

Indian Agrochemicals Industry: Insights and Outlook

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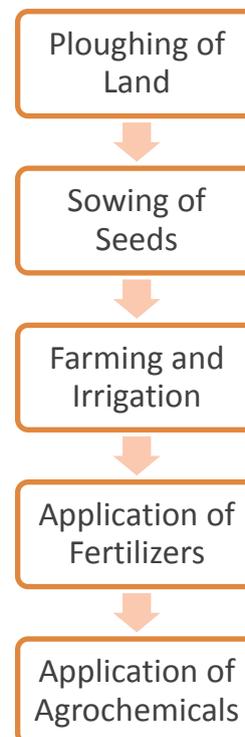
Overview

India is an agrarian country, where more than 50% people are dependent on agriculture for their livelihood and is the largest producer of spices, pulses, milk, tea, cashew and jute & the 2nd largest producer of wheat, rice, fruits and vegetables, sugarcane, cotton and oilseeds.

Agrochemicals (Crop protection products/pesticides) are designed to protect crops from insects, diseases and weeds. They do so by controlling pests that infect, consume or damage the crops. Uncontrolled pests significantly reduce the quantity and quality of food production. It is estimated that annual crop losses could double without the use of crop protection products. Food crops must compete with 30,000 species of weeds, 3,000 species of nematodes and 10,000 species of plant-eating insects. Agrochemicals are the last and one of the key inputs in agriculture for crop protection and better yield.

Currently, India is the world's 4th largest producer of agrochemicals after United States, Japan and China and has emerged as the 13th largest exporter of pesticides globally.

Chart: Rationale for Agrochemical use



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Source: Industry

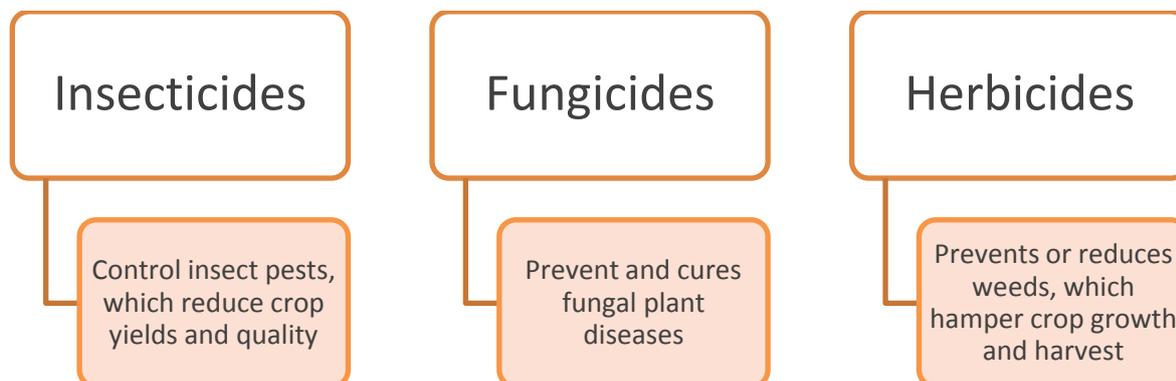
The agrochemicals are diluted in recommended doses and applied on seeds, soil, irrigation water and crops to prevent the damages from pests, weeds and diseases. Therefore to improve crop performance,

yield or to control pests, agrochemicals is the most relevant and reliable solution in the current context especially on .

Segmentation of the Indian Agrochemical market

Agrochemicals are broadly classified as insecticides, herbicides, fungicides, rodenticides etc. depending on the type of pest they control.

Chart: Types of key Agrochemicals and its primary use



Source: Industry

Agrochemicals can be broadly classified into five types:

1. **Insecticides:** Insecticides provide protection to the crops from the insects by either killing them or by preventing their attack. They help in controlling the pest population below a desired threshold level. They can be further classified based on their mode of action:
 - Contact insecticides: These kill insects on direct contact and leave no 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.

Tropical climatic conditions and a high production of paddy, cotton, sugarcane and other cereals in India has catalysed the consumption of insecticides.

2. **Fungicides:** Fungi are the most widespread cause of crop loss. Fungicides are used to control disease attacks on crops and are used to protect the crops from the attack of fungi. There are of two types – protectants and eradicates. Protectants prevent or inhibit fungal growth and eradicates kill the pests on application. This in turn improves productivity, reduces blemishes on crop (thus enhancing market value of the crop) and improves storage life and quality of harvested crop. Fungicides find application in fruits, vegetables and rice.

The key growth drivers for fungicides have been a shift in agriculture from cash crops to fruits and vegetables and the government support for exports of fruits and vegetables.

3. **Herbicides:** Herbicides also called as weedicides are used to kill undesirable plants. Their main competition is cheap labour which is employed to manually pull out weeds. Sales are seasonal, owing to the fact that weeds flourish in damp, warm weather and die in cold spells. Herbicides can be of two types - selective and non-selective. 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. As the weeds grow in damp and warm weather and die in cold seasons, the sale of herbicides is seasonal. Rice and wheat crops are the major application areas for herbicides.

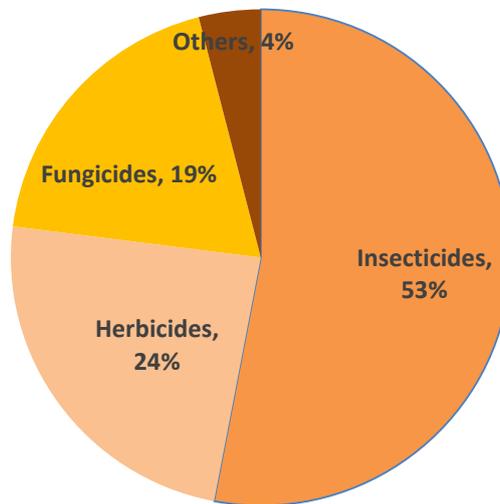
Increasing labour costs and labour shortage are key growth drivers for herbicides.

4. **Bio-pesticides:** Bio-pesticides are the new age crop protection product manufactured from natural substances like plants, animals, bacteria and certain minerals. They are eco-friendly, easy to use; require lower dosage amounts for same performance as compared to chemical based pesticides. Currently a small segment, the bio-pesticide market is expected to grow in the future owing to government support and increasing awareness about use of non-toxic, environment friendly pesticides.
5. **Others:** Fumigants and rodenticides are the chemicals which protect the crops from pest attacks during crop storage. Plant growth regulators help in controlling or modifying the plant growth process and are usually used in cotton, rice and fruits.

Insecticides dominate the Indian crop protection market and form almost 53% of the domestic agrochemicals market. Herbicides are, however, emerging as the fastest growing segment amongst the agrochemicals.

Paddy accounts for the maximum share of agrochemicals consumption around (26%-28%) followed by cotton (18% -20%). The eight states including Andhra Pradesh, Maharashtra, Punjab, Madhya Pradesh, Chhattisgarh, Gujarat, Tamil Nadu and Haryana account for usage of >70% of the agrochemicals used in India. Andhra Pradesh is a leading consumer of crop protection chemicals with a market share of 24%.

Chart: Domestic Market segmentation by type of pesticides



Source: FCCI

Note: Others include Bio-pesticides, Plant growth regulators, Nematocides, Rodenticides, Fumigants etc. Rodenticides and plant growth regulators are the stars of this segment.

Production

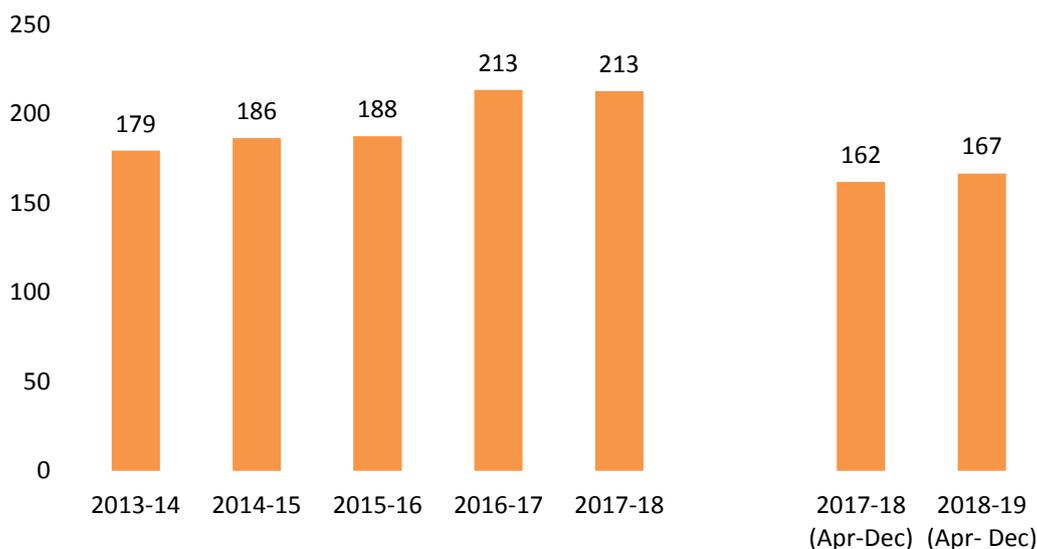
As per the latest annual report (2017-18) released by the Department of Chemicals and Petrochemicals the **production capacity of agrochemical players in India is around 292 (000' MT).**

Note: Companies are not required to mention segment wise production capacity i.e. production capacity of insecticides, fungicides, herbicides, rodenticides. Hence the production numbers will not match the export and import numbers.

A pesticide has two main components, namely, the active ingredient(s) and the inert ingredient(s). The active ingredient is the one that gives a pesticide its pesticidal action. It's called the technical grade of a pesticide. The active ingredient is the technical grade of the pure pesticide. A pesticide is rarely applied in its pure form. It is usually formulated by adding inert ingredients that improve storage, handling, application, effectiveness or safety. The inert ingredient does not have any pesticidal action.

Pesticides are first manufactured as technical grade product, which has 85% or more of the active chemical ingredients as it has a higher commercial purity. The active ingredients are then mixed with inert ingredients (solvents, adjuvant and fillers) to achieve the desired formulation. The active ingredient kills the pest whereas the inert ingredient facilitates ease of handling, spraying and coating on plants.

Chart: Production of Agrochemicals* (000' Tonnes)



Source: CMIE

*Technical grade (approximately 43 grades)

Production of agrochemicals has grown at a CAGR of 4.3% during FY14-18. In the current financial year, production has risen by 2.9%. To feed a rising population, food production needs to be increased, creating a case for the need for more agro-inputs for better production and yield of crops. With the growth of population in India, there has been a subsequent increase in the production of crops. Food grain production has grown at a CAGR of 1.8% and horticulture production has grown at a CAGR of 3% during FY 14-18.

Production of agrochemical has also increased in-lieu of the new product additions which are formulated to combat the pest attacks.

Labour shortage, rising labour costs and growth in GM crops has led to growth in the use of herbicides whereas on the other hand the fungicide industry in India has grown due to the growth in Indian horticulture industry.

Trade Data

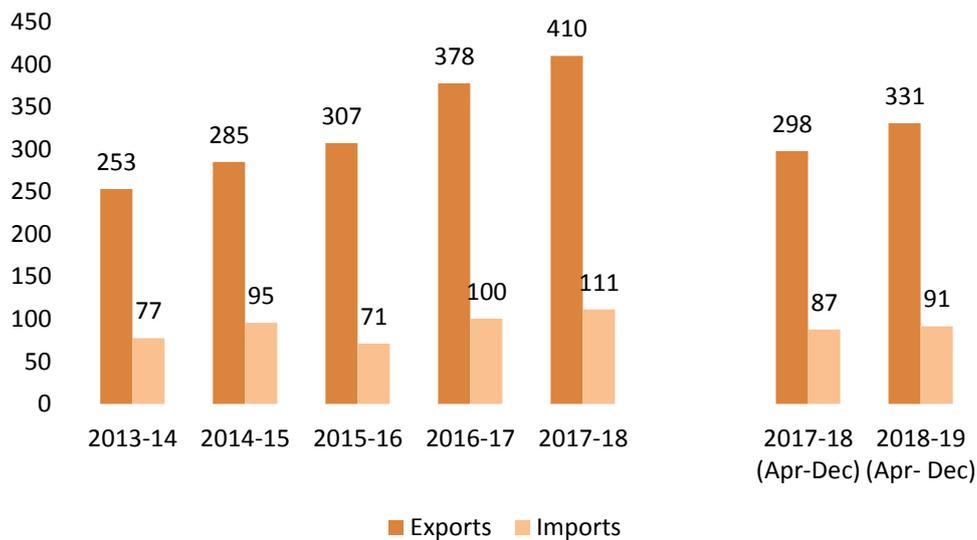
India is a net exporter of agrochemicals and is 13th largest exporter of pesticides and disinfectants in the world.

Agrochemical exports have increased on account of India’s capability in low cost manufacturing, availability of technically trained manpower, seasonal domestic demand, overcapacity, better price realization globally and strong presence in generic pesticide manufacturing.

Due to the reasons mentioned above, India offers good scope for contract manufacturing as well and is also emerging as a destination for undertaking contract research. New technical applications have also increased the export capacity of Indian agrochemical manufacturers.

India imports agrochemicals mainly from China (55%), USA (11%), Germany (6%) and Israel (5%). China also sources India most of the raw materials needed to manufacture agrochemicals.

Chart: Exports and Imports of Agrochemicals* (000’ Tonnes)



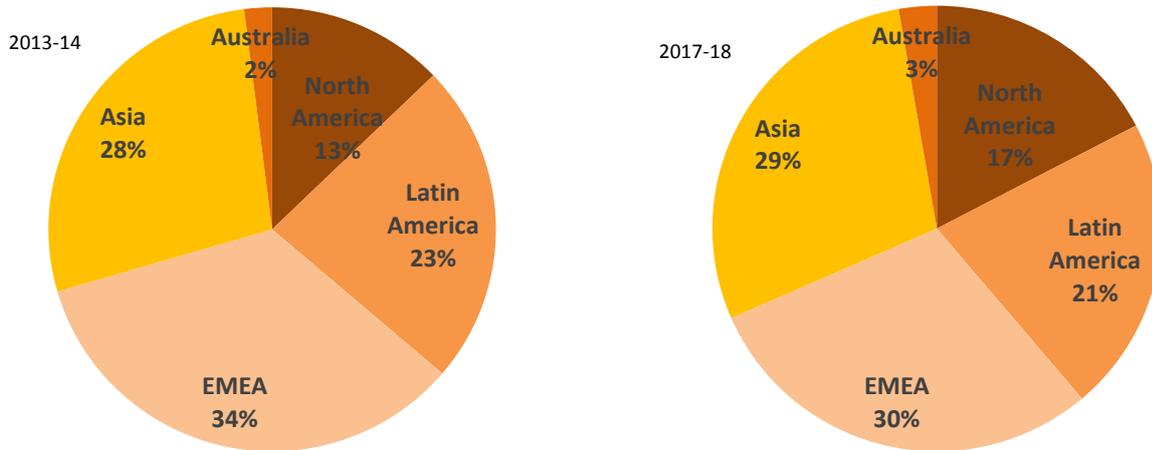
Source: Ministry of Commerce

* (Insecticides, Rodenticides, Fungicides, Herbicides, Anti-sprouting products and plant growth regulators, disinfectants)

Agrochemical exports have increased by 12.8% CAGR during FY14-18. In the current financial year agrochemical exports have increased by 11.0% whereas imports have also increased by 4.4% as compared with the corresponding cumulative period in the previous financial year. Most of the exports are of off-patent products.

Over the years there has been a steady increase of fungicide and herbicide exports which has led to the overall increase in agrochemical exports.

Chart: Region-wise share of exports of India

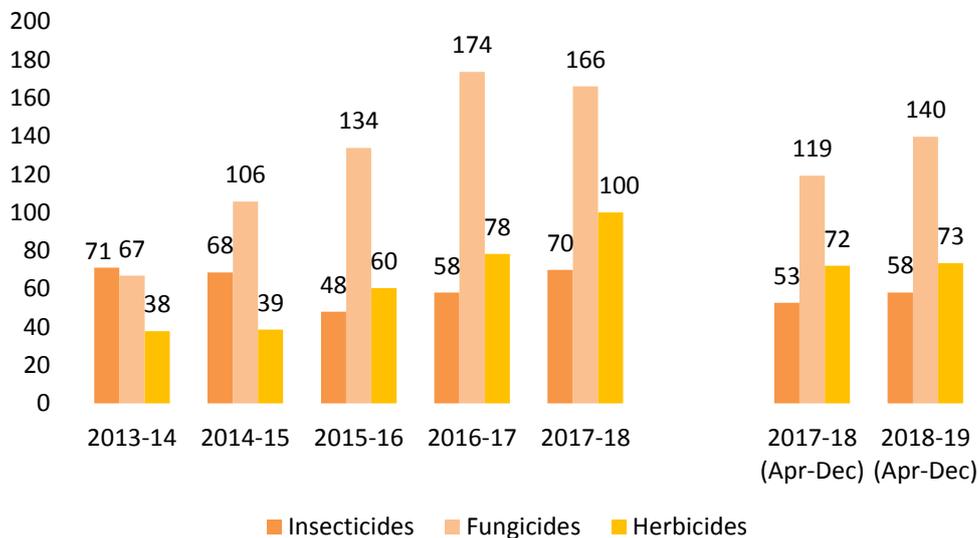


Source: Ministry of Commerce, CARE Ratings

EMEA- Europe, Middle East and Africa

Latin America, North America, Europe and Asia have emerged to be important markets for the Indian agrochemical industry. Share of exports towards North America have increased significantly from it being 13% during FY14 to 17% during FY18.

Chart: Exports of Key Agrochemicals (000' Tonnes)



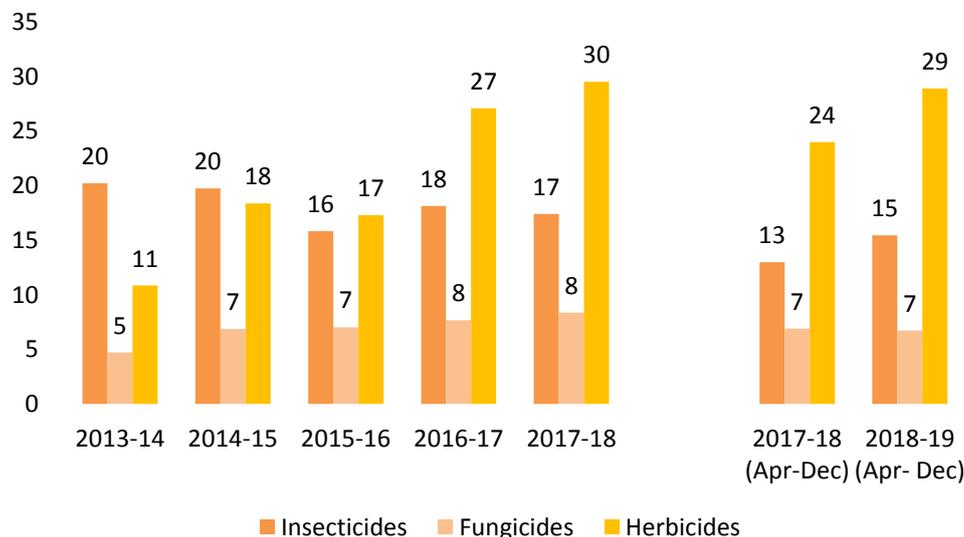
Source: Ministry of Commerce,

The agrochemical export market has augmented by the growth in the fungicide and herbicide segment. Fungicide and herbicide exports have grown at a CAGR of 25.5% and 27.5% during FY14-18 respectively. Insecticide exports have fallen by 0.4% during the same time period.

Favourable climatic conditions in North American and European markets have driven the herbicide exports. Insecticide exports have declined in developed markets following the increased use of GM crops.

In the current financial year there has been an increase in exports of insecticides, fungicides and herbicides by 10.2%, 17.2% and 1.8% respectively.

Chart: Imports of Key Agrochemicals (000' Tonnes)



Source: Ministry of Commerce,

Fungicide and herbicide imports have grown at a CAGR of 15.5% and 28.4% during FY14-18 respectively. Insecticide imports have fallen by 3.7% during the same time period.

In the current financial year there has been an increase in exports of insecticides and herbicides by 18.9% and 20.5% respectively. Fungicide imports have fallen by 2.6%.

Growth Drivers

To achieve higher crop yields, crop protection chemicals are expected to play a significant role. Simultaneously, it will also be critical to use them judiciously to maximize benefits and minimize the impact on non-targeted species.

Budgetary support: The Government of India has continuously been providing budgetary support towards reviving the rural economy and increase the farmers’ income. A number of measures and initiatives have been proposed and announced during the FY20 budget for the improvement of the agriculture sector and the rural economy.

Going forward, it is expected that the government will be increasing the level of agri-credit, to be provided, corroborating it to be beneficial for agri and agri-allied manufacturers. Availability of rural bank credit can increase the demand for pesticides.

Off Patent Molecules: The share of post patent products as compared to patent products and proprietary off-patent products has been increasing over the years. Agrochemicals worth USD 4.1 billion are expected to go off-patent by 2020. This provides significant export opportunities for Indian companies which have expertise in generic segment.

Increase in demand for food grains: India has 17% of the world's population. An increasing population, need for food security and high emphasis on achieving food grain self-sufficiency is expected to drive the demand for crop protection chemicals.

Growth of horticulture: Fruits and vegetables account for nearly 90% of total horticulture production in the country. India is now the 2nd largest producer of fruits and vegetables in the world and is the leader in several horticultural crops, namely mango, banana, papaya, cashew-nuts, areca nut, potato and okra.

Growth in horticulture and floriculture industries is to result in increase in demand for agrochemicals, especially fungicides. As India's diverse climate ensures production of all varieties of fresh fruits & vegetables, the trend has slowly shifted from production of food grains to horticulture, with production of horticulture consistently exceeding the production of food grains.

Incidence of pest attacks: One of the major challenges to ensure food security and good crop yields is incidence of pests. On an average agro-pests are estimated to cause 15%–20% yield losses in principal major food and cash crops. Pest attacks across various stages of crop life-cycles are affecting farmers. Due to the hot humid climatic conditions prevalent in India, the number of pest attacks has been increasing.

Use of agrochemicals can help mitigate the pest problem and increase crop output by 25%-50%. So far, the presence of more than 40,000 different types of insects have been recorded in India and of these about 1,000 have been listed as potential pests of economic plants, 500 pests have caused serious damage at some time and 70 have been causing damage more often.

Changing climatic conditions: Erratic climatic conditions are impacting crop output. Farms need an array of inputs to protect crops from adverse climatic realities. Irregular monsoons coupled with lack of irrigation (60% of cultivable land is non-irrigated) results in low agricultural yield in India. Damp and warm weather conditions aid in breeding of weeds.

Limited farmland availability: Rapid urbanisation has had a detrimental impact on land availability. The pressure is therefore to increase yield per hectare which can be achieved through increased usage of farm productivity-enhancing inputs like agrochemicals.

Increasing awareness: Educating the farmers about advantages of agrochemicals and its safe usage, will lead to increase in demand. Companies are increasingly training farmers regarding the right use of agrochemicals in terms of quantity to be used, the right application methodology and appropriate chemicals to be used for identified pest problems.

Regulatory Overview

Pesticides if not used judiciously can be toxic and hazardous to mankind and the environment. The Government of India regulates the manufacture, sale, transport, export/import etc. of pesticides under the guidelines of the **Insecticides Act, 1968**. The Insecticide Act, 1968 is administered through Ministry of Agriculture, Department of Agriculture and Cooperation (DAC). The other vital issues of pesticides industry such as prevention of use of spurious pesticides, quality standards, testing, review of use of pesticides, to create awareness about judicious use of pesticides among the farmer community are also looked after by the DAC.

Central Insecticides Board and the Registration Committee are the agencies under the Department to regulate the manufacture, distribution, export, import, ban and usage of pesticides. Insecticide Act is enforced by the State

Governments. The Department of Chemicals and Petrochemicals plays the role of a facilitator for the growth of the Industry.

A few salient features of the act are as follows:

- As per this act, no pesticide is allowed for production/import without registration. Compulsory registration is needed for the product in the central level and licenses for manufacture, formulation and sale at the state level.
- Power to prohibit the import, manufacture and sale of pesticides and also confiscate the stocks.
- Classifications of misbranded insecticides which are divided into the following categories viz; (a) misbranded, (b) substandard, (c) spurious, and (d) duplicate. These classifications have been fixed according to the severity of the offence.
- For an offence deemed to be misbranded, there is provision for issuing administrative warning of the offence which may be compounded by imposing fine up to INR 2,000. An offence deemed to be sub-standard, shall be punishable for first offence with fine up to INR 5,000 and for subsequent offence with imprisonment for a term which may extend to 6 months or fine up to INR 10,000 or both.
- Similarly, for an offence deemed to be adulterated, shall be punishable with imprisonment for a term which may extend to 1 year or fine up to INR 20,000 or both for the first offence and for second and subsequent offences with imprisonment for a term which may extend to 2 years or a fine up to INR 50,000 or both.

Shortcomings

One of the key short-coming of this act is that it is mainly pertinent to insecticides as the name suggests and the powers invested in the state are quite negligible in comparison.

The act controls the import, manufacture, sale, transport, distribution and use of insecticides with a view to preventing risk to humans and animals, and for other matters connected therewith. Significantly, the legislation does not explicitly recognise environmental hazards of pesticides or the threat they pose to biodiversity.

Pesticide Management Bill, 2017

The Pesticide Management Bill aims to replace the current act governing the agrochemicals industry after being approved and authenticated. The draft bill was created in lieu of several pesticide-related deaths.

The aim of the Pesticides Management Bill, 2017 is to mainly

- Regulate the import, manufacture, export, storage, sale, transport, distribution, quality and use of pesticides;
- Control pests;
- Ensure availability of quality pesticides;
- Allow its use only after assessing its efficacy and safety;
- Minimize the contamination of agricultural commodities by pesticide residues;
- Create awareness among users regarding safe and judicious use of pesticides,
- To take necessary measures to continue, restrict or prohibit the use of pesticides with a view to prevent its risk on human beings, animals or environment.

As per the bill, any person, institution or agency shall register any pesticide at the Plant Quarantine and Pesticides Management Centre prior to production, synthesis, import, export, commercial use, storage, sale or distribution, transportation, packing or repacking and prohibits the same of pesticides which are not registered with the centre.

Only after the prescribed requirements are met, the centre shall register such pesticides and provide the certificate. If the person, institution or agency does not abide by the terms and conditions referred to in the certificate or if any registered pesticide appears to cause adverse effects on human and animal health, and the environment, the certificate may be suspended or cancelled at any time without assigning reasons whatsoever.

Highlights of the Bill

- The draft bill proposes an increase in penalties on sale of spurious, substandard and misbranded pesticides and gives state governments more power to deal with the issue and take action against them.
- The draft contains clauses relating to allowance of provisional registration of new pesticides in India in case of “national exigency” for a period of 2 years.
- The maximum punishment for violation (such as sale of prohibited or spurious pesticides) is a penalty of up to INR 50 lakh and up to 5 years imprisonment. Earlier, the punishment was limited to INR 2,000 and up to 3 years imprisonment.
- The draft provides for punishment to anyone who ‘uses’ a pesticide in contravention to the provisions of this Act.
- The proposed bill provides for paying of compensation to the affected farmers or users under the provisions of Consumer Protection Act, 1986.
- The bill contains detailed clauses for registration of new molecules.
- It has also tightened the guidelines for registration and licensing of new molecules.
- It includes a broader category of offences and provisions for paying compensation to the farmers.
- The state government has to report all cases of poisoning to the centre on a quarterly basis according to the draft.
- States can ban chemical pesticides for up to 6 months, unlike the current provision which allows ban for up to 2 months.

Global picture

Approximately 25% of the global crop output is lost due to attacks by pests, weeds and diseases and thus agrochemicals have an increasing role to play in enhancing crop productivity. United States, Japan and China are the top 3 producers of agrochemicals in the world and China is the world’s largest producer of agrochemical raw materials, supplying 90% of the world’s technical raw material requirements.

The global market for agrochemicals, used in both crop and non-crop situations, has increased by 4.1% to USD 64,038 million at the ex-manufacturer level.

Table: The Global Crop Protection Market (USD million)

Year	Crop Protection	Non Crop	Total Agrochemical
2013	54,075	6,512	60,587
2014	58,746	6,515	65,261
2015	56,160	6,882	63,042
2016	52,882	7,106	59,988
2017	54,219	7,311	61,530
2018(P)	56,500	7,538	64,038

Source: Agribusiness Intelligence

Based on this analysis, the global crop protection market is estimated to have increased by 4.2% to a total value of USD 56,500 million. during 2018.

Growth in the global crop protection market is due to the recovery in the Brazilian market (Latin American nations are key consumers of agrochemicals in the world), after its significant decline during CY16 and CY17. The excessive crop protection inventory issue has also been addressed. Increase in market value can also be attributed to the high level of prices (partly from supply shortages) prevailing in the markets. Environmental pressures (Operation Blue Sky) and consolidation in the Chinese industry had resulted in the rise in prices of crop protection chemicals. The US-China trade war was also responsible in the rise in prices, given the US had imposed tariffs on some Chinese chemical imports.

The global agrochemical industry introduced 8 new actives during CY18, the highest new product introductions since CY12;

- The pyropene insecticide afidopyropen (trademarked as Inscalis) from Meiji Seika Pharma and licensed to BASF;
- The triketone herbicide fenquinotrione from Kumiai; the insecticide flometoquin from MSK/Nippon Kayaku;
- The arylpicolinate herbicide florpyrauxifen-benzyl (marketed as Rinskor) from DowDuPont;
- The insecticide/acaricide fluxametamide (Gracia) from Nissan Chemical;
- The fungicide pyraziflumid from Nihon NohyakuThe herbicide tiafenacil from FarmHannong;
- The rice insecticide triflumezopyrim (trade marked as Pyraxalt), also from DowDuPont.

Table: Regional Market Performance 2018 (USD Million)

Region	2018 (P)	% Change (y-o-y)
NAFTA	11,105	3.2%
Latin America	13,425	6.0%
Europe	12,770	3.2%
APAC	17,050	4.6%
MEA	2,150	1.9%
Total	56,500	4.2%

Source: Agribusiness Intelligence

Hence, all regional markets are estimated to have increased with Latin America and Asia Pacific being most positive.

Consolidation in the Agrochemicals Industry

In the past few years a number of agrochemical companies in the international markets have acquired or merged their business operations in order to counter the fluctuations in currencies, crop prices and crude oil prices which had adversely affected the sales and profit margins. The combined entities are now dealing with the seeds business, R&D and agri – chemicals, a strategy aimed for the companies to move from pure agro-inputs to an agri-science company as they start addressing end to end needs of the farmer beyond agro-inputs.

Table: M&A of the top agrochemical players in the global markets

		Combined Entity	Year*
DuPont	Dow Chemical	DowDuPont	2017
ChemChina	Syngenta AG	ChemChina aquired Syngenta	2018
Bayer	Monsanto	In process	-
ChemChina	Sinochem	In process	-

Source: Industry

* Year the company was acquired or when the combined entity came into existence

The companies listed in the above table control 80% of the market share. The trigger for these companies to merge their business operations was to boost margins, lower the cost & development time, streamline the workflows and increase the efficiency of the R&D process.

Table: Notable M&A of the agrochemical players in the Indian markets over the years

Acquirer	Acquiree
UPL Corp	Arysta Life Science
UPL Crop	Advanta Seeds
UPL Crop	MTM Agrochemical UK
UPL Crop	Devrinol
UPL Crop	Reposo
UPL Crop	DVA Agro and SIB
Crystal Crop Protection	Syngenta India (3 Brands)
Bayer	Monsanto India
Sumitomo Chemicals India	Excel Crop Care

Source: Industry

Indian agrochemical companies are not far behind in terms of acquisitions. Indian agrochemical companies are also restoring to mergers and acquisition to increase their global presence. In order to build a strong export base, companies often set up marketing offices in association with domestic players in export geographies. Companies also look for strategic alliances with local companies to expand their marketing and distribution reach.

Following the acquisition of Arysta Life Science, UPL will be one of the world's largest global crop protection companies, with an innovative and differentiated product portfolio. The company will be able to offer a complete basket of solutions comprising of crop protection chemicals, bio-solutions and seeds covering the entire crop value chain from planting to post harvest. The acquisition will give UPL access to a variety of patented products through collaborations and partnerships as well as enhanced in-house R&D capabilities. UPL will have an integrated supply chain with a backward integrated manufacturing base in major markets and deep distribution capabilities across the globe to address needs of growers.

Crystal Crop Protection acquired 3 insecticide and fungicide brands from the Syngenta AG in order to enhance the company's product portfolio, especially across protection of pulses, cotton, rice, wheat, vegetable and grapes in India. The company has acquired Proclaim, Tilt and Blue Copper brands from Syngenta.

Alternative Crop Protection Techniques

In this section we will be discussing alternative methods which are being deployed instead of relying on agrochemicals, fully. Use of GM crops, bio-pesticides and IPM discourage/limits the use of agrochemicals in crop protection.

Integrated Pest Management

Integrated Pest Management (IPM) is an eco-friendly approach which aims at keeping pest population at below economic threshold levels by employing all available alternate pest control methods and techniques such as cultural, mechanical and biological with emphasis on use of bio-pesticides and pesticides of plant-origin like neem formulations. The use of chemical pesticides is advised as a measure of last resort when pest population in the crop crosses economic threshold levels (ETL).

There are 4 key methods of IPM, several of these methods may be carried out concurrently or may be implemented at different times to achieve a truly integrated management approach.

- **Cultural Method:** The cultural method of IPM relates to controlling the environment to avert serious pest damage. The method depends on knowledge of both the plant's needs and its potential problems. This includes the techniques right from the sowing of the crop to harvesting. For example, spacing roses to enhance air circulation can reduce powdery mildew and black spot diseases.
- **Mechanical Method:** The mechanical method is a simple but tedious way of pest management and the most effective if implemented when pest population is low. Some examples for insect control include pinching leafrollers, washing aphids off leaves with a garden hose, pruning out tent caterpillars and fall webworms and various destructive barriers for slugs and weevils.
- **Biological Method:** The biological method of pest control is the use of living organisms, either native or introduced, to suppress pests below levels of serious economic or aesthetic damage. This method is considered one of the best methods.
- **Chemical Method:** The chemical method is the application of the chemical ingredients to the crop in order to destroy the pest. It is the philosophy of IPM practitioners to consider more selective materials like insecticidal soaps and botanically derived pesticides, such as neem seed extracts.

Advantages of IPM

- Reduces severity of pest infestations.
- Stable, reliable and quality yields.
- Improves consumer confidence in the quality of food and fibre products.
- Lower residual levels.
- Secures agricultural environment for future generations.
- Helps farmer control diseases, insects, etc. in a cost-effective, environmentally sound and socially acceptable way.

Disadvantages of IPM

- Cannot be performed on a large scale basis;
- Lack of training facilities and technical know-how

Bio-Pesticides

Bio-pesticides are a type of pesticide derived from natural resources such as animals, plants, minerals and micro-organisms such as bacteria and viruses.

Currently bio-pesticides constitute only 3% of Indian crop protection market; however there are significant growth opportunities for this product segment due to increasing concerns of safety and toxicity of pesticides, stringent regulations and government support.

Increasing awareness about the ill-effects of pesticides on human health has led to increase in the demand for bio-pesticides.

Advantages of bio-pesticides

- They are intrinsically less harmful than chemical pesticides;

- They affect only the target pests and closely related organisms;
- They are even effective in small quantities. They decompose quickly and also avoid pollution problems caused by conventional pesticides;
- When used as a component of IPM, they considerably decrease the use of conventional pesticides without affecting the crop yields.

Major categories of bio-pesticides:

- Biochemical pesticides are naturally occurring substances that control pests by non-toxic mechanisms.
- Plant-incorporated protectants or PIPs are substances produced by plants and the genetic material necessary for the plant to produce the substance.
- Microbial pesticides consist of a microorganism (e.g. a bacterium, fungus, virus or protozoan) as the active ingredient. It has virtually all the health, safety and environmental properties that one would desire in a pesticide. The most widely used microbial pesticides are subspecies and strains of *Bacillus Thuringiensis* (Bt). The other microbial pesticides are Baculoviruses, Neem, *Trichoderma*, and *Trichogramma*.

Potential for Bio-pesticides

Globally, the bio-pesticides market is growing at 10-15%, however it is still at nascent stage in India constituting a meager 3% of the global bio-pesticides market. Nevertheless, with rising awareness levels among the farmers and increasing government initiatives, the demand for bio-pesticides is expected to witness healthy rise in near to medium term period.

Genetically Modified (GM) Crops

The term genetically modified means a plant that contains a gene that has been introduced artificially. Such plants are also described as being transgenic. Genetic modification of plants became possible in the late 1970s as a result of the development of techniques for manipulating DNA in the laboratory and introducing it into the DNA of the plant.

Transgenic techniques have the potential to reduce the pesticide usage and increase productivity by introducing pest resistance traits in high-yielding varieties, which combat pathogens, where no adequate control measures existed before. Cotton is the only GM crop currently approved for cultivation by the Indian government.

Consumption of insecticides for cotton has come down to 50% from 63% of total volume after introduction of BT cotton.

Financials

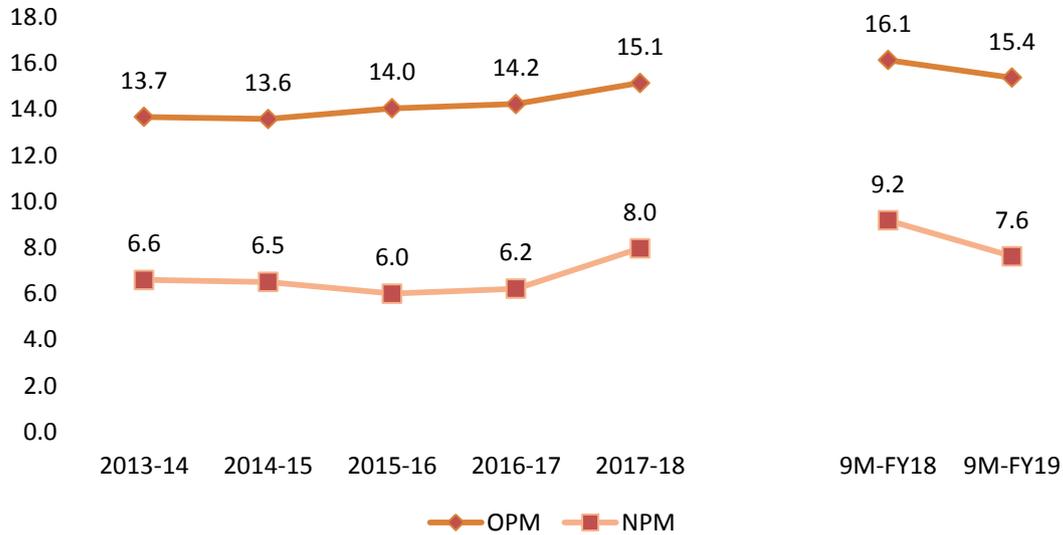
The demand for pesticides is dependent on crop yields, pest attack, farmer's capacity to buy pesticides depending on the availability of credit and his awareness level.

The agrochemicals industry largely consumes crude oil-linked raw materials which are the second and third derivatives of crude, chlorine, yellow phosphorus and bromine etc. These are essential raw materials needed for manufacturing of technicals. Thus, sharp fluctuations in crude oil prices affect their profitability. Indian crop protection companies import a significant portion of their technical requirements from China.

Revenues and profitability of agrochemical companies also depend on the agricultural conditions in North American, Latin American and EMEA regions as most of these companies have expanded their operations abroad. India exports about 50% of its production hence exports is a key revenue component.

Here we will be analysing the financials of 21 agrochemical companies. In our analysis we have noticed, the top 3 players are controlling 57% of the market share. **During FY14-18, sales revenue, operating profit and net profit of these 21 agrochemical companies grew by 6.8%, 9.6% and 12% CAGR respectively.**

Chart: OPM and NPM of Agrochemical companies



Source: Ace Equity

The margins of agrochemical companies had been stagnant during FY14-17 mainly due to the varying weather conditions (including El Nino phenomenon and weak monsoons), drought like conditions which affected the acreages and crop prices and weakening herbicide prices. Slowdown in the Latin American and European markets had also affected the margins of agrochemical companies. The demonetization of banknotes and de-stocking activities undertaken by distributors regarding the uncertainty concerning around GST had also added to the woes of the industry thus, the sales of agrochemical enterprises were inhibited.

During FY18, India’s crop protection industry faced a double whammy. Increase in raw material prices due to rising crude oil prices and supply constraints emanating from the shut-down of industries in China on pollution concerns added pressure on the profitability of agrochemical manufacturers. Despite these headwinds restocking post GST, a near normal monsoon and Kharif season, higher frequency of pest attacks and expansion of cotton acreages worked in favour of agro chemical companies. Rise in the price of end-use products, increased sales from Latin America, Europe and the US, as well as registrations and launches of new products in other strategic markets also favoured the agrochemical markets which resulted in the uptick of margins.

In the current financial year (9M-FY19), an increase in crude oil prices by 33.2%, and the on-going farm distress has led to the fall in the margins of the agrochemical companies. Lower acreages during the existing rabi season and ban on use of organophosphorus compounds in several states, erratic rainfall in key agrarian states and poor price realization in the key crops has impacted the margins of the industry.

Concluding remarks

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 due to the tight supply from China, strategic partnerships with global counterparts, robust product launches, tie-ups with innovators for new products and substantial prospects to explore products going off – patent.

India's agrochemical consumption is one of the lowest in the world with per hectare consumption being just 0.6 kgs as compared to the United States (5-7 kgs/hectare) and Japan (11-12 kgs/hectare). With the increase in awareness and market penetration, consumption is likely to improve in the near future.

The agrochemicals 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 of plant nutrients and protection is the need of the hour. Given the farm distress across the country, as well as the upcoming general elections in 2019, the government's focus will be to ease the agrarian crisis through budgetary support, increased irrigation coverage and better procurement.

Every year pests and diseases eat away on an average 15%-25% of food produced by the farmers. Due to the continuous increase in population, the demand for food grains is increasing at a faster pace as compared to its production. This therefore necessitates putting more thrust on the use of crop protection methods. Use of agrochemicals can increase crop productivity by 25%-50%, by mitigating crop loss caused due to pest attacks.

In the next few years, Indian agrochemicals market will be driven by the growth in herbicides and fungicide. Contrary to global trends where herbicides form the largest share in use, the Indian agrochemicals industry is dominated by the growing use of insecticides given India is a tropical country marked by insect and fungi attacks. This coupled with the traditional farm practices (farmers tend to pull out weeds rather than using herbicides), had resulted in a low use of herbicides (~16% in India compared to the global average of ~42%).

However, the use of herbicides has been increasing due to shortages of farm labour and concerns about the affordability of labour costs. The aforementioned reasons have been the primary driver for the growing popularity of the agrochemical and herbicides is expected to emerge as a key growth segment.

Investment in safe, effective agricultural chemicals will only continue to expand. The ever increasing need to grow more food on less land, with minimal impact on human health and the environment, creates a vast market for effective agrochemicals.

The Chinese government's environmental clampdown had led to the closure of ~35% of small agrochemical manufacturing industries which resulted in the short supply of key technicals and intermediates, leading to sharp increase in the prices in the international markets. Indian players with backward integrated facilities can gain from these changing dynamics. Meanwhile, other companies are resorting to backward integration via direct acquisitions, in order to be less dependent on outsourced supplies. Almost all major players have resorted to backward integration. The backward integration strategy of Indian companies is expected to effectively increase the pesticide technical production capacity in India.

CARE Ratings Outlook for the Agrochemicals Industry

Agriculture is the backbone of the Indian economy, as it employs nearly half of India's workforce and contributes ~15% to the nation's GDP. The total number of pests attacking major crops has increased significantly. **We expect India's agrochemical industry in terms of active ingredient (technical grade) production to record a 3.7% compounded growth rate till FY22. Technical grade agrochemicals production is to be 246 (000' tonnes) by FY22.**

- Government focus on agriculture to drive domestic consumption. The focus on doubling farmer income by 2022, significant public spending for improving rural infrastructure (particularly irrigation projects), greater crop insurance coverage, and increase in agricultural credit is expected to boost crop yields and farmers' awareness regarding crop protection benefits is to drive domestic demand.
- Increase in the disposable income of farmers with the PM-KISAN scheme is to lead in the rise in sales of agrochemicals. PM-KISAN is estimated to benefit 12 crore farmer families.
- Stringent environment regulations, changing weather conditions, increased agricultural trade and improved farming practices are triggering innovation and research in the agrochemicals industry.
- Growth in horticulture and floriculture industries is to aid in the increase in use of agrochemicals.

Usually ~50% of the demand comes from domestic consumers while the rest goes towards exports.

- Exports will likely grow on account of supply disruption from China, and India being viewed as an assured supplier for technicals.
- Exports of herbicides and fungicides are to continue gathering momentum and boost the revenues of agrochemical manufacturers.

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