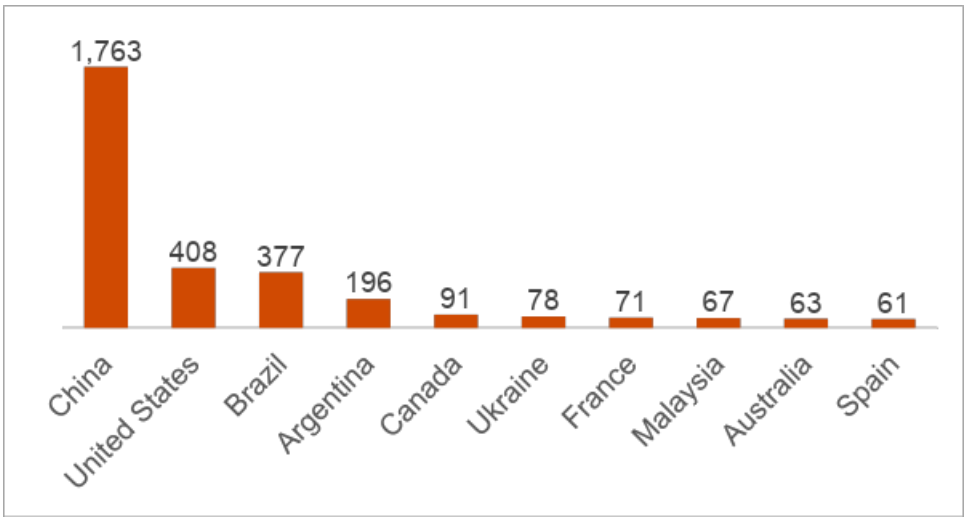
Source: PIB,Ministry of Stats & Programme Implementation, PwC Analysis

The sector becomes all the more important as it provides employment to more than 50% of the Indian population. The fact that the Government of India aims to double the farmer income by **2022**[6], is another testament to agriculture's potential in pushing the economy forward. Moreover, the sector has remained robust despite the pandemic, and has been relatively unimpacted so far. With the increasing focus on sustainable agricultural practices, the agriculture sector has created immense opportunities for private sector players operating in the domain of agri-inputs, micro-irrigation, warehousing, organic farming, food processing, exports, etc. Another facet of the industry is how rapidly it has undergone transformation in recent years with the advent of agri-tech firms, venture capital funds and innovative business model, hence, eventually becoming the silver lining for the **country**[7] and its economy.

2.3 Overview of the global agrochemicals sector

The global agrochemicals industry was estimated to be of USD 216 billion and is expected to grow at a CAGR of 3.4% by **2025**[8] [Market and Markets, 2021]. The key drivers of the growth of the agrochemicals industry are intensification of agriculture due to growing food demand and shrinking agricultural land. Moreover, the developing economies of the world which are also largely dependent on agriculture will fuel this growth. The graph below illustrates the top consumers of pesticides by volume:

Fig 4: Top countries by pesticide use (thousand tonnes)



Source: FAOSTAT

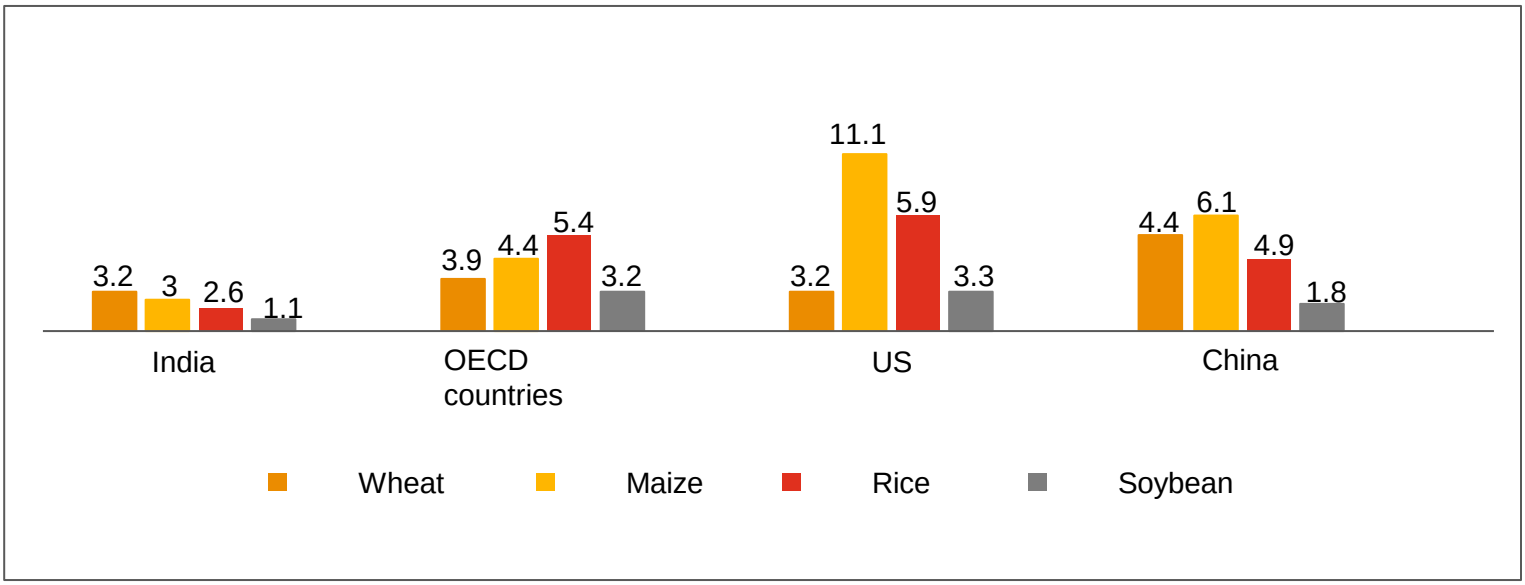
[6] Economic Times, Govt pursuing target of doubling farmers income by 2022
[7] Forbes India, Why agriculture is India's silver lining
[8] Market and Markets, 2021, PwC Analysis

Europe and Asia-Pacific are the highest consumers of agrochemicals and account for around half of the global consumption. These regions also account for around **85%**[9] [Worldstopexports] of the agrochemical exports around the world, making them the global manufacturing and exports hub. Agrochemical consumption around the world has transformed agriculture and has helped in achieving substantial gains in yields of many agricultural crops. A study in 2013 estimated that pests can cause a yield loss of as much as 28.2% in wheat, 31.2% in maize and 28.8% in cotton. Therefore, there is a direct relation between pesticide usage and agricultural production. A study in 2018 showed that during the period of 2010–2014, the cost-to-benefit ratio of pesticide usage was highest in Brazil (1.88) followed by Japan (1.85), Mexico (1.678) and China (1.243), some of which are also incidentally amongst the highest consumers of pesticides.

> "With an estimated crop loss of above 2 trillion INR per annum due to pests, coupled with very low level of pesticides usage of 340 g/ha (compared to most developing agriculture economies), there is a strong role that agrochemicals can play in protecting food sufficiency and quality of agricultural produce in India, with very favourable cost-benefit ratio."
>
> **Raju Kapoor**
> Director, Industry and Public Affairs
> FMC Corporation

Usage of agrochemicals along with other high-quality agri-inputs has been instrumental in improving agricultural production and productivity around the world. However, there are disparities when it comes to productivity of major food crops amongst countries. Although the disparities can be contributed by many factors, such as extent of agri-input usage, availability of resources, agro-climatic conditions and markets, it is safe to assume that higher but correct pesticide usage can lead to substantial improvements in yield. Below infographic illustrates comparison of yields of major food crops in India with major food producing countries.

Fig 5: Comparison of yields (kg/ha) of major food crops in India with major food producing countries



Source: OECD Data

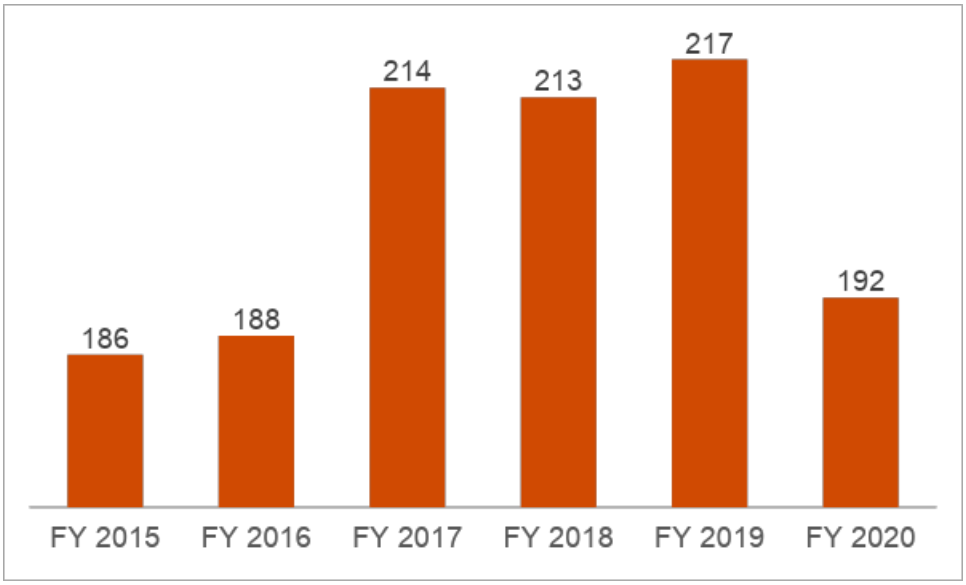
[9]Worldstopexports

India is the fifth largest producer and the fourth largest exporter of agrochemicals. The Indian agrochemicals industry was valued at around INR 42,000 crore in FY20 [PwC Research][10], 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% till 2025 and the growth is expected to 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.

There are several global and Indian players operating in the Indian agrochemical industry, including BASF, Bayer Crop Science, Syngenta, UPL, Dhanuka, Rallis India Limited, Crystal CropCare, PI Industries, KREPL, Indofil, Coromandel International Limited etc. Companies operating in India are focusing on strengthening their supply chain strategies to improve distribution and reach in the country as well as catering to international markets.

In the first half of the fiscal year 2021, the pesticide production volume amounted to 101 thousand metric tonnes across India. Over the years, the production in India has grown from 186,000 metric tonnes in FY 2015 to 217,000 metric tonnes in FY 2019. The trend is depicted in the infographic below:

Figure 6 - Pesticide production in India (in '000 MT)



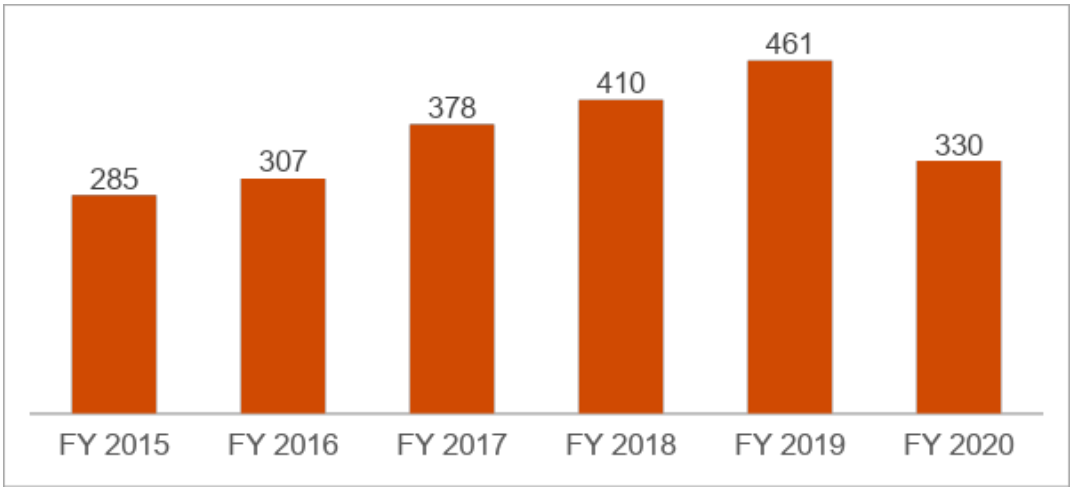
Source: Statista

During the fiscal year 2020, more than 3,30,000 metric tonnes of agrochemicals were exported from India to other countries, marking a year-over-year decrease of 2 % from the previous year. Perceived trade war between the United states and China and the disruption of supply chain due to COVID-19 pandemic caused a slide in the **export volume**[11]. The trend for past few years is shown below:

[10]PwC Research

[11] Statista

Figure 7 - Agrochemical Exports from India (in 1000 MT)



Source: Statista

"Agriculture in India emerged as a bright spot during the pandemic with a positive growth of 3.4 percent however covid has brought out dependence of our industry on export for major raw material and a.i. While celebrating 75 years of independence it would be apt to commit ourselves to invest in R&D and develop our country into a major hub for agro chemical export."

Kamlesh Saxena
General Manager
Rallis India Ltd.

There are several important trends that drives Indian Agrochemical sector. Following pointers highlight the current and upcoming trends in the agrochemical industries:

- Increasing focus towards digital avenues has improved decision making and enhanced traceability across the value chain
- Evolving models like direct selling through FPOs and direct-to-consumer (D2C) platforms like e-commerce are impacting the entire ecosystem of agrochemicals in India
- Increasing focus on diversification into specialty nutrients products such as biofertilizers, bio-stimulants, micronutrients and organic products has picked up across the industry. These segments have seen multiple investments in a bid to develop innovative and cost effective products for farmers
- Monetization of farming services such as spraying of agrochemicals and direct-to-farm delivery of agri-inputs are changing the landscape of the industry. Various start-ups have come up in the domain and have been trying to capitalize on the existing market demand
- Increasing interest of farmers towards solutions like 'product as a service', mobile app based advisory, market information etc. have enabled quick dissemination of information enabling better decision making from farmers. This is also expected to drive the farm productivity, profitability and higher risk adjusted returns for farmers.
- Specialty chemicals have come up as an attractive emerging area which has witnessed strong growth, new investments and capability enhancement among Indian Agrochemical players. Their application in variety of end-user industries makes these all the more suitable for agrochemical companies as a product offering. Following table highlights the subsegments and user industries wherein specialty chemicals find large range of applications:

Table 2 - Applications of specialty chemicals in sub-segments and user industries

Subsegments	User Industries
Paints & Coatings	Construction, Automotive
Special Polymers	Packaging Automotive
Construction Chemicals	Infrastructure, Real Estate
Textile Chemicals	Printing, Packaging
Water Chemicals	Apparel, Technical Textile
Water Chemicals	Industrial Water, Municipal Water
Cosmetic Chemicals	Bath, Shower, Haircare
Flavors & Fragrances	Food Processing, Personal Care
Agro Chemicals	Agriculture, Exports
Home Care Surfactants	Laundry Care, Dishwashing
Colourants	Textile Exports

Source: IBEF report on Chemicals 2021

> "It's time to create a 360-degree buzz about the role of agrochemicals in Indian agriculture and its importance in ensuring food and nutrition security. Government and industries should work together, review existing regulatory and policy hassles right from production to end consumption, and make a robust plan towards the theme of "Make in India and Make for the World."
>
> **Rajesh Agarwal**
> Executive Director
> Krishi Rasayan Exports Pvt. Ltd.

2.4. Key challenges in the Indian agriculture and agrochemicals sector

Some of the major challenges faced by the agriculture sector are as follows:

- Productivity per unit of land: Productivity of several crops per unit of land in India is less than major producing countries. Productivity will have to be the driving engine of agricultural growth as virtually all cultivable land is farmed. With ever increasing limitations in terms of resources (water, land and labour) and judicious utilisation of these is the only way to keep up with the agricultural production while fulfilling industrial and urban needs. Some of the measures to increase productivity will need cautious planning and be aimed towards increasing yields, diversification to higher value crops and developing value chains to reduce marketing costs amongst others.
- Low research and development investment: The amount spent on agricultural research in countries like China and USA are 10–15 times higher than that in **India**[12] . India's rice yields are one-third of China's and about half of those in Vietnam and Indonesia. The same is true for most other agricultural commodities. Advancements in agricultural technology and efforts on indigenous research would result in better agricultural inputs and practices specific to the Indian context.

[12] OECD Library

- Infrastructure challenges: Lack of market information, infrastructure, storage and transportation facilities, inadequate food processing and cold chain facilities lead to significant losses across the agricultural value chains, hence limiting the potential for growth
- Small landholding: The 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**[13] . Small size of landholdings not only limits the ability of farmers to take risks but also limits the returns from farming activities.

Following pointers highlight key challenges faced by the agrochemical industry in India:

- Counterfeit and spurious products: There is a significant share of counterfeit agrochemical products in the Indian market. This also includes spurious, and sub-standard products. These products are more common in states where farmers are less educated. Also due to lack of proper awareness and influence of local retailers in impacting the final purchase of farmers, farmers often fall prey to sub-standard and spurious agrochemicals, which adversely impact the revenues of the organised sector. According to an industry report, use of spurious chemicals accounted for loss of 10.6 million tonnes of food grain production during **FY 2015**[14] .
- Complexities in managing supply chain: The large number of end users make it important to have a strong and efficient distribution network for crop protection products. However, owing to reliance on imports for key raw materials and logistical inefficiencies due to poor infrastructure, it becomes difficult to manage the complexities. Moreover, the sudden outbreak of COVID pandemic highlighted the importance of a robust distribution network.
- 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 with the same or declining impact on productivity and crop loss. The adoption of newer or better molecules, although increasing, is still low. This is owing to high costs of R&D and thereby resulting into limited efforts by domestic players in India
- Current regulatory framework: Some of the challenges posed by the current regulatory framework include registration process which is perceived as a time-consuming, iterative and complex procedure by the industry players. Apart from this, Pesticide Management Bill 2020 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 contributed to the industry's growth.

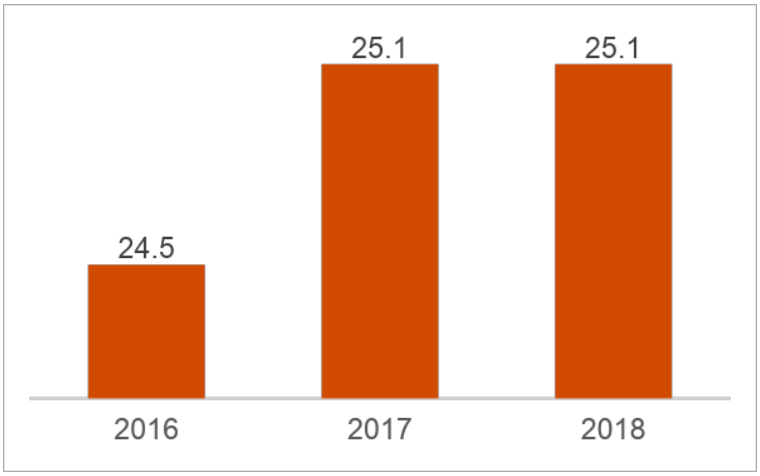
> "India has the potential to become Agriculture super power of the world. To achieve the same, agri input industry in India needs to come out of traditional ways of thinking. We should look at some of the best practices globally and make ourselves capable of adopting those in a sustainable manner."
>
> **Gur Prasad**
> Chief General Manager Marketing
> HURL

[13] NABARD
[14] Business Standard, Practical tips to overcome challenges in Indian agrochemicals sector

3. Case Study- Enhancing economic growth through agriculture in Nigeria

Nigeria has an arable land area of 34 million hectares and accounts for over 20 percent of the country's **GDP**[15]. Over the years, agriculture has become an important sector for the country. Following in graph highlights contribution of agriculture to country's GDP:

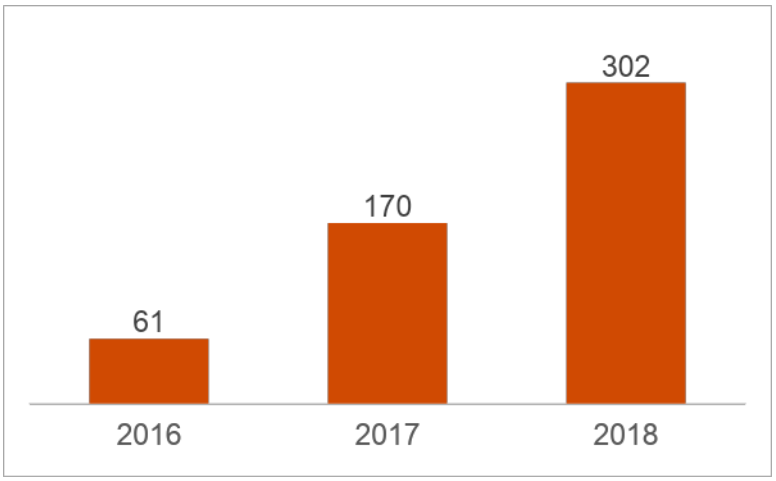
Figure 8 - Agriculture Contribution to Nigeria's GDP (in %)



Source: PwC report on agriculture in Nigeria

The country has become leader in various types of agricultural production, like palm oil, cocoa beans, pineapple, sorghum etc. It is the second largest producer of sorghum in the world and ranks fifth in the production of palm oil and cocoa beans. It is also one of the largest exporter of nuts. Following infographic represents country's agriculture exports over past few years:

Figure 9 - Agricultural Exports of Nigeria (in Nigerian Naira)



Source: PwC report on agriculture in Nigeria

While the overall agricultural scenario and its contribution to GDP seems robust as of now, it wasn't the case always. If we go in the past, the country was struggling to enhance its agricultural productivity. In order to overcome this challenge, the government started providing subsidies on the usage of fertilizers and agrochemicals. This not only improved the farmers' access to fertilizers, agrochemicals but also to better quality seeds.

[15] Statista

Hence, the government's agricultural policy not only gave a boost to productivity of agricultural crops in the country but also developed a foundation of an important sector having the potential to fuel the economic development of the country. In this entire case study, it is imperative that agrochemicals played a major role in transforming the scenario and acting as a fuel for the country's economy.

Apart from Nigeria, past research showcases that an improved access to the agricultural inputs has proven an important driver of agricultural production and productivity amongst farmers in **sub-Saharan Africa**[16]. Further, the research and past trends have shown that the use of herbicides had a positive correlation with the productivity achieved by farmers in the region in the longer term.



[16] IFPRI

4. Towards sustainability in Agriculture

4.1. Ensuring sustainable availability of agrochemicals

The Indian agrochemicals sector has grown at a rapid pace and is expected to grow based on the increasing intensification of agriculture and shrinking agricultural land. There are however, several areas where Government and private players should join hands and work together to ensure sustainable availability of agrochemicals:

- The industry is highly reliant on imports of raw materials and technical active ingredients required to manufacture the formulations to be sold. Favorable changes in the import/export policies, push to Make in India policy for agrochemicals, resolving geopolitical issues and trade sanctions with exporting countries can help the sector achieve sustainability.
- Agriculture in India is highly dynamic and is dependent on the vagaries of nature. The consumption of agrochemicals is linked to the likeliness of farmers to investment in agrochemicals, which can vary based on crop growth, market prices, weather conditions and pest infestation. This can create substantial gaps in supply and demand if any of the factors change drastically. Moving towards a digital and data-driven demand forecasting approach can help the industry players in managing this challenge and ensuring supply chain efficiency. Several agrochemical companies have adopted digital tools for data collection, compilation and analysis of data related to the demand indicators to create a much robust demand forecasting system.
- The industry relies heavily on generic and older molecules, many of which are also hazardous. This makes the agrochemical industry exposed to the risk of strict regulatory reforms that aim at discontinuation of such products. The Banning of Insecticide Order 2020 was a recent example of the same. Therefore, there needs to be an action plan for gradual replacement of the existing products that may be prone to regulatory actions. In-licensing of active ingredients is being practiced by many companies to expand their product offerings and de-risking their portfolio.
- Creating a digital led robust agrochemicals supply chain would help in ensuring availability of the right products at the right time to the Indian farmers.

4.2. Environmentally sustainable usage of agrochemicals

As highlighted in the previous sections, agrochemicals are important to prevent losses and enhance yields in agricultural production and their usage is required to keep up with the growing demand for food. On the contrary, over usage or incorrect usage of agrochemicals carries implications to the environment and human health. Several agrochemical molecules being used in large quantities in India and globally are hazardous and can be harmful to the environment, flora and fauna and can create health issues in humans if not used properly. A study in 2021 [Risk of pesticide pollution at the global scale: Fiona H.M. Tang et al, 2021] estimated the world geography at risk of environmental pollution based on the pesticide residue levels exceeding the no-effect concentrations defined by the agrochemicals industry. The study found that around 64% of the global agricultural land (around 24.5 million sq. km) is at risk of pesticide pollution by more than one active ingredient and 31% of the land is at high risk (pesticide residue levels exceed the no-effect concentrations by three orders of magnitude). The study also found South Africa, China, India, Australia and Argentina to be regions of high concern since they are at high risk of pesticide pollution, bear high biodiversity and suffer from water scarcity. Several health studies have also established that pesticide residues of several active ingredients in the environment, water sources and foods cause health problems like cancer and neurological diseases, among many [Chemical Pesticides and Human Health: The Urgent Need for a New Concept in Agriculture: Polyxeni Nicolopoulou-Stamati et al, 2016].

Therefore, the current situation with the usage of agrochemicals carries heavy weightage for both the benefits and challenges of using agrochemicals. On one hand, eliminating or minimizing their usage will have negative impact on agricultural productivity and thereby create gaps in food security. On the other hand, unchecked usage of agrochemicals has negative impact on the environment and human health. Thus, the way ahead in this situation is to create a balance on both sides i.e. sustaining and improving agricultural productivity while minimizing risks created by usage of agrochemicals.

The world is facing serious challenges like global warming, depleting natural resources, scarcity of water and climate change. Sustainable development of the present world is the key to mitigating these challenges and has been the buzzword in economic and industrial policy planning and development initiatives for the past few decades. Sustainable agriculture and sustainable usage of agrochemicals and chemical fertilizers have also followed suit. Food and Agriculture Organization (FAO) defines sustainable agriculture as agriculture that meets the needs of present and future generations, while ensuring profitability, environmental health, and social and economic equity. It majorly involves five key principles:

Increase productivity, employment and value addition in food systems	Protect and enhance natural resources	Improve livelihoods and foster inclusive economic growth	Enhance the resilience of people, communities and ecosystems	Adapt governance to new challenges

Since agrochemicals have direct and indirect impact on environment, economy, food system and people, sustainable usage of agrochemicals will create impact across all five principles of sustainable agriculture. Agrochemicals industry and R&D institutions, Governments, agriculture education and research institutions and farmers across the globe are the major stakeholders that can contribute towards making agrochemical usage sustainable. The major objectives of sustainable usage of agrochemicals should mainly be focused around minimizing the adverse impact of agrochemicals through changes in products, practices, technology or policy while maximizing their effectiveness.

With the advancement in technology, interventions that encourage sustainability across the lab to land value chain of agrochemicals shall be encouraged. Following are some of the key areas where sustainability initiatives can create major impact.



Research & Product Development

- Research activities and development of new active ingredients and products shall become more focused towards green molecules which have minimal or neutral impact on environment and health
- The industry is moving in this direction with launch of several green and bio products such as biopesticides, biofertilizers and bio stimulants
- The Government can play a role in providing policy, funding and subsidy based support towards research, registration and licensing, production and commercialization of such sustainable products. As an example, promotion of electric mobility solutions has seen support from the Government in India in terms of production linked incentives and tax subsidy

Production

- Production activities of agrochemicals should be made sustainable in nature through usage of renewable energy, net zero approaches and effective waste management
- Encouragement of safe production practices and creating social and economic equity in the production workforce
- Investment in the human capital through upskilling and training & development initiatives in the areas of sustainability, leadership and quality management can be focused upon by the industry players. This can help in development of leaders and retention of talent.

Packaging

- Agrochemical packaging can majorly contribute towards environmental pollution for three major reasons:
  - The packaging is mostly made of plastic
  - The residue of the product remains in the packaging even after use
  - There is very limited effort to regulate or manage the waste generated from agrochemical packaging
- Recycling, renewal or reusage of agrochemical packaging should be explored by the industry and government. An example of such model can be taken from the soft drink bottling and dairy bottling industry, where reverse supply chains are established to reuse the glass bottles.
- Alternative packaging material such as recycled paper should be explored to address plastic pollution. Global giants like Unilever, P&G and Diageo have either introduced or are exploring 100% paper based recyclable packaging for liquid products.
- Packaging technologies that minimize the residual product in the packaging after use should be explored. Technologies like LiquiGlide, which acts as a slippery barrier between a surface and a liquid has seen applications in the FMCG industry in packaging of food products and cosmetics. Similar technologies may be explored by the agrochemicals industry to achieve the objective

Application and usage

- Application methods of agrochemicals around the world are largely based on dilution of the concentrated product and dousing the plants with the solution through manual or machinery based spraying. Research suggests that not more than 5% of sprayed liquid actually sticks to the foliage and absorbed by the plant. About half of the remaining 95% is lost as drift while the remaining bounces off the leaves, polluting the soil, groundwater and surface water.
- Technologies that enhance the adhesion of agrochemicals to plants and thereby enhance efficiency, such as improved nozzles, electrically charged liquids and adhesives can significantly reduce the amount of agrochemicals used, thereby improving productivity, reducing costs and minimizing the adverse environmental impact
- Several players across the globe and in India have introduced agrochemical spraying as a 'Product as a Service' and 'Spraying as a Service'. One such example is the Aadarsh Farm Services by UPL Ltd. In India, which provides agrochemical spraying through boom sprayers as a service to farmers. The initiative helps in improving spraying efficiency, minimizes the risk of human exposure to the spray and saves time and cost. Another innovative and global example is Bee Vectoring Technology, where commercial bees are used as a vector for targeted delivery of certain agrochemical powders to flowers. This has found application in crops in which flower borne diseases are prevalent such as strawberries, blackberries, apples, tomatoes and sunflower.

Information and awareness

- While the agrochemicals industry and the Government make efforts towards making agriculture more sustainable, the acceptance and adoption of the technology, products and practices by farmers has to be at the centre of it
- Agrochemicals industry is already connected directly with farmers through their awareness creation and demand generation campaigns on the ground. The existing relations of the industry are a great strength in creating awareness related to sustainable products and practices
- The public sector extension infrastructure like Krishi Vigyan Kendras (KVKs) are being used to demonstrate beneficial farming methods. The infrastructure and the trained human resources available also present a substantial opportunity to promote sustainable agricultural practices, given the micro-level reach of the network across the country and their understanding of the local challenges and opportunities.

The Agrochemicals industry in India has brought forward many sustainable and environmentally safe green products which help in managing crop health and boost production. Some of the major product categories are:

- **Biofertilizers:** Biofertilizers are products which are derived biologically and either consist of plant nutrients or enable the nutrient absorption capacity of plants. It is estimated that around ~100,000 MT of biofertilizers are being consumed in India annually. Some of the major products under this category are VAM, nutrient fixing microbes and micro-algae based products.
- **Bio-pesticides:** Bio-pesticides are products derived from biological sources or are biological agents with pest controlling properties. It is estimated that around 8645 MT of bio-pesticides are used in India annually. Also, around 22 million hectares use a mix of chemical of which around 14 million hectare use bio-pesticides only. Some of the major products in this category are bacteria (such as B Thuringiensis), pheromones, fungi (such as Trichoderma) and neem based products.
- **Bio-stimulants:** Bio-stimulants are biological products that promote plant growth and plant health. The bio-stimulant market in India is estimated to be about 106 million USD. Some of the major products in this category are humic acid, amino acids, seaweed and kelp based products and enzymes.

"Products having favorable environmental and toxicity profile are increasingly being preferred by all stakeholders. More precise, safe and judicious application of products is the need of the hour to enhance efficiency becoming the new necessity. Application of pesticides through Drones and Precision Agriculture wll open new vistas for industry"

Raju Kapoor
Director, Industry and Public Affairs
FMC Corporation

Sustainability is a broad term that can be interpreted across environment, natural resources, human rights, quality of life, human health, policy and regulation, among many. In order to enable capturing and measuring impact across these areas, Environment, Social and Governance (ESG) reporting has rapidly emerged as the standard to report sustainability related performance of corporations.

Environment related metrics comprise of areas in which relate the impact of business activity on nature across areas like climate change, natural resource, pollution and waste, and environmental opportunities. Society related metrics comprise of areas which measure contribution towards fairness in the society in the areas of human capital, product liability, stakeholder opposition, social opportunities and tax contribution. Governance relate metrics are related to the quality of decision making in context of sustainability and is mainly concerned with corporate governance and ethical business practices.

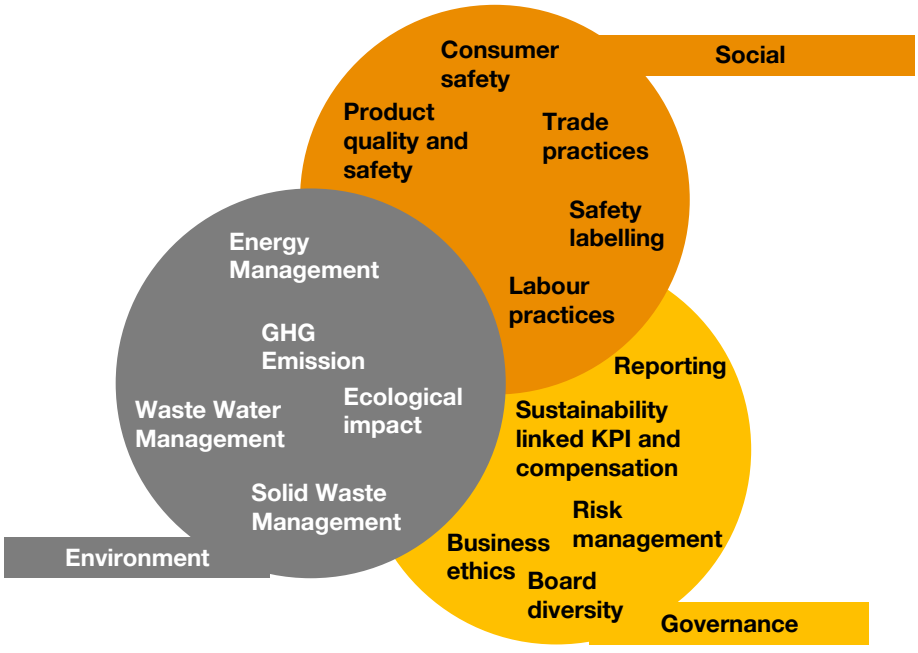
Depending on the industry, the material issues or key themes related to sustainability can vary in terms of magnitude and priority. The figure below represents major impact areas in general:

Environmental – Minimizing the impact of a business on nature	Reducing carbon emissions	Addressing water stress	Net zero initiatives	Reducing electronic waste
	Reducing hazardous waste	Reducing toxic emissions	Responsible raw material sourcing	Adopting renewable Energy
Social – The contribution of business to wellbeing and equity in society	Product Safety & Quality	Health & Safety	Human Capital Development	Supply Chain Labor Standards
	Access to Health Care	Social security		
Governance – Quality of processes for decision making	Board Diversity	Remuneration	Business Ethics	Reporting
	Financial System Instability			

Agrochemicals industry is small in comparison to the industries such as chemicals, mining, energy and electronics. However, its potential impact on sustainability is high mainly because of its end use by a large proportion of the population, across geographies, with direct application on soil and near water sources. Therefore, the challenges and opportunities related to sustainability can be big, complex and diverse.

In India, ESG reporting will be done in the framework of Business Responsibility and Sustainability Reporting (BRSR) which will replace the existing Business Responsibility Reporting (BRR).

Starting FY 2023, the Government of India has mandated the top 1000 listed companies (by market capitalization) to report under the BRSR framework. Several entities are already preparing and disclosing sustainability reports in India and globally based on the accepted reporting frameworks such as GRI, SASB, TCFD or Integrated Reporting.
Some of the material issues related to sustainability in context of the agrochemicals industry can be:



5. Conclusion

Indian economy has transformed by leaps and bounds since its independence. Agriculture has played a crucial role in enabling this progress. All stakeholders across the value chain, especially the farmers, have played their role towards the progress of this sector. Agricultural development has been an area of priority for the Government and a multitude of policy decisions and development initiatives have helped in speeding the progress. The Indian economy and Indian agriculture have inherent strengths by the virtue of being rich and diverse in many resources. These strengths along with the Government's policy support are enabling and promoting the 'Make in India' initiative which will help in India becoming 'Aatmanirbhar Bharat'. The Indian agrochemicals industry is among the major global exporters of agrochemicals. With the required policy support the industry can also aim towards becoming a global hub for production and exports of agrochemicals.

The supply chains in the agri input sector, especially agrochemicals are quite complex, where the consumption can be a function of factors like season, pest infestation, weather conditions, market prices and competition. At present, the agrochemicals industry has very limited visibility at the retailer level and even lower at the farmer level consumption. With the increasing penetration of digital technology, the industry can plan to adopt digital led demand forecasting systems and supply chain planning. This will help the industry players in mapping and forecasting demand with better accuracy which will reduce overall costs and improve business output and will ensure availability of the right products at the right place at the right time for farmers.

Apart from complex supply chains, the industry also faces challenges from the regulatory and policy support side. Registration of new molecules is a long, costly and complex process which keeps the small players in the industry to develop and introduce new products. The sampling and quality testing of agrochemicals by the Government is necessary to ensure consumer safety but also reduces the ease of doing business. In order to support the sector to achieve its potential of becoming a global leader, the Government can play a major enabling role. The challenges of the industry need to be analyzed as a whole and an action plan to address the same should be a priority. The action plan can focus on major areas like ease of introduction of new active ingredients, improvements in R&D infrastructure and funding, single window licensing system and production linked incentives for green products. With the advantage of major organizations moving their manufacturing businesses or sourcing operations away from China, India can become a major benefactor in the agrochemicals space.

While economic growth through industry action and Government's support is an area of priority, equal importance should be placed towards doing it sustainably. Agrochemicals if not manufactured, handled or used properly can be potentially harmful for the environment and the society. The agrochemicals industry together should baseline their current impact on the environment and society from sourcing till consumption and work towards neutralizing the negative impact through a strategic action plan. Across the world, Environment, Social and Governance (ESG) based measuring of impact of business activities and reporting the impact of sustainability linked initiatives have gained tremendous popularity, especially among large corporations. The Indian Government also plans to implement BRSR reporting for large corporations while other corporations can also choose to report their sustainability impact voluntarily. Globally, this has helped corporations in generating value from valuations, cost of capital, trust in the company's purpose and attracting and retaining the best minds. The Indian agrochemicals industry can voluntarily aim towards setting sustainability goals, create strategies to achieve them and report them. Not only will this enable in value generation over the long term but will also help in making the industry more robust and poised for the required growth.

Achieving sustainability in the agrochemicals sector can be complex, especially since farmers are the end consumers and will play a major role in completing the cycle of sustainability. Currently, there are many challenges in the way agrochemicals are consumed by the farmers that pose significant environment and health risks. The application of agrochemicals at present involves dousing of plants with the solution which creates soil and water pollution due to unabsorbed runoff. The containers of agrochemicals are not properly disposed and can end up in close proximity to food products, water sources or landfills. The farmers or the farm workers who actually spray the agrochemicals seldom use protective gear which can lead to toxicity. The industry has taken action towards addressing these issues through awareness generation campaigns and farmer safety drives. However, given the scale and complexity of these challenges, an entire ecosystem for managing these risks may be the most effective way. Farmer engagement programs that educate the farmers about sustainability, how their actions can help in ensuring sustainability and incentivizing the farmers to practice sustainable usage of agrochemicals and other farm practices can help the industry in addressing the most important end of the sustainability cycle.

6. About FICCI

Established in 1927, FICCI is the largest and the oldest apex business organization in India. Its history is closely interwoven with India's struggle for independence, its industrialization, and its emergence as one of the most rapidly growing global economies.

A non-government, not for profit organization, FICCI is the voice of India's business and industry. From influencing policy to encouraging debate, engaging with policymakers and civil society, FICCI articulates the views and concerns of industry. It serves its members from the Indian private and public corporate sectors and multinational companies, drawing its strength from diverse regional chambers of commerce and industry across states reaching out over 2,50,000 companies.

FICCI provides a platform for networking and consensus building within and across sectors and is the first port of call for Indian industry, policymakers and the international business community.

Contact us



Rinky Sharma
Senior Assistant Director, FICCI
rinky.sharma@ficci.com



About PwC

At PwC, our purpose is to build trust in society and solve important problems. We're a network of firms in 155 countries with over 284,000 people who are committed to delivering quality in assurance, advisory and tax services. PwC refers to the PwC network and/or one or more of its member firms, each of which is a separate legal entity. Please see **www.pwc.com/structure** for further details.
Find out more about PwC India and tell us what matters to you by visiting us at **www.pwc.in**

Contact us

Ajay Kakra
Executive Director
Agri & Social (Management consulting)
PwC India
ajay.kakra@pwc.com

Priyank Bhardwaj
Director
Agri & Social (Management Consulting)
priyank.bhardwaj@pwc.com

Authors

Anuj Dutt Sharma
Manager, Agri & Social (Management Consulting)
sharma.anuj@pwc.com

Harshit Mullick
Senior Associate, Agri & Social (Management Consulting)
harshit.mullick@pwc.com

Prabal Chauhan
Senior Associate, Agri & Social (Management Consulting)
prabal.p.chauhan@pwc.com

Editorial support

Shalini Sen

Design

Ansuman Dey
Puja Saraogi



pwc.in

Data Classification: DC0 (Public)

In this document, PwC refers to PricewaterhouseCoopers Private Limited (a limited liability company in India having Corporate Identity Number or CIN : U74140WB1983PTC036093), which is a member firm of PricewaterhouseCoopers International Limited (PwCIL), each member firm of which is a separate legal entity.

This document does not constitute professional advice. The information in this document has been obtained or derived from sources believed by PricewaterhouseCoopers Private Limited (PwCPL) to be reliable but PwCPL does not represent that this information is accurate or complete. Any opinions or estimates contained in this document represent the judgment of PwCPL at this time and are subject to change without notice. Readers of this publication are advised to seek their own professional advice before taking any course of action or decision, for which they are entirely responsible, based on the contents of this publication. PwCPL neither accepts or assumes any responsibility or liability to any reader of this publication in respect of the information contained within it or for any decisions readers may take or decide not to or fail to take.

© 2021 PricewaterhouseCoopers Private Limited. All rights reserved.

SG/September 2021/M&C-9721