

# CROP PRO



# TECTION

## KEY TO FOOD SECURITY

**C**rop Protection is a significant component of crop management. A good crop always do not ensure a good harvest or better returns. A number of factors influence the outcome, and pest and diseases are an important determinant. On an average, 20-30% of food produced is destroyed by the incidence of pests and diseases in India which translates to around Rs. 45000 crore loss for the farmers. This is a monumental loss considering our resolve

to double farmers' income by 2022. At this juncture, it becomes imperative to contain these losses. Crop Protection therefore assumes significance.

### **CROP CARNAGE**

Damage to crops by biotic elements is universal. Fungal infections, according to a study destroy at least 125 million tonnes of the top five food crops of the world -- rice, wheat, maize, potatoes and soybeans -- each year. These crops provide the majority

of calories consumed by people worldwide. World over, the damage by fungi to rice, wheat and maize alone costs \$60 billion per year. The effects assume catastrophic proportions for the developing world, where 1.4 billion people live on less than \$1.25 per day, and rely most heavily on these low-cost foods. Stemming fungal diseases alone in the world's five most important crops could feed more than 600 million people.

Insect pests are also important while considering the losses inflicted to crops. There are around 10,000 species of insects who eat and damage crops. Of these, only 10 per cent are considered to be major pests. However, these insect pests are potent enough to destroy one fifth of the global crop output annually. In India the losses due to insect pests have come down from 23.3 per cent in the post green revolution era to 15.7 per cent now. This loss calculates to around US\$ 36 billion annually. Globally, the losses come to around 1.3 billion tonnes per year.

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to weeds, according to a study by researchers associated with the Indian Council for Agricultural Research (ICAR). At \$4.42 billion, the actual economic losses due to weeds were found to be highest in rice, followed by wheat (\$3.376 billion) and soybean (\$1.56 billion). However, the average yield loss is the lowest in rice — 14 per cent in transplanted rice and 21 per cent in direct-seeded condition. The overall loss went up because of high rice production in India, said the study. The greatest average loss, on the other hand, was reported from groundnut cultivation, followed by maize and soybean. A groundnut farmer on an average lost 36 per cent of his crop to weeds, resulting in an estimated loss of \$347 per hectare.

The average losses in maize and soybean farming were \$136/ha and \$117/ha, respectively. The average yield loss in wheat was \$116 per ha. The researchers, from the Jabalpur-based Directorate of Weed Research (DWR), estimated the economic losses using data generated by an all India co-ordinated research project on weed management, which carried out 1,580 on-farm research trials on 10 major crops at different locations in 18 States over a decade. Studies some years ago showed that globally, weeds are responsible for decreasing production of the eight most important food and cash crops by 13.6 per cent, leading to an economic loss of \$100 billion.

Crop epidemics that led to Irish famine and Bengal famine have very well established the impact plant diseases can have on a country and its people. A well managed strategy for crop protection thus becomes pertinent in any crop production plan. While some are based on prophylaxis, others are curative.

### CROP CARE CHEMICALS

The disease and pest incidence are inevitable components in today's agriculture. Changing climates have resulted in new pests and diseases and aggravation of minor pests. Regularity in their occurrences have warranted an in-built regime of crop





### AGRICULTURE OUTPUT AND SPEND ON CROP PROTECTION CHEMICALS

Country	Agriculture Production in US Dollar per USD of pesticide spent	Pesticide Spend per (Billion USD)
China	126	8
India	126	2.5
USA	31	9
Brazil	10	13

Source: DAC

protection measures that focusses more on prevention and containment. Although efficacy of plant protection chemicals are undisputed, their continuous and indiscriminate use have far outweighed their benefits and brought the side effects to the center stage. The result was the adoption of integrated pest and disease management wherein chemical means of pest management were one of the components.

Among the most commonly used chemicals in agriculture - Insecticides, fungicides and herbicides- insecticides form the highest share in total pesticide use in India. In the year 2014-15, pesticide consumption was 0.29 kg/ha (GCA), which is roughly 50 per cent higher than the use in 2009-10. The recent increase in pesticide use is believed to be due to the higher use of herbicides as cost of manual weed control has risen due to increase in agricultural wages (FICCI, 2015). However, per hectare use of pesticide in India is much lower as compared to other countries like China (13.06 kg/ha), Japan (11.85 kg/ha), Brazil (4.57 kg/ha) and other Latin American countries.

If we compare with other countries, India's spend on crop protection countries is \$2.5 billion, which is just 0.8 per cent of total agrarian production. It means that India and China's per dollar spend on crop protection chemicals stand at \$126, which is far higher than that in countries like US and Brazil. Indian farmers may be termed as using crop protection chemicals in a more efficient way with a better generation of agricultural produce.

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This is in contrary to the claims of excessive and inefficient use of chemicals by Indian farmers for plant protection. The data above suggests that India uses fewer chemicals than many of the developed nations and other emerging economies of the world. It is evident that China has got less arable area (106 million hectare) than India (155 million hectare).

Among the states in India, Maharashtra tops in pesticide consumption, followed by Uttar Pradesh, Punjab and Haryana. During the last decade, the total consumption increased in Maharashtra and Uttar Pradesh, while it slightly declined in Punjab and Haryana. States like West Bengal, Gujarat and Karnataka have seen a steep decline in the total consumption. On the other hand, Chhattisgarh and Kerala showed a steep increase in total pesticide consumption. Per hectare consumption of pesticides was the highest in Punjab (0.74 kg), followed by Haryana (0.62 kg) and Maharashtra (0.57 kg) during the year 2016-17, while the consumption levels were lower in Bihar, Rajasthan, Karnataka and Madhya Pradesh.

The share of pesticides in the cost of cultivation was 3 per cent in cotton, 1.9 per cent in paddy, further lower in wheat (0.7%) and sugarcane (0.3%). Agricultural Input Survey data show that in 2011-12, per cent area treated with pesticides was the highest in cotton (66.70%) followed by arhar (64.74%), jute (53.27%) and paddy (48.62%) and low in maize (25.01%). Over the period 1991-92 to 2011-12, there has been a substantial increase in the proportion of area treated with pesticides across all crops, except cotton and jute. However, during 1991-92 to 2011-12, difference between the proportion of area treated with pesticides under irrigated and un-irrigated conditions has narrowed down primarily because of the use of hybrids in rainfed areas which require effective pest management

Pesticide production in India is dominated by insecticides and fungicides followed by herbicides and rodenticides. However, the share of insecticides has come down from more than 70 per cent in 2003-04 to 39 per cent in 2016-17. The shares of fungicides, herbicides and rodenticides are growing over the period. The growth in the use of fungicides is high mainly because of their application in fruit and vegetable crops. Major pesticides produced in India are Mancozeb, 2-4-D, Acephate and Profenofos. Total export of agro-chemicals in 2016-17 stood at 377.76 thousand tonnes, with the share of fungicides being the largest in terms of export quantity (45.94%) and herbicides accounting for the largest share in terms of value of exports (28.19%). As per data provided by Central Board of Excise and Customs (CBEC) for the year 2016-17, top five pesticides exported from India were Mancozeb, Cypermethrin,



Bio-pesticides have the potential to control crop losses and reduce negative environmental effects. Bio-pesticides constitute around 3 per cent of pesticide market in the country. So far 14 bio-pesticides have been registered under the Insecticide Act 1968 in India. Consumption of biopesticides has increased from 219 tonnes in 1996-97 to 683 tonnes in 2000-01, and further to around 3000 tonnes in 2015-16. Bio-pesticides can serve as a reliable, sustainable and environment friendly options. But the pace of development of market for bio-pesticides is not so impressive. Storage of bio-pesticides requires special facilities and skills, which should be developed at all levels in the supply chain. Also, if necessary, fiscal incentives may be provided for production and use of bio-control agents.



Sulphur, Acephate and Chlorpyrifos, while the major products imported were Glyphosate and Atrazine. The trade data need careful interpretation as both formulations and technical grade pesticides are traded by different firms. However, Indian firms mostly import technical grades, or formulations which are protected through patents, and the exports are mostly of formulations. Brazil, USA and France are the major destinations for export of agro-chemicals from India, while China and Germany are major exporters of agro-chemicals to India.

### BEYOND CHEMICALS...

Although chemicals have become synonymous with plant disease management, there exists a wide array of crop protection measures. They may not yield a standalone result, but together with the rest of the measures, they can help in reducing the chemical load on the plant.

Resistance is the first line of defense against invading pathogens and pests. Therefore most of the breeding programmes include Plant disease and pest resistance as an important breeding strategy. Many of the varieties and hybrids thus developed have exhibited fantastic results. Other than the conventional breeding, genetic engineering has also yielded excellent outcomes. In 2009-10, Bt cotton spread to 85 per cent of the India's cotton area. It was claimed that this took the country's production to new heights. A study jointly undertaken by the Council for Social Development (CSD) and Bharat Krishak Samaj, has reported that the overall production of cotton has grown by 9.25 per cent since the introduction of Bt cotton in 2002-03 and farmers' income has gone up by nearly 375 per cent. The study titled 'Socio Economic Impact Assessment of BT Cotton in India' indicated that high-yield hybrid cotton seeds resulted in lower pesticide use and have helped cotton farmers get better yields. The genetically engineered crop varieties offer a promising direction as it combines the qualities of pesticides without polluting the immediate environment with harmful chemicals.

## SPURIOUS PESTICIDE SPEWING TROUBLE

The flourishing spurious pesticide market is worth about Rs 1,200 crore. Almost a fourth of the total Indian pesticide market is accounted for by the spurious or sub-standard brands.

Nearly one-fourth of pesticide samples sold in open market are substandard and losses on account of use of such spurious products are estimated at Rs.30,000 crore to the farming community, according to Bharatiya Krishak Samaj (BKS). Out of a total 50 samples of pesticides sold in open market, 13 have been found to be substandard in a test conducted at a government lab. Makers of spurious pesticides usually imitate popular and expensive brands from multi-national and leading Indian manufacturers that have better acceptance among the farmers. Some counterfeit pesticides do not even contain any active plant protection ingredient and largely comprise materials like talcum powder, chalk powder, any odd solvent or just kerosene. Others may contain some active ingredients but only a fraction of that mentioned on the label.

Inadequate legal and other preventive action by the authorities concerned against manufacturers and traders of fake and sub-normal pesticides accentuate the situation. The adoption and adherence to good manufacturing practices should be made mandatory for pesticides manufacturers. State-level pesticide testing laboratories need to be revamped and equipped with modern technology to ensure better monitoring of the pesticides quality.



But the lack of confidence in the genetically manipulated technologies and the lingering doubts about the crossover of these 'foreign' genes to local varieties have marred the prospects of this technology. It has been almost close to two decades since the introduction of Bt cotton and no other Bt product has been approved for commercial cultivation so far. Even the field trials have been met with hostility from the public and environmental activists. A classic case is that of Bt Brinjal and GM Mustard, the introduction of which is still pending today owing to the differing positions of state governments, the lack of consensus among the scientific community, the incompleteness of tests and lack of independent professional mechanism to instill confidence in the general public.

Plant disease forecasting is an underexploited area in India. Pest and diseases are dependent on weather variables to a great extent and many models have been developed to predict the onset of diseases and pests. However, those models are seldom used in

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conventional agriculture. But in years to come, model based predictions would find favour in agriculture. Access to weather data and derived variables from temperature, rainfall, humidity, and other measurements, is essential for developing, testing, and evaluating these models. In consonance with meteorology department, prediction models can be developed applied across farms in India. An example of a multiple disease/pest forecasting system is the EPIdemiology, PREdiction, and PREvention (EPIPRED) system developed in the Netherlands for winter wheat that focused on

multiple pathogens.

Biopesticides and biocontrol agents present another dimension of crop protection. This assumes significance considering the resolve of many states in India to go completely organic. Biological control or biocontrol is a method of controlling pests using other organisms. Neem-based bio-insecticide is used against Diamondback moth, *Plutella xylostella* in cabbage management. Farm yard manure (FYM) enriched with *Trichoderma harzianum* is used to control thrips, mites, and soil-borne diseases and *Pseudomonas fluorescens* is used for inducing systemic resistance in hot peppers. *Beauveria bassiana* alone or in combination with BT have been used to control soil insects including potato beetles. The isolates of *Trichoderma* spp. have been characterized for biopriming, plant growth promotion characteristics, reduction of disease incidence, and corresponding yield increase in cabbage, cauliflower, mustard, and field pea. There are many successful biocontrol agents that have been

tested and commercialized in India. Bioformulation like Kalisena (*Aspergillus niger*-based formulation) and Josh (VAM base formulation) were also found to be effective in managing wilt infections in Indian conditions.

Nanotechnology is a fascinating and rapidly advancing science and has the potential to revolutionize many disciplines of science, technology, medicine and agriculture. Conversion of macromaterials in to nano size particles (1-100 nm) gives birth to new characteristics and the material behaves differently. Nanomaterials can be potentially used in the crop protection, especially in the plant disease management. Nanoparticles may act upon pathogens in a way similar to chemical pesticides or the nanomaterials can be used as carrier of active ingredients of pesticides, host defence inducing chemicals, etc. to the target pathogens. Because of ultra small size, nanoparticles may hit/target virus particles and may open a new field of virus control in plants. The disease diagnosis, pathogen detection and residual analysis may become much more precise and quick with the use of nanosensors.

### CROP PROTECTION CHALLENGES

Predictions place India as the most populous nation in the world by 2022. Currently supporting nearly 17.84% of the world population, with 2.4% land resources and 4 % of water resources,

India is precariously perched in a position to meet the demands of a constantly expanding population. With the inevitable loss of about one fourth of total harvest to pest and diseases, crop protection becomes an important part of agriculture. Crop protection industry thus is slated to play a pivotal role in ensuring food security of the country. For that notion to materialize, we need to address the challenges the sector face.

Pest and disease dynamics are constantly changing and so it becomes incumbent upon the industry to cater to the differing demands. The sector therefore is in the cusp of constantly changing technologies to suit the varied demands and R&D becomes a priority. But higher cost on R&D deters many manufacturers from investing in new solutions. R&D to develop a new agrochemical molecule takes an average of 9 years and approximately Rs.1,000 crores. Indian companies typically have

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not focused on developing newer molecules and will face challenges in building these capabilities, while continuing to remain cost competitive.

Farmers at large remain unaware of the new products or they lack the knowledge regarding a product at hand. This is a precarious situation as the efficacy or the usefulness of the product is closely linked to the knowledge of the user. Lack of education and awareness among farmers is counted as one of the main reasons behind failing efficacies of the crop protection product or their misuse. The main point of contact between the farmers and the manufacturers, the retailers too are not bothered or are unable to provide a proper understanding of the product to the farmers. Also, very often farmers are not able to communicate their needs effectively. Post harvest losses are yet another segment of yield losses suffered by farmers. Supply chain inefficiency and inadequate infrastructure are the major causes for such losses. The lack of knowledge of the farmers that there are products and storage techniques to effectively cut short these losses have added to the agony of the sector.

The threat of spurious products is real and their use by the gullible farmers have questioned many times the veracity of plant protection products. These

products not only failed to kill pests but also inflicted damages on crops and not to mention the economic losses suffered by the farmers.

Climate change is another important development that has affected global population and agriculture. Pest and disease dynamics have altered considerably. Many minor pests have become major pests and many new pest and diseases have emerged. This has kept the crop protection sector on toes. Besides the sweeping changes in climate, the continued emphasis on sustainability of agriculture and environmental concern, the industry will be keen on investing in better delivery techniques and products that leave very little impact on the plant and the soil.

Crop protection is in constant evolution. Lethargy either in terms of technology development and delivering the technology to the farmers would be critical lapses for a country like India, where agriculture is a source of income to more than half of its population. With a real possibility of an increasing population, India needs to invest in better technologies and surveillance for better results. We cannot afford to lose one quarter of our production to pest and diseases which could be clearly avoided through better crop protection strategies.

# 'INDIA NEEDS STRINGENT POLICIES TO COUNTER ILLICIT TRADE OF SPURIOUS PESTICIDES'

**Dhanuka Agritech Limited, manufacturer of a wide range of agro-chemicals, has a pan-India presence with a network of more than 7,000 distributors/ dealers selling to over 75,000 retailers across India and reaching out to more than 10 million farmers. Highly innovative, Dhanuka keeps adding new products every year through its global collaborations and is continuously on the lookout to bring the latest technology to Indian Farmers. Speaking with Rashmi Singh, Business Editor at Agriculture Today, the Chairman of Dhanuka Agritech Limited, Shri R.G. Agarwal highlighted the significance of crop protection products in Indian agriculture and stressed on bringing in stringent policies to curtail trading of spurious and illegal pesticides.**



## What is the significance of Crop protection products in Indian agriculture?

Crop protection is similar to pharmaceuticals used by human beings. They are needed to protect the crops from the attack of insects, weeds and diseases. They are not only needed in India but used all over the world. There is no innovation in our country and the technologies that are in use in India are courtesy of the multinational companies. If we don't use pesticides, then as per the report of IARI (2008), there may be crop losses of up to 8-90 percent. A committee under the Ministry of Chemicals and Fertilisers (2002) estimated crop losses of over Rs. 90,000 crore. Recently, in the parliament session, the crop loss issue was discussed during question hour round, where the fact that 10-30 percent crop losses are happening annually in India was highlighted. So, if we take its average as 20 percent, then sighting the present market value of agriculture production, this loss may not be less than Rupees 5 lakh crores. And the question then arises; can India afford this loss of Rupees 5 lakh crores? Today, none of the companies in India is competent enough. It takes nearly Rs. 2000 crore investment in a period of 10-12 years for innovating a new molecule and for such kind of investments, even MNCs find it difficult and that is why, we witnessed certain mergers of companies, eg,

Dow Chemicals & DuPont, Monsanto & Bayer, FMC & Cheminova, Syngenta & ChemChina. At present, we can't think of original research in our country and we are using only the generic pesticides. We manufacture those pesticides that are patented internationally and so, their costs come down. Well, it is not always cost though. When a new technology is brought into practice, it is always costly. So, we have to deal with the cost-benefit ratio in a right perspective for the benefit of the farmers in the long run.

## How has digitisation influenced agriculture in general and crop protection in particular?

We have around 14 crores of farmers in more than six lakhs villages in India. Reaching out to them by any individual or institutions is impossible. In today's scenario, with the use of smart phones, one can take the technology to a large number of farmers inhabited in remote areas. Through the availability of smart phones, farmers can find the right solutions to their problems by downloading certain apps, or they can reach easily to companies like us by sending images regarding their problems to get the accurate solutions. So, in this way, digitisation can help farmers to a large extent. We are still at a nascent stage but internationally, all the data comes through satellites

and they are very much precise in agriculture. Overall, digitisation could help farmers in getting technology at their doorsteps eg- weather forecasting, prediction of diseases in advance, projection of insect attack, estimation of market prices etc. would be very helpful to the farmers.

### Why does India lag behind when it comes to introducing new molecules in the crop protection segment?

Chlorinated pesticides like DDT, BHC, lindane, Chlorobenzilate etc were used by the farmers in the beginning. They remained in soil for a longer period of time. They were used in kilos per hectare. So, they were later banned by the government. The new technologies use pesticides just in grams. It sends less chemicals-pesticides load in the environment and are harmless. There

is no original research in our country. All toxic pesticides are banned now. Our country is also working in that direction. But unfortunately, bringing out safe molecules processes are very slow. For example, in our country around 250 pesticides are available to farmers, while Pakistan has 500 kinds of pesticides and U.S has almost 750. The reason being the registration of a new molecule in our country, takes the time period between 5-7 years. The Insecticides Act(1968) says that the registration period should be limited between one to one and half years and not more than that. But, that doesn't happen, and because of which, the cost of the molecule increases and new pesticides become a farther dream to reach for the farmers. Ultimately, they lose crops in huge amount. Apart from that, insects develop resistance to the regular use

of the same pesticides. For example, a new pest called Fall Army Worm from Africa and America has affected crops to a large extent and we have no solution to curb that pest. Considering this fact, government has accepted adhoc recommendations of some pesticides based on some international data. So, why can't we expedite the process? The Chemicals and Fertilisers industry is a regulated industry. The Insecticides Act, 1968 & Insecticides Rules, 1971 regulate overall processes of control mechanism. Any product contrived by any company, which has to be manufactured or marketed, needs separate registration under Central Insecticide Board and Registration Committee in the Ministry of Agriculture. This is headed by a secretary. It is a full-fledged department where files are submitted and are scrutinised as per the instructed protocols. In India,



registering a new product and commercialising it, may cost around 75 – 100 crores of rupees of investment. This also involves 5-15 years of data protection.

**What are the challenges faced by the Crop Protection industry today and how can we minimise them? What necessary steps can be taken by the government to address those issues?**

Data protection is a challenge for the registration of a new molecule. The next biggest thing is improper implementation of the Insecticides Act. Because of which, vested interests get involved, causing illegal smuggling of spurious and counterfeit pesticides and thus, duplicate trade flourishes. Since, farmers are not educated enough, they can't make out which of the pesticides would benefit them and which one would harm their crops. Apart from that, the audit that needs to be done by the inspectors from time to time is also inconsistent. This is an important step for drawing the samples for quality control. Over 5000 companies have been given licences unnecessarily. Thus, illegal products are being sold in the market freely and farmers are being cheated additionally. In that case, it becomes important to execute the Act in the right direction to curb all the challenges for the sake of the farmers. As per the survey conducted by the Ministry of Consumer Affairs, 58 percent of agri-inputs sold in the rural areas are spurious. Then another report prepared by Tata Management Services (2015) cited that nearly 25-30 percent of the pesticides brought into the market are illegal.

**What are the other control strategies integrated into practical pest management programs covering high and low level of inputs in agricultural systems across varied geographical regions in India?**

Firstly, the will of the government takes the first and foremost stage to regulate or implement any scheme. Proper implementation and execution of Insecticides Act 1968 would have solved most of such problems faced by the farmers. Secondly, putting QR code for each product can be confirmed from smart phone be an effective step to minimise the selling and trading of

spurious pesticides. Then, inspectors can play a big role in cancelling licences of unlawful companies. Educating farmers regarding the use of right pesticides for their crops is a crucial step. China's agriculture GDP is three times higher than India despite having agriculture land of nearly 128 million hectares while our country possesses nearly 142 million hectares of the farm land. China gets a minimum of 600 mm of rainfall, while India receives over 1000 mm of rain but China's agriculture GDP was \$999 billion and Indian Agri GDP was only \$401 billion in the year 2018. This difference in the GDP itself justifies how serious we are towards our farm sector and farming community.

**Most of the chemicals used in the pesticides directly or indirectly affect the Food chain system. What are the parameters taken on behalf of the Crop protection companies to deal with those dangers?**

It is a myth which has been spread through different agencies regarding the use of chemical pesticides, entering food chain and creating harm to the system. There is no such statistics and data that can prove it even. The Ministry of Agriculture, which is the official body and All India Residue Network tested around 16,000 samples of various foods throughout country in their 25 NABL labs and hardly in 2 percent samples, pesticides was found above Minimum Residue Limit (MRL) fixed by the Food Safety Authority of India. In comparison to Europe, U.S and in many other countries, we are using just 2 percent of the pesticides of what they use and we produce 16 percent of the food of the world. In Global context, we use 600 grams of pesticides per hectare, while Japan uses 10 kilo grams and China, 13 kilo grams. So, it is all just a myth as people do not know the real facts and figures and no efforts have been made to pass on the correct information. As per the world-renowned Indian scientists: Dr. Debabrata Kanungo (Retd. Additional Director General and board member of FSSAI), Dr. K. K Sharma (a residue chemist and Head of All India Residue Network) and Dr. Sandhya Kulshreshtha (a Medical Toxicologist), pesticides are safe enough to use.

# ‘THERE WILL BE A DEFINITE INCREASE IN CONSUMPTION OF AGROCHEMICALS AND SOIL NUTRIENTS’



Indofil Industries (International) BV, a Netherland based holding company of Indofil Industries Ltd. headquartered at Mumbai India has acquired majority stake in Agrowin Biosciences, a crop protection and plant nutrients company based in Milan, Italy. Recognising the strong presence of Agrowin in European Agribusiness market of Italy through its distribution network and brand equity, Indofil with its own expertise in manufacturing, product development, regulatory and global Agribusiness technology see this acquisition to create a stronger presence in European markets. The Italian agrochemical market presently is third largest in Europe with market size of USD 1.2 billion. With its varied climatic zones, Italy grows large number of crops like vines, fruits vegetables, cereals sugar beet to name a few. Fungicides are the most important crop protection segment in Italy. Indofil Industries Limited, established in 1965, as a Crop Protection & Specialty Chemicals Company with a turnover of over USD 360 Million, has direct presence in Indian market through a large sales organization and well spread distribution network. It also has presence over 100 countries

through direct distributors as well as five operating subsidiaries. It derives 50% of its revenue from international business. Indofil has five manufacturing plants supporting its product range, a backward integration through manufacturing joint venture Indobaijin and strong R&D and product management team. In an interview with Agriculture Today, Mr. R. K. Malhotra, Group CEO, Indofil Industries discusses the prospects of this association.

### How significant is the partnership with Agrowin Biosciences for Indofil?

Agrowin has a strong presence in European Agribusiness market of Italy through its distribution network and brand equity. Indofil has its own expertise in manufacturing, product development, regulatory and global Agribusiness technology. Hence this partnership will help Indofil create a stronger presence in European markets.

### How is the association with Agrowin going to influence the operation of Indofil in the rest of the market?

The synergies will affect both the Italian business, through direct presence and strong partnerships with key national distributors, and the European business development, leveraging Agrowin expertise and network.

### How important as a market is Italy and how will the presence of Indofil going to leverage the company's foothold in Europe?

Italy is the 3rd agribusiness market in Europe, accounting for USD 1.2 billion with a relevant fungicides business. Agrowin, giving a stronger position in this important market will contribute to feed the growth of Indofil and will provide a good platform for launching several new and differentiated products in Europe.

### What are the other future associations that are in the pipeline for Indofil?

There are similar opportunities that are being explored by Indofil in similar Agribusiness markets.

### In terms of products, are there any new additions to the Indian products profile?

Indofil has recently commissioned new technical synthesis plant focused at Oomycetes segment fungicides for F&V, Azoles and SHDI's fungicides



for rice crop besides facility for Triazoles & couple of other chemistries. Among new introductions Thaifluzamide based product (Iglare) & Tricyclazole based patented mixture (Impression) are the unique offerings.

### How has Indian crop protection market changed over the years?

India is currently the 4th largest manufacturer of agrochemicals after The United States, Japan and China. In 2016, agrochemicals market was valued at \$4.1 billion and is expected to grow at a growth rate of 8.3 percent to reach \$8.1 billion by 2025. There is a continuous learning curve & awareness amongst the Indian farmers regarding the safe and correct use of agrochemicals, along with its right dosage and its applications. Indian market has witnessed a significant rise in the use of fungicides & herbicides on crops like fruits, vegetables and soybean. However Insecticides continue to dominate the market, contributing to about 50%. It has been one of the key objectives of the Prime Minister of India Narendra Modi to "Double farmer's income by 2022." Thus, there will be a definite increase in consumption of agrochemicals and soil nutrients.

# POSITION PAPER ON FALL ARMYWORM



**F**all Armyworm (FAW) is a destructive pest native to the tropical and subtropical regions of the Americas, having been found everywhere from South America to eastern and central North America. FAW targets more than 80 different plants including maize, rice, cotton, sugarcane, wheat and soybeans, and has been particularly devastating in the maize producing regions of Brazil, Africa and recently India.

The pest was first detected on the African continent in Nigeria in January 2016 and has quickly spread to 44 countries across sub-Saharan Africa. In 2018, the pest was reported in Asian countries such as India, Thailand, Sri Lanka, Myanmar, and Bangladesh. Its spread

across the continent has continued in 2019. FAW was detected for the first time in Pu'er City and Dehong in the Yunnan Province of China, and most recently has been found in Vietnam. The FAO has warned that it could threaten the food security and livelihoods of millions of small-scale farmers in Asia as the pest is likely to spread further, with India, South East Asia and South China most at risk. It is thought the pest could also spread to Europe.

Based on data from Africa, CABI estimates FAW will reduce annual maize production by 21%-53% in the absence of pest management.

This CropLife International and CropLife Asia position paper outlines the holistic approach to ensure effective management of FAW

through integrated pest management (IPM); clear, evidence-based advice to farmers; a regulatory environment that gives access to technology; stakeholder coordination and emergency phytosanitary measures. Our collective goal must be to protect farmer livelihoods and ensure food security globally, but especially in the high-risk regions of Asia.

## AN INTEGRATED PEST MANAGEMENT (IPM) APPROACH

The components of IPM should be based on evidence of their effectiveness and awareness of their risks. Such a position has been clearly outlined by the World Trade Organisation Committee on Sanitary and Phytosanitary Measures as



submitted by Brazil, Kenya, Madagascar, Paraguay, the United States of America and Uruguay.

A sound IPM strategy should include effective scouting and monitoring for the pest and preventative measures to stop any infestation. Where an economic threshold is reached, farmers must be given access to effective tools to prevent the destruction of their crop, as outlined in the US Agency for International Development (USAID) guide for IPM in Africa.

For successful IPM intervention, the cost-effective tools available to farmers should include:

- **Insecticides- Seed Treatment and Foliar applications.**

Insecticides are one of the few proven and effective tools for the management of FAW, and their deployment should be given balanced consideration – through both foliar applications and seed treatments. A practical approach for small-scale farmers must focus on:

- Seed treatments: FAW often invades at an early stage. Damage during emergence and the early growth period has a major impact on final crop yield.
- Using in-country registered pesticides, and pesticides that are recommended to effectively control FAW by credible resources (governmental / non-governmental);
- Avoidance of illegally traded pesticides and/or counterfeits;
- Avoidance of WHO class 1a acute toxic pesticide or only use them where farmers

are trained and use respective precautions (or as a last resort);

- Pesticide procurement that follows demand and requirement, and has appropriate measures in place to ensure obsolete stocks do not result;
- Guidance to avoid build-up of resistance.
- Plant Biotechnology

Insect-resistant biotech crops have been another tool in the IPM approach and used successfully across North and South America in effectively managing FAW. The effectiveness of biotech maize against FAW has been demonstrated in field trials in Kenya, Mozambique, South Africa, Tanzania and Uganda through the Water Efficient Maize for Africa (WEMA) project. Furthermore, despite the millions of hectares of maize in Africa that have been devastated by FAW in 2017, South Africa has largely been exempt from the infestation. This is due in part both to the 1.6 million hectares of insect-resistant, biotech maize planted in South Africa and the commercially available and approved pesticides.

The FAO has previously stated that it is “imperative for Africa to make biotechnologies, knowledge and innovation available, accessible and applicable to small farmers to help them maximize their agricultural productivity while keeping the environment healthy and sustainable.

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“This statement of FAO should also be applied to Asia. We urge policy makers in countries from Asia where biotech crops are currently unavailable, to develop the regulatory framework to provide farmers with choices and ability to access this important technology. We also urge regulatory agencies in countries where biotech crops are available or under the de-regulation process, to be flexible in adopting the existing products for FAW control and to fast track the introduction of new products effective to FAW.

#### • Other pest management tools

Other pest control methods should be used in conjunction with pesticides as part of an IPM approach. These include agronomic practices, legitimate biological pesticides and natural enemies. CABI has been reviewing different approaches to FAW management in Africa and this work forms a strong basis for the promotion of pest management options. Farmers need to know about the efficacy and risks of pest management approaches and information on this should be

evidence-based.

#### CLEAR, EVIDENCE-BASED ADVICE TO FARMERS

Given that the FAW is an invasive species, there are few validated control methods available – farmers therefore require technologies that are evidence-based and cost-effective for adoption.

Farmers and those who advise them (such as extension officers and agricultural product retailers) also need clear and consistent advice. Importantly, farmers should be made aware of the danger of the pest, taught to recognize it, and informed of its ecology and lifecycle, including when it is most vulnerable to pest management options. Farmers need to be given information about pest management approaches, their efficacy, the extent to which they have been validated, and how insecticides should be applied so as to maximise their efficacy and mitigate human health and environmental risks.

For crop protection and plant biotech solutions, advice on identifying counterfeit products and

resistance management should also be provided. Governments must also ensure biological pesticides available to farmers are legitimate and do not contain hidden (unlabelled) synthetic insecticide ingredients. We expect, over time, as research is conducted, that more pest management approaches will be incorporated into the IPM strategy, in particular the use of biological control agents. Clarity and consistency are critical in FAW management.

#### ACCESS TO THE TECHNOLOGY

Sound regulations need to be based on science and evidence, considering not only the products' intrinsic qualities but also its purpose and condition of use. This enables regulatory decisions to weigh risks and benefits, not just hazards.

A well-functioning regulatory system will give farmers a choice of tools to protect their crop from FAW, while also protecting human and environmental health, balancing risks and benefits. Evaluations should be grounded in real use-situations and where lacking, capacity of

national and regional regulators should be increased to achieve this across Asia.

In the event of farmers' inaccessibility to crop protection solutions for FAW, the need for emergency use regulatory permits should be explored with regulatory agencies. This process is in place in several western nations (including the United States among others) and has served a critical role in guarding against the unintended consequences posed by misuse, overuse and off-label use of registered pesticides as well as the impact of illegal products.

Here is a list of suggested options for government to consider on providing access to technology/product:

(a) Grant of temporary I14label expansion or government use recommendations on existing products considering efficacy, safety and resistance management principles.

(b) Allowing fast track registration for newer molecules / product mixtures which are under regulatory scrutiny or approval process, supported by international biological data against FAW.

(c) Inviting potential candidate molecules applications from the industry, for granting conditional registrations. This should consider data transportability on efficacy and MRLs from outside the country.

(d) Plant Biotechnology considerations could include the utilization of data from other jurisdictions to make more timely regulatory decisions about either existing or new products that have already been validated as efficacious against FAW in real world situations.

Strengthening law enforcement on seed technology and product security to deflect resistance and ensure durability of biotechnology products against FAW.

#### • Stakeholder coordination

FAW management should entail multi-stakeholder engagement with farmers, governments, service providers, NGOs and the private sector. There needs to be effective coordination of all stakeholders involved with a focus on solution-oriented dialogues.

CropLife International's member companies research, manufacture and sell crop protection and plant biotechnology products, and the global CropLife network spans 91 countries; therefore, we feel we can make an important contribution on this issue.

Advancements by our members in technology, such as pesticides, plant biotechnology and precision agriculture, will aid the ability of farmers to deal with FAW, and a collaborative and constructive relationship with the FAO, UN Environment and wider stakeholders can be used to promote optimal and responsible use of plant science tools around the world, with our collective aim to successfully meet the Sustainable Development Goals.

As one specific example of where our industry can make a contribution, in 2018, CropLife Africa Middle East was engaged as a project partner on USAID's Feed the Future project in Ethiopia to train agricultural extension staff and farmers in FAW identification and control. In February 2018, CropLife Africa Middle East trained Master Trainers from Ghana, Mali, Cote D'Ivoire and Nigeria in FAW IPM. Each trainer has an action plan to cascade the training to other trainers. More widely, the global CropLife network is working with partners to incorporate FAW IPM into existing training projects across key countries in Africa and Asia.

#### • Consideration of emergency phytosanitary measures for FAW

The seed industry suggests that governments considering implemen-

tation of emergency phytosanitary measures to address the risk of entry and establishment of *Spodoptera frugiperda* in their country take the following points into account when addressing any such risk associated with the importation of seed for sowing:

- assessment of risks associated with this pest are fairly straightforward when compared to other plant diseases or insect pests;
- infestation by this pest is known to spread from vegetative plant parts to ears (for corn) – risks of spread and introduction are also more prevalent through domestic and regional movement of the adults, where the moth can travel and spread;
- the degree of phytosanitary risk is therefore insignificant on seeds – for seed imports, the post-harvest stages of seed processing (which include husking, drying, shelling and cleaning) eliminate the potential for FAW larvae to survive;
- as such, the seed industry believes that it is NOT necessary to apply specific phytosanitary measures for FAW on imports of seed for sowing; and
- If phytosanitary measures are to be applied, a preferred approach that is currently in force in the European Union is that, where phytosanitary measures have not been applied to seed for sowing and grain imports of *Zea mays* to address FAW - however, an effective post-harvest treatment (or country or pest free place of production Additional Declarations) are required for the import of ears and related products.

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