

Knowledge Partner



Role of Agrochemicals in Sustainable Farming



A report on
Indian Agrochemical Industry

July 2019

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Indian Agrochemical Industry
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Mr. R G Agarwal

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



Message

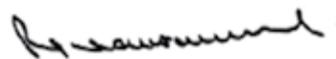
India has huge potential for high and sustained growth in the agriculture and allied sectors, considering that there is huge untapped potential along the value chain. To achieve high agricultural growth, it is important to reduce both pre and post-harvest losses significantly.

Agrochemicals are one of the key inputs for crop protection and better yield during pre-harvest stage. Judicious use of crop protection chemicals supports sustainable farm management and delivers socio-economic benefits to meet the challenges of feeding an ever-growing population. Therefore, for sustainable development of agricultural production in India, it is important to promote and highlight the benefits of agrochemicals among the farmers.

Our Honorable Prime Minister has given a herculean task of Doubling Farmers Income by 2022 and it is possible if we focus on bringing reforms and innovations in technology, irrigation, marketing, taxation & finance, and quality of agri inputs.

I am glad to know that Department of Agriculture Cooperation & Farmers Welfare and Department of Chemicals & Petrochemicals, Govt. of India in association with FICCI have taken an initiative to organize the 8th Agrochemicals Conference 2019.

I hope we will have very good deliberations in the Conference and fruitful recommendations will come. I wish this event all the success!

A handwritten signature in black ink, appearing to read 'R G Agarwal', written in a cursive style.

R G Agarwal

Mr. Dilip Chenoy
Secretary General
FICCI



Message

The Indian Population currently stands at 1.3 billion and is estimated to rise to 1.7 billion by 2050. With the growing population, the country will not only have to raise its agricultural production, but also the productivity to ensure food and nutrition security of the nation.

Agrochemicals or Crop Protection Chemicals are an active ingredient of the agriculture sector, which prevent crop losses. Efficient and judicious usage of agrochemicals and crop protection solutions within the confines of a regulatory framework is the need of the hour, so that agriculture is practised in a sustainable manner, without compromising the needs of the future generations.

I am happy to note that FICCI jointly with Department of Agriculture Cooperation & Farmers Welfare and Department of Chemicals & Petrochemicals, Govt. of India is organizing 8th Agrochemicals Conference with the theme "Role of Agrochemicals in Sustainable Farming" on 16th July 2019 at New Delhi.

I'm sure that all the issues and the solutions will be well deliberated in the Conference, and wish the event all the success.

A handwritten signature in black ink, which appears to read "Dilip Chenoy". The signature is written in a cursive, flowing style.

Dilip Chenoy



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Foreword

The agrochemical industry is expected to play a pivotal role in attaining food security for a populous country like India. With dwindling land under cultivation and a lower portion of that under irrigation, the need to increase farm productivity with efficient use agrochemicals is the need of the hour.

The macro environment for the agrochemicals industry will always remain positive and will be driven by strong fundamental growth, rising domestic demand, improved export opportunities, tie-ups with innovators for new products and substantial prospects to explore products going off – patent.

This paper highlights the key challenges faced by agriculture and industry. It also presents roadmap for agrochemical industry, mentions imperatives for the industry, farmers, and government required to encourage the development of industry and spur investments.

Mott MacDonald thanks FICCI for providing us an opportunity to develop a Knowledge paper which can play a pivotal role in achieving this objective.

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Executive Summary



The Indian economy has undergone a structural transition from being an agriculture driven to a predominantly services and manufacturing driven economy. However, agriculture still contributes about 17.4% of the total Gross Value Added (GVA) in 2018 and continues to support a vast majority of the population by providing employment opportunities to about 54% of the workforce.

India is currently at food surplus stage with increasing production of food grains and horticulture. The latter exceeds in production than food grains due to increasing demand of fruits and vegetables and more remunerative nature compared to large crop farming. However, low productivity per hectare, lack of awareness for proper agrochemical use, high monsoon dependency, unpredictable weather patterns, reduction in arable land, high post-harvest losses and declining soil fertility are key challenges faced by agriculture.

In order to improve efficiency of agri-value chain and reduce post-harvest losses, government should focus on promoting food processing and packaging sector which has huge untapped potential and further ensures remunerative prices to the farmers.

Agrochemical industry has huge unrealized potential for growth due to very low level of agrochemical consumption currently as compared to global norms. 15-20% of the India's crop output is lost due to attacks by pests, weeds and diseases. Indian agrochemical manufacturer have huge capacity base with innovative product portfolios to support farmers. Domestic demand is dominated by Insecticides accounting for 60% of overall demand followed by Fungicides and Herbicides. Agrochemical industry has witness huge investment and mergers and acquisition which is helping Indian companies to reduce the Research & Development cost ,development time and improving efficiency in R&D process.

Seasonal domestic demand of agrochemicals leads to more than 50% of production being exported. The outstanding capacities with Indian manufacturing companies creates a huge potential for further increase in exports with adequate support via government policies.

Increasing raw material cost, high registration time for new molecule, high environmental pollutant treatment cost and lack of awareness/education among farmers are the major challenges agrochemical industry is facing.

Government should focus on developing capabilities of pesticides testing laboratories, improving sampling process by bringing in transparency to the process, strengthen imports inspection and registration for new bio pesticides to reduce the pseudo pesticides sell in Indian markets.

Increasing food and horticulture demand, off patent molecules, export potential, budgetary and policy support from government, and environmental clampdown of chemical industry in China are key growth drivers for agrochemical industry.

Government of India has proposed new Pesticides Management Bill, 2017 which was passed for comments on 19th February 2018. The bill aims to regulate manufacturing, storage, import, export, sale, transport, distribution, quality and use of pesticides. In order to make most out of Pesticides Management Bill, government should focus on resolving on few points like data requirement for exports, private and government laboratory both should have GLP accreditation among others.

To achieve sustainable farming, there are some imperatives which all related stakeholders need to focus on as in Table 1.

Table 1: Key Imperatives

Key Imperatives for Government	Key Imperatives for farmers	Key Imperatives for Agrochemical Companies
Import Substitution	Increasing oilseeds production using Agrochemicals	Agriculture Research
Warehouse based post-harvest system on credit	Invasive species	Training dealers
Innovation fund for Agri sector/ Agritech	Post-harvest loss reduction using Agrochemicals	Technology transfer for Indigenous Production
Leveraging PPP mode		
Rationalization in GST rate:		

1

Agriculture in India



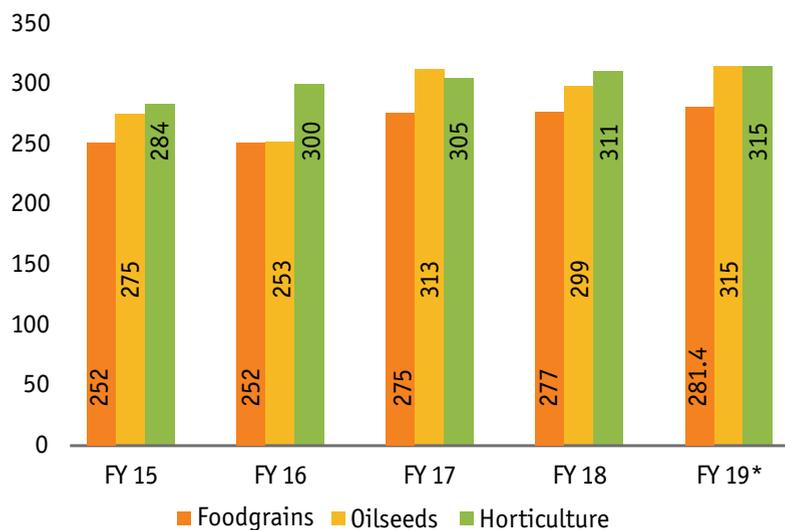
The Indian population currently stands at 1.3 billion and is estimated to rise to 1.7 billion by 2050. India is the second most populous country after China in the world. According to United Nations statistics, India will surpass China to become the world’s most populous country by 2022. With the economic growth in absolute terms, Indian economy is likely to reach US\$ 10 trillion by 2030 making India 3rd largest economy after China and US. Today, more than 34% of India’s population lives in cities and accounts for 60% of consumption which leads to a change in dietary needs of country.

India being an agrarian country, more than 54% of population is engaged in agriculture and allied activities and accounted for INR 17.67 trillion (USD 274 billion) in 2018 i.e. 17.4% of gross value added to GDP.

India is the 2nd largest food grain producer in the world after China. Food grain production has grown at CAGR 2.8% between FY15-19 with 281.4 Million tonnes of food grain produced in FY19 with cereals making up 91% of the production and rest being pulses.

Production of horticulture is consistently exceeding food grain production from FY15-19 and grew at CAGR 2.6%. Primary reasons for greater horticulture production are higher remunerative capacity, low water utilization for small farms, faster turnaround and increasing demand owing to changes in lifestyle. Fruits (35%) and Vegetables (66%) together form 91% of total horticulture production in India.

Figure 1: Food grains, Oilseeds, Horticulture Production India (Million Tonnes)



Source: Department of Agriculture Cooperation and Farmer Welfare *Target Production



Apart from agriculture, other allied activities like dairy and animal husbandry have grown consistently in last few years. India's total exports from agricultural and processed food products in FY19 stood at INR 1.28 lakh crore with 7% increase compare to FY18.

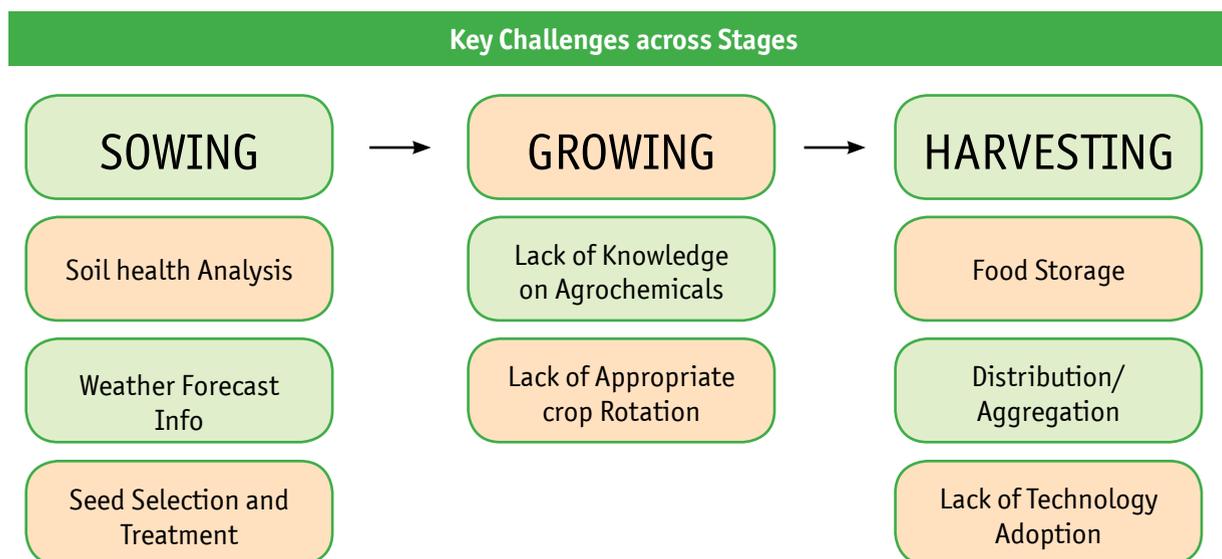
India's food grain demand is estimated to be 355 million tonnes by 2030. Though there is net surplus production, the pressure of constantly increasing population, declining arable land, small landholdings, high monsoon dependency and declining soil fertility are major challenges for Indian agriculture. Sustaining the growing population's food needs and globally accepted nutrition standards are the major objectives the industry has to fulfil. Hence, India will have to adopt the sustainable measures to maximize efficiency across value chain for sustainable output.

2

Challenges faced by Indian Agriculture



Figure 2: Key Challenges



Source: MM Analysis

2.1 Challenges in Sowing

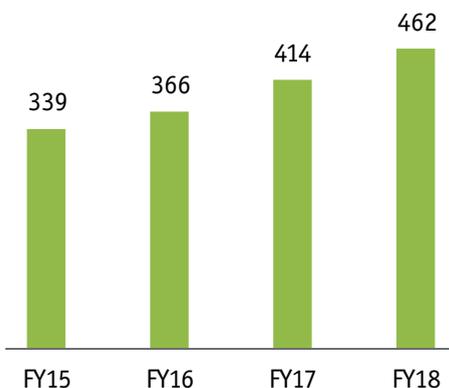
- Poor weather updates and higher monsoon dependency
 - Only 42% of farmers receiving district level weather forecast through SMS and mKisan portal out of total 9.5 crore farmers as of FY19.
 - To minimize weather related crop losses Indian council of agrochemical research (ICAR) along with Indian Metrological department is targeting to issue alerts to 6500 blocks across 660 districts in country by 2020. As per reports from mKisan portal for FY19 the pilot study in 200 blocks is underway. Ministry of Agriculture has partnered with IBM and is working on developing a prediction model for crop yield using artificial intelligence technology.

- India's ratio of net irrigated area to total cropped area is 34.5% which is far lower than other developed countries. Decline in average rainfall, increase in average temperature and other climate changes are reducing farmers income
- Soil Health Assessment:
 - Soil health is often the main reason for stagnating or declining crop yields and low output efficiency. Soil health is majorly declining due to:
 - Soil erosion
 - Soil degradation- Salinization, soil toxification, acidification.
 - Physical degradation- water logging, submergence, flooding, soil compaction, crusting
 - Biological degradation- soil erosion by water and reduction of Biomass in soil resulting in loss of flora and fauna.
 - Around 36.7% of total arable and non-arable land surface in India suffers from various forms of degradations. India's yield per hectare stands at 3 tons/ha compared to global average of 4 tons/ha majorly due to poor soil health management, low quality seeds, improper usage of water and chemical fertilizer, lack of awareness of crop protection solution and degrading soil quality.
 - More need to be done to make farmers understand importance of soil health card and what pesticides and fertilisers to use, most of the farmers do not understand what the deficiency and which fertilizer in what ratio is to be used.

2.2 Challenges in Growing

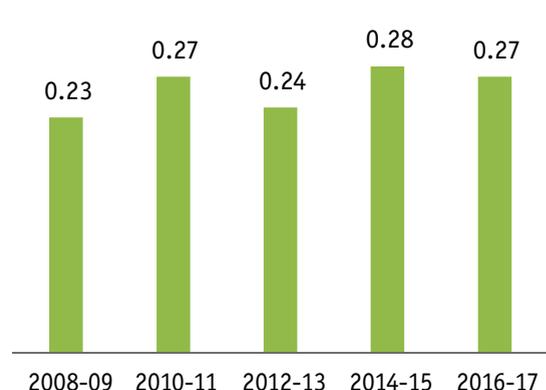
- Lack of Knowledge on Agrochemical:
 - Agrochemicals are the last and one of the key inputs in agriculture for crop protection and better yield However, India is facing challenge for using agrochemicals in farming due to lack of awareness of such chemicals among farmers.

Figure 3: Fertilizer Production in India (Lac Metric tonnes)



Source: Annual Report 2018-Ministry of Chemical & Fertilizers

Figure 4: Per Capita Consumption of Pesticides, India (Kg/Ha)



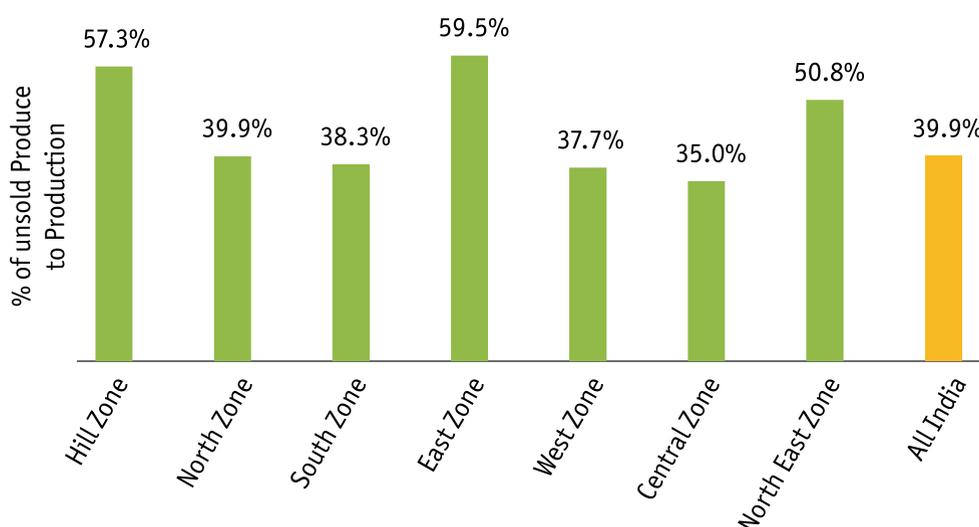
Source: ICAR

- Production of fertilizer has increase at CAGR 11% from FY15-18 due to increased consumption of fertilizers per hectare currently 165 kg/ha. Further government of India is providing fertilizers like Urea, DAP, Complex fertilizers in subsidize way which has increased consumption.
- Indian farmers are not aware of the cost benefit ratio for use of pesticides due to lack of awareness on optimum pesticides use hence per capita consumption of pesticides of India stands at 0.27(kg/Ha) which is lower than other developed countries like China (13.06 kg/ha), Japan (11.85 kg/ha), Brazil (4.57 kg/ha) and other Latin American countries which in turn lowers food productivity causes loss of crops caused by pest attacks.
- India has -157 Mn hectares of arable land which has reduced by 62% from 0.34 hectares per person in 1951 to 0.13 hectares per person in 2011. Hence, increase in judicious and right use of pesticides training is very important for increasing per hectare crop yield.
- Lack of appropriate crop rotation has also become challenge due to small farms size. About 85% of Indian farming suffer from serious disadvantage of scale. Small farm size is not profitable for use of high-tech machinery and mechanization hence, to take the advantage farmers should come forward for cooperative farming for which support is provided by government via farmer producer organizations.

2.3 Challenges in Post Harvesting

- Food Storage and Logistics:
 - Post-Harvest food loss are primarily due to range of practices such as harvesting, collection, threshing, grading/sorting, winnowing/cleaning, drying, packaging, transportation, and storage, weather conditions, lack of infrastructure and availability of financial markets. Post-harvest food losses can result into:
 - Quantitative food loss
 - Qualitative food loss
 - Food waste
 - Lack of Agri-logistics, infrastructure is lowering the farmers ability to monetise their produce specially in case of perishable fruits and vegetables which eventually increases time for harvest to reach markets. Indian farmers incur INR 92,651 crore per year losses in post-harvesting, the primary causes of which are poor storage and transportation facilities.

Figure 5: Proportion of unsold Fruits & Vegetables Produce to Production (%)



Source: Status of Farmers Income Report by Doubling Farmers income Committee, 2017

- At the all-India level about 40% of total fruits and vegetables produced are unable to sell in the market as mentioned in Figure 5 precisely due to improper storage and logistics reach.
- As per post-harvest loss assessment report of ministry of agriculture, 2017, post-harvest losses for major crops are Paddy (5.53%), Wheat (4.93%), Maize (4.65%), Soybean (9.96%), Groundnut (6.03%) respectively.

Food grains like Paddy, Wheat usually needed primary processing after harvesting before going to market for sell however, in case of horticulture products are perishable in nature specially fruits and vegetables needs secondary processing facilities which has higher value add compared to primary processing. As per Directorate of Marketing and inspection (DMI), India's food grain storage capacity is 877.37 lakh tonnes, while developing post-harvest infrastructure facilities for horticulture is need of hour.

Figure 6: Post-Harvest Agro-logistics requirement for Horticulture products



Value Chain Component	Infrastructure Requirement	Infrastructure created
Integrated Pack house (Nos.)	70,080	249
Reefer trucks (Nos.)	61,826	<10,000
Cold Storage (Million tonnes)	35.1	31.8
Transportation to Final Market	97% of Horticulture produce transported by Road	
Ripening Units (Nos.)	9,131	812

Source: Post-Harvest Agro-logistics Report by Doubling Farmers income Committee, 2017

India needs an investment of INR 89,375 crore to improve the storage and transportation infrastructure facilities for food crops according to double the farmer income committee report. 16% of the target set for creating integrated pack-houses, refer trucks, cold storage and ripening units has been met as shown in Figure 6.

At an aggregate level, India's cold storage capacity is at the required levels. However, 60% of these cold storages are located in just four states: Uttar Pradesh, Punjab, West Bengal and Gujarat. Further, existing cold storage capacity is confined mostly to certain crop types and not integrated with other requirements.

India has huge potential for a high and sustained growth in the agriculture and allied sectors, considering that there is huge untapped potential along the value chain. Hence, there is an urgent need to work on developing Agri logistics infrastructure facilities and integrate value chain for industry to succeed.

2.3.1 Way Forward To Reduce Post-Harvest Losses

In order to drive sustainable agriculture growth, priority will be on reducing post-harvest losses which could be achieved by value addition through:

- Promotion of food processing industry by increasing sorting, grading and packing know-how for fresh product retailing.
- Attracting big brands, retailers and promoting local brands/ entrepreneurs with the ability to export and market large quantities of available surplus after processing as strategic partners with the farmers to help maximize the "processed to produce ratio".
- Focus on enhancing the market linkages and providing information and communication technologies (ICT) enabled agri-marketing systems.
- Developing clusters for horticulture and vegetable crops so that advantage can be taken in marketing including export.
- Economic and market information and intelligence services (EMIS) including price information mechanism for farmers.
- Setting up of monitoring and evaluation (M&E) system.

Indian Agrochemical Industry



Agrochemicals commonly referred as Crop protection chemicals/pesticides are substances manufactured through chemical or biochemical processes containing the active ingredient in a definite concentration designed to protect crops from insects, diseases and weeds and eventually rescue crop losses.

In India, pests and diseases on an average eat away around 20-25% of the total food produced. As per Ministry of Agriculture, India is losing agricultural production worth INR 1.48 lakh crores annually due to damage from pests, weeds and plant diseases. Overall food crops compete with around 30,000 species of weeds, 3,000 species of nematodes and 10,000 species of plant-eating insects. Hence, Agrochemical acts as key input for crop protection and better yield. Commenting on the affordability of agrochemicals, Dr. Dalwai Committee report, on “Doubling Farmers Income” mentions that cost of pesticides is only 0.4% of total cost incurred by the farmers.

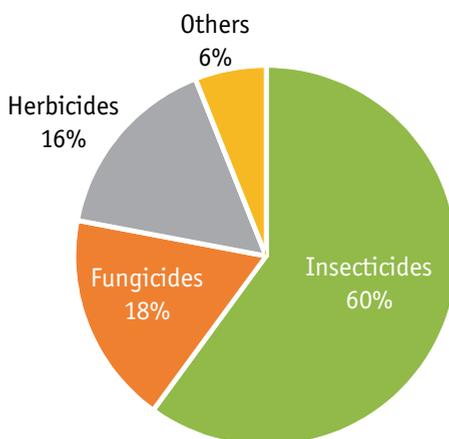
India is the 4th largest producer of agrochemicals after United States, Japan and China. It is a net exporter of agrochemical and has emerged as the 13th largest exporter of pesticides globally. Indian Agrochemicals market was expected to reach US\$ 5 billion in FY19 with exports contributing more than 50% share. Indian Agrochemical market has a stable growth with potential of growth in exports.

3.1 Industry Structure

Agrochemicals are broadly classified as insecticides, herbicides, fungicides, rodenticides, bio-pesticides and nematicides depending on the type of pest they control. Indian Agrochemical industry has approximately 125 technical grade manufacturers, 800 registered formulators, more than 1,45,000 distributors and 60 technical grades pesticides. Around 80% of the generic and non-generic pesticides are manufactured by major Indian manufacturing and multinational companies.

Agrochemicals are diluted in recommended doses and applied on seeds, soil, irrigation water and crops to prevent the damages from pests, weeds and diseases. Technical grade manufacturers make high purity chemicals which act as key raw material for the value chain. These high purity chemicals are sold in bulk to formulators, who in turn prepare formulations by adding inert carriers, solvents, surface active agents, deodorants etc. These formulations are packed for retail sale and bought by farmers. Market segmentation by type of agrochemicals is depicted in Figure 7.

Figure 7: Agrochemical Market segmentation by Pesticides



Source: Ministry of Chemical & Petrochemical Statistics

Industry is dominated by insecticides accounting for 60% of overall demand. Paddy accounts for the maximum (26%-28%) share of pesticide consumption followed by cotton (18%-20%). Andhra Pradesh is leading consumer of agrochemicals with share of 24%. Eight states including Andhra Pradesh, Maharashtra, Punjab, Madhya Pradesh, Chhattisgarh, Gujarat, Tamil Nadu and Haryana account for more than 70% usage of agrochemicals in India.

Agrochemicals are broadly classified into five types:

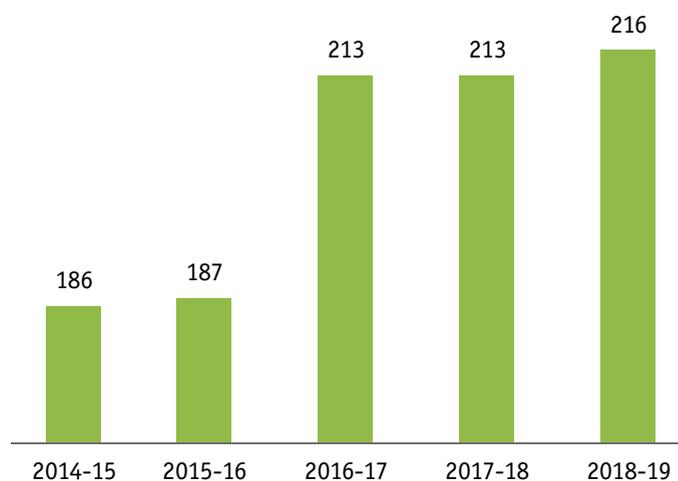
- Insecticides:
 - Insecticides provide protection to the crops from insects by either killing them or by preventing their attack.
 - Insecticides can be further classified based on their mode of action:
 - Contact insecticides: These kill insects on direct contact and leave minimum residual activity, hence causing minimal environmental damage.
 - Systemic insecticides: These are absorbed by the plant tissues and destroy insects when they feed on the plant. These are usually associated with long term residual activity.
- Fungicides:
 - Fungicides comprises only 18% of total pesticides market share with its application in fruits, vegetables and rice. Fungicides play important role to reduce post-harvest losses in fruits and vegetables.
 - Fungicides are used to control diseases on crops and are used to protect the crops from the attack of fungi. Fungicides are of two types – protectant and eradicant.
 - Protectant prevent or inhibit fungal growth and eradicant kill the disease on application which in turn improves productivity, reduces blemishes on crop and improves storage life.

- **Herbicides:**
 - Herbicides also called as weedicides are used to kill undesirable plants.
 - Herbicides are the fastest growing pesticides segment and comprises 16% market share.
 - Herbicides are majorly used in rice and wheat crops due to non-availability of cheap labour. Herbicides have seasonal demand due to the fact that weeds flourish in damp, warm weather and die in cold spells.
 - Herbicides are of 2 types as per their mode of action:
 - Selective herbicides kill specific plants, leaving the desired crop unharmed, while non-selective herbicides are used for widespread clearance of ground and are used to control weeds before crop planting.
 - Herbicides are of 3 types based upon their use:
 - Pre-Emergence: Used before sowing of the crop.
 - Post-Emergence: Used after emergence of the weeds.
 - Early Post-Emergence: Used immediately after sowing.

- **Bio-pesticides:**
 - Bio-pesticides are the new age crop protection product manufactured from natural substances like plants, animal waste, bacteria and minerals.
 - Bio-pesticides are eco-friendly, easy to use but currently have a small segment, however, the bio-pesticide market will have higher growth potential in the future owing to government support and increasing awareness about environment friendly pesticides.

- **Others:**
 - Other agrochemicals mainly include Fumigants, Bio-stimulants, nematocides and Rodenticides which protect the crops from pest attacks during crop storage.

Figure 8: Pesticides* Production (000' Metric Tonnes)



Source: CMIE *Technical grades

3.2 Supply and Demand Scenario

The current use of agrochemicals in the Indian market is very low and is 0.27 kg per hectare which is far less viz a viz developed countries like United States where it is 4.58 kg per hectare. Low consumption is a likely reason for the low yield per hectare of agricultural produce in India.

Production of agrochemicals has grown at CAGR 3.8% during FY15-19. Despite the sizable growth of the industry, low capacity utilization, high inventory (owing to seasonal & irregular demand on account of monsoons) and long credit periods to farmers remain key concerns, making operations 'working capital' intensive.

3.3 Capacity addition

Indian pesticides industry has a strong capacity base and it is expected to reach 14,93,300 tonnes by 2022. Owing to seasonal domestic demand, industries are focusing on exports having huge potential due to India's capability in low cost manufacturing, availability of technically trained manpower, better price realization globally and strong presence in generic pesticide manufacturing. However, domestic consumption of pesticides is likely to increase due to increasing awareness among farmers and government support.

China's environmental clampdown will reduce the number of local chemical enterprises from 6884 to no more than 2000 by the year 2020 and to further reduce to only 1000 by 2022. This indicates that China's chemical installed capacity will fall sharply. Hence, agrochemical companies in India are expected to effectively increase the capacity utilisation in India.

Table 2: Capacity Addition in Agrochemical Industry

	Capacity addition ('000 tonnes)	Total capacity ('000 tonnes)
2013-14	20.6	1,388.20
2014-15	16	1,404.20
2015-16	11.1	1,415.30
2016-17	0	1,415.30
2017-18	3.7	1,419.00
2018-19	22.7	1,441.70
2019-20E	40.9	1,482.50
2020-21E	10.8	1,493.30
2021-22E	0	1,493.30

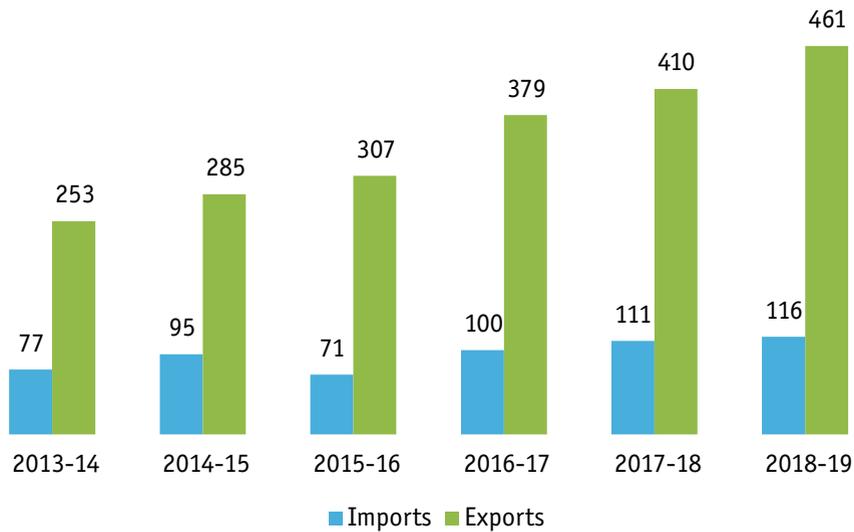
Source: MM Research



3.4 Agrochemical Trade

Overall exports have grown at CAGR 12.77% from FY 2015-19, while imports have grown at CAGR 5.12%.

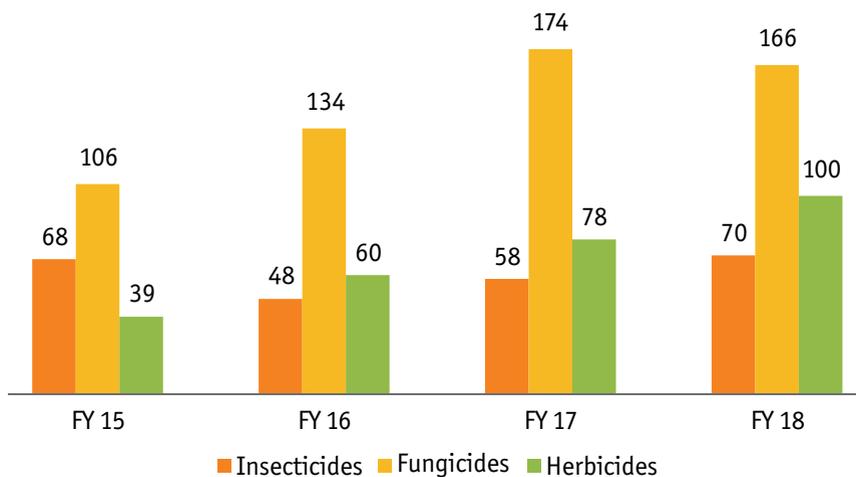
Figure 9: Agrochemical Trade (000' Metric Tonnes)



Source: CMIE

Exports are dominated by fungicides and herbicides segments while imports are majorly technical raw material. Indian agrochemicals imports are mainly from China (>50%), USA, Germany and Israel while Latin America, North America, Europe and Asia have been top export markets for the Indian agrochemical industry with 51% share of total export in FY 19. Around 50% of the demand for Agrochemical products comes from domestic consumers while the rest goes towards exports.

Figure 10: Exports of Key Agrochemicals (000' Metric Tonnes)



Source: CMIE

Exports for Fungicides and Herbicides have grown at a CAGR of 16.12% and 36.87% during FY15-18 respectively.

3.5 Investments

100% foreign direct investment (FDI) in agriculture is allowed by the central government via an automatic route in the following activities related to agriculture, subject to certain conditions specified in the FDI Policy:

- Floriculture, horticulture and apiculture
- Development and production of seeds and planting material
- Animal husbandry (including breeding of dogs), pisciculture and aquaculture; and certain other specified services

Agrochemical industry in India has been a favoured candidate for investments in the recent years with established players growing due to favourable market conditions and new players coming in to tap into the large domestic and global market.

Table 3: Investment Trends in Pesticides Industry

	Project Announced (INR Million)	Project Completed (INR Million)	Total Investment (INR Million)
2011-12	4,626	7,600	36,010
2012-13	2,750	1,250	37,735
2013-14	1,914	5,572	34,062
2014-15	5,351	1,960	13,371
2015-16	15,166	500	28,077
2016-17	10,796	-	61,255
2017-18	10,386	350	69,497
2018-19	7,218	1,520	73,335
2019-20E	-	700	-
2020-21E	-	1,270	-

Source: MM Research

3.6 Synergies from Mergers & Acquisition in Agrochemical Industry

In the past few years a number of agrochemical companies in India as well as international markets have acquired or merged their business operations. Key synergies from Mergers and Acquisition which will help growth of India agrochemical industry are:

- Shift from Agro inputs to Agro science companies providing end to end solutions to farmers.
- Reduce the R&D cost and development time.
- Enhance capability and efficiency in R&D process.
- Innovative and differentiated product portfolios covering entire crop value chain from planting to post-harvest.

Industry Problems and Key Suggestions for Government



- Registration Process of New molecule:
 - Development of new molecule has huge R&D and time costs, followed by final registration process which has an extremely slow pace.
 - Intervention is needed from government and regulatory authorities to streamline the registration process and further registration should be granted by a reasonable time-line of one year.
- Increasing Raw Material Cost:
 - Raw material as percentage of sale for top 5 Indian pesticides manufacturer is 47%. India imports nearly 50% of its technical grades requirement from China which fulfils 90% of the world's technical requirement.
 - Increasing raw material cost pressures due to macro-economic factors followed by high inventory due to sessional demand is reducing margins.
 - Government should focus on creation of clusters areas for the chemical industry manufacturing technical grade raw materials under Make in India programme.
- Absence of Contract Manufacturing:
 - With huge R&D cost followed by high development time required for new molecule, Contract Manufacturing can help agrochemical companies to outsource various aspects of the business, which can help with scalability and allow the major companies to focus on molecule discovery and molecule marketing.
- Safety and Handling of Pesticides:
 - Poor handling of pesticides during production by some local companies and consumption by untrained farmers/ labourers causes health issue to framers and other stakeholders who are exposed to the process.

- High Air & Water pollution treatment cost:
 - Agrochemical is considered a polluting industry hence industries need to comply stringently with norms laid out by National Green Tribunal (NGT) for effluent disposal and generation, environmental protection norms which increase the cost of treatment and further impact the low cost value of agrochemical production.
- Non-Favourable perception for use of Agrochemical spread by few NGOs
 - Lack of adequate training on optimum use of pesticides by group of farmers
 - Lack of experience for use of agrochemical in farms

4.1 Proliferation of Spurious Crop Protection Chemicals and Companies:

Non-genuine Pesticides are Pseudo Biological products laced with agrochemicals. These products are counterfeit, spurious, adulterated, sub-standard or illegally imported, which do more harm to the harvest, soil and the environment than to the pests. Primary reasons for consumption of spurious pesticides are:

- Illegal imports of technical grade chemicals having no Central Insecticides Board (CIB) and Registration Committee (RC) registration which further has led to the formulation of non-genuine pesticides locally.
- Selling insecticides in the name of 'Bio-fertilizer, Bio-stimulants to avoid rigorous registration procedure.
- Lack of awareness among group of farmers who are being cheated by manufacturers/ dealers of spurious chemical pesticides in the name of bio-products / pesticides.
- Lack of transparency in sampling process.

Increase in consumption of spurious pesticides needs a serious intervention from government and regulatory authorities to further arrest the proliferation of both non-genuine products and companies.

4.1.1 Key Suggestions by Industry

- Developing capabilities of government pesticides testing laboratories.
- Improving sampling process in such a way that the non-genuine pesticide manufacturers come into the net.
- Government should consider and review companies violating Insecticides Act & Rules, concern government analysts/inspectors and fix their responsibility.
- Strengthen the registration norms for Bio-pesticides:
 - Government should verify the status for already registered bio pesticides and also analyse the manufacturing capabilities before giving registration to new bio pesticides since a lot of illegal insecticides are sold in the name of bio pesticides.
- Stringent actions should be taken by government on companies not sharing import-export data as per Central Insecticides Board and Registration Committee norms.
- Strengthen review process of chemical imports from China and other countries.

Key Opportunities and Demand Drivers for Agrochemical Industry



- **Increasing Food Demand:**
 - With 1.7 Billion population by 2050, Indian food grain demand is estimated at 355 Million tonnes by 2030. Taking into account reducing arable land, small land holdings and low consumption of pesticides per hectare, increasing productivity of farming is only way out in increasing outputs which can be achieved through optimum usage of farm productivity-enhancing inputs like agrochemicals.
- **Increasing demand of Horticulture & Floriculture:**

Fruits and vegetables account for nearly 90% of total horticulture production in the country. Due to rapid urbanization and shift towards nutritious and healthy diet demand for fruits & vegetables is likely to increase by 141% from 268 million tonnes to 647 million tonnes in 2050. Hence, in order to reduce post-harvest loss in fruits & vegetables demand for fungicides will increase.
- **Off Patent Molecules:**
 - Pesticides worth USD\$ 4.1 Billion are expected to go off-patent by 2020, This provides significant export opportunities for Indian companies to develop generic molecules.
 - Further, Chinese government’s clampdown on environmentally polluting industries will also open opportunities for Indian manufacturers in form of off patent molecules to effectively increase exports from India.
- **Increasing Export Potential:**
 - Government has set Agricultural export policy and agri exports to USD\$ 60 billion by 2022.
 - Government is targeting cluster-based developments which will boost competitiveness of exports and domestic sales by reducing logistics cost.

- Government Budgetary and Policy Support:
 - Growing institutional credit to provide credit facilities to farmers in the rural areas are increasing continuously. Way forward increasing availability and low interest rates of farm loans are expected to encourage farmers to use more pesticides in order to improve crop yields.
 - Increasing minimum selling price
 - Government's focus on water management and rain water harvesting
 - Enhancing exports of rice and wheat.
 - Focus on National mission on Food processing
 - Agro Market infrastructure fund (corpus of INR 2000 crore) for setting up, developing and upgrading agricultural marketing infrastructure in 22,000 Grameen Agriculture Markets and 585 APMCs.
- Opportunities in Genetically Modified (GM) seeds:
 - GM of seeds is a transgenetic techniques have the potential to reduce the pesticide usage and increase productivity by introducing pest resistance traits in high yielding varieties.
 - Cotton is the only GM crop currently approved for cultivation by the Indian government. Consumption of insecticides for cotton has reduced to 50% from 63% after introduction of BT cotton. GM seeds gives farmers high monetary benefits per hectare due to lower labour costs and improved yields.
 - Agrochemical companies can look at the untapped potential in GM seeds segments to further their impact on the agricultural yield of farmers.
- Increase usage of Bio-pesticides:
 - Globally, the bio-pesticides market is growing at 10-15% while in India bio-pesticides segment constitute only 3% of Indian crop protection market.
 - However, increasing awareness for eco-friendly approach, use of integrated pest management (IPM) method for crop protection there is significant opportunity for growth of bio pesticides in agrochemical industry.

Pesticides Management Bill 2017



In order to regulate the import, manufacture sale, transport, distribution and use of insecticides a comprehensive Insecticides Act, 1971 was brought into effect. However due to the alarming rate of pesticides related deaths by spraying of pesticides on the fields and other issues again brought the attention towards pesticide regulation. Thus, to replace the Insecticides Act, 1971 and a new legislation was proposed in the Pesticides Management Bill, 2008.

After the demand for certain changes and suggestions made by the standing committee of the Parliament came a new Pesticides Management Bill, 2017 which was passed for comments on 19th February 2018.

The aim of the Pesticides Management Bill, 2017 is to mainly to regulate the import, manufacture, export, storage, sale, transport, distribution, quality and use of pesticides, control pests, ensure availability of quality pesticides, minimize the contamination of agricultural commodities by pesticide residues, create awareness among users regarding safe and judicious use of pesticides. The PMB will bring material changes to the workings of the industry, its cost structure, reach to market and the nation's food security.

Table 4: Key Imperatives on PMB by Industry

Issue	Impact	Suggestions
Present Pesticides bill suggest Efficacy, Chemistry, Toxicology, Packaging and other data requirement for pesticides being exported.	Regulation on Exports defeats Agri Export policy of government and further the objective of "Make in India" and "Ease of doing business"	The term 'Export' should be deleted from PMB and export should be continued to be regulated as per present provisions of the Insecticides Act.
Technical grade pesticide are exempted from being substandard	-	Substandard Technical grade pesticides should also be brought into the ambit of punishment
Private laboratory are accredited with GLP, Government laboratory are accredited with NABL.	No alignment with global standards since NABL and GLP cannot be compared in relation to quality control parameters.	Private and Government Laboratory both should have GLP accreditation

Issue	Impact	Suggestions
Prohibition of sale for Pesticides for Public safety is currently 8 months (6+2)	-	It should be curtailed to 2 (1+1) months.
Registration committee has been provided with excessive, subjective and overboard powers.	RC decided to discontinue the pesticides with a view that safer alternatives are available, while safer alternatives has not been defined.	Secretary of CPB and RC should not be the member of RC because it brings about conflict of interest

Government should also add representative of industry in Central Insecticides Board and Registration Committee to register the industry problems and find sustainable solutions together. Further, pesticides management bill should give provision to boost post-harvest and seed treatment technology.

National Mission for Sustainable Agriculture



Government's continued efforts at protecting, supporting and promoting agriculture and better agro practices have a larger impact on the climate change resilience of the country and is a key link for a sustainable future. This is recognised and acted upon when the National Action Plan on Climate Change was published in 2008. The plan effectively pull together various government plans on water, renewable energy, energy efficiency, agriculture and others which earlier operated as standalone efforts. It elaborates on a novel approach to reduce stress of climate change and uses the poverty-growth linkage to highlight the issue at hand. Emphasising the priority of high economic growth rates to effect raised living standards, the plan "identifies measures that promote development objectives while also yielding co-benefits for addressing climate change effectively."

The core of the Action plan are eight missions addressing areas for achieving the broad goals of adaptation and mitigation. Among the eight, National Mission for Sustainable Agriculture focusses on capacity building and augmentation of the sector and its stakeholders.

- Major objectives of the scheme:
 - Making agriculture more productive, sustainable, remunerative and climate resilient by promoting location specific Integrated/ Composite Farming systems.
 - Conserve natural resources through appropriate soil and moisture conservation measures and comprehensive soil health management practices
 - Optimise utilisation of water resources through water management for achieving "More crop per Drop"
- Adaption measures laid out by the mission focus on 10 key dimensions encompassing the issues which plague Indian agriculture.
- The mission will derive benefits from converging, consolidating and subsuming all ongoing as well as newly proposed activities/programmes related to sustainable agriculture.

Figure 11: Key Dimensions for Indian Agriculture



Source: National Mission for Sustainable Agriculture

The Way Forward



Sustainable farming implies quality output with adequate quantity of produce and livelihood for farmer. To achieve sustainable farming, there are some imperatives will all related stakeholders need to focus on.

Key Imperatives for Government:

- Import Substitution:
 - India’s raw material imports from china for agrochemicals has grown at CAGR 32% during FY14-18.
 - Government should focus on creation of agrochemical parks with common utilities which includes effluent treatment plant, waste disposal infrastructure, dedicated trucking hub, tank-farms and warehousing with favourable environmental, pollution and labour norms which would enhance country capabilities to prepare technical grade pesticides.
- Warehouse based post-harvest system on credit:
 - Create storage and handling facilities which enable farmers to off load their produce in a staggered manner, preventing spoilage, and also allow for credit period to realise better prices post harvesting.
- Innovation fund for Agri sector/Agritech
 - Government should establish Innovation funds which will support agri-tech start-ups and industry players in building proof of concepts (PoCs) for technologies across agri value chain. This support will absorb high costs of R&D and expedite realisable profits since development of molecules and its adaptability to real life challenges takes a long period.
- Leveraging PPP mode
 - Focussing on development of post-harvest infrastructure for storage, processing and access to market.
 - Outreach and awareness programmes can be driven via a PPP model which will allow for the government and industry to work together for better trainings and knowledge transfer.

- Research of New Business Models:
 - Zero Budget Farming program of government should be reviewed and taken up through countrywide coordinated research project trials as step to prove its commercial viability and its impact on livelihood of the farmers.
- Focus on seed treatment
 - For increasing the production and productivity, use of hybrid and certified seeds is very important. Farmers need to be made aware of the benefits of major research for hybrid and new varieties of seed carried out by the private sector including multi-national companies.
- Rationalization in GST rate:
 - Currently Agrochemicals are taxed at 18% GST which can be reduced to lower slabs.
- Strategy for farmer produce organisation (FPO):
 - Putting out a well-structured strategy for an effective growth of the movement is of utmost importance for a strong push to Farmer Producer Organisations which will reward the farmers in terms of an adequate remuneration for their produce.
- Post-Harvest agrochemical regulations:
 - Ease of regulatory oversight for development and application of those post-harvest agrochemicals which are in use and are acceptable in other countries for agricultural commodities imported by India.

Key Imperatives for Farmers:

- Increasing oilseeds production using Agrochemicals:
 - Government is targeting oil seed production of 45 million tonnes by 2022. Domestic production of edible oil haven't kept pace with the growing demand, necessitating huge imports. Increasing production due to use of agrochemicals in oilseed farming will allow farmers to reap monetary benefits of domestic demand.
- Invasive species:
 - An invasive species is a species that is not native to a specific location (an introduced species), and that has a tendency to spread to a degree believed to cause damage to the environment, human economy or human health.
 - Management of these species can be carried out effectively by a farmer to maximize productivity by application of appropriate agrochemicals.
- Post-harvest loss reduction using Agrochemicals:
 - Enhancing post-harvest shelf life of produce is crucial for sustainable livelihood of farmers which can be achieved through the use of agrochemicals in processing.

Key Imperatives for Agrochemical industry:

- Agriculture Research:
 - Focus on research specially in the domains of insects, weeds and crop diseases.
 - Focus on generic molecule discovery in both agro chemicals and bio pesticides segment
 - Focus on developing bio-degradable molecules.
 - Focus on balanced use of fertilizers including micro nutrients.
 - Focus on using new technology on bio-fertilizers and bio-stimulants.
- Training dealers:
 - Farmers look upon to dealers for their technology requirement and being the first contact for purchase of their requirements of Agri Inputs, they should be adequately trained by the industry to educate and assist the farmers in proper and adequate usage.
 - Industry should ensure the compliance of their dealers with the notifications released by the government regarding licenses and registration.
- Focus on collaborative projects with top academics institutes in India.
- Technology Transfer for Indigenous Production:
 - Due to increase capabilities through technology transfer from foreign partners, Indian manufacturers will be able to enhance indigenous production. It will allow Indian manufacturers to take large share of value and due to high acceptability of Indian indigenous products in global markets will boost exports.

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A non-government, not-for-profit organisation, FICCI is the voice of India's business and industry. From influencing policy to encouraging debate, engaging with policy makers 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 to over 2,50,000 companies.

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