



Agricultural input markets in India – Recent policy reforms and way forward: A review

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ABSTRACT

The paper reviews the policies in three major input sectors; seeds, pesticides and fertilisers. There are many new policies (regulations and acts) which are recently implemented, few recommended and few others yet to be implemented. The new policies and regulations are tailored for the changing dynamics in the input sector and are intended to have greater implications on restructuring the sector. The input sectors are governed by different actors and roles. The current challenges in the agri-input markets are lack of quality seeds and emerging technology policy conundrums in seed sector, lower innovation and research and development in pesticide sector, and subsidy governance in fertilizer sector. We have discussed how these challenges are being addressed by the new policies and what is the plausible way forward.

Key words: Agriculture, Fertilisers, Input markets, Pesticides, Policy, Seeds

Agricultural input markets have large implications on welfare of the farmers. On one hand, quality inputs could increase the productivity of the farmers, and on other, lower prices of inputs could reduce the cost of production and thus increase the net income of farmers. During the green revolution period, increased use of inputs, high yielding varieties, fertilizer and irrigation has resulted in increased productivity and production in India. This trend continued over period with higher research and development (R & D) investment from the public system (Pal 2017).

The agriculture input markets in India is undergoing numerous changes in terms of scale of operation, participation, and diversification. During the last four decades, the share and role of state owned firms of agricultural input industries are declining while that of private firms are increasing (Pray and Nagarajan 2014). Other than these internal structural transformations, external factors such as government policies are also shaping the sector. Various new policy reforms such as nutrient base subsidy scheme 2010, neem coated urea 2015, direct benefit transfer (2017) in fertilizers sector, price control order of bt-cotton 2015, Seed Bill 2011 (pending) in case of seed sector, and the proposed pesticide management bill 2008 and Insecticides (Amendment) Draft Rules 2017 in case of pesticides would have greater implications on the sector. The paper discusses agricultural input markets of three major

inputs (fertilizers, seed and pesticides) in India. The article summaries input industry structure, recent policy reforms, its challenges and suggests few recommendations.

Seed sector

Global seed markets are growing at 10% and the major factor in increasing in the turnover is due to GM crops (Bonny 2017) and increase in seed replacement rate (Venkatesh and Pal 2014). The largest market is North America and Europe with a market share of 55%. Recently, six multinational companies have combined through merger and acquisitions (Maisashvili *et al.* 2016). In early 1990s major firms in agro-chemicals ventured into seed sector due to high cost of and lower returns in agro-chemical sector and prospective higher returns in seed sector (Bonny 2017). The recent mergers and acquisition in seed sector is due to reduction in sales of seeds and agrochemicals alongside tightening regulation in many countries (Bonny 2017).

The Indian seed industry accounts 4% global share with fifth position in world. The seed sector could be divided into two segments; high volume low value and High value low volume. Public institutions are mostly in high volume low value seed segment and private companies are in high value low volume seed sector (Kolady *et al.* 2010). As a result of it, in value terms, private sector accounts 70% of the market. In public sector after merging of State Farms Corporation of India Limited (SFCI) with National Seed Corporation (NSC), there is only one organization with 16 state seed corporations, while in case of private, more than 500 seed companies (Multi-National Companies and domestic private seed companies) are in business.

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Government policy reforms

Government policy intervention has shaped seed sector in the last 30 years. The major development initiative of seed sector was done through National Seed Project Phase-I (1977-78), Phase-II (1978-79) and Phase-III (1990-1991), and later through New Seed Development Policy (1988 – 1989) (Kolady *et al.* 2010, DAC & FW 2018). Indian seed industry is currently under several regulations; Seed Act of 1966, Seed Control Order 1983 and Protection of Plant Varieties and Farmers Right Act, 2001 (PPV&FR Act). Two most recent policies in seed sector are Cotton Seed Price Control Order 2015, and the Seed Bill 2011 (pending with the Government).

Seed Bill 2011

The Seed Act 1966 and its rules 1968 are the regulations which govern seed sector in India. With the changing dynamics in seed technology and industry, Government of India introduced Seed Bill 2004. The bill had undergone numerous revisions since then and the current form in 2011 is pending (Singh and Chand 2011). In principle, Seeds Bill, 2011 has accounted to ensure regulation in line with the current scenario. Comparing it with Seed Act 1966 it has included major changes on registration, transgenic varieties, compensation to farmers, export import rules and penalties on spurious seeds.

Cotton price control order, 2015

With the advent of Bt-Cotton the pricing of cotton seed has been in political attention as its direct implication on farmers' plight. Various states such as Gujarat, Maharashtra and Andhra Pradesh enacted state legislations to control cotton price. Andhra Pradesh fixed its price under the A.P. Cotton Seeds Act 2007. In 2015, Department of Agriculture issued the Cotton Seed Price (Control) Order, 2015, under Section 3 of the Essential Commodities Act (1955) to regulate Bt cotton seed prices. The order came into effect from march 2016 and fixed the prices as ₹ 635 and ₹ 800 for BG-I and BG-II, respectively (Table 1). In 2017, the companies filed a case in Delhi High Court. So the prices were kept the same as the previous year. In 2018, the prices were reduced for BG-II, but kept the same for BG-I. On one hand the Cotton Seed Price (Control) Order, 2015 had brought greater relief to resource poor farmers, this has influenced the structure of the industry. Murugak *et al.* (2007) in their study had shown that the initial interventions by government interference, by imposing price ceiling, lead to dis-advantage to new entrants. The Cotton price control order (2015) might have also promoted the planned dis-investments in bt-cotton sector by multi-national companies.

Protection of Plant Varieties and Farmers Right Act, 2001 (PPV& FRA 2001)

India being a member of World Trade Organization (WTO), under the Agreement on Trade related aspects of the intellectual property (TRIPS) obligation opted for *sui-generis* system for protection of plant varieties. Under the

Table 1 Bt Cotton seed price (₹/450 g packet; nominal prices)

Year	BG-I	BG-II
2010	650	750
2011	830	930
2012	830	930
2013	830	930
2014	830	930
2015	830	930
2016	635	800
2017	635	800
2018	635	740

BG is Bollgard (Bollgard-I and Bollgard-II). The price in table for the period 2010-2015 is of Andhra Pradesh. *Source:* Compiled from multiple sources (Newspaper articles, Government press release, CCI documents, research papers) by authors.

sui-generis system, PPV&FRA 2001 was enacted (Kolady *et al.* 2010, Venkatesh and Pal 2014). In 2007, under PPV&FRA Act 2001, PPV&FR Authority started receiving applications for registration and protection. Initially 12 food crops species were notified, now about 62 crops are covered under this act. The trend in the varieties registered shows that public institutions are focused on food crops, while private companies are concentrated in non-food crops (Table 2). This act plays a key role in providing intellectual property for all actors in the seed sector (Pal *et al.* 2007).

Challenges and way forward

Major challenges in seed sector are non-availability of good quality seeds, spurious seed (Esp. Cotton and vegetables), policy dilemma over GM technology, lack of investment in R & D, Government regulatory interventions. Ensuring good quality seed and preventing spurious seed is a key priority in the sector. The proposed legislation (Seed bill 2011) takes care of the issue of spurious seed to some extent. Compensation for farmers and penalties on wrong doers would solve this issue to a great extent. To ensure availability of good quality seeds, both private and public enterprises should be promoted. Public sector could also venture into high value low volume sector with varieties developed by Indian Council of Agricultural Research (ICAR). The public sector companies need to

Table 2 Crop varieties registered by actors in PPV&FRA

	Food crop		Non-food Crop		Total
	Number	Percentage	Number	Percentage	Number
Public	832	78.34	230	21.657	1062
Private	395	64.86	214	35.140	609
Farmer	1212	99.43	7	0.574	1219
Total	2439	84.39	451	15.61	2890

Note: Data on certificates issued till 30.06.2017. *Source:* PPV&FR Authority (2018)

focus on marketing and branding of their seed varieties to compete with private players. Domestic private sectors should be encouraged for investment in R & D and also to collaborate with public research institutions for R & D. The agri-business incubators set-up in ICAR institutes (Subash *et al.* 2016) could be a nodal organization for such collaborations. Government also needs to bring clarity on the GM technology and other emerging technologies in seed (CRISPR-Cas9). The current decision of considering GM crops on case to case basis (Datta *et al.* 2019) could bring uncertainty in the industry. The regulatory mechanism in the seed sector should be made predictable, transparent, fair and science-based. Further deliberations, discussion and research is warranted in this regard (Gupta *et al.* 2020).

Pesticides

Global pesticide industry at distributor level is more than \$50 billion and forecast to grow at 6 to 8% per year (Uttely 2014). India accounts for 1.7% of the global pesticides use (67000 ton) of the 3.52 million tons of pesticides (Active Ingredient) used in the world. The highest pesticides consuming country is China followed by USA, EU, Brazil and Argentina, which contributes for 90% of the pesticides used globally (FICCI 2015). Among the total pesticide, the share of Insecticides is 39%, Fungicides is 38.7%, herbicides are 18.8% and rodenticide is 3.6% (Subash *et al.* 2017). Indian market expected to grow at approximately 12% with Fungicides and Herbicides growth expected to be higher than Insecticides (FICCI 2015).

Pesticide industry in India

There are two categories of producers, manufactures and formulators. Manufacturers produce technical grade materials and about 10 manufacturer's account 80% of the production of technical grade (FICCI 2015). Formulators buy technical grade and use different concentration for different crops. The current pesticide industry constitutes multi-national companies which are strong on R & D, while traditional Indian companies are mostly formulators. There are a total of 125 basic manufacturers, who produces or sell them as brand to more than 800 formulators, with around 145000 distributors catering about 130 million farmers (FICCI 2015).

The industry is shaped by intellectual property rights (IPRs) as the companies are characterised by R & D based and generic based. There is a decline in the agro-chemical innovation in the last decade (4-8 new Active Ingredients are in market each year). IPRs are also granted for mixture of products and formulations. Only 25% of the total market products are patented product, 25-30% is generic and 45-50% is off-patent products (Uttley 2014). There are large number of patents are coming off-patents which brings opportunity for generic pesticide products (FICCI 2015).

Government Policy reforms

The Insecticide Act (1968) is the key legislation to regulate production, registration, import, sale distribution

of pesticides (Subash *et al.* 2017). Pesticide manufactures and formulators need to register with Central Insecticides Board and the Registration Committee (CIB&RC) under the Insecticides Act of 1968. CIB&RC undertakes registration of pesticides. Central Insecticide Laboratory and State Pesticide Testing Laboratories (SPTL) test samples of fertilizers are point-of-Sale. There are two recent proposed reforms of these legislations; Insecticides (Second Amendment) Rules, 2017 and Pesticide management Bill, 2008 (2017).

Insecticides (Second Amendment) Rules, 2017

This is amendments to the Insecticides rules 1971. As per the latest amendment, issued by the Department of Agriculture and Co-operation, 'A person who applies for grant for license to sell, stock, or exhibit for sale or distribute insecticides shall possess or shall employ a person possessing a graduate degree in Agriculture Sciences, or Biochemistry, or biotechnology or Life science or in science with Chemistry or Botany or Zoology as a minimum qualification.' This have raised objection from various quarters. Agricultural graduates have criticized it as a dilution of the original proposal as biology and other science graduates were also allowed. Also severe criticism was drawn on as giving equal value to graduation and diploma, which is only of 45 days. Dealers have argued that they may not be able to such a course even if it's for 45 days for a year.

Pesticide management Bill, 2008 (currently 2017)

The bill was introduced on 2008, and intends to replace the existing Insecticide Act (1968) (Table 3). The key highlights of the bill are i) definition of pesticide as substance used to destroy or control the spread of pests in agricultural commodities or animal feed, ii) definition of misbranded criteria expanded to three categories; misbranded, sub-standard, or spurious, iii) pesticides should adhere to the residue limits in crops as per the Food Safety and Standards Act, 2006, iv) Central pesticides board is established to advice government on matters related to pesticides, v) defined procedures to license manufacturers, distributors and retailers. There are issues such on narrower definition of pesticides (Parliamentary Standing Committee on the bill recommended broader definition), the tolerance limit as per Food Safety and Standards Act, 2006 is yet to be brought into force, the penalties on misuse of power by pesticide inspectors and analyst and not defined.

Challenges and way forward

There are several regulatory hurdles in pesticides industry. A new innovation takes minimum five years, whereas incremental innovations (newer formulations) take less 1-2 year. For inventing a new molecule, it incurs a huge investment to an extent of ₹1200-1400 crore and a time period of 9-10 years. This dis-incentivizes the companies for developing newer molecules. The time of regulatory clearance could be reduced to 2-3 year and encourage data generation under Good Laboratory Practices (GLP) (WHO 2009). The current provision under the proposed Pesticide

Table 3 Comparison between Insecticides Act 2008 and Pesticide Management Bill 2008

Topic	The Insecticides Act, 1968	The Pesticide Management Bill 2008
Coverage	Insecticides are defined as substances which are in the Schedule to the Act.	Pesticides, defined as any substance used for control of pests in agriculture and animal feed. Could be of chemical or biological origin..
Power of registration committee	Only central government has the power to cancel the registration of an insecticide	Registration committee has the power to suspend or cancel registration in case of impact on crops, animals or humans or any violations under the Act .
Conditions and process of registration	No tolerance limits on pesticide residues. They were defined under Prevention of Food Adulteration Act, 1954. There is no protection of registration data, it was used by multiple applicants.	The bill specifies tolerance limits as a requirement for registration. The limits are fixed by the Food Safety and Standards Authority, under the Food Safety and Standards Act, 2006. The data submitted by one applicant for registration cannot be used by others without permission for three years. .

Source: The Pesticide Management Bill, 2008

Management Bill 2008 (2017) gives a data protection of three years, and in case of products with patent, it is extended to patent period.

One major concern is presence of counterfeit and spurious pesticides in the market. It accounts about 3200 Cr, which is roughly 25% of total market by value and 30% by volume (FICCI 2012). The draft Pesticide management Bill (2017), though tried to address these issues, is being criticized as it had left out core issues raised while the bill was introduced in 2008 (Aga 2018). Another key issue is that low awareness among farmers and lack of adequate technical expertise. Other than these legislative efforts, Government could collaborate with private company for spreading awareness and training among farmers on pesticides. Government could support industries in communicating right kind of perception towards pesticides through mass media workshop and other public forum. Retailer should have at least a diploma in agriculture. Though this was made a part of the act, it has been diluted and lost its purpose. There should be stringent regulation for preventing illegal import to avoid counterfeit and spurious pesticides in the market.

Fertilizer sector

Globally fertilizer industry is characterized by higher concentration with top five countries accounting 50-80% of production capacity (Hernandez and Torero 2013). Countries in sub-Saharan Africa and Latin America depend on imports from these countries and in recent years similar trend is seen among South Asian countries (FAO 2015). India is second largest consumer of fertilizers after China in terms of total quantity (Sharma and Thaker 2011). India depends on import to the extent of about 25% of our requirement of Urea, 90% in case of Phosphates (either as raw material or finished fertilizers; DAP/MAP/TSP), and about 100% in case of Potash.

Government interventions in Fertilizer Sector

Fertilizer industry is capital driven and is highly subsidized by Government of India (GoI) (Praveen 2017). The total budget of subsidies on fertilizers accounts about 0.5-0.8% of GDP. There are three kinds of fertilizers;

Urea, Phosphate (eg DAP) and Potash fertilizers (MOP). Government has fixed the MRP (Minimum retail price) of Urea at ₹ 5360/MT plus 5% extra for neem-coating (FAI 2016). The difference of production cost and MRP of the Urea is the subsidy paid to the Manufacturer/Importer by GoI. The production cost of gas based domestic Urea ranges between ₹ 13000-23000/MT depending upon size and age of the plant. The cost of imported Urea at present is about ₹ 16500/MT. In case of P&K fertilizers, the MRP is decontrolled and subsidy is paid on per kg nutrients (N,P,K,S) in the fertilizers (nutrient based subsidy- NBS) (GoI 2018). In P & K fertilizer the subsidy is fixed but the MRP is varying while in case of Urea the MRP is fixed and subsidy is varying. In 2013-14, the average maximum retail price (MRP) of DAP and MOP are about ₹ 25183.5/MT and ₹ 17972/MT, respectively (GoI 2018). As the price of Urea (₹ 11.65) is lower compared to other P & K fertilizers such as Diammonium Phosphate (₹ 48.70), Single Super phosphate (₹ 46.76), and Muriate of Potash (₹ 26.67) (FAI 2016), the farmers have tendency to use more of Urea than P&K fertilizers irrespective of nutrient requirement. This results in imbalanced fertilizer use and consequently decreased agricultural productivity and issues with soil health.

Policy reforms

Marketing of fertilizers is regulated under Essential Commodities Act 1955 and Fertilizer Control Order 1985. Under this act and order the territory and quantity of sales by different manufactures could be regulated. Fertilizer Control Order also provisions State Government to check the quality of fertilizers. Recently, GoI came up with newer policies in this sector.

Neem-coating of Urea 2015

Government of India mandated neem-coating for 100% of domestic production w.e.f. 01.09.2015 and 100% imported Urea is also neem coated w.e.f. 01.12.2015. There are several benefits of neem coating of Urea. Neem coating leads to more gradual release of urea, helping plants gain more nutrient and resulting in higher yields, it could reduce

the underground water contamination as a result of leaching of urea, it also serves as a natural insecticide. Other than these direct benefits, Government intension was to prevent the leakage of heavily subsidized urea's to chemical industry and other uses such as making of adulterated milk. About 41% of urea is getting diverted to non-agricultural purpose (Economic Survey 2016). Urea accounts about 75% of the total fertilizer subsidy and only 35% urea fertiliser goes to small and marginal farmers. Studies had shown that the efforts had paid off and there has been significant reduction in leakage of urea into non-crop purposes and improvement in productivity (Ramappa and Manjunath 2017).

Dechannelizing Urea

Government had given permission to imports of urea to three companies (channelizing); State Trading Corporation Limited (STC), Metals and Minerals Trading Corporation of India (MMTC) and Indian Potash Limited (IPL). India is also importing approximately 20 lakh tonnes from Oman India Fertiliser Company (OMIFCO) through a Long Term Urea Off Take Agreement (UOTA) between GOI & OMIFCO. The Economy survey (2016) recommended dechannelizing urea imports and allowing more number of players to import, which would lead to increased competition and reduced price. It also recommends bringing urea under the NBS (nutrient based subsidy) program.

Direct Benefit Transfer (DBT) in fertilizers, 2017

The Direct Benefit Transfer (DBT) in fertilizers in India was rolled out after a series of initiatives taken by GoI. DBT on fertilizer was initially rolled as a pilot project in 7 states in 2017, since March 2018, it has been implemented in another 12 major states. DBT in fertilizers provides subsidy to the companies after the farmer based biometric identification is conducted by input dealer (retailer). It is designed to provide subsidy on the urea based on physical offtake by farmers. It would also help in reducing diversion of urea for non-agricultural purposes. In the earlier system about 90% of the payment to the companies is done once the fertilizer reaches at district level and the remaining when it reaches at retailer level once certified by the state. In the present regime, 100% of the payment is done once the sale of fertilizer is bio-metrically authenticated by the retailer. The whole transfer of fertilizer is tracked by iFMS (GoI 2018). This holds lesser challenges than that posed by Direct Cash Transfer mode of fertilizer subsidy transfer (read more about in Kishore *et al.* 2013).

Expected benefit of DBT

The expected benefit from DBT on fertilizers is that it could prevent leakage and diversion of fertilizers by creating Aadhaar seeded database of beneficiaries, which could ensure visibility of transaction at buyer level. The subsidy could be transferred to manufacturers on the basis of actual sales by retailer to farmer. There are other co-benefits which could be derived from DBT. The availability of PoS device (in approx 2.0 lakh) with retailers provides

newer opportunities for the Government to reach rural India. It could be used for service delivery channel by other Ministries and programs. It could also help in digitizing transactions and create purchase history for farmers. This could also be used by financial institutions to provide credit to farmers based on transaction history at fertilizer outlets.

Challenges

One of the major challenge is in defining the beneficiaries; consumer vs farmer. Whether beneficiary should be small farmer and marginal farmer or large farmer? How to handle variation of subsidy component for different grades of fertilizers, and variation of subsidy component from company to company even for the same product? Other than these, there are challenges in providing infrastructure such as network connectivity and devices, which needs to be addressed in priority basis. An initial assessment by NITI Aayog had shown that the acceptance levels (of retailers and farmers) towards technology intervention (PoS devices) are low (Giri *et al.* n.d.). The report also shows that the transaction time of the PoS machine is also slower (5 minutes per transaction), in that way retailers can only handle 120 transactions per day, which is much shorter than number of transaction (300-500 per day) in peak season. Another major concern is mounting subsidy backlogs. The current subsidy backlog estimated by FAI is ₹ 30000 crores.

The Way forward

The price of P&K fertilisers could be rationalised to mitigate the distortion in NPK ratio. Such an initiative 'Kethata Aruna' was implemented in Sri Lanka, in which the prices of Urea, Triple Super Phosphate, and Muriate of Potash was kept same, had shown positive impact on imbalanced fertiliser usage (Herat *et al.* 2013). The fertilizer subsidy payment mechanism needs to be streamlined by eliminating the subsidy backlog to the industry to prevent cost implications to farmers and to ease working capital requirements to fertilizer industries. The DBT provision of clearing subsidy within seven days could help the industries financial concerns. There is a need to reform the regulatory framework by making the registration simpler and easing movement controls. There is a need to ensure the quality control at various levels of the fertilizer supply chain. An intensive media campaign is needed to educate farmers about the need of balanced fertilization and promotion of organic fertilizers. The organic fertilizers should be also made fertiliser control order (FCO) compliant. Setting up of joint ventures abroad to secure long term fertilizer supplies from locations where energy prices are cheap is necessary for ensuring a sustainable future. Such an initiative with Oman (OMFICO) is currently accounting 25% of the total urea imports. The existing subsidy on fertilizer subsidies could be targeted ideally for small and marginal farmers through direct benefit transfers without excluding the landless farmers tilling someone else's lands.

Conclusion

The study shows that each input (seeds, pesticides and fertilizers) are characterized by unique market structure. In case of seed and fertilizers, the industry is characterized by both public and private firms handling different niche portfolios. While, pesticide sector is completely owned by private sector the existing policies are protective in seed sector, subsidy based in fertilizer and regulatory in case of pesticides. Quality and availability of the inputs is a core issue in all the three sector. The recent policy reforms had considered these issues to some extent. The sector is facing severe delay in coming up with newer policies. Considering the dynamic nature of the sector the policies need to be realigned and reformed in a faster pace. There is a need to strengthen policies to build partnership; public-private partnership for R & D in case of seed, for quality control in case of pesticides, and for foreign joint ventures in case of fertilizers.

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