Indian Agrochemicals Industry

Imperatives of Growth

Knowledge and Strategy Paper

released at

3rd National AGROCHEMICALS CONCLAVE 2013
July, 2013

Knowledge and Strategy Partner

TATA STRATEGIC MANAGEMENT GROUP
About FICCI

Established in 1927, FICCI is one of the largest and oldest apex business organizations in India. FICCI's history is closely interwoven with India's struggle for independence, industrialization and emergence as one of the most rapidly growing global economies. FICCI has contributed to this historical process by encouraging debate, articulating the private sector's views and influencing policy.

A not-for-profit organization, FICCI is the voice of India's business and industry. FICCI draws its membership from the corporate sector, both private and public, including MNCs; FICCI enjoys an indirect membership of over 2,50,000 companies from various regional chambers of commerce.

FICCI provides a platform for sector specific consensus building and networking and is the first port of call for Indian industry and the international business community.

Our Vision

To be the thought leader for industry, its voice for policy change and its guardian for effective implementation.

Our Mission

To carry forward our initiatives in support of rapid, inclusive and sustainable growth that encompasses health, education, livelihood, governance and skill development.

To enhance the efficiency and global competitiveness of the Indian industry and to expand business opportunities both in domestic and foreign markets through a range of specialized services and global linkages.
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With nearly 1.2 billion population, India requires a robust and modernized agriculture sector to ensure food security for its population. The scope for increasing the extent of cultivable land is limited. In order to meet the food, natural fibre and bio-fuel requirements of the nation, agricultural productivity and growth need to be sustained and improved. Pesticides or Agrochemicals are recognized as an essential input for increasing agricultural production and preventing crop losses before and after harvesting. The judicious use of agrochemicals is very important for the sustained growth of agriculture and the economy.

I am sure that this Conference, organised jointly by the Department of Chemicals and Petrochemicals and FICCI, will have a good outcome.

I wish all success to the "Third National Conference on Agrochemicals" to be held on 30-31 July, 2013 at New Delhi.

July 16, 2013

Indrajit Pal
Message

The Chemical industry is critical for the economic development of any country, providing products and enabling technical solutions in virtually all sectors of the economy. Agrochemicals are an important input for the agriculture sector used to improve crop performance. With increasing population, demand for food grains is increasing at a faster pace as compared to its production and this indicates the important role of the agrochemicals industry.

India due to its inherent strength of low cost manufacturing and competent manpower is producing quality agrochemicals, which not only meet the domestic demand, but there is also substantial exports, accounting for almost 50% of total production. The India’s agrochemicals consumption per hectare is only 0.58 kgm, while for Europe it is 3.0 kgm and for Japan 10.80 kgm. This portrays the huge growth potential as the Indian economy moves forward.

The purpose of this Conference is to bring focus to this sector and discuss the issues, the potential and the way ahead. This is in every way the most timely initiative to which I wish all the best.

Dated: 17th July, 2013

A Didar Singh
TATA Strategic Management Group (TSMG) in association with FICCI has been meticulously studying the trends in chemical industry and thereby supporting chemical companies across various verticals to achieve business excellence. The same knowledge and experience gives us an additional advantage to realize this report. The report attempts to highlight the current scenario regarding the consumption patterns and future growth potential of crop protection industry in India. With declining arable land and more mouths to feed, there is continuous pressure to increase yield and reduce losses by usage of crop protection products. Usage of crop protection products in North America and Europe has increased in order to boost yield and quality. However, per capita consumption of crop protection products in India is still much lower at 0.6 kg/ha compared to 13 kg/ha in China and 7 kg/ha in USA. Indian crop protection market is largely dominated by insecticides which account for 65% of the total crop protection chemicals market. Herbicides are the largest growing segment and currently account for 16% of the total market. Paddy and cotton are the major consumers of crop protection chemicals accounting for 28% and 20% respectively & top three states Andhra Pradesh, Maharashtra and Punjab account for ~50% of the total pesticide consumption in India.

Bio-pesticides look like the next big thing in the industry and offer benefit of being more environment friendly and more effective than the traditional chemicals. However, increase of spurious bioproducts in the market has caused more harm than good to the industry and needs to be addressed immediately to avoid further damage to industry. It is hoped the result of this collaborative effort between FICCI and TSMG in the preparation of this resourceful report is useful. As always it was very insightful experience for the team to materialize this report. We hope it acts as a guiding light for the players in the crop protection chemical industry in India.
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1. Executive summary

With increasing population, demand for food grains is increasing at a faster pace as compared to its production. In addition to that, every year, significant amount of crop yield is lost due to non-usage of crop protection products.

Agrochemicals are used to improve crop performance, yield or control pests, etc. Agrochemicals are substances manufactured through chemical or biochemical processes containing the active ingredient in a definite concentration along with other materials which improve its performance and increase safety. For application, these are diluted with water in recommended doses and applied on seeds, soil, irrigation water and crops to prevent the damages from pests.

There are broadly 5 categories of crop protection products:

1.1. **Insecticides**: Insecticides protect crops by killing insects or preventing their attack. Insecticides may attack a particular type of insect or could be broad spectrum insecticides. Insecticides are used to manage the pest population below the economic threshold level. E.g. Chlorpyrifos is used to control insect pests in crops such as cotton, corn almonds, etc.

1.2. **Fungicides**: They are used to prevent the deterioration of crops due to fungi infestation. Fungicides are classified as protectants or eradicants. Protectant fungicides prevent or inhibit fungal growth and may have to be applied at regular intervals. Eradicant fungicides kill the pests on application. E.g. Anilazine is used to control fungal attack on lawns and turfs, cereals, coffee and various vegetables and other crops.

1.3. **Herbicides**: Herbicides or weedicides are used to prevent the growth of unwanted plants in a crop field. Herbicides could be selective, which kill the unwanted plants without any harm to the crop, or non-selective which kill all the plants. E.g. Glufosinate ammonium, a broad-spectrum contact herbicide, is used to control weeds after the crop emerges or for total vegetation control on land not used for cultivation.

1.4. **Bio-pesticides**: These are derived from natural substances like plants, animals, bacteria and certain minerals and control pests by nontoxic mechanisms. Bio-pesticides are considered eco-friendly and easy to use. They could be classified as microbial pesticides, plant incorporated protectants and biological pesticides. They are of low volume and high effect formulations and require lesser dosages as compared to chemical pesticides. A growth area for bio-pesticides is in the area of seed treatment and soil amendments. Example of bio-pesticides includes Bacillus subtilis which is used as soil inoculant in horticulture and agriculture.

1.5. **Others (Nematocides, Rodenticides etc.)**: Fumigants and rodenticides are used to prevent the attack of pests during storage of crops. Plant growth regulators control or modify the plant growth process and are most commonly used in cotton, rice and fruits.
As per Indian Journal of Ecology report, major crop losses due to non-usage of pesticides were about 17.5% of the yield amounting to ~INR90,000 Cr per annum (FY12 estimated). It is estimated that the present food grain production can jump from 3 Trillion to 4 Trillion by using crop protection products.

**Figure1 Losses caused by different pests(%age), FY12**

![Pie chart showing losses caused by different pests](image)

Source: Industry Reports, Analysis by Tata Strategic

Therefore, right usage of crop protection chemicals is essential in increasing agricultural production by preventing crop losses before and after harvesting.
2. Global market overview

The global crop protection industry has registered a CAGR of 6% p.a. from FY06 to reach USD 48Bn in FY12. This market is expected to grow further owing to the increasing food and fuel needs and is expected to grow at a CAGR of 5.4% p.a. to reach ~USD 71.3 Bn by FY18.

Figure 2 Global Crop Protection Industry (USD Bn)

2.1 Geographical distribution

The crop protection chemicals market is mainly concentrated in the major developed countries such as United States and Western European nations. Europe has the largest share in the agrochemical market followed by Asia, Latin America and North America. There is an increased usage of products in Europe due to high commodity prices and in order to boost yield and quality. Increased demand for palm oil has led to increasing usage of herbicides in Japan, Malaysia and Indonesia. Strong rice prices and other food grains are driving the agrochemical consumption in India. In Latin America, increased production of soybean and sugarcane for animal feed as well as for bio-fuels is the driving the growth of agrochemical consumption.

Figure 3: Geographical share of Global Crop Protection Industry, FY12

Source: Industry Reports, Analysis by Tata Strategic
It is believed that the crop protection chemicals market has reached its saturation in developed regions such as North America and Western Europe whereas regions such as Asia Pacific, Middle East and Latin America will offer high growth opportunities in the future.

2.2 Global market scenario

The global crop protection market is fairly consolidated with top nine companies accounting for over 80% of the market. Syngenta, Bayer and BASF are the market leaders in the global crop protection market.

Global crop protection market is characterized by large number of mergers and acquisitions in the recent years. Several large companies have consolidated their presence in the existing geographies or ventured into new areas through acquisitions of local companies. Some of the recent acquisitions in 2013 include acquisition of ISEM’s fungicide technologies valifenalate by Belchim Crop Protection, acquisition of Alpha Pesticides (Britain) by De Sangosse Group’s and acquisition of Plant Syence by Verdesian Life Sciences. Another major acquisition happened in 2011 when United Phosphorus Limited acquired 51% stake in Brazil based DVA Agro Do Brasil from Isagro (Italy) to consolidate its presence in the distinguished Brazilian Market.

An indicative list of recent mergers & acquisitions is given below -

**Figure 4: Recent mergers & acquisitions in Agro-chemical space**

<table>
<thead>
<tr>
<th>Year</th>
<th>Acquirer</th>
<th>Target Company</th>
<th>Highlights</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>Belchim Crop Protection</td>
<td>ISEM’s fungicide technologies valifenalate</td>
<td>Belchim Crop Protection acquired ISEM’s fungicide technologies valifenalate and IR 8854 to expand the range of products that Belchim Crop Protection offers to potatoes, vines and vegetables growers</td>
</tr>
<tr>
<td>2013</td>
<td>De Sangosse Group</td>
<td>Alpha Biopesticides</td>
<td>The French DE SANGOSSE Group acquired stake in the British Company Alpha Biopesticides to provide marketing synergies</td>
</tr>
<tr>
<td>2011</td>
<td>United Phosphorus Limited</td>
<td>DVA Agro Do Brasil</td>
<td>United Phosphorus Limited acquired 51% stake in Brazil-based DVA Agro Do Brasil</td>
</tr>
<tr>
<td>2010</td>
<td>Cheminova</td>
<td>Isagro</td>
<td>Cheminova acquired the insecticide business of Isagro to strengthen its presence in Italy &amp; gain access to new markets such as India</td>
</tr>
<tr>
<td>2010</td>
<td>Advanta</td>
<td>Crosbyton Seed Company</td>
<td>Advanta India acquired the assets and business of Texas-based sorghum seeds producer Crosbyton Seed Company (CSC) through its American subsidiary, Advanta US Inc.</td>
</tr>
<tr>
<td>2010</td>
<td>Agrium Retail</td>
<td>Miles Farm Supply</td>
<td>Agrium Retail purchased crop protection business of Miles Farm Supply of Owensboro, KY</td>
</tr>
<tr>
<td>2009</td>
<td>Bayer Corpscience</td>
<td>Athenix Corp</td>
<td>Bayer Corpscience acquired a biotechnology company, Athenix Corp to Strengthen its R&amp;D presence in North America.</td>
</tr>
</tbody>
</table>
2.3 Distribution of global crop protection market - Product category

Herbicides are the most widely used agrochemical products globally, followed by insecticides and fungicides. Fungicides is the highest growing segments as it helps increasing yield, improving quality and in seed treatment. Individual sales of various categories however depend on climatic conditions and crop variance.

<table>
<thead>
<tr>
<th>Product category</th>
<th>Top molecules- Global</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herbicides</td>
<td>Glyphosate, Triazines, Sulphonyl urea</td>
</tr>
<tr>
<td>Insecticides</td>
<td>Pyrethroids, Organophosphates, Neonicotinoids</td>
</tr>
<tr>
<td>Fungicides</td>
<td>Triazoles, Strobilurin, Dithiocarbamates</td>
</tr>
</tbody>
</table>

Herbicides are used in most of the regions of the world. However, major markets for herbicides are North America and Europe due to the favorable climatic conditions in these regions. Insecticides are more prevalent in Asian countries. This is due to higher growth of cotton, cereal, fruits and vegetables in these regions which have higher incidence of insect attacks. Increased usage of genetically modified crops in North America has reduced the usage of insecticides. Fungicides are used in almost all agriculture markets of the world due to favorable climatic conditions for the fungal growth.
2.4 Distribution of global crop protection market - Crop wise

Globally, fruits and vegetables and cereals account for the largest share of the crop protection industry.

Figure 6: Global Crop Protection Market by Crops, FY12

Source: Industry Reports, Analysis by Tata Strategic

2.5 Global Trade of crop protection products

Germany, France, US, China and Belgium are the largest exporters of crop protection products while Brazil, Canada, United Kingdom, Italy and Spain are the major importers.

Figure 7: Major Import/Export countries, FY12

<table>
<thead>
<tr>
<th>Leading trading countries, FY12 ($ Bn)</th>
<th>Exporters (Insecticides, Pesticides and Herbicides)</th>
<th>Importers (Insecticides, Pesticides and Herbicides)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>3.6</td>
<td>Brazil</td>
</tr>
<tr>
<td>France</td>
<td>3.5</td>
<td>Canada</td>
</tr>
<tr>
<td>USA</td>
<td>3.3</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>China</td>
<td>2.8</td>
<td>Italy</td>
</tr>
<tr>
<td>Belgium</td>
<td>1.8</td>
<td>Spain</td>
</tr>
</tbody>
</table>

Source: Intracen
2.6 Global Industry Challenges

- **Evolution of biotechnology**: Development of genetically modified crops in recent years, especially for pest resistance would result in relatively lesser need for traditional crop protection chemicals. However, this could lead to newer strains or pests driving need for other agrochemicals. E.g. new sucking pests have emerged causing significant harm to the BT cotton.

- **Stringent regulations**: Stringent environmental regulations across all countries increase the cost of developing new products. These regulations are primarily affecting the older products while at the same time resulting in delay in introduction of new products.

- **Mergers and Acquisitions affecting SMEs**: Larger companies are acquiring/entering into strategic alliances with smaller companies to increase their market reach. This poses a threat to local companies who are forced to reduce prices in order to compete, thereby leading to lower margins.
3 Indian market overview

The crop protection chemicals accounts for ~2% of the total chemicals market in India. India is currently the second largest manufacturer of pesticides in Asia, second only to Japan. The Indian pesticides industry has been growing at 8-9% p.a. over the past five years (FY07-FY11). Industry size is estimated to be USD 3.8 billion (INR 21,000 CR) in FY12 with exports accounting for 50% of the market. Over the 12th plan period, the segment is expected to grow at 12-13% p.a. to reach ~USD 7 Bn (INR 39,000 Cr) by FY17 with domestic demand growing at 8-9% p.a. and export demand at 15-16% p.a. Three broad categories of companies are present in the industry - Multi-National, Indian including the public sector companies and small sector units.

3.1 Industry structure

The crop protection industry in India is generic in nature with ~80% of the molecules being non-patented. Hence, strong distribution network and brand image act as competitive factors. Crop protection chemicals are manufactured as technical grades and converted into formulations for agricultural use. The crop protection industry consists of technical grade manufacturers, formulators producing the end products, distributors and end use customers. According to Pesticide Monitoring Unit, GOI, there were about 125 technical grade manufacturers, including about 10 multinationals, more than 800 formulators and over 145,000 distributors in India in FY12. Over 60 technical grade pesticides are being manufactured indigenously.

Figure 8: Crop protection market, FY12 (USD Bn)

3.2 Indian market scenario

Consumption of crop protection products in India is among the lowest in the world. Per capita consumption of crop protection products in India is 0.6 kg/ha compared to 13 kg/ha in China and 7 kg/ha in USA. Some of the reasons for low consumption in India are low purchasing power of farmers, lack of awareness among farmers, limited reach and lower accessibility of products. This presents an immense opportunity for the crop protection industry to grow in India.
Technical grade manufacturers sell high purity chemicals in bulk (generally in drums of 200-250kgs.) to formulators. Formulators, in turn, prepare formulations by adding inert carriers, solvents, surface active agents, deodorants etc. These formulations are packed for retail sale and bought by the farmers.

3.2 Indian market scenario

India due to its inherent strength of low-cost manufacturing and qualified low-cost manpower is a net exporter of pesticides to countries such as USA and some European and African countries. Exports formed ~50% of total industry turnover in FY12.

The industry suffers from high inventory (owing to seasonal and irregular demand on account of monsoons) and long credit periods to farmers, thus making operations 'working capital' intensive.

3.2.1 Domestic consumption

Consumption of crop protection products in India is among the lowest in the world. Per capita consumption of crop protection products in India is 0.6 kg/ha compared to 13 kg/ha in China and 7 kg/ha in USA. Some of the reasons for low consumption in India are low purchasing power of farmers, lack of awareness among farmers, limited reach and lower accessibility of products. This presents an immense opportunity for the crop protection industry to grow in India.

3.2.2 Distribution of domestic crop protection market - Product category

Insecticides form the largest segment of the domestic crop protection chemicals market accounting for 65% of the total market. It is mostly dependent on rice and cotton crops. Herbicides are the largest growing segment and currently account for 16% of the total crop protection chemicals market. Sales are seasonal, owing to the fact that weeds flourish in damp,
warm weather and die in cold spells. Rice and wheat crops consume the major share of herbicides. Increasing cost of farm labor will drive sales of herbicides going forward. Fungicides, accounting for 15% of the total crop protection market, are used for fruits and vegetables and rice. Farmers moving from cash crops to fruits and vegetables and government support for exports are increasing the fungicides usage. Biopesticides include all biological materials organisms, which can be used to control pests. Currently, a small segment, bio-pesticides market is expected to grow in the future owing to government support and increasing awareness about use of non-toxic, environment friendly pesticides.

**Figure 10: Crop protection market split, India, FY12**

<table>
<thead>
<tr>
<th>Segment</th>
<th>Major Products</th>
<th>Main Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insecticides</td>
<td>Acephate, Monocrotophos, Cypermethrin</td>
<td>Cotton, Rice</td>
</tr>
<tr>
<td>Fungicides</td>
<td>Mancozeb, Copper Oxychloride, Ziram</td>
<td>Fruits, Vegetables, Rice</td>
</tr>
<tr>
<td>Herbicides</td>
<td>Glyphosate, Isoproturan, 2,4-DR</td>
<td>Rice, Wheat</td>
</tr>
<tr>
<td>Bio-pesticides</td>
<td>Spinosyns, neem based</td>
<td>Rice, Maize, Tobacco</td>
</tr>
<tr>
<td>Others</td>
<td>Zinc Phosphide, Aluminium Phosphide</td>
<td>Stored produce</td>
</tr>
</tbody>
</table>

**3.2.3 Distribution of domestic crop protection market - Crop-wise**

Cotton and Paddy are the major consumers of crop protection chemicals accounting for 50% and 18% respectively of the total domestic crop protection chemicals market. Fruits and vegetables also account for a significant share of the crop protection chemicals market.
Cotton, which accounts for just 5 per cent of the cropped area consumes about 50% of the pesticides. Rice grown over 24% of the cropped area uses ~18%, fruits & vegetables raised over 3% consume ~14%, plantation crops covering 2% of the area consume ~8% and cereals, millets and oilseeds extending over 58% of the area consume ~7%. Sugarcane uses 2 per cent of pesticides and other crops grown over 6% of the cropped area account for another 1%.

### 3.2.4 Distribution of crop protection Market - State-wise

The top three states Andhra Pradesh, Maharashtra and Punjab account for ~50% of the total pesticide consumption in India. Andhra Pradesh is the largest consumer of pesticides with a share of 24%.
3.2.5 Competitive Landscape

The Indian crop protection chemicals market is highly fragmented in nature with over 800 formulators. The competition is fierce with large number of organized sector players and significant share of spurious pesticides. The market has been witnessing mergers and acquisitions with large players buying out small manufacturers.

Key market participants include United Phosphorus Ltd, Bayer Cropscience Ltd, Rallis India Ltd, Gharda Chemicals Ltd, Syngenta India Ltd, BASF India Ltd, etc. Top ten companies control almost 80% of the market share. The market share of large players depends primarily on product portfolio and introduction of new molecules. Strategic alliances with competitors are common to reduce risks and serve a wider customer base.

![Figure: 13 Key Industry players, India](image)

3.2.6 Distribution and Sales Channel

Maximum sales of crop protection chemicals are in rural areas. Hence for a wider reach, large manufacturers with all India presence use a three-tier sales and distribution network comprising distributors, wholesalers and retailers. Regional participants cater only to local markets.
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3.2.6 Distribution and Sales Channel

Maximum sales of crop protection chemicals are in rural areas. Hence for a wider reach, large manufacturers with all India presence use a three-tier sales and distribution network comprising distributors, wholesalers and retailers. Regional participants cater only to local markets. Typically, a company with all India presence could have 400-1000 distributors catering to 25,000-30,000 retailers. Companies keep their stocks in warehouses or depots from where it is supplied to distributors. Multinationals, at times, enter into co-marketing and co-distribution arrangements with Indian companies. For example, Syngenta entered into an agreement with Rallis for marketing of its products in India. Mid-size and small scale companies operate through direct marketing of their products. Most companies also engage in extension services or field demonstrations to increase farmer awareness and promote their products.

3.2.7 Import/Exports

Indian exports of pesticides have been witnessing a strong growth in recent times. This is primarily due to its competence in low-cost manufacturing and technically trained manpower. Seasonal domestic demand, domestic overcapacity and better price realization in the overseas market have also led to this trend. India has emerged as the thirteenth largest exporter of pesticides in the world. However, most of the exports are off-patent products.

Currently, the total export value of crop protection chemicals amount to USD 1.9Bn (INR 11,000 Cr). America, Asia (excluding Middle East) and Europe are the major exporting destinations. Key market drivers for Indian crop protection market export are:

- **Excess capacity**: India’s production capacity is 146,000 MT against the production of 82,000 MT in FY12. This excess capacity against domestic demand is a key growth driver for exports.

- **Low processing cost**: Availability of cheap labor and low processing costs has made India a manufacturing hub with several multinationals setting up their manufacturing facilities in India.
Availability of process technologies: India has a very strong presence in generic pesticide manufacturing and has process technologies for more than 60 generic molecules. However, complex registration procedures and decreasing market size for generic molecules in United States and Europe pose a major challenge for the Indian crop protection chemicals export.

3.2.8 Future Outlook

Since the Indian agricultural sector is highly dependent on monsoons, the market for agrochemicals is expected to grow at a conservative growth rate of 8% p.a. to reach ~ USD 3.2Bn (INR 18,000 Cr) by FY18. Exports are expected to grow at a higher rate of 15% p.a. to reach ~ USD 5.8 Bn (INR 32,000 Cr) by FY20.

Contract manufacturing is also an emerging opportunity for agro-chemical companies. There are several leading companies in crop protection industry, who are actively involved in contract manufacturing of agrochemicals and intermediates for global innovators. Some of the factors which make contract manufacturing an attractive opportunity for Indian players are as follows:

- Strong presence of MNCs in Indian markets who have the ability and know-how to develop and launch innovative products. For small Indian players, developing capability for contract manufacturing would be easier than capability to invent new chemicals.
- High investment requirement in R&D for new molecule development and long gestation period of 3-5 years for registration of new chemicals. High investments have deterred Indian players from developing new molecules and have instead led to increased focus on generics.
• Large pool of technically skilled manpower which enables Indian players to develop custom products at low cost. This gives an opportunity to Indian players to tie-up with large MNCs.

Key growth drivers include:

• **Increasing demand for food grains:** India has 16% of the world’s population and less than 2% of the total landmass. Increasing population and high emphasis on achieving food grain self-sufficiency as highlighted in the FY12 budget, is expected to drive growth.

• **Limited farmland availability:** India has ~190 Mn hectares of gross cultivated area and the scope for bringing new areas under cultivation is severely limited. Available arable land per capita has been reducing globally and is expected to reduce further. The pressure is therefore to increase yield per hectare which can be achieved through increased usage of agrochemicals.

![Figure 15: Arable land per capita (ha)](image)

- **Low Productivity:** India has low crop productivity as compared to other countries. Average productivity in India stands at 2 MT/ha as compared to 6 MT/ha in USA and world average of 3 MT/ha. At the same time, India’s pesticide consumption is also low at 0.60kg/ha as compared to the world average of 3 kg/ha. Hence, increased usage of pesticides could help the farmers to improve crop productivity.
Figure 16: Average crop productivity and crop protection chemicals usage

- **Growth of horticulture and floriculture**: Buoyed by 50% growth experienced by Indian floriculture industry in last 3 years, Government of India had launched a national horticulture mission to double production by FY12. Growing horticulture and floriculture industries will result in increasing demand for agrochemicals, especially fungicides.

- **Increasing exports**: Indian companies have successfully expanded into other geographies for exports and this trend has been increasing in recent times.

- **Patent expiry**: Between 2009 and 2014 many molecules are likely to go off patent throwing the market open for generic players. The total viable opportunity through patent expiry is estimated at over USD 3 Bn.

- **Availability of credit facilities**: Govt. initiatives to provide credit facilities to farmers in the rural areas will provide boost to the agriculture industry. Access to finance would encourage them to use more pesticides in order to improve the crop yield.

- **Rural Infrastructure and IT**: Linking the production areas with the market would help in easy distribution of pesticides. IT services would help create awareness among farmers and educate them for optimum use of crop protection chemicals.

- **Increasing awareness**: As per Government of India estimates, total value of crops lost due to non-use of pesticides is around Rs. 90,000 Cr every year (FY12 estimates). 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. With increasing awareness, the use of agrochemicals is expected to increase.
• **Product portfolio expansion**: Threats like genetically modified seeds, Integrated Pest Management, organic farming etc. can be turned into opportunities if the industry re-orient itself to better address the needs of its consumers and broadens its product offering to include a range of agro-inputs instead of only agrochemicals.

### 3.2.9 Market Trends

• Increasing focus on development and production of environmentally safe pesticides by the industry as well as the Government.

• Focus by larger companies on brand building by conducting awareness camps for farmers and providing complete solutions.

• Increase in strategic alliances among large players for greater market reach and acquisitions of smaller companies globally to diversify product portfolio. For example: Rallis has a marketing alliance for key products with FMC, DuPont, Syngenta, Bayer and Nihon Nohayaku. In addition, UPL has had a series of small acquisitions globally to enter new geographies and gain product expertise.

• Emphasis is on yield and quality output by the farmers. With increasing dispensable income, farmers are willing to spend more to gain high yield and quality output. Preference for high quality products is on the rise.

• Usage of herbicides and fungicides is on the rise due to increased focus on fruits and vegetables and increased awareness levels among end users.

### 3.2.10 Technology Trends

• Increased R&D expected for development of new molecules and low dosage, high potency molecules. New pesticides such as sulfonyleurea and imidazolinone herbicides require less volume of chemical per unit treated area in comparison to older chemicals.

• Increasing focus on seed treatment chemicals. The advantage of these products is that they require very small volume of the compound and are more effective than the normal crop protection chemicals.

• Focus on R&D in bio-pesticides segment with increasing preference for environmentally safe products in the market.

• With participation from leading corporate houses such as PepsiCo, Reliance Life Sciences, ITC (agri-business division) and McDonalds and Govt. initiatives in policy changes, the trend of contract farming is catching up in the Indian agriculture sector. This is leading to faster technology transfer and adoption and has led to greater market access (both domestic and global). This in turn is leading to fast development of new chemistry products.
3.2.11 Key challenges

- **Low focus on R&D by domestic manufacturers due to high costs**: R&D to develop a new agrochemical molecule takes an average of 9 years and ~INR1,000 Cr. Indian companies typically have not focused on developing newer molecules and will face challenges in building these capabilities, while continuing to remain cost competitive.

- **Lack of education and awareness among farmers**: The main point of contact between the farmers and the manufacturers are the retailers who are generally not technically sound and are not able to provide a proper understanding of the product to the farmers. Also, very often farmers are not able to communicate their needs effectively to the manufacturers.

- **Need for efficient distribution systems**: Since, the number of end users is large and widespread, effective distribution via retailers is essential to ensure product availability. Lately, companies have been directly dealing with retailers by cutting the distributor from the value chain thereby reducing distribution costs, educating retailers on product usage and offering competitive prices to farmers.

- **High post-harvest losses**: Post harvest losses of crops are estimated at INR44,000 Cr every year. Supply chain inefficiency and inadequate infrastructure are the major causes for such losses.

- **Spurious products**: There is a significant share of spurious pesticides and spiked bio-pesticides. According to pesticides industry body, Agrochemicals Policy Group (APG), spurious and substandard pesticides accounted for ~40% of the pesticides sold in India in FY12. These products not only failed to kill pests but also inflicted damages on crops.

- **Support for Integrated Pest Management (IPM) and rising demand for organic farming**: Promotion of IPM, zero budget farming and usage of bio-pesticides by Indian Government and NGOs is gaining momentum. With increasing demand for organic food, farmers in certain states like Karnataka have reduced chemical usage and have adopted organic farming. Agrochemical companies will have to tackle the rising environmental awareness and address concerns on negative impact of pesticide usage.

- **Threat from Genetically Modified (GM) seeds**: Genetically modified seeds possess self-immunity towards natural adversaries which have the potential to negatively impact the business of agrochemicals.

- **Longer period for registration of innovative products**: In India, registration of new products takes 3-5 years which discourages domestic manufacturers.
4. IPM and newer methods of crop protection

Integrated Pest Management (IPM) is a sustainable approach to pest management by combination of biological, mechanical, physical and chemical methods. These methods are performed in three stages: prevention, observation and intervention. It is an ecological approach and strives for eliminating or significantly reducing the use of pesticides and at the same time controlling pest growth at acceptable levels. There are six basic components of IPM which are employed to control pest growth.

**Basic components of Integrated Pest Management**

- 1. Acceptable pest levels
- 2. Preventive practices
- 3. Monitoring
- 4. Mechanical controls
- 5. Biological controls
- 6. Chemical controls

Source: Industry reports, Tata Strategic analysis

Apart from IPM, newer molecules with better efficacy are being developed. These molecules such as sulfonylurea and imidazolinone require lesser volume of chemicals per unit treated area. Newer products such as biological pesticides, seed treatment chemicals, and semiochemicals are being introduced. Seed treatment chemicals require a very small volume of the chemical as compared to normal crop protection chemicals.
5 Bio-pesticides

Agriculture always had to face the destructive activities of numerous pests like fungi, weeds and insects. Advent of chemical pesticides resolved this crisis to a great extent. But the over dependence on chemical pesticides and eventual uninhibited use of them has raised environmental concerns like degraded soils and groundwater pollution, which has resulted in nutritionally imbalanced and unproductive lands. Pesticide residues also sometimes raise food safety concerns among domestic consumers and pose trade impediments for export crops.

Therefore, an ecofriendly alternative became the need of the hour. Bio-pesticides or biological pesticides based on pathogenic microorganisms specific to a target pest offer an ecologically sound and effective solution to pest problems. They pose less threat to the environment and to human health. The most commonly used bio-pesticides are living organisms, which are pathogenic for the pest of interest like biofungicides (Trichoderma), bioherbicides (Phytophthora) and bioinsecticides (Bacillus thuringiensis).

<table>
<thead>
<tr>
<th>Factors</th>
<th>Benefits of Bio-pesticides</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost effectiveness</td>
<td>Costlier but reduced number of applications</td>
</tr>
<tr>
<td>Persistence and residual effect</td>
<td>Low, mostly biodegradable and self perpetuating</td>
</tr>
<tr>
<td>Pest resurgence</td>
<td>Less</td>
</tr>
<tr>
<td>Resistance</td>
<td>Less prone</td>
</tr>
<tr>
<td>Effect on beneficial flora</td>
<td>Less harmful on beneficial pests</td>
</tr>
<tr>
<td>Target specificity</td>
<td>Mostly host specific</td>
</tr>
</tbody>
</table>

The potential benefits to agriculture through the use of bio-pesticides are considerable. The interest in bio-pesticides is based on the advantages associated with such products which are:

- Inherently less harmful and less environmental load
- Designed to affect only one specific pest or, in some cases, a few target organisms
- Effective in very small quantities and often decompose quickly

5.1 Market trends

Biopesticides are used globally for controlling insect pests and diseases. Bioinsecticides, biofungicides and bioherbicides are rapidly growing market segments and are expected to boost the demand for biopesticides in future. Globally, there are 175 registered biopesticide-active-ingredients and 700 products available in the market. The global market for biopesticides was valued at USD 1.3 Bn in FY12, and it is expected to reach USD 3.2 Bn by FY18.
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Factors Benefits of Bio-pesticides

- Cost effectiveness: Costlier but reduced number of applications
- Persistence and residual effect: Low, mostly biodegradable and self perpetuating
- Pest resurgence: Less
- Resistance: Less prone
- Effect on benefical flora: Less harmful on beneficial pests
- Target specificity: Mostly host specific

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5.1 Market trends

North America dominated the global biopesticide market and accounted for about 40% of the global biopesticide demand in FY12. The US biopesticides market was valued at around USD 205 Mnin FY12 and is expected to grow to ~USD 300 Mn by FY20. European market is estimated at ~USD 200 Mn, and is expected to be the fastest growing market due to the stringent pesticide regulations and increasing demand from organic producers. Asian markets also present a good growth opportunity for biopesticides as China and India adopt more biopesticides.

Currently, biopesticides represent only 4.2% of the overall pesticide market in India and is expected to exhibit an impressive annual growth rate of about 10% in the coming years. However, only 20-25 biopesticides have been registered asper the Insecticide Act 1968 (as on 2008). Neem based pesticides, Bacillus thuringiensis, Nuclear Polyhedrosis Virus and Trichoderma are some of the major biopesticides produced and used in India.

5.2 Rising sale of spurious Bio-products in Indian markets

The sale of spurious products have spiked in India lately. A recent survey by National Level Pesticide Manufacturers Association showed that there are multiple bio-products being sold in the market which either don’t have any registration certificate number issued by CIRB& RC (Central Insecticide board and registration committee) or don’t mention active ingredients, license number or address on the label.

Many such spiked bio-products laced with chemical pesticides are manufactured and sold throughout the country. The sale of spurious products was estimated at ~INR5,000 Cr in India in FY12. The damage caused by the use of such spurious products is much higher in monetary terms.

The spiked bio-products available in the market are made with pesticides which are smuggled/procured illegally from unregistered sources also leading to rejection of export consignments of grapes, chilies and rice in recent years. Most of the farmers using these products are gullible and don’t know the ingredients being used and hence, lead to contamination and rejection of export consignments. Market studies show that only 25-30% of the farmers are aware of the use of pesticides and hence the majority of farmer easily fall prey to spurious products.

The problem is particularly grave in the states of Andhra Pradesh, Maharashtra, Karnataka, Tamil Nadu, Madhya Pradesh, Gujarat etc. where these bio products are not within the purview of Insecticides Act, 1968 or any other act. As an example, ~298 companies in Andhra Pradesh were involved in unscrupulous activities in 2010 and another 83 companies got added to the list by the year 2011. The business of spurious products in AP alone was estimated at ~500 Cr in 2011.

The loss caused by sale of such products is not only monetary but also in terms of loss of faith of the customer in the product.

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1 This figure has been estimated from interactions with people in industry
2 This figure has been estimated from interactions with people in industry
5.3 Regulatory framework

Pesticide industry is highly regulated across the globe. In the US, the regulation of chemical pesticides is done under Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 1947 which has undergone several amendments. In 1970s, Environmental Protection Agency (EPA) was created and control of pesticide regulation was shifted from US Department of Agriculture and Department of Food and Drugs Administration to the EPA. EPA has been encouraging the development and use of biopesticides in USA.

Biopesticides and Pollution Prevention Division (under the Pesticide Programs) were established in 1994 to facilitate registration of biopesticides. Since biopesticides tend to pose fewer risks than chemical pesticides, EPA generally requires much less data to register a biopesticide than to register a conventional pesticide. Data about the composition, toxicity, degradation, and other characteristics of the pesticide is required to be submitted by the registrants to EPA to make sure that a pesticide is safe. Often less than a year is required to register a new biopesticide, compared with more than three years for a chemical pesticide. EPA conducts rigorous reviews to ensure that pesticides do not have adverse effects on human health or the environment.

In Europe, European Community legislation is being implemented for regulating the marketing and use of plant protection products and their residues in food. The legislation lays down rules and procedures for approval of the active substances at EU-level and for the authorization at Member State level of plant protection products (PPPs) containing these substances. The legislation states that substances cannot be used in plant protection products unless they are included in a positive EU list. Once a substance is included in the positive list, member states may authorize the use of products containing them.

In India, the Ministry of Agriculture regulates the manufacture, sale, import, export and use of pesticides through the 'Insecticides Act, 1968' and the rules framed thereunder. Central Insecticides Board (CIB) constituted under Section 4 of the Act advises Central and State Governments on technical matters. The Registration Committee (RC) constituted under Section 5 of the Act approves the use of pesticides and new formulations to tackle the pest problem in various crops. The monitoring of pesticides residue levels in food comes under the purview of Union Ministry of Health and Family Welfare.

Some of the challenges posed by the regulations for the industry are as below:

- A long period of ~3 years is required for approval of pesticides due to requirement of data on parameters of Chemistry, Toxicology, Metabolism, Persistence, Efficacy, and Patents & Trade Marks. The cost of data generation is ~2 Cr, leading to loss of business opportunity for the companies in terms of both cost and time.

- Export registration requirements are extremely stringent leading to huge data generation costs and missed opportunity due to long clearance period.

- Due to lack of inspection staff, inspection of pesticides is generally done for top 20 to 25 MNCs or large Indian companies, which usually follow the procedures and meet the norms. However, this leaves many small companies and importers products to remain uninspected.

Some of the key highlights of the Bill are:

- The bill sets criteria by which the pesticides can be classified as misbranded, sub-standard or spurious.
- The Bill establishes a procedure to license manufacturers & distributors of pesticides which is administered by state governments. Pesticide inspectors are given the power to inspect facilities and collect pesticide samples to be tested by pesticide analysts.
- The bill also proposes to provide exclusivity of three years to the test data submitted by the original registrant of a new pesticide, to enable companies to recover R&D costs.

Further following steps can be taken to enhance the effectiveness of regulatory bodies:

- Bring more transparency in the working of CIB & RC with accreditation of central/state pesticide testing labs.
- Enforce "Minimum Manufacturing facility" standards before granting licenses and ensure regular checks on the facilities every 2-3 years.
- Simplify the export registration processes for pesticides as normally companies importing these products would follow their respective countries' norms.
- Build visual identification features on the packaging like holograms which highlights the authenticity of the brand and ensure display of pesticide ingredients, target pests and safety measures on the packaging.
- Publicly announce the name of companies engaged in spurious bio-pesticides.
- Educate farmers about the use of bio-pesticides through seminars and demonstrations through initiatives like ITCs e-choupal.
5.4 Way forward

To control the emerging insect pests, diseases and weeds for enhancing crop production without falling prey to spurious products new crop protection solutions are required. The Government of India is discussing the introduction of new Pesticide Management Bill (First proposed in 2008) to address some of the gaps from previous regulations. Some of the key highlights of the Bill are as:

- The bill sets criteria by which the pesticides can be classified as misbranded, sub-standard or spurious
- The Bill establishes a procedure to license manufacturers & distributors of pesticides which is administered by state governments. Pesticide inspectors are given the power to inspect facilities and collect pesticide samples to be tested by pesticide analysts.
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6. Plasticulture in agriculture

1970s witnessed the first Green Revolution in India. With the adoption of high-yielding variety of seeds along with better farming techniques like better use of fertilizers, insecticides and pesticides, made it possible for India to turn from Export deficit to a self-reliant agricultural nation. India currently supports nearly 16% of the world’s population with 2.4% land resources and 4% water resources and nearly 65% of population directly or indirectly depends on agriculture and it provides employment to 58.2% of population. Also, it contributes nearly 17% of India’s GDP consuming 80% of available water resources which is likely to decrease in the coming year.

6.1 Plasticulture Applications

Plasticulture refers to the use of plastics in agriculture and horticulture. Plasticulture is a huge subject with a great variety of applications in modern agriculture and promise to transform Indian agriculture and bring in the "Second Green Revolution”. Both the quality and the quantity of the crops and other farm products can be optimized using various techniques. Some of the major applications of Plasticulture are listed in the table below:

<table>
<thead>
<tr>
<th>Application</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drip Irrigation System</td>
<td>Precise application of irrigation water and plant nutrients at low pressure and frequent intervals through drippers/ emitters directly into the root zone of plant</td>
</tr>
<tr>
<td>Sprinkle Irrigation System</td>
<td>Application of water under high pressure with the help of a pump</td>
</tr>
<tr>
<td></td>
<td>Water is released through a small diameter nozzle placed in the pipes</td>
</tr>
<tr>
<td>Ponds and Reservoir Linings</td>
<td>Plastics film lining to prevent against seepage in canals, ponds and reservoirs</td>
</tr>
<tr>
<td></td>
<td>Also avoids depletion of stored water used for drinking &amp; irrigation purpose</td>
</tr>
<tr>
<td>Plastic Mulching</td>
<td>Mulching is covering the soil around the plant with plastics film, straw, grass, hay, dry leaves, stones etc.</td>
</tr>
<tr>
<td></td>
<td>Prevents loss of moisture and acts as a barrier between the soil and atmosphere</td>
</tr>
<tr>
<td>Greenhouse</td>
<td>Greenhouse is a framed structure covered with glass or plastics film</td>
</tr>
<tr>
<td></td>
<td>Acts as selective radiation filter, in which plants are grown under the controlled environment</td>
</tr>
<tr>
<td>Plastic Tunnel</td>
<td>Plastics tunnel facilitates the entrapment of carbon dioxide, thereby enhancing the photosynthetic activities of the plant that help to increase yield</td>
</tr>
</tbody>
</table>

Plastics which are most widely used in agriculture, water management and related applications are PE, (LLDPE, LDPE and HDPE), PP and PVC. The range of plastics constantly upgrades the Plasticulture product scenario to work in favor of the farming community.

India is a vast nation. Every region has got specific agricultural characteristics and problems. These area specific problems can be tackled with innovative and scientific use of Plasticulture techniques. This would not only maximize the output of farms but also optimizes the input factors. The table below shows the region specific constraints in agriculture. For example, in Western Himalayan region the productivity is low because of constraints like severe soil erosion, degradation due to heavy rainfall/floods and deforestation and inadequate market delivery infrastructure.

6.2 Plasticulture Potential

The application of Plasticulture can substantially decrease the costs and therefore can lead to high productivity with a better quality of crops. The table below shows the water saving, water use efficiency and fertilizer use efficiency. Each application can drastically save water by about 30 to 100%. In case of farm pond lined with plastic film the total loss by seepage of water can be minimized to zero which is again very beneficial. Also efficient use of fertilizers can bring the costs down which again is beneficial for the farmers.

<table>
<thead>
<tr>
<th>Application</th>
<th>Water Saving (%)</th>
<th>Water Use Efficiency (%)</th>
<th>Fertilizer Use Efficiency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drip Irrigation</td>
<td>40-70</td>
<td>30-70</td>
<td>20-40</td>
</tr>
<tr>
<td>Sprinkle Irrigation</td>
<td>30-50</td>
<td>35-60</td>
<td>30-40</td>
</tr>
<tr>
<td>Plastic Mulching</td>
<td>40-60</td>
<td>15-20</td>
<td>20-25</td>
</tr>
<tr>
<td>Greenhouse</td>
<td>60-85</td>
<td>20-25</td>
<td>30-35</td>
</tr>
<tr>
<td>Shade Nets</td>
<td>30-40</td>
<td>30-50</td>
<td>Not Available</td>
</tr>
<tr>
<td>Tunnel</td>
<td>40-50</td>
<td>20-30</td>
<td>Not Available</td>
</tr>
<tr>
<td>Farm Pond Lined</td>
<td>100</td>
<td>40-60</td>
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<table>
<thead>
<tr>
<th>States/Parts of States</th>
<th>Region Specific Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>J&amp;K, HP, Uttarakhand</td>
<td>Severe soil erosion, Land Degradation, Poor market delivery infrastructure</td>
</tr>
<tr>
<td>Bihar, Eastern UP, West Bengal</td>
<td>Flood/ Water logging, improper drainage, salinity, contamination</td>
</tr>
<tr>
<td>Western UP, Punjab, Haryana</td>
<td>Groundwater depletion, micro-nutrient deficiency, decreasing productivity</td>
</tr>
<tr>
<td>Assam, NE States, Sikkim</td>
<td>Aluminum toxicity and soil acidity, soil erosion and floods, shifting agriculture</td>
</tr>
<tr>
<td>Orissa, Jharkhand, Chhattisgarh</td>
<td>Moisture stress, drought, soil acidity, iron toxicity, poor infrastructure</td>
</tr>
</tbody>
</table>

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<td>Tunnel</td>
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<td>20-30</td>
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<td>Farm Pond Lined with Plastic Film</td>
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<td>40-60</td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>

**Figure17: Potential benefits from Plasticulture applications**
The greater use of plastic in agriculture can also help to a great extent to achieve up to fifty percent of the intended targets in Agriculture (as shown in the figure). The wider use of Plasticulture can reduce the loss of harvest and can increase the efficiency thus contributing more to the GDP. The agriculture output can be increased by ~INR 68,000 Cr by using proper Plasticulture applications like drip irrigation, mulching etc. Also, using innovative plastic packaging and handling techniques can promote proper harvest management which will in turn, can contribute towards the Agriculture-GDP.

**Figure 18: Potential growth in Agriculture-GDP through Plasticulture, 2012**

Greater Utilization of Plastic can drive-
- Food processing industry
- Improve agricultural productivity
- Reduce post harvest losses

<table>
<thead>
<tr>
<th></th>
<th>Regular agri practices</th>
<th>Post harvest management</th>
<th>Plasticulture</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand</td>
<td>76,000</td>
<td>6,000</td>
<td>68,000</td>
<td>150,000</td>
</tr>
</tbody>
</table>

6.3 A Window to Plasticulture

The growing use of plastics in different segments of economy has been very useful. The use of plastics esp. in agriculture has helped farmers increase crop production, improve food quality as also in more efficient usage of water resources. Similar has been their contribution to other key sectors namely; Automotive, Construction, Electronics, Healthcare, Textiles, and FMCG etc. The sector has been growing at a very good pace at above 10% for the past many years and is also highly employment intensive. With a turnover of above Rs.90,000 crores and employing above 3.6 million persons (both directly and indirectly) the sector is making good contribution to the national economy.

There is a huge unrealised potential of further growth of plastic industry as indicated by the present very low per capita consumption level in the country. Per capita consumption of plastics in only about 8 kgs in India compared to about 95 kgs in USA and about 65 kgs in Europe,
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### Population Vs Petrochem Demand

<table>
<thead>
<tr>
<th>Region</th>
<th>Population (%)</th>
<th>Demand (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern</td>
<td>33</td>
<td>24</td>
</tr>
<tr>
<td>East</td>
<td>27</td>
<td>12</td>
</tr>
<tr>
<td>West</td>
<td>21</td>
<td>45</td>
</tr>
<tr>
<td>South</td>
<td>19</td>
<td>19</td>
</tr>
</tbody>
</table>

This indicates regional imbalance as also potential in North India.

Due to their versatility, and imperviousness to water, Plastics save significant amounts of energy and water resources and emit lower quantum of green house gases. They have already displaced many traditional materials, such as wood, leather, paper, metal, glass and ceramic, in most of their former uses.

- **Plasticulture applications** are one of the most useful indirect economy & agriculture inputs with huge unrealized potential such as:
  - **Water Management** - Lining of canals, ponds & reservoirs with plastics film/Drip & sprinkler irrigation system/Water conveyance using PVC & HDPE pipes & Sub-surface drainage
  - **Nursery Management** - Nursery bags, Pots, Pro-trays, Root trainers, Coco peats, Hanging baskets, Plastic trays, etc.
  - **Surface cover cultivation** - Soil Solarisation/Plastics Mulching
  - **Controlled environment agriculture** - Greenhouses/Shade net houses/Plastic tunnels/Plant protection nets
  - **Innovative Packaging Solutions** - Plastic crates, bins, boxes, leno bags, unit packaging nets etc/CAP covers, controlled atmospheric packaging (CAP) & modified atmospheric packaging (MAP)
- Organic Farming-HDPE vermin bed
- **Benefits of Plasticulture Applications** - These can help the country to meet both food and nutrition needs at a time when population growth is +1% per annum with depleting natural resources such as land & water.

While the usage and benefits of plastics are manifold, the sector has an image issue (which can be linked to inappropriate civic handling of waste). The myth regarding the polluting characteristic of plastic needs to be addressed. Plastics are chemically inert substances and they do not cause either environmental or health hazards. If plastics can be collected and disposed off or recycled as per laid down guidelines/rules, the issue of plastic waste can be suitably addressed. In fact, there is good potential for industries based on re-cycling of plastics waste.

However, the quantum of usage of plasticulture applications is still limited in India. Out of total 193.7 million hectares (mha) of cropped area in the country, 65.0 mha is under different forms of irrigation sources out of which only about 5.5 mha is under Micro Irrigation. Estimates show that the total cropped area suitable for drip irrigation in the country is to the tune of 27 mha and sprinkler irrigation is about 42.5 mha. Thus there is huge unrealized potential in this sector.

**Agriculture Area (Million Hectare)**

<table>
<thead>
<tr>
<th></th>
<th>Million Hectare</th>
</tr>
</thead>
<tbody>
<tr>
<td>India's total cropped area</td>
<td>193.7</td>
</tr>
<tr>
<td>Net Irrigated area</td>
<td>65</td>
</tr>
<tr>
<td>Area Suitable for drip Irrigation</td>
<td>27</td>
</tr>
<tr>
<td>Area suitable for sprinkler</td>
<td>42.5</td>
</tr>
<tr>
<td>Area covered under Drip Irrigation</td>
<td>2.2</td>
</tr>
<tr>
<td>Area covered under sprinkler irrigation</td>
<td>3.35</td>
</tr>
<tr>
<td>Total area covered</td>
<td>5.5</td>
</tr>
</tbody>
</table>

*Source: Ministry of Agriculture, Government of India*

(This article is co-authored by: Mr Prabhsharan Singh, prabhsharan.singh@ficci.com & Ms Charu Smita, charu.smita@ficci.com)
7 Critical Success Factors and Strategic Imperatives

Agro-Chemicals industry offers huge opportunities for the players due to current lower consumption levels and hence huge scope of increasing market penetration. Companies need to develop strategic roadmap to ensure survival in the long run. Some of the Critical Success factors and hence the strategic imperatives for the industry players are:

- **Product innovation**: Product innovation needs to capture emerging market trends and match international standards. Companies in agro-chemical space can focus on the following:
  - Companies need to innovate products which can improve the effectiveness of pesticide usage as well as reduce the negative impacts on environment. With the advent of GM crops and increasing popularity of bio-pesticides, environment friendliness of the agro-chemicals could be a differentiating factor.
  - Indian companies would need to increase focus on developing new active ingredients rather than just focusing on generics. Indian companies usually spend 1-2% of their turnover on R&D while corresponding spend by MNC’s is 12-15%.
  - Indian companies can also look for strategic tie-ups/ alliance with large MNCs for contract manufacturing if they lack the ability to invest in developing new molecules.

- **Wider range of solutions**: Companies need to offer wider range of solutions to reach-out to larger customer segments. They can re-invent themselves in some of the following ways:
  - Companies can look at widening their product portfolio to offer wider range of options to the agriculture community. Major agrochemical companies in the world have reoriented themselves as Agriculture companies, focused at chemistry and biotechnology based innovation to deliver better yield and quality of food. Companies like Bayer, Syngenta, Monsanto, DuPont and Dow Agro Sciences have both pesticides and seeds in their product portfolio. This orientation contributes to a broader perspective over the entire plant production system, because it integrates pesticide and seed technology development.
  - The agro-chemicals industry has huge scope for consolidation through mergers & acquisitions. Companies need to keep themselves updated with the latest industry trends and be prepared to capture any opportunity for alliances/acquisitions. M&A also opens up opportunities for firms to enter into newer product offerings. As an example, Dupont acquired Nandi seeds and Nagarjuna seeds in India to enter cotton seed market. Coromandel International Ltd. acquired Sabero Organics to enter into fungicides and insecticides market.
• **Effective marketing and distribution**: Rising sales of spurious products in agro-chemical space has hampered the image of the industry. Companies need to invest more in marketing and increase customer base by adopting some of the following strategies:

  - Educating the end-users (farmers) about the pesticides, their ingredients, usage, safety measures etc. is required to prevent them from falling prey to spurious products. Companies can reach-out to farmers and educate them via seminars, discussions through initiatives like E-Choupal.

  - Industry bodies also need to invest in overall "Image improvement" of the industry. Companies can increase the transparency about the implications of using the pesticides by displaying the ingredients on the packaging. Benefits of Bio-pesticides also need to be promoted to encourage shift from the traditional products.

  - Companies can also tie-up with government bodies/ state agriculture universities to increase their distribution reach and target current non-users. Free knowledge camps can be organized in rural areas and pesticides can be distributed at subsidized rates to showcase the benefits to the non-users.
8 Special Feature: Strategic Supply Chain Management for Agrochemical Companies

Agrochemical companies in India need to operate in a mode with a higher focus on effectiveness of its supply chain. Companies operate in an environment having seasonal nature of demand, unpredictability of pest attacks and high dependence on monsoons, and have a push based model with month end skews and high inventory across the channel as a perennial problem for the industry. Most companies choose to focus on introducing new products regularly followed by promotion, farmer engagement and brand awareness rather than sensing the demand and ensuring product availability, reducing lost sales, minimizing inventory, freeing up capital across the channel and improving channel partner ROI.

Currently few of the key agrochemical companies have a mechanism to monitor secondary sales. There is high opacity of the channel beyond the CFA/ company depots. Companies are forecasting demand, planning production, setting sales targets and competing to push stocks to distributors (which are largely non-exclusive) based on primary sales, without having an idea of actual demand and consumption by farmers. Use of technology to track sales, if at all, is ineffective. Few companies track lost sales on account of product unavailability and most are laden with inventory of slow moving SKUs.

Larger companies have a large distributor and retailer network, which is considered a critical success factor. As a result companies with strong networks are coveted as co-marketing partners by others who are limited in their reach. However, the distributors and retailers that form the network are not really looked upon as strategic partners. Stocks are pushed onto them, irrespective of demand, leading to month-end skews and there is no focus on maximizing their ROI. This is contrary to the ‘best practices’ for an industry where distribution network has such a critical role to play.

Apart from high channel inventory, lost sales and month-end skews emerging from ineffective forecasting, companies are also grappling with the challenge of managing multiple logistics service providers (LSPs). In the absence of a pan-India LSP, companies are forced to deal with multiple local transporters, sometimes as many as 40 transporters on a single route. At the same time, hazardous nature of the product makes warehousing and transportation costly.

While majority of the companies continue to battle these challenges, a number of smaller players are challenging the norms and changing the rules of the game. Instead of adopting the strategy of new product introduction, they are focusing on operational effectiveness and channel re-orientation. They have eliminated the distributor layer wherever necessary and
service the retailers directly. This provides them absolute clarity on actual product demand in the market and transforms the planning process. The additional complexity of servicing multifold customers is offset with the use of apt technology. Mobile applications integrated with ERP systems are used efficiently for placing orders and recording payments. Inventory is rationalized by following a replenishment model with frequent ordering. This approach is rationalized by following a replenishment model with frequent ordering. This approach is enabling these players to achieving improved levels of responsiveness with service rates of 24 to 48 hours.

These companies are challenging the myths associated with seasonality and manufacturing as per demand as close to the season as possible. They do not shy away from keeping plants idle in times of low/no demand and refuse to consider plant utilization level as a performance indicator. They are adopting ways of making manufacturing more flexible and are delaying packaging to serve demand better.

In the detailed report, Tata Strategic raises vital questions about the effectiveness of current SCM practices in agrochemicals and uncovers innovative ways new practices from within the industry adopted by a select set of more nimble, progressive companies who are setting new benchmarks in supply chain performance.
We believe that the agrochemicals supply chain is amongst the most complex chains and there is a need to fill in critical gaps in channel information to make it more manageable. Ideas have been put forth to help agrochemical companies

- Increase visibility of secondary sales to get attuned to actual demand
- Increase responsiveness to this demand and
- Manage logistics complexity

Given their scale, large companies may find it challenging to adopt these practices and will require significant change management efforts. Nevertheless, it is imperative for companies to start thinking of their supply chain function as a strategic lever for achieving operational excellence and addressing revenue and cost pressures.

Note: The above chapter is an executive summary of a Report titled "Strategic Supply Chain Management for Agrochemical Companies - Changing the Rules of the Game".
9 Special Feature: Spurious/Counterfeit Pesticides

The sale of sub-standard and spurious as also counterfeit pesticides is a major problem area having serious implications for the farmers, Indian Agriculture, Indian society and the economy at large. This report deals with this issue in Chapter 3-Indian Market Overview as also Chapter 5-Bio-Pesticides.

These products not only fail to take care of pests but also inflict damages on crops. The resultant loss is multiple. It is not only the farmer who is cheated, but the low yield also impacts the national economy.

A recent FICCI study reveals the convergence of four key factors that make the Indian market susceptible to grey market operations. These are:

- Market attractiveness
- Supply Chain inefficiency
- Enforcement challenges
- Customer unawareness

There are varying estimates of impact of this illegal activity. According to pesticides industry body, Agrochemicals Policy Group (APG), spurious and substandard pesticides accounted for ~40% of the pesticides sold in India in FY 12.

To establish facts there is need to undertake a focussed scientific study is suggested to bring out the detailed reasons of this problem, extent of problem as also possible solutions. That will be helpful not only to the farmers, industry, the policy makers but also to the economy.
10 Key Players: Profile

<table>
<thead>
<tr>
<th>BASF India Limited</th>
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</thead>
</table>
| Company overview | Founded in 1943 as an Indian arm of global chemical company BASF  
Engages in manufacture and sale of agrochemicals, performance products, plastics, inorganic chemicals, and functional solutions  |
| Product segments/ Verticals | Chemicals  
Plastics  
Performance Products  
Functional Solutions  
Agricultural Solutions  |
| Crop Protection Chemicals |  |
| Products | Insecticides  
Herbicides  
Fungicides  
Specialties  |
| Sales Revenue in FY12 | Rs.3,601 Crores (includes revenue from other product segments)  |
| Manufacturing locations | The company has five manufacturing plants  
1. Thane (Maharashtra)  
2. Manglore (Karnataka)  
3. Dahej (Gujarat)  
4. Chennai (Tamil Nadu)  
5. Ankleshwar (Gujarat)  |
| Marketing | Adoption of innovative marketing initiatives  
Company operates as a total solution provider through programs like Samruddhi program  |
| R&D | Collaborative research with BASF SE, BASF Schweiz AG and BASF Corporation in USA.  
Expenditure on R&D: INR 9.18 Cr  |
| Key Mergers/ Acquisitions | Acquired the business of Cognis Specialty Chemical Pvt. Ltd in India in 2011  |
### Bayer Crop Science India

#### Company overview
- Bayer CropScience is one of the world’s leading cropscience companies in the world with presence in 122 countries.

#### Product segments/ Verticals
- Crop Protection
- Environmental Science
- Bioscience

#### Crop Protection Chemicals

<table>
<thead>
<tr>
<th>Products</th>
<th>Insecticides</th>
<th>Fungicides</th>
<th>Herbicides</th>
<th>Seed treatment chemicals</th>
<th>Plant growth regulators</th>
</tr>
</thead>
</table>

#### Sales Revenue in Fy12
- Rs. 2204 Cr (includes revenue from other product segments)

#### Manufacturing locations
- Manufacturing locations at Himmatnagar & Ankleshwar
- Total production capacity of 5770 MT of active ingredients and formulation capacity of 10,025 KL & 3650 Mt for liquids & solids respectively
- ~70% of the formulations are contract manufactured

#### Distribution structure
- Has own distribution network & is also in co-distribution alliances with several other companies in India

#### R&D
- Apart from crop protection, major areas of research include seeds & plant traits
- R&D spend in FY12 is 0.65% of net revenue

#### Key Mergers/ Acquisitions
- Acquisition of Biotech company Athenix Corp., 2009

### Dhanuka Agritech Limited

#### Company overview
- Started in 1980 by the acquisition of Northern Minerals Pvt. Ltd
- Manufacturer of wide range of pesticides, plant growth regulators reaching out to more than 10 million farmers.

#### Product segments/ Verticals
- Agrochemicals
- Crops
- Surfactants

#### Crop Protection Chemicals

<table>
<thead>
<tr>
<th>Products</th>
<th>Insecticides</th>
<th>Fungicides</th>
<th>Herbicides</th>
<th>Plant Growth &amp; Regulators</th>
</tr>
</thead>
</table>

#### Sales Revenue in Fy2013
- INR 646 Cr (Exports Sales: INR 0.25 Cr)

#### Manufacturing locations
- Three manufacturing units located at:
  1. Gurgaon (Haryana)
  2. Sanand (Gujarat)
  3. Udhampur (J&K)

#### Distribution structure
- Pan-India presence through its marketing offices

#### R&D
- Two R&D centres at Gurgaon and Jullundur for generation of scientific data, and evaluation of new molecules, soil testing, advisory services, training of farmers among all.
- Total expenditure on R&D was INR 1.45 Cr (0.25% of Total Turnover)

#### Key Mergers/ Acquisitions
- Collaborations with various international chemical companies like Du Pont, Chemtura, FMC, Bayer, Sumitomo, Mitsui, Arysta, Dow AgroSciences India Pvt. Ltd.
### Bayer Crop Science India

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**Product segments/ Verticals**
- Crop Protection
- Environmental Science
- Bioscience

**Crop Protection Chemicals**
- Insecticides
- Fungicides
- Herbicides
- Seed treatment chemicals
- Plant growth regulators

**Sales Revenue in FY12**
INR 2204 Cr (includes revenue from other product segments)

**Manufacturing locations**
- Manufacturing locations at Himmatnagar & Ankleshwar
- Total production capacity of 5770 MT of active ingredients and formulation capacity of 10,025 KL & 3650 Mt for liquids & solids
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**Product segments/ Verticals**
- Agrochemicals
- Crop Protection Chemicals
- Insecticides
- Fungicides
- Herbicides
- Plant Growth & Regulators

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- Three manufacturing units located at:
  1. Gurgaon (Haryana)
  2. Sanand (Gujarat)
  3. Udhampur (J&K)

**Distribution structure**
- Pan-India presence through its marketing offices
- Network of more than 7,500 distributors/dealers selling to over 70,000 retailers

**R&D**
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- Total expenditure on R&D was INR 1.45 Cr (0.25% of Total Turnover)

**Key Mergers/ Acquisitions**
- Collaborations with various international chemical companies like Du Pont, Chemtura, FMC, Bayer, Sumitomo, Mitsui, Arysta

### Dow AgroSciences India Pvt. Ltd.

**Company overview**
- Fully owned subsidiary of Dow AgroSciences headquartered in Indianapolis, U.S.A.
- Global company that provides pest management, agricultural and biotechnology products.

**Product segments/ Verticals**
- Crop Protection
- Seeds, Traits and oil

**Crop Protection Chemicals**
- Insecticides
- Herbicides
- Fungicides
- Plant growth regulators

**Sales Revenue in FY12**
INR 14,500 Cr (Global)

**Manufacturing locations**
- Manufacturing plant: Lote, Parashuram, 250 km away from Mumbai (Maharashtra)

**Distribution structure**
- Dow AgroSciences markets its products through a network of distributors and divisional sales managers.

**R&D**
- Extensive importance to R&D with a global annual R&D budget excess of INR 1,000 Cr
- 4:3:1 process of product development
## DuPont

<table>
<thead>
<tr>
<th>Company overview</th>
<th>DuPont's India subsidiary was setup in 1994 and Contract manufacturing of crop protection products started in 1995</th>
</tr>
</thead>
</table>
| Product segments/ Verticals | Crop Protection  
Seeds |
| **Crop Protection Chemicals** | |
| Products | Insecticides  
Fungicides  
Herbicides  
Seed treatment chemicals |
| Sales Revenue in Fy12 | India contributed 2.5% of overall revenues  
INR 4,900 Cr (includes revenue from other product segments) |
| Manufacturing locations | Manufacturing locations at Savli, Gujarat and Hyderabad for crop protection and seed treatment |
| Distribution structure | Has own distribution network & is also in co-distribution alliances with several other companies in India  
Signed a distribution alliance with Punjab State Cooperative Supply and Marketing Federation Limited (Markfed), a federation of more than 3,000 societies in Punjab State in 2012 |
| R&D | DuPont's knowledge centre at Hyderabad was inaugurated in 2008, which was its first R&D centre outside the US  
Globally the company spends ~USD 2 Bn p.a. on R&D activities |
| Key Mergers/ Acquisitions | Acquired Nandi seeds and cotton germplasm business of Nagarjuna seeds in India in 2009 |

## Excel Crop Care

| Company overview | Established in 2002  
A major player in domestic and export market in India |
|------------------|-------------------------------------------------------------------------------------------------------------|
| Product segments/ Verticals | Soil health  
Seed treatment  
Crop protection  
Growth enhancers  
Post-harvest  
Home & Garden |
| **Crop Protection Chemicals** | |
| Products | Insecticides  
Herbicides |
### Excel Crop Care

| **Company overview** | • Established in 1967  
• A major player in domestic and export market in India |
| **Product segments/ Verticals** | • Agrochemicals  
• Intermediates  
• Pigments  
• Veterinary drugs  
• High performance polymers  
• Contract services |
| **Crop Protection Chemicals** | • Insecticides  
• Herbicides  
• Fungicides  
• Plant growth regulators |
| **Sales Revenue in Fy2011** | • Sales revenue of INR 957 Cr (about 60% are exports) |
| **Manufacturing locations** | • 5 manufacturing locations at Dombivli, Ankleshwar, Lote, Jamm & Panoli |
| **Distribution structure** | • Products are sold through distributors |
| **R&D** | • In House R&D activities include product research & process improvement for backward integration and import-substitution |
| **Key Mergers/ Acquisitions** | • Set up Gujarat Insecticides Ltd. In joint venture with Gujarat Agro Industries Corporation Ltd. In 1980  
• In 1996, Gharda Chemicals purchased the entire holdings of Gujarat Agro Industries Corporation Ltd and Gujarat Insecticides Ltd. Became the subsidiary of Gharda Chemicals. |

### Gharda Chemicals Limited

| **Company overview** | • Established in 1967  
• A major player in domestic and export market in India |
| **Product segments/ Verticals** | • Agrochemicals  
• Intermediates  
• Pigments  
• Veterinary drugs  
• High performance polymers  
• Contract services |
| **Crop Protection Chemicals** | • Insecticides  
• Herbicides  
• Fungicides  
• Plant growth regulators |
| **Sales Revenue in Fy2013** | • Sales revenue of INR 745 Cr with exports of INR 300 Cr |
| **Manufacturing locations** | • Manufacturing locations at Gajod, Bhavnagar and Silvassa |
| **Distribution structure** | • Products are sold through distributors |
| **R&D** | • R&D focused on fungicides and herbicides and development of combi-formulations for enhanced efficiency |
| **Key Mergers/ Acquisitions** | • Set up Gujarat Insecticides Ltd. In joint venture with Gujarat Agro Industries Corporation Ltd. In 1980  
• In 1996, Gharda Chemicals purchased the entire holdings of Gujarat Agro Industries Corporation Ltd and Gujarat Insecticides Ltd. Became the subsidiary of Gharda Chemicals. |
### Meghmani Organics Limited

**Company overview**
- Incorporated in 1995 from Gujarat Industries which was established in 1986

**Product segments/ Verticals**
- Crop Protection
- Pigments

**Crop Protection Chemicals**

**Products**
- Pesticides
  - Technical products
  - Formulations
  - Intermediates

**Sales Revenue in Fy13**
- INR 1,040 Cr (includes revenue from other product segments) with revenue from agro-chemicals ~INR 340 Cr
- Export sales of INR 248 Cr in agro-chemicals

**Manufacturing locations**
- Manufacturing locations at Ankleshwar, Chharodi, Dahej and Panoli

**Distribution structure**
- Has own distribution network & is also in co-distribution alliances with several other companies in India

**R&D**
- R&D focused on development of off-patent molecules and improvements in process parameters
- R&D spend in FY12 is 0.18% of net revenue

### Monsanto India Limited

**Company overview**
- Monsanto India Limited (MIL) is a subsidiary of the Monsanto Company, USA and is the only publicly listed Monsanto entity outside USA
- It has been present in India for over six decades now

**Product segments/ Verticals**
- Crop Protection
- Seeds

**Crop Protection Chemicals**

**Products**
- Insecticides
- Fungicides
- Herbicides
- Seed treatment chemicals
- Plant growth regulators

**Sales Revenue in Fy13**
- INR 460 Cr (includes revenue from other product segments)

**Manufacturing locations**
- Production unit at Silvassa, Bellary and an integrated manufacturing plant in Hyderabad

**Distribution structure**
- Reaches out to over 1 Mn farmers every year through various farmer engagement programs
- Has own distribution network through distributors and dealers
- Monsanto has tied up with seven states through public-private partnership where it plays the role of seed supplier as well as knowledge partner

**R&D**
- Globally, Monsanto invests 9-12% of the sales on R&D
- R&D in India focused on improving maize seeds and herbicides for weed management
### Meghmani Organics Limited

**Company overview**

Incorporated in 1995 from Gujarat Industries which was established in 1986.

**Product segments/ Verticals**

- Crop Protection
- Pigments
- Crop Protection Chemicals
- Products
- Technical products
- Formulations
- Intermediates

**Sales Revenue in FY13**

INR 1,040 Cr (includes revenue from other product segments)

With revenue from agro-chemicals ~INR 340 Cr

**Export sales of INR 248 Cr in agro-chemicals**

**Manufacturing locations**

Manufacturing locations at Ankleshwar, Chharodi, Dahej and Panoli.

**Distribution structure**

Has own distribution network & is also in co-distribution alliances with several other companies in India.

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**Product segments/ Verticals**

- Crop Protection
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- Fungicides
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**Sales Revenue in FY13**

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Production unit at Silvassa, Bellary and an integrated manufacturing plant in Hyderabad.

**Distribution structure**

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**R&D**

- Globally, Monsanto invests 9-12% of the sales on R&D.
- R&D in India focused on improving maize seeds and herbicides for weed management.

---

### Nagarjuna Agrichemical Limited

**Company overview**

Established in 1994.

**Product segments/ Verticals**

- Crop Protection
- Plant growth promoters
- Crop Protection Chemicals
- Insecticides
- Fungicides
- Herbicides

**Sales Revenue in FY13**

INR 614 Cr (includes revenue from other product segments)

**Manufacturing locations**

Production unit at Silvassa and integrated manufacturing plant in Hyderabad.

Developing a corporate R&D centre near Hyderabad to look at contract manufacturing opportunities.

**Distribution structure**

Extensive warehousing and logistics network to handle operations in 20 states.

Strong network of ~10,000 dealers.

**R&D**

- R&D/ Process development department of NAACL is claimed to be second largest of any Indian Agro-chemical company in terms of size and scope.
### PI Industries

| Company overview | • Incorporated in 1947 as Mewar Oil and General Mills Ltd.  
• Corporate office in Gurgaon with R&D setup at Udaipur |
|------------------|----------------------------------------------------------|
| Product segments/ Verticals | • Agro-chemicals  
• Specialty products  
• Custom Synthesis and Manufacturing |
| Crop Protection Chemicals | Products  
• Insecticides  
• Fungicides  
• Herbicides |
| Sales Revenue in Fy12 | • INR 877 Cr. (includes revenue from other product segments)  
• YoY revenue growth of 22% |
| Manufacturing locations | • Manufacturing plant at Ankleshwar and formulation unit in Jammu |
| Distribution structure | • Robust distribution network with ~8,000 distributors & direct dealers and 35,000 retail points across the country  
• 27 stock points including own depots and C&Fs  
• Strong database of farmers with their contact details for direct customer reach out |
| R&D | • R&D expense was ~0.62% of the total turnover  
• R&D centre at Udaipur focused on synthesis and development of new molecule for Agro-chemicals, fine chemicals & specialty chemicals |

### Rallis India

<table>
<thead>
<tr>
<th>Company overview</th>
<th>Rallis is one of the leading Indian agrochemical company</th>
</tr>
</thead>
</table>
| Product segments/ Verticals | • Agri business domestic: Five segments: Pesticides, seeds, fertilizers, household products & seed treatment chemicals  
• Institutional business: Formulations & technical bulk sales to leading companies like Bayer, Syngenta, UPL, etc  
• International business  
• Contract services |
| Crop Protection Chemicals | Products  
• Insecticides  
• Herbicides  
• Fungicides  
• Rodenticides  
• Seed treatment chemicals |

Sales Revenue in Fy2012 INR 1,274 Cr (includes revenue from other product segments) with 32% from outside India
Manufacturing locations Five manufacturing plants at Akola, Ankleshwar, Lote, Patancheru and Dahej
Total installed capacity of pesticides is 22,020 MT for solids & 15,225 MT for liquids
Distribution structure Distribution network covers 80% districts of India, with more than 2,500 dealers & 37,000 retailers
Four regional & zonal offices each, 33 area sales offices, 23 depots present all over India
International business is done through own registrations & agents & distributors
Institutional sales are direct
Digitized base of ~7,00,000 farmer with multiple farmer engagement programs
R&D R&D is involved in developing new formulations, providing better delivery and sustainable solutions to the farmers
New Millennium Indian Technology Leadership Initiative (NMITLI) is being pursued to find new molecules and further association is done with National Chemical Laboratory, Pune
Involved with regulatory studies & registration process
Key Mergers/ Acquisitions Acquired 22% stake in Zero waste Agro Organics Pvt. Ltd. involved in organic manure and soil conditioners manufacturing
Acquired majority stake in Bangalore based Metahelix Life, 2010
Co-marketing alliances with several companies such as DuPont, Syngenta, Bayer, FMC, Makhteshim Chemical works, Ghrada Chemicals, etc
### Rallis India

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<thead>
<tr>
<th><strong>Sales Revenue in Fy2012</strong></th>
<th>• INR 1,274 Cr (includes revenue from other product segments) with 32% from outside India</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Manufacturing locations</strong></td>
<td>• Five manufacturing plants at Akola, Ankleshwar, Lote, Patancheru and Dahej</td>
</tr>
<tr>
<td></td>
<td>• Total installed capacity of pesticides is 22,020 MT for solids &amp; 15,225 MT for liquids</td>
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<tr>
<td><strong>Distribution structure</strong></td>
<td>• Distribution network covers 80% districts of India, with more than 2,500 dealers &amp; 37,000 retailers</td>
</tr>
<tr>
<td></td>
<td>• Four regional &amp; zonal offices each, 33 area sales offices, 23 depots present all over India</td>
</tr>
<tr>
<td></td>
<td>• International business is done through own registrations &amp; agents &amp; distributors</td>
</tr>
<tr>
<td></td>
<td>• Institutional sales are direct</td>
</tr>
<tr>
<td></td>
<td>• Digitized base of ~7,00,000 farmer with multiple farmer engagement programs</td>
</tr>
<tr>
<td><strong>R&amp;D</strong></td>
<td>• R&amp;D is involved in developing new formulations, providing better delivery and sustainable solutions to the farmers</td>
</tr>
<tr>
<td></td>
<td>• New Millennium Indian Technology Leadership Initiative (NMITLI) is being pursued to find new molecules and further association is done with National Chemical Laboratory, Pune</td>
</tr>
<tr>
<td></td>
<td>• Involved with regulatory studies &amp; registration process</td>
</tr>
<tr>
<td><strong>Key Mergers/ Acquisitions</strong></td>
<td>• Acquired 22% stake in Zero waste Agro Organics Pvt. Ltd. Involved in organic manure and soil conditioners manufacturing</td>
</tr>
<tr>
<td></td>
<td>• Acquired majority stake in Bangalore based Metahelix Life, 2010</td>
</tr>
<tr>
<td></td>
<td>• Co-marketing alliances with several companies such as DuPont, Syngenta, Bayer, FMC, Makhteshim Chemical works, Ghrada Chemicals, etc</td>
</tr>
</tbody>
</table>
### Syngenta India Limited

| Company overview | 84% subsidiary of Switzerland headquartered Syngenta Global  
| Formed by merging agri-businesses of Novartis & AstraZeneca in 2000 |
| Product segments/ Verticals | Seeds  
| Crop protection chemicals |
| **Crop Protection Chemicals** | **Products** | Insecticides  
| Fungicides  
| Herbicides  
| Seed Care |
| Sales Revenue in Fy2012 | INR2539 Cr. (includes revenue from other product segments) |
| Manufacturing locations | Manufacturing plant at Santa Monica, Goa |
| Distribution structure | Products are sold through distributors and co-marketing alliances with leading Indian companies |
| R&D | Research & Technology centre at Goa, involved in product research of organic chemical synthesis and analytical chemistry research. R&D expenditure was 1.88% of total turnover |
| Key Mergers/ Acquisitions | Co-marketing alliance with Rallis India  
| Crop protection technology exchange with DuPont, partnership on improving crop quality with Embrapa - the Brazilian Agricultural Research Corporation, R&D agreement with Dow AgroScience  
| Product license from Sumitomo |
### United Phosphorous Limited

| Company overview | Established in 1969 and has its presence in all value-added agricultural inputs ranging from seeds to crop protection & post harvest activity  
|                  | Largest Manufacturer of agrochemical in India  
|                  | Has its own subsidiary offices worldwide  
|                  | Global player with customer base in 123 countries |

| Product segments/ Verticals | Agrochemicals  
|                            | Industrial and Specialty chemicals  
|                            | Animal Nutrition  
|                            | Riceco |

### Crop Protection Chemicals

| Products | Insecticides  
|          | Fungicides  
|          | Herbicides  
|          | Fumigants  
|          | Rodenticides  
|          | Plant Growth & Regulators |

| Sales Revenue in Fy2013 | Rs. 4136 Cr (61% of companies revenues are derived from exports) |

| Manufacturing locations | 23 manufacturing location across the globe with 9 in India  
|                        | Production capacity of 98,264 MT of pesticides & 42,631 MT of pesticides intermediates |

| Distribution structure | Products are sold through distributors spread across the country |

| R&D | R&D activities in product development & registration. Spend about 2% of total revenues |

| Key Mergers/ Acquisitions | Product acquisitions from DuPont and Bayer  
|                           | Company acquisitions of Metahelix Life, EvoFarms, AG, Cequisa and ICONA, Advanta, RiceCo US  
|                           | United Phosphorus Acquires Dutch Company Agrichem  
|                           | Acquisition of a 51% stake in DVA Agro Do Brasil, a Brazilian company, from DVA Group, Germany |
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12. About Tata Strategic

Founded in 1991 as a division of Tata Industries Ltd, Tata Strategic Management Group is the largest Indian own management consulting firm. It has a 70 member strong consulting team supported by a panel of domain experts. Tata Strategic has undertaken 500+ engagements, with over 100 clients, across countries and sectors.

It has a growing client base outside India with increasing presence outside the Tata Group. A majority of revenues now come from outside the group and more than 20% revenues from clients outside India.

Tata Strategic offers a comprehensive range of solutions covering Direction Setting, Driving Strategic Initiatives and Implementation Support

Our Offerings

- Vision
- Market insights
- Growth Strategy/Business Plans
- Rural Strategy
- Digital Strategy

- India Entry
- Alliance & Acquisition Planning
- Strategic due diligence
- Scenario Planning
- Manufacturing Strategy

- Organization Structure
- Corporate Center Design
- Roles & Decision rules
- Performance Management
- Capability Assessment
- Talent Management
- Delegation & M&G

- Revenue Enhancement
- Product Innovation
- Market Share
- Rura/Urban
- Go to Market
- Dealer Effectiveness

- Supply Chain Optimization
- Throughput enhancement
- Superior Fulfillment
- Project Excellence
- Procurement Transformation
- Strategic Cost Reduction
- Vendor Compliance

- Implementation Plan
- Program Management
- Refinements/Course Correction

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Reports co-authored by Manish Panchal, Charu Kapoor, Mansi Mahajan and Manan Agarwal
About FICCI

Industry’s Voice for Policy Change

Established in 1927, FICCI is one of the largest and oldest apex business organizations in India. FICCI’s history is closely interwoven with India’s struggle for independence, industrialization and emergence as one of the most rapidly growing global economies. FICCI has contributed to this historical process by encouraging debate, articulating the private sector’s views and influencing policy.

A not-for-profit organization, FICCI is the voice of India’s business and industry.

FICCI draws its membership from the corporate sector, both private and public, including MNCs; FICCI enjoys an indirect membership of over 2,50,000 companies from various regional chambers of commerce.

FICCI provides a platform for sector specific consensus building and networking and is the first port of call for Indian industry and the international business community.

Our Vision

To be the thought leader for industry, its voice for policy change and its guardian for effective implementation.

Our Mission

To carry forward our initiatives in support of rapid, inclusive and sustainable growth that encompasses health, education, livelihood, governance and skill development.

To enhance the efficiency and global competitiveness of the Indian industry and to expand business opportunities both in domestic and foreign markets through a range of specialized services and global linkages.

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Indian Agrochemicals Industry

Imperatives of Growth

Knowledge and Strategy Paper

released at

3rd National AGROCHEMICALS CONCLAVE 2013

July, 2013

Knowledge and Strategy Partner

TATA STRATEGIC MANAGEMENT GROUP