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Strategic Flexibility for Competitive Advantage: A Case of Indian Pesticide Industry

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ABSTRACT

This study investigates the environmental turbulence caused by competitive, regulatory, market and technological forces in Indian pesticide industry post 1995. With the help of flexibility triad model, the study reveals how the firms reshaped their strategies to combat pressures from environmental variables. The study has concluded how domestic companies adopted strategic flexibility in three areas i.e. competitive flexibility, market flexibility and production flexibility to strengthen their competitive position in the markets. We conclude that companies concentrated on international markets with strategic alliances to gain access to new products /brands and formation of subsidiaries abroad. Related diversification, product line extension, horizontal integration, backward integration, quality management and customer relationship management were some of the strategies adopted to attain flexibility for gaining competitive advantage in future.

1. INTRODUCTION

Continuous changing technologies and the competition arising thereafter put a lot of pressure on firms to maintain their competitive position. Researchers have used various terms to describe the competitive changes caused by information and communication technologies such as, ‘‘hypercompetition’’, ‘‘turbulent markets’’ or ‘‘high-velocity environments’’. *(Eisenhardt and Martin, 2000; Wirtz et al, 2007).*In these environments, boundaries and industry structures are blurred, successful business models have not yet been established and the roles of the market players change continuously. The term high-velocity environment embraces all those characteristics and emphasizes the brisk and discontinuous changes in demand, competition, regulation and technology. IT industry and biotech industry has been designated as high velocity industry. *(Wirtz et al, 2007)* The central feature of a high-velocity environment is the rapid and increased complexity in environment and the management has to account for a huge number of variables regarding the competitive environment while formulating strategy. Moreover, management needs to be highly

flexible due to environmental dynamics and the resulting limited forecast ability. *(Hart & banbury, 1994).*The arguments are on in the research field whether traditional strategy concepts are applicable in high-velocity environments. *(Chakravarty, 1997)* Researchers have stressed on the increased importance of flexibility, agility, responsiveness and simple rules in such type of environments. *(Eisenhardt et al, 2007).* The concept of Strategic Flexibility has become increasingly relevant in such type of turbulent environments .Strategic flexibility is firm's intent and capability to identify major changes in the external environments and ability to respond to dynamic competitive environments, to create option bundles of product development resources, and to ensure the sustained competitive advantage of the firm. (Sanchez,1995) in a competent manner. It also helps firms to achieve sustained profitability in dynamic market conditions (Hitt et al., 1998; Sanchez, 1995) Researchers have identified three key areas concerned with strategic flexibility viz. (i) market flexibility, (ii) production flexibility, and (iii) competitive flexibility and have termed this as Flexibilty Triad model (Abbott, 2003; Yip, 1989).

3. OBJECTIVES AND RESEARCH METHODOLOGY

The pesticide industry passed through a phase of paradigm shift during last decade, which was induced by environmental pressures due to maturing products, outdating technologies, rising environmental concerns from society and other concerned stakeholder groups. The entry of multinationals with new products in the market during early nineties also posed a threat to Indian firms already fighting with mature products and regulatory concerns. Firms were facing the challenge of sustainability in the market as the environmental situation was changing at a fast pace. With the set of resources and competences, domestic firms found it difficult to cope with turbulence. Hence, the firms adopted strategies in order to gain competitive advantage in this kind of turbulent environment.

Keeping the above issues in mind, our study aims at answering the following questions? What are the environmental factors which caused turbulence in the industry? How they impacted the different groups in the industry? How did the firms react and cope with the turbulence, especially domestic ones? How did these firms attain flexibility to cope with the turbulence in future? Keeping these views in mind, the objectives of the study are:

- To analyse the environmental turbulence in pesticide industry environment post 1995.
- To present the strategic situation faced by firms in pesticide industry
- To present the strategic flexibility approach adopted by the domestic firms in terms of production flexibility, competitive flexibility and market flexibility

The methodology adopted is case study method .Two domestic companies having the highest turnover in the industry have been selected for study. The cases selected for the study are Rallis India and Excel Crop Care Ltd. The reasons for selecting these cases are that these are the oldest domestic firms, have a large area of operations including domestic as well as international market and are fully backwardly integrated. Hence, they provide a vast scope for studying the strategies in different operational areas of domestic firms. Also, these are the companies which were mostly impacted by the environmental turbulence. The research is based on secondary data collected from company websites, annual reports and articles published in national dailies, business newspapers and websites. The study describes

all the strategies, by the firm along with their motives to compete in the market and ends with the managerial implications on strategies to enhance the competitiveness of the said firm vis-à-vis other firms. The limitations of the research include those with any other case study method.

3. The Industry Environment (1995-2005)

During 1995-2005, industry environment was turbulent triggered by new products and technologies, rising environmental concerns, subsequently changing regulations, change in market, production and export trends. The existing product and market strategies demanded change.

3.1 Social and Regulatory Clamps

During the last few years, the NGO's, environmentalists and other social groups raised their eye on the excessive use of the toxic pesticides and made people aware of the harmful effects of these pesticides on environment and other living beings. The Delhi-based Centre for Science and Environment (CSE) raised a hue and cry through one of its reports where it revealed that a "cocktail of pesticide residues" were contained in some of the soft drink brands. The same organisation had also made public a report on pesticide residue in bottled water and the exercise had ended with the Indian health ministry notifying new norms for pesticides in packaged drinking water. Food consumers in India were also getting aware about the pesticide residues in the food products and hence the demand for organic food was on rise. The farmers also were aware of the harmful effects of pesticides, but were only interested in cost effective rather than environment –friendly solutions.

Due to rising environmental concerns in society and among consumers, there was a great hue and cry to withdraw use of persistent molecules. With a view to review the continued use of pesticides in India that are either banned or restricted for use in other countries, the Government of India set up an Expert Committee, which took a few important measures during last few years. The committee reviewed many pesticides and banned/ phased out some of the toxic molecules. The fate of some important molecules such as Monocrotophos and Endosulphan is under the preview of the expert committee. The ex cise duty on pesticides was raised. The Government encouraged trial, production and use of genetically modified (GM)/transgenic crops; GM crop area (as percent of acreage in cotton) increased from 0.7 percent in 2003 to around six percent in 2004. With increase in GM cotton area in Punjab and Maharashtra, the two top pesticide consuming states, the consumption of pesticides got reduced. The Government also started promoting new crop protection techniques such as Integrated Pest Management (IPM) at the central and state levels, but unfortunately even after excessive promotion of these methods among the farmers, the share of biopesticides in the total pesticide sales is two percent in 2008. Since Indian companies were mainly dealing with generics, they were to be affected more by rising social and regulatory concerns.

3.2. Technological Environment

The technology has played an important role in shaping the industry environment as old products and processes are being continuously replaced by newer ones. Old molecules are less effective in the field because of resistance problems. During early nineties, a large number of new generation chemicals were launched in the market by multinationals, which were relatively safer for the environment. The threat intensified with the entry of new technological substitutes. During early nineties, biopesticides and biological control agents were launched in the Indian market, but they were unable to establish themselves in the market because of technical reasons such as less shelf life, difficulty in use etc. The revolution in the industry came with the launch of Bt cotton in 2002, which picked up a substantial share in cotton areas and posed a threat on sales of pesticides. The industry strived to develop environmental friendly and sustainable crop protection products that were more target specific, less toxic, less harmful to beneficial organisms, and effective while using smaller amounts of active ingredients. Product development also focused on preventing undesirable side effects of existing chemicals, by improving safety, reducing toxicity, and minimization of environmental damage. With the commencement of new patent protection from 2005, the multinationals became aggressive in launching new molecules. The R&D facilities of the Indian pesticide companies focused on process development rather than new product development. In India, there has not been much research in new products, but companies like Rallis, Excel and Gharda were involved in process research where the efforts are being made to manufacture the generic chemicals through cost-effective chemical routes. This gave Indian companies a competitive edge in marketing generics both in Indian as well as international markets.

3.3 Market Trends

The sales of pesticides had declined during last few years owing to bad monsoon and lack of realization of farmers' money. The purchasing power of farmers was increasing alongside growing awareness and availability of more options in products/services/brands. The farmers were also inclined towards purchasing more quality-oriented products, as they were having more choice in terms of brands available for a single molecule. The price of different products vary from company to company with the multinationals having a higher price range. The price is governed by the market forces such as demand, competitors, quality, brand name etc. But the demand and supply scenario, agricultural situation, incidence of pest attack and other firm related factors such as quality, brand image etc. play the most significant part in determining the prices of the products. During 1995-2005, the prices of generic molecules crashed down in the market. These molecules were either at the mature stage or are facing competition from new molecules. New molecules which are being launched by multinationals or other Indian giants commanded premium price. Their bargaining power of the consumer was increasing alongside hypercompetition in the market owing to increase in the number of brands offered.

The distribution of agri-inputs in India is done mainly through private trade channels. Quite recently, realizing the needs of farmers regarding agri-input marketing, some agri-input companies decided to set up one stop shops for providing all the agri-inputs i.e seeds, pesticides, fertilizers, farm implements to the farmers under the same roof along with other services such as soil testing, plant protection. equipment leasing, credit facilities, farmers' training etc. Pesticide companies such as Tata (Tata Kisan Kendra), DSCl (Hariyali Kisaan bazaar) have followed this concept and are selling their products through these one –stop shops. These emerging channels

have in fact disrupted the traditional marketing system and have linked the farmers directly to the companies facilitating better interaction between the two. But keeping in view the turnover dealt with by traditional retail outlets, these channels still have a long way to go. The usage pattern of different product lines was continuously changing. Insecticides had been occupying a major share in the pesticides sales.

3.4. Production

The industry is running with very low capacity utilization with mainly manufacturing generic molecules. Till now, huge capital, process R&D, strict registration procedures acted as entry barriers and thus the existing companies maintained their profits. But low cost of production in India because of easy availability of raw materials, low-cost trained and skilled workforce, low overheads, and technically qualified managerial base made India an attractive destination for chemical outsourcing. A few companies such as Bayer and Syngenta identified Indian locations as global sourcing hub and established their new plants in the country from where they supplied insecticides to the markets across the globe.

3.5. Exports

Global pesticide market offered opportunities for companies manufacturing generic chemicals Because of the seasonal pesticide demand in India, and the long-term trend of declining demand, the pesticide industry in India turned to increased exports for better capacity utilization. The increased export of pesticides in recent years was also due to the shift in pesticide production from the developed countries to developing countries. Amongst the developing countries, India is the second-largest exporter of pesticides, behind China. It accounted for three percent of the world export of pesticides in 2003, as compared with 5.9 percent for China. Though export opportunities were rising, a major threat for pesticide exports was that of regulatory barriers. Access to foreign markets was restricted through registration procedures stipulated by different countries. A company desirous of marketing a generic product in a new market is required to obtain registration for that product in each target market. Registration involved significant high initial investments, and a period of 4-5 years for field trials.

3.6. Strategic Shift

The above mentioned macro as well as micro factors brought out a paradigm shift during this period. During late nineties, many multinationals entered the industry through joint ventures and launched many proprietary molecules, which posed a threat to the generic market dominated by Indian firms. This was the stage when the industry consolidated through mergers and acquisitions. Hoechst –Schering Agrevo was formed after merger of the three companies, which again merged with in 2003 to form a new company called Aventis Cropscience. This was later acquired by Bayer Cropscience. Novartis and Astrazeneca merged to form a new agribusiness company as Syngenta Crop protection. The two giants offered new crop protection solutions to the farmers as they had a large assortment of proprietory molecules as well as generic brands in their portfolio. Also, these were backed by the R&D arms of their parent companies. The companies also marketed seeds and other biotechnology solutions. The two companies now dominated the industry along with Du Pont, Monsanto and BASF. The Indian companies also restructured themselves from mere chemical companies to agribusiness companies offering a range of agri-inputs such as pesticides, fertilizers and other related services. Some big companies like Rallis and

UPL integrated forward to have control over the retail channels. The consolidation put multinationals on the top position with respect to market share because of enhanced product portfolio and expanded markets. A large share of the industry was held by spurious manufacturers, which were mainly small unorganized players. These companies had a regional origin and were manly formulators. Because of the low price of their products, they were able to make huge margins. As a result of which domestic companies were under extreme pressure in market front. Their survival in the industry demanded changes in their production, market and competitive strategies.

4. Strategic Reaction of Firms through Flexibility

Flexibility Triad Model defines three types of (a) market flexibility, (b) production flexibility, and (c) competitive flexibility (Yip, 1989; Abbott,). Market flexibility deals with the ability of the firm to have a high global market share, ability to sell its major products in a large number of international and geographic markets, and have a strong presence in those markets that are the home bases of global competitors. This allows the firm to reduce the dependence on a particular set of markets. Production Flexibility is the ability of a firm to manufacture / provide goods or services, in most major markets around the world, with a short lead time at competitive costs. Competitive flexibility provides a firm to compete with the capability to compete in an industry with turbulent environment with high competitive intensity, and demand / technological uncertainty. Here the firm acquires such resources and competences so that it is able to face the uncertainties arising out of the competitors' actions through new technologies or market moves. The selected cases from the pesticide industry have been analysed on the basis of the strategic flexibility adopted by them to cope environmental turbulence.

4.1 Competitive Flexibility adopted by Domestic Firms:

Following were the strategies adopted by the firms to attain competitive flexibility

Restructuring:

The pesticide firms were mainly chemical firms dealing with only pesticides and other industrial chemicals for different industry. The competitive changes in the industry forced the firms to have a different strategic focus than chemicals for sustainability. The firms realized that to attain competitive flexibility, the companies had to restructure their businesses with focus on different areas of agribusiness and not only on chemicals. Excel Industries restructured their business by spinning its agribusiness division into a separate company called Excel Crop Care along with Nufarm Ltd. of Australia as strategic partner. Nufarm was chosen as strategic partner as it is having over 2000 registrations worldwide and has manufacturing and formulation facilities in thirteen countries including Australia, USA, Austria, U. K., France, Egypt, Indonesia and Malaysia. The objective of the alliance between the Company and Nufarm Ltd. was to have several advantages for both the companies. This helped Excel to gain entry into a new product segment such as weedicide and gained hold over its formulation facilities to strengthen its position in overseas market.

Rallis also restructured itself by merging its five wholly owned subsidiaries i.e. Rallis Finance and Investments Ltd., Rallis Farm Management Services Ltd., Rallis Hybrid Seeds Ltd., Ralchem Ltd. and Sankhya Garments Ltd. with itself. The company identified specialty fertilizers, seeds and pesticides exports as its future

growth areas. Specialty Fertilisers, Seeds and Farm Management Services are referred to as "acorn" businesses to indicate that they are nascent and require nurturing before they can impact the company results positively. It divested from many unrelated businesses and focused on pesticide business. As a part of its restructuring exercise, in 2001-02, the pharmaceutical business of Rallis, which was engaged in marketing of household remedies and manufacturing of basic drugs was sold to Shreya Life Sciences Pvt. Ltd. Pazchem-a joint venture located in Israel wherein the company has 40 percent stake has closed its formulation unit in Israel and shifted the entire production base to company's formulation facility in Akola.

Related Diversification

The companies followed related diversification strategy to reduce the risk of being in the pesticide business presently under environmental pressures. It forayed into related agribusinesses such as drip irrigation, post harvest Management, organic manure, Integrated Pest Management and biopesticides, seed dressing. This *strategic fit* was an effort of the company to keep pace with the agribusiness environment, which demanded more environmentally safer products. It also diversified into micro-irrigation systems, waste management and biofertilizers. The company entered into the business of municipal waste management and converting this waste into the biofertilizer, Celrich. It also diversified into microbial products; foliar nutrition products, herbals, disinfectants and sanitizers are products available from the Life sciences division. The other company Rallis diversified into hybrid seeds to reduce the sole dependence on pesticide business. Rallis forwardly integrated to distribute a complete agri-input range to the farmers. This was to attain market flexibility through control over distribution channels. As the competition from foreign giants made it difficult to make margins through traditional channels.

Adding new Products/Product lines

Both the companies added new products and product lines to their product portfolio to have competitive flexibility as competitors, mainly multinationals offered innovative and patented products. Excel extended its product lines to weedicides and fungicides also. Earlier, it was marketing only insecticides, rodenticides and fumigants. As compared to their companies, the number of products with the company is very less. Few products such as Endosulfan and Glyphosate are having more than fifty percent share in the total turnover of the company and both these products are at maturity stage. Endosulfan is also facing pressures from environmental groups. The company launched new products in all product lines and also some new products such as biopesticides, seed dressings, plant growth promoters.

Rallis introduced new environment-friendly chemicals to face competition from foreign giants. Strategic alliances have been one major component of company's strategy. In order to have flexibility to reduce the sole reliance on generic chemicals. The company undertook the marketing and distribution of several world-class products of leading global players. Rallis has entered into strategic long term alliances with research based multinationals and Japanese companies for bringing in new molecules and new formulation technologies for commercialization in India which gives it access to molecules with high business potential. It enabled the company' entry into new markets and new crop pest segments and enhanced the speed to market, provided a greater flexibility in product portfolio, helped give access to make

the best use of each others competencies, sharing of knowledge capital and lowers costs (R&D and high capital investment). The alliances have helped the company to improve its capacity utilization through toll manufacturing, alliance partners sourcing products from us for their domestic / export sales. Currently almost 20 percent of its sales turnover comes through the sale of alliance products.

4.2 Market Flexibility adopted by Domestic Firms

It was obvious that the domestic firms having competitive edge in manufacturing generic chemicals had to look for international markets as a part of their flexibility approach. Various flexibility strategies such as targeting diversified international markets, concentrating home markets to capture more market share were adopted. To gain market share in future, companies strengthened the customer relations with their unique campaigns.

Strengthening International Markets

The companies, threatened at the domestic front felt the need to occupy foreign markets to attain market flexibility. Excel is one of the leading companies exporting to many nations across the world. Its technical actives as well as the bulk and branded formulations are presently registered and marketed in Asia-Pacific, South Asia, West Asia, Africa, Europe (West & East including CIS countries), Central and South America and the USA. Exports accounted for about 32 percent of the turnover in 2004-2005. With an objective to boost exports, these subsidiaries were set up in Europe in order to intensify its efforts to strengthen its presence in European market and to protect its product registrations in Europe; the former was set up in 1998 and later in 2001-2002. Rallis also shifted its focus from the US, Western Europe destinations to south-east Asia, Australia, Africa, Sri Lanka and Vietnam and concentrated on few emerging markets such as Brazil.

Horizontal Integration

The company is also following horizontal integration and concentrating on new markets. It is providing new and safer solutions for the pest problem. Excel has redefined business by expanding its areas of operation from agrochemicals and plant protection areas to become a source of major agricultural inputs for the farmer, processor and consume the company has played a major role in managing, marketing and value addition for agricultural produce for the farmer by using the Integrated Pest Management and Integrated Crop management products and packages. The company also plans to increase its emphasis on development of environmentally safe and natural products and use the strengths of R&D and technology in chemistry and engineering to develop high value specialty chemicals mainly for exports.

With a view to establish the long term relationship with the farmer, it launched *Excel & Me*, a project specially designed to introduce farmers to the benefits of holistic farming. *Excel and Me* focuses on solutions that are long term and which contribute to the prosperity of the farmer. *Excel and Me* builds long-term credibility and loyalty of farmers as well as builds customer base and profile. In addition, the field trials are held at farmer fields, which yield crucial findings, further aiding in fulfilling the commitment to giving farmers the best products and the best crop production technology. *Excel Kisan Mitra* was started with aim to improve economic stability and security of farmers of Gujarat by enhancing their access to appropriate

and affordable technologies, expert advice and risk coverage option through information and knowledge mechanism at the village level.

Production Flexibility adopted by Domestic Firms

As a result of pressures from outside environment, both the companies are adopting production processes to gain flexibility in production function. The strategies adopted were backward integration, quality management, and rationalization of processes for cost reduction which provides it leverage to attain competitive flexibility in market as well. Backward Integration has been an important part of the company's strategy after diversification. The company is a long-term integrated player as it is also in the manufacturing of raw material such as phosphorous and its compounds, pesticide intermediates, pesticide technicals and formulations. This is also a part of company's cost reduction strategy, which is desirable from any company to attain flexibility in such type of environment. The quality management function has also been strengthened in the company. In 1994, Excel became the first Indian agrochemical company to be certified ISO 9002. Four of the major plants are ISO 9002 certified and two of the sites have ISO 14001 certification. The main manufacturing facility of the group at Bhavnagar is ISO 9002; ISO 14000 and OSHAS 18000 certified. Capacity of pesticide intermediates i.e. raw materials were also expanded.

The company also continued to make investments in modernization of its plants to improve the productivity, cost competitiveness, process waste minimization and safety, all this to achieve production flexibility. In year 2001-2002, the company expanded the manufacturing capacity of Organophosphorous compounds at its Bhavnagar Unit. The division also made substantial expansion of production capacities of Diethyl thiophosphorus chloride, a pesticide intermediate at its Roha Unit and Sodium pentachlorophenate and Acetyl chloride at its Lote Parashuram Unit. The company is also establishing new plants to fulfill the demand of overseas market. As the biofertilizers provide a good opportunity, the company has also established a plant to manufacture that product. New manufacturing units for raw materials have also been acquired.

Rallis too adopted strategies for attaining production flexibility in terms of rationalization of manufacturing facilities as it closed the manufacturing units at Cuddalore (Fine Chemicals), Ankleshwar Unit II and the Howrah Formulation Unit. The company is following flexible manufacturing process, which enables it to produce any new product in shortest time duration and make available to the remotest location. With a view to have quality oriented production, all plants were accredited with **ISO 9002.** This guarantees standards of high caliber with strict adherence to time and competitive cost structures, making Rallis an ideal partner for toll manufacturing. With an objective to enhance productivity, a major initiative of Total Productive Maintenance, with Six Sigma was undertaken under the name of TBEM - SANKALP, to identify areas in manufacturing and the supply chain, where the Company could achieve substantial cost savings. This has led to establishing and accelerating the key processes such as Process Optimization, Energy Management, Environment Management System and Procurement etc. The project is being continued successfully and the Company has undertaken a number of steps to institutionalize the process and monitor implementation. As a part of this rationalization strategy, it also (including its subsidiaries) reduced its workforce by 935 employees from 3,120

employees in September 2000. Rallis also concentrated on cost reduction through backward integration.

Table 5 Strategies adopted by Excel CropCare

Competitive Flexibility	Market Flexibility	Production Flexibility
Restructuring and formation of a separate agribusiness unit Strategic collaboration with Nufarm Related diversification Adding new product lines Adding new services such as micro-irrigation, biofertilizers, spraying services , waste management, disinfectants, herbal products	Domestic markets Horizontal Integration Repositioning products Adding new product line such as weedicides and fungicides Introduction of Biopesticides Strengthening customer relations International markets Entry into new markets Establishing subsidiaries abroad Strategic alliances	New Plant establishment Plant Modernization Continuous Capacity Expansion Backward Integration Acquisition of manufacturing Plants Quality management systems Developing Process technologies

6. CONCLUSION & MANAGERIAL IMPLICATIONS

The study concludes that the turbulence existing in the industry had far-reaching influence on firms' businesses. We conclude that domestic companies attained strategic flexibility to gain competitive advantage in such type of highly turbulent environment. To attain flexibility, the companies targeted at new export markets since the domestic market was saturated and there was more demand for generic molecules overseas. For increasing exports turnover, the companies set up subsidiaries abroad and adopted strategies such as joint ventures, strategic alliances, and acquisitions. New products and brands were acquired. Related diversification, backward integration, horizontal integration were also some of the strategies pursued by the said firms. Market penetration, product line extension and customer relationship strategies helped the firms to combat threat in domestic sector. For having production flexibility, the company followed backward integration and continuously expanded the capacity of its plants to meet the needs of export markets. Rationalization of production processes was done to achieve cost reduction in production, which helped the companies to combat threat from competitive sector.

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Annexure I : A Note on Indian Pesticide Industry

The pesticide industry is the major agri-input industry after fertilizers. The products of the Indian pesticide industry are used as agricultural inputs to protect the crop from harmful pests, diseases etc. besides having other professional uses such as public health, animal health and construction purposes. The industry has been essentially involved in the production of generics, which have had a long run in the crop protection in the country. The industry is the second biggest producer of active ingredients in Asia, next only to Japan and is ranked 12th in the world. Around 80-85 percent of indigenous production and balance of technical pesticides are being imported. The pesticide industry in general has large domestic market, but a wide export market also exists. Insecticides are the largest product sector contributing to 59 percent of the total market. Around 144 insecticides are approved for use on crops**.** *(DPPQ,2005)* Insecticides dominate consumption with around 61 percent of estimated consumption of pesticides, followed by fungicides (18%), herbicides/ weedicides (16%), and others (5%). Cotton accounts for about 45 percent of pesticide consumption in India, followed by rice (23%), jowar (9%), vegetables (7%), wheat (6%), and pulses (4%). *(APO,2002).*Any insecticide which is to be manufactured, marketed, exported or imported in the country has to be registered with the Central Insecticide Board, which registers insecticides after scrutinizing formulae, verifying claims of efficacy and safety to human beings and animals.*(Central Insecticide Act, 2005).*

Strategic Flexibility in Indian Pesticide Industry