CROP PROTECTION

PROTECTING CROPS, PROTECTING FOOD SECURITY

Indian Agriculture as an industry has the mammoth task of catering to the food demands of the constantly increasing population of the second most populous country in the world and providing employment to the largest number of people in the country. The economic safety and nutritional guarantee notwithstanding, the rural economy of the country has a direct bearing on the stability of agriculture and so to an extent on the general economy of the country. So it becomes imperative by any standards to maintain, develop and expand the India's agricultural footprint.

The agriculture, world over and India in particular, faces innumerable challenges. The highly monsoon dependent vocation has an inbuilt instability in terms of production and productivity, thereby constraining the yield , at many occasions. With the irrevocable expansion of population, it becomes pertinent to enhance production by all means. In such instances, the production increment strategies also involves minimizing losses. About 15-25% potential crop production is lost due to pests, weeds and diseases. Hence a responsible crop production and management requires adoption and implementation of practices that critically address this portion of loss. Crop Protection practices thus becomes an important aspect of agriculture.

Assessing Pesticide Industry

Chemicals manage most plant diseases and pests with a finality. Crop protection chemicals when applied in recommended doses can bring down the impact of pest and diseases to a considerable extent. However, this route of crop protection has been recommended as the last resort due to its implications on health and environment, especially when and where other control measures fail. India figures only at the end in terms of consumption of pesticides. At present, per hectare consumption of pesticides in India is amongst the lowest in the world and stands at 0.6 kg/ha against 5-7 kg/ha in the UK and 13 kg/ha in China. Use of crop protection chemicals can increase crop productivity by 25-50%, by mitigating crop loss due to pest attacks. Crop protection chemicals thus becomes very essential to ensure food and nutritional security.

India is the fourth largest global producer of agrochemicals after the US, Japan and China. This segment generated a value of USD 4.4 billion in FY15 and is expected to grow at 7.5% per annum to reach USD 6.3 billion by FY20. Approximately 50% of the demand comes from domestic consumers while the rest goes

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Crop Protection Strategies

Pest, Disease and weeds – the fearsome trio is responsible for the wastage of a considerable amount of agriculture produce. Besides, these usual suspects, rodents, nematodes, plant parasites, snails and nematodes have also been able to inflict monumental losses to the crops. The damages would run to formidable numbers if we do not adopt management practices suitably. According to a study by the Associated Chambers of Commerce and Industry of India, annual crop losses due to pests and diseases amount to Rs.50,000 crore ($500 billion), which is significant in a country where at least 200 million Indians go to bed hungry every night. Plant protection therefore is highly relevant for a country like India.

Plant protection decisions are usually dependent on many factors. In today's world, sustainability is a crucial determinant. Chemical means of control are absolute, but their effect on the environment and the humans have been detrimental. So crop protection measures have been centered around a combination of all the available strategies in an integrated manner. Integrated Pest/Disease/Weed Management thus employs effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices. The UN's Food and Agriculture Organization defines IPM as "the careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment. IPM emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms.

IPM measures includes growing resistant/tolerant varieties, cultural practices such as decoy crops/trap crops, crop rotation, mixed cropping etc., physical control measures such as seed treatment, soil solarization, etc., chemical measures and Biocontrol options. Lately, genetic engineering has also been employed as a crop protection measure.

towards exports. While the domestic demand is expected to grow at 6.5% per annum, exports are estimated to grow at 9% per annum during the same period.

The Annual Survey of Industries data show that the industry comprises around 600 companies, of which more than 60 per cent are involved in producing insecticides, fungicides and herbicides. The 4-company concentration ratio in 2014-15 was 19 per cent, showing that top-4 companies produce one-fifth of total output of the industry. The 8-company concentration ratio was 29 per cent. Subsidies form a meager part in this industry. The total production subsidy received during the year 2014-15 amounts to Rs. 12 crores, which is only 0.03 per cent of total output produced.

The Indian crop protection market is dominated by Insecticides, which form almost 60% of domestic crop protection chemicals market. The major applications are found in rice and cotton crops. Fungicides and Herbicides are the largest growing segments accounting for 18% and 16% respectively of total crop protection chemicals market respectively.Rice and wheat crops are the major application areas for herbicides. Increasing labour costs and labour shortage are key growth drivers for herbicides. The fungicides find application in fruits, vegetables and rice. The key growth drivers for fungicides include a shift in agriculture from cash crops to fruits and vegetables and government support for exports of fruits and vegetables. Bio-pesticides include all biological materials organisms, which can be used to control pests. Currently bio- pesticides constitute only 3% of Indian crop protection market; however there are significant growth opportunities for this product segment due to increasing concerns of safety and toxicity of pesticides, stringent regulations and government support. Andhra Pradesh (including Telangana & Seemandhra), Maharashtra and Punjab are top three states contributing to 45% of pesticide consumption in

India. Andhra Pradesh is the leading consumer with 24% share. The top seven states together account for more than 70% of crop protection chemicals usage in India.

With an increasing thrust on improving crop productivity and reducing crop losses, India is a fertile market for crop protection chemicals. India is slowly emerging as an important exporter of pesticides. Mostly off-patent products, majority of export takes place to Brazil, USA, France and Netherlands. Low cost manufacturing, availability of technically trained manpower, seasonal domestic demand, overcapacity, better price realization globally and strong presence in generic pesticide manufacturing are the strong growth drivers in this segment and hence India also offers good scope for contract manufacturing as well. Agrochemicals worth USD 4.1 billion are expected to go off-patent by 2020. This provides significant export opportunities for Indian companies which have expertise in generic segment. A strong export base has to be generated by Indian companies through strategic alliances and partnerships. Merger and acquisition opportunities could also be explored to increase their global presence.

Herbicides, a hitherto small player in crop protection segment, is increasing its share in India. Labour shortage, rising labour costs and growth in GM crops has led to growth in the use of herbicides. The herbicide consumption in India stood at 0.4 USD billion in FY15 and is expected to grow at a CAGR of 15% over the next five years to reach around 0.8 USD billion by FY20. The fungicide industry is also showing similar trend, thanks to India's new found interest in horticulture, which has grown at a CAGR of 7.5% over the last five years. In general the per hectare consumption of pesticides in India is amongst the lowest in the world and currently stands at 0.6 kg/ha against 5-7 kg/ha in the UK and at almost 20 times ~ 13 kg/ha in China . In order to increase yield and ensure food security for its enormous population, agrochemicals penetration in India is bound to go up.Besides these, a renewed energy has been noticed in the agriculture segment with thrust on formation of units like Farmer Producer Organizations (FPOs). Their collective strength has augured well for the crop protection segment. Availability and dissemination of

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appropriate technologies through several start ups and the extension wing of many corporate players have increased the awareness and consumption of crop protection chemicals.

However, there remains many grey areas that are yet to be addressed. There is a significant share of spurious pesticides available in the market. More than 40% of the pesticides sold in India in FY14 were tested as Spurious. These products are inferior formulations which are unable to kill the pests or kill them efficiently. They also result in by-products which may significantly harm the soil and environment. Apart from crop loss and damage to soil fertility, use of non-genuine products leads to loss of revenue to farmers, agrochemical companies and government. There is a lack of awareness amongst the farmers and this makes it immensely difficult for them to differentiate between genuine and non-genuine products. Stringent environmental regulations across the world are increasing the cost of developing new products and simultaneously delaying the introduction of new products in the market.

Registration and Quality Control

The Insecticides Act (1968) and Insecticides Rules (1971) regulate import, registration, production, sale, transport, distribution and use of pesticides with a view to prevent risk to human beings or animals. All pesticides have to necessarily undergo the registration process with the Central Insecticides Board and the RegistrationCommittee (CIB&RC) before production or sale. For manufacturing or import, applicant submits data on various aspects, including chemical composition, toxicity, bioefficacy, etc. to CIB&RC. On some aspects, (particularly bioefficacy of pesticides) published, authentic report of R&D organizations is also considered as a valid data source. The Committee after ensuring the validity of application provides a registration number and certificate. As on June 2017, total 279 products (265 chemicals and 14 bio-pesticides) and 658 formulations including combinations were registered with CIB&RC. There are regulations and procedures for testing pesticides at different stages. The Central Insecticide Laboratory (CIL) is mandated to test the referral samples submitted by any officer or agency of the Central or State Government, while State Pesticide Testing Laboratories (SPTL) mainly test the samples taken at the manufacturing and point-of-sale for quality control. Results of STPLs indicate that around 2.5 to 3 per cent of samples tested were misbranded (not as per the label) during 2008-09 to 2012-13. In total, 28 pesticides and four formulations are banned for manufacturing, import and use, eight pesticides are withdrawn and 13 pesticides are restricted for use in the country. Recently, on the advice of an expert committee, 12 pesticides are completely banned from January 2018 and another six from December 2020 (DAC&FW, 2016).

This has become a dampening factor for innovation and development. Research and development demands huge capital investment and many domestic companies are hence exceedingly reluctant to invest in innovation. Indian Companies spend only 1-2% of their revenues in Research and Development as against the global MNCs which invest about 8-10% of their revenues. This makes Indian manufacturers uncompetitive globally in specialty molecules. Another major bottleneck is the Lack of knowledge and awareness among farmers regarding the appropriate kind of pesticide, its dosage and quantity and application frequency. Owing to linguistic differences it also becomes difficult to convey the same to a large number of farmers. Hence the interface between farmers and the manufacturers are the retailers who don't have adequate technical expertise and are thus unable to impart proper product understanding to the farmers. It is also very difficult for the farmers to convey their needs effectively to the manufacturers. Lack of efficient distribution system also makes it difficult for agrochemical companies to reach out to the farmers and promote their products and educate them about their benefits.

Biological Alternative

Excessive and indiscriminate use of pesticides with scant regard to their toxicity has led to a deluge of instances of pesticide contamination, poisoning and pesticide residue in agricultural products. Notwithstanding the effects on environment, the injudicious use of pesticides have incited many health hazards in humans as well. Endosulfan poisoning in Kerala - the longest running instance of pesticide poisoning and the recent Yavatmal tragedy are all pointers that we need to search for better alternatives. Biological control which employs nature's defenses against diseases and pests as biopesticides or Biocontrol agents, is one of the alternatives that has been employed in agriculture.

Bio-pesticides have the potential to control crop losses and reduce negative environmental impacts. 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 . In India, so

far 166 exotic biological control agents have been introduced of which 33 could not be released in the field, 71 recovered after release, 6 providing excellent control, 7 substantial control and 4 partial control. Studies indicate that use of bio-pesticides in integrated pest management can reduce pesticide use by 66 per cent in cotton and by 45 per cent in cabbage. Thus, bio-pesticides can play an important role in shifting the focus from chemical pesticides to reliable, sustainable and environment friendly options.

Worldwide there are about 1400 biopesticide products being sold. At present, there are 68 biopesticide active substances registered in the EU and 202 in the USA. The EU biopesticides consist of 34 microbials, 11 biochemicals and 23 semiochemicals, while the USA portfolio comprises 102 microbials, 52 biochemicals and 48 semiochemicals. These biopesticide products represent just 2.5 per cent of the total pesticide market.

However, the transition from chemical to biocontrol may not be a smooth one considering many challenges spread out for the bio pesticide commercialization. Many bio pesticides have high levels of selectivity, which means that bio pesticides are niche market products with low profit potential. Hence adopters of bio pesticides face large fixed costs of adoption that will only decrease once the technology is used more widely. Bio

pesticides are living entities and their efficacy depends on the proper storage. 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.

Genetic Modification – Successful but controversial

With time, technology took many manifestations in search of alternatives for application of chemicals to control pests and at the same time derive effective means to address the problem. During 2002, one such breakthrough happened in India in cotton.

Cotton, an important cash crop to India

was prone to boll worm infestation. The conventional methods failed to guarantee a reasonable control. Bt cotton was an effective remedy to this problem. The Bt crops carries a gene engineered to it to produce a toxin, rendering the plant toxic to pests. India went ahead with rapid adoption of Bt varieties in cotton. In 2009-10, Bt cotton spread to 85 per cent of the country'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 to get better yields.

Since, the introduction of Bt cotton in 2002, there has been a near doubling of cotton production in the country. At present, 96% of cotton cultivated in India is under Bt cotton crops. Cotton production rose from 14 million bales in the pre-Bt year of 2001-'02 to 39 million bales in 2014-'15, a rise of almost 180%. India's cotton imports fell, exports grew and as of 2015-16 India is expected to have overtaken China as the biggest cotton producer it the world.

The genetically engineered crop varieties offer a promising direction as it combines the qualities of pesticides without polluting the immediate environment with harmful chemicals. But the lack of confidence in the genetically manipulated technologies and the lingering doubts about the crossover of these 'foreign' genes to local varieties has marred the prospects of this technology. There is considerable resistance in introducing the technology to food crops.

It has been ten years 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, the introduction of which is still pending today owing to the differing positions adopted by the state governments, the lack of consensus among the scientific community, the incompletion of tests and lack of independent professional mechanism to instill confidence in the general public. Bt mustard has also been shelved.

Food security is critical to any country's development. Unfortunately, the food production has to come from limited resources and hence as a country we cannot afford to lose the food produced to pest and diseases. This requires a robust crop protection regimen that is not only effective but also sustainable. ■

'Agriculture can take our GDP from 7.5% to 10%'

It is a matter of pleasure that our country has become second after China in Agriculture GDP surpassing USA and for this, credit goes to our hard working farmers.

As per data our country's agricultural production amounted to 356 Billion Dollar, while China's 1036 Billion dollar and USA's 192 US Billion dollar in 2014. All credit goes to the agriculture and farmers for their initiatives and hard work. Without much support they have made India second in GDP, and if proper support would have been provided, they could have brought our country to No.1 in the Agriculture GDP.

Our agriculture land area is 191 million hectares and that of China is 167 million hectares. Our average rainfall is 1083 mm and China's rainfall is 645 mm. Despite this, they have around three times GDP from agriculture in comparison to our country. We did an analysis on how China, which was just equivalent or behind India, could grow so fast, as all the growth has happened in last 30 years. The reason happened to be new technology that was available to their farmers.Unfortunately, our farmers remain ignorant of the new technology as the present system and strategy of Government Extension is not sufficient to reach the large number of farmers.

As per 37th Standing Committee (under Ministry of Chemicals and Petrochemicals) Report of 2002, they have estimated crop loss of around Rs.90,000/- crores due to non use of pesticides, weedicides, fungicides and on the basis of today's MSP , the loss would amount to more than Rs.4.0 lakh crores. While answering the questions in Parliament, the Government has also accepted that there are 10-30% crop losses, and if we are successful even in saving 15%, our GDP can be improved considerably.

Our Hon'ble Prime Minister while addressing the public meeting on 28.2.16 has given the call for Doubling the Farmers' Income by 2022 and here the first question that comes to mind is whether it possible or not? Our Hon'ble PM whose vision is unmatchable and his target of Doubling Farmers' Income is easily possible. If Chinese farmers can do, then why not our farmers?

Shri RG Agrawal
Chairman, Dhanuka Agritech Limited

For Doubling the Farmers' Income these few initiatives can be considered.

Technology –There are more than Five Lakh input dealers today and if they are given training, then they may prove very good extension services provider. We have experimented this in 2006 with MANAGE. MANAGE has designed a Diploma course (DAESI). Our company has written to all the universities that our company will sponsor first batch of 40 dealers with 50% subsidy of fees i.e. Rs.10,000/dealer as MANAGE has fixed fees of Rs. 20,000/-. We have already completed this arrangement with 3 universities of Gujarat i.e. Anand Agricultural University, Navsari Agricultural University and Junagadh Agricultural University. Some more universities have shown their interest e.g. PAU, HAU, BHU, GBPUAT and Akola. We will soon begin the training program at the earliest .

Right Quality Input – In input first is soil management. Government has taken very good initiative to issue Soil Health Card to farmers. But on the basis of Card, there should be someone to advise them on which crop which fertilizers including micro nutrients, compost, green manure and bio fertilizers including bio stimulants should be used. Right dose of fertilizers will help as earlier our Govt subsidy was only in Urea. So farmers used disproportionately urea which instead of being beneficial was harmful. Our Hon'ble PM has also called for reducing the Urea consumption by 50% by 2022 and use fertilizer based on soil health card.

Seed Treatment - Apart from Hybrid Seed, seed treatment is very important. In 2007, a campaign of 100% seed treatment was started by our company jointly with the Ministry of Agriculture. The campaign slogan was 'Jaise Her Bachche ko Polio Ka Tika Vaise Her Beej ko Suraksha ka Tika'. Our company has done lot of work in this field and continues farmers training.

Plant Protection– There is a myth about crop protection chemicals but the fact is entirely different. Our country's pesticides consumption is very nominal(600 gm per hectare while China use 13 kg per hectare) in comparison to the world. That is one of the reason large portion of crops is lost by insects, fungus, weeds as well as during storage by rats and other pests. As per the All India Pesticide Residue Network Project of the Govt. of India, in the past six years over 1,13,000 samples of various food items were analyzed and hardly in 2% samples, pesticides residue was found above MRL, while in several European countries , the percentage of samples above MRL were around 4-5 %.

Organic - Dr. K.K.Sharma, Network Coordinator, All India Network Project on Pesticide

Residue, IARI analysed 166 samples in Government Laboratories (AINPPR, ICAR). The analysis showed that 27% samples contained pesticide residue and in these 4.8% were organic vegetable samples and had pesticide residue above MRL. Organic farming is good for niche market only as Noble Prize Winner Dr. Norman Borlaug said there are 6.6 billion people on the planet today. With organic farming we could only feed four billion of them. Which two billion would volunteer to die?

Myths Regarding Pesticides: Pesticides prevent our crops from weeds, Insects, pests and increase farmers' income. Even then, some NGOs, urbanites, environmentalists and media, due to their own ulterior motives and/or for reasons best known to them, under the garb of saving environment, human concern and safety, have been voicing hoarsely against use of pesticides for raising crops. Recently there was an NGO report which said that in vegetables and fresh fruits, residue of banned pesticides like Aldrin, Dieldrin, Heptachlor and Chlordane were present. These pesticides have already been banned in India about 30 years ago. There is no chance to get residues of these pesticides in fresh fruits and vegetables. For their vested interest, these NGOs are spoiling our country's image and government should take strict action against them. As analyses of 1,13,00 sample by AINPPR revealed that no banned pesticide residue has been found which prove that their reports are false and misleading.

Lastly, if we give right focus to Agriculture which has been given by Government of India in last two budgets and in current budget the special attention and recent announcement of Govt of India to give 50%+ of the cost as per Dr Swaminathan Committee recommendation will definitely create more money in the hands of farmers to uplift their livelihood. If farmers get more money their spending power will increase which will increase the demand for all goods resulting in growth of the industry, employment which can take our GDP to more than 10%. If it is achieved, our country will become No.1 in the overall GDP in the world.

'INDIA HAS A GREAT OPPORTUNITY IN AGRO CHEMICALS EXPORTS'

Four decades into its establishment, Bharat Insecticides Limited (BIL)has a nationwide network of 26 offices, 60000 dealers and 5500 distributors with strategically located warehouses. Recognized as an Export House, BIL has exported its products to more than 65 countries. CHEMEXCIL (Basic Chemicals, Pharmaceuticals & Cosmetics Export Promotion Council), set up by the Ministry of Commerce & Industry, commended the company for Outstanding Performance in Exports with 'Certificate of Merit' in the category of Inorganic & Organic Chemicals for the year 2008-09. With two manufacturing plants, located at Bahadurgarh that comes under Delhi NCR and Kathua in Jammu and Kashmir, BIL manufactures insecticides, fungicides and herbicides with applications in agriculture, preventive public health measures and veterinary treatment formulated in various concentrations, quantities and fool-proof packing. In an interview with Agriculture Today, Mr. SN Gupta, Director of Bharat Insecticides Limited discussed the general scenario of crop protection segment in India and the challenges faced by the segment.

What is the outlook for the crop protection industry in India?

Crop Protection industry in India will continue to grow significantly (6.5% per annum) in coming years because of various factors – more demand for Fruits and Vegetables due to more disposable income, need to grow more food to feed growing population, more demand of weedicides as a result of labor shortage, plant stress management due to climate change etc. For 2018, the sentiments for Crop Protection industry are positive on prediction of normal monsoon by IMD. For Crop Protection industry to do well, it is important to have good spread of rains - geographically and over time. Due to stringent Pollution control measures in China, there is a supply constraint of many Agro Chemicals and intermediaries which are imported from China. This may lead to increase in price of few Agro Chemicals.

What is India's share of crop protection products in the world market?

World Crop Protection market is about 55Bn $ while Indian market is 2.6 Bn $. India's share is about 5% of the world market. Even though India is globally second in Agricultural production behind China, it is having much lower consumption of pesticides compared to other countries. It ranks 11th in terms of pesticide consumption globally, even lower than small countries like France and Spain.

In terms of global trade, what are the opportunities for India in the crop protection segment?

Due to low cost of production in India there is great opportunity for exports of Agro Chemicals from India. Due to environmental issues in China and strict pollution control measures being undertaken,cost of production has gone up in China as well and this has resulted in significant opportunity for India. Export of Agro Chemicals are expected to grow by 9% per annum between 2015 to 2020.

How significant is the threat of spurious pesticides? How can we address it?

The current market of spurious pesticide is at about Rs 3,200 crore constituting 25% by value and 30 % by volume of the total domestic market of agro chemicals in India (Study on Sub-Standard, Spurious/Counterfeit Pesticides in India released by Tata Strategic Management Group). Many Agro Chemicals are also sold under the garb of Bio pesticides. Strict action is required against the Manufacturers and the Retailers who are involved in manufacturing and selling of spurious products. There is also need for farmers to be educated on the topic.

How successful are organic measures to address crop protection?

Globally area under organic farming is quite small as it is difficult to protect crop with biological methods alone. Organic food is also expensive due to high cost of production. In next few years,India will be the most populated country in the world, beating China. The biggest challenge for us will be to feed a population of more than 1.5 billion. As yield through organic cultivation is limited, it will be difficult to feed the entire population by following Organic cultivation.

What are your views on the new Pesticide Management Bill?

The current Insecticide Act 1968 is 50 years old, although a number of amendments have been incorporated, a comprehensive review is required. This will give clarity on lot of ambiguous rules and laws of existing act. Harsh punishment for misbranded and substandard products will help in keeping check on spurious pesticides. Immense power to the Insecticide inspectors may bring back the Inspector Raj. Import of formulations without registration of its technical (a.i.) should not be allowed.Registration of technical grade of pesticide should be made mandatory prior to the registration of its formulation/s.

What are the future products that the industry is looking forward to?

The farmers are looking for products which can provide long duration protection to crops and broad-spectrum control as cost of labour for application is going up. Industry is looking forward to launch products providing above benefits. Industry is working on to launch environment friendly formulations. Industry is also looking forward to introduce new weedicides for Wheat, Rice and Soybean to overcome resistance, better insecticides for BPH and other sucking pests. Plant health and Nutrition is another upcoming segment in India.

Are you satisfied with the level of R&D happening in Crop Protection sector in India?

No. Globally MNCs are spending around 8-10% of their earnings on R&D. It takes 11 years and $286 Mio investment to get one new pesticide to farmers. Indian companies do not have this kind of budget and also there is not enough support from Government on R&D in Crop Protection.