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Trends in seed production, growth drivers and present market status of Indian seed industry: An analytical study

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ABSTRACT

The establishment of National Seeds Corporation (NSC) in 1963 marked the begining of formal seed sector in India and the Indian seed industry has come a long way since then. The seed industry was dominated by the public sector during the first 25 years, ie till 1988. The growth drivers in this period were the ushering of green revolution and special government schemes to increase SRR through programmes like National Seed Project. The liberalisation of seed policy in the form of New Policy on Seed Development (NPSD) 1988 opened the doors for private domestic and multinational seed companies for import of seeds and technologies as well as investment in research and development. The laws and policies thereafter have encouraged private participation, benefitted private seed companies and provided better market access to foreign seed companies. The fact that from 1984 to 1995, around 50-60% of the seed requirement was met by the private sector and in 2010 it was estimated that 80% of turnover in seed business came from private companies establishes the dominance of private seed companies at present. The seed production has quadrupled from 1991 to 2011. The growth was more spectacular in the last decade (2001 to 2011) when seed production tripled with a robust Compound Growth Rate (CAGR) of 15% pa. The growth drivers in this period were the rapid growth of innovations (improved varieties, hybrids and proprietary technologies) and seed markets (especially for Bt cotton, single-cross maize hybrids, hybrid rice, vegetables and few self-pollinated crops), strengthening of IPRs coupled with liberalised seed policies. The future growth drivers of Indian seed industry would be technological breakthroughs to mitigate biotic and abiotic stresses including climate change, favourable regulatory environment for GM crops, government policies to promote investment in seed R&D and infrastructure (both in public and private sector) and providing access to international markets.

Key words: CAGR, Growth drivers, India, Market, Production growth, Public and private seed sector, Seed industry, Seed policy, Status

Seed being a commodity of trade, its production, supply and quality are serious source of concern to all the countries for food security. The trade in seed is subject to bilateral and/or multilateral agreements at local, regional and international levels. In general, the seed trade is one of the most regulated in all countries, with a plethora of seed laws, testing and certification procedures. The Indian seed industry has come a long way since its inception with the establishment of National Seeds Corporation (NSC) in 1963. The Indian seed industry was dominated by the public sector during the first 25 years, i e till 1987. The liberalisation of seed law in the form of New Policy on Seed Development (NPSD) 1988 opened the doors for domestic and multinational seed companies for import of seeds and technologies as well as investment in research and development. The laws and policies thereafter have encouraged private participation, benefitted private seed companies and provided better market access to foreign seed companies. A significant change has been observed in the evolution of the private sector and its interface with the public sector in the case of the rice seed system in Andhra Pradesh, India (Pal *et al*. 2000). Asia (particularly India and China) is emerging as the largest seed market in the world for the European Union and the USA (Dastagiri 2008).

This paper examines the production growth, drivers and market status of Indian seed industry and its position in the world seed market. The specific objectives of the study are: (i) To assess the status of Indian seed industry and its position in the world seed market. (ii) To analyse the trend in production growth of various kinds of seeds in the last three

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decades and the growth drivers behind it. (iii) To examine the sector-wise growth of seed industry for cereals, pulses, oilseeds, fibres and other crops.

MATERIALS AND METHODS

This is an analytical study. The secondary data regarding production of breeder, foundation and certified/quality seeds and monetary value of India's domestic seed market and its growth have been compiled from various sources including websites and published secondary sources. The growth drivers behind the spectacular growth of Indian seed industry have been analysed. The growth rates have been analysed using Compound Annual Growth Rate (CAGR) calculated separately for breeder, foundation and certified/quality seeds. The analysis of sector-wise growth rates has also been done to reflect on the disparities in seed growth in various subsectors like cereals, pulses, oilseeds, fibres and other crops.

RESULTS AND DISCUSSION

India's position in global seed market scenario

The estimated value of the domestic seed markets of the top 10 countries in the world is given in Table 1. The estimated value of the world seed market is approximately US $ 42 billion of which the USA stands first with US $ 12 000 million. The Indian domestic seed sector ranks fifth in the world with a turnover of US $ 2 000 million, next only to the USA, China, France and Brazil.

India's rank in the world seed market in terms of value has increased from 10th position with value of US $ 600 million in 2002 to 5th position with US $ 2 000 million in 2011. The Indian seed market is almost exclusively supplied by domestically produced seeds except for very little quantity of hybrid vegetables (Dravid 2011a). However, India's share in global seed export is less than 2% (Tonopi *et al*. 2011). The top ten countries of the world with highest value of seed export in vegetable and field crops along with position of India are given in Table 2 and 3 respectively. The close

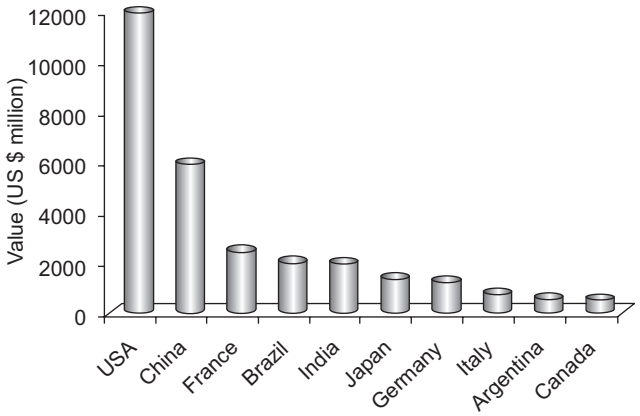

Fig 1 Domestic seed markets of top 10 countries in the world

Table 1 Estimated value of the domestic seed market of top 10 countries (March 2011)

Rank	Country	Value (US $ million)
1	USA	12 000
2	China	6 000
3	France	2 400
4	Brazil	2 000
5	India	2 000
6	Japan	1 400
7	Germany	1 261
8	Italy	780
9	Argentina	600
10	Canada	550
	Total (World)	37 098

Source: International Seed Federation (2011) and NSAI (2011)

Table 2 Seed export of vegetable crops (Calendar Year 2010)

Rank	Country	Quantity (Metric tonnes)	Value (US $ million)
1	Netherlands	12 174	1004
2	USA	21 603	485
3	France	9 200	298
4	Israel		106
5	Italy	10 453	106
6	Chile	2 316	104
7	Japan	1 406	98
8	China	5 742	88
9	Germany	1 741	55
10	Denmark	9 769	53
15	India		22
	Total (World)	106 295	2 851

Source: International Seed Federation 2011 and NSAI 2011

Table 3 Seed export of field crops (Calendar Year 2010)

Rank	Country	Quantity (Metric tonnes)	Value (US $ million)
1	France	378 307	925
2	USA	215 186	695
3	Germany	84 707	504
4	Netherlands	123 082	245
5	Hungary	79 134	235
6	Chile		208
7	Canada	164 500	207
8	Denmark	82 021	181
9	Austria	63 262	176
10	Belgium	28 644	176
31	India		19
	Total (World)	1 907 715	5 129

Source: International Seed Federation, 2011 and NSAI, 2011

examination revealed that India's export of seeds in case of vegetable and field crops is very negligible both in terms of quantity and value.

India exports the seeds of vegetable and field crops worth of US $ 22 and 19 million respectively. India did not find a place in the list of top 10 countries in terms of value of export of seeds. Hence, in order to enhance the seed export potential, India has become the member of OECD seed schemes since October 2008. This will facilitate all the stakeholders to participate in multiplication of seeds abroad as well as increase the international seed trade.

Indian seed production scenario

India with a population of more than 1.2 billion and 140 million hectares of arable land has one of the largest potential seed markets in the world. Yet, in India, large portion of seed trade involves local exchange of established varieties or farmer bred seeds. India is one of the few countries where the seed sector has advanced in parallel with the agricultural production. However, the availability of quality seed of improved varieties and hybrids is grossly inadequate and is a major constraint to enhanced production. Studies made by several researchers (Gadwal 2003, Patil *et al*. 2004, Hanchinal *et al*. 2007) clearly indicate that with high-volume low-value seeds, such as wheat, groundnut, soybean and chickpea, 80% of the cropping area is sown with farm-saved seeds of old and obsolete varieties. Ayyappan and Kochhar (2010) reported that more than 70 percent seed usage in India, particularly for food crops is through the farm-saved seed. Private seed industry is well built only for selective crops and public seed organisations also cater to a few kinds of seed only. The organized sector (including both private and public sector companies) account for about 15 to 20 percent of the total seed distributed in the country (MoA 2011a). Within the formal sector, the composition of seed industry by volume of turnover, has reportedly reached a ratio of 60:40 between the private and public sector (Govindan 2003). Angadi (2011) reported that positive environment created by government policies attracted more investments in R&D by private players. This is evident from the fact that from 1984 to 1995, around 50-60% of the seed requirement was met by the private sector and in 2010 it was estimated that 80% of turnover in seed business came from private companies.

Table 4 Growth of certified/quality seed distribution in India

Year	Quantity (Lakh quintals)
1953-54	1.83
1970-71	5.16
1981-82	29.80
1991-92	57.50
2000-01	86.27
2010-11	277.34

Source: Centre for Sustainable Agriculture, 2005 and Directorate of Economics and Statistics, Department of Agriculture and Cooperation, 2011.

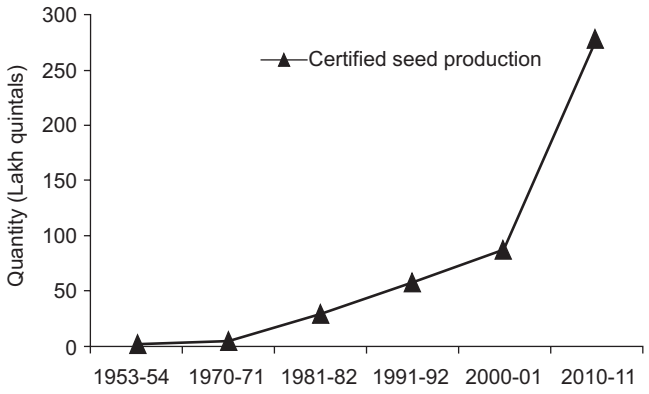

Fig 2 Growth of certified/quality seed distribution

Growth of certified/quality seed production in India

The growth of the certified/quality seeds production in India since 1950s is given in Table 4.

The quality seed production in the country till 1960's was almost negligible. The establishment of National Seeds Corporation (NSC) in 1963 marked the begining of formal seed sector in the country and the Indian seed industry has come a long way since then. The seed industry was dominated by the public sector during the first 25 years reaching a turnover of about ₹ 600 crores by 1987. The key growth driver during this period was ushering of green revolution leading to rapid conversion of area under HYVs of rice and wheat coupled with introduction of hybrids in jowar, maize, cotton, sunflower and few vegetable crops. The special efforts of government by launching schemes like National Seed Project in 1977 also helped in rapid multiplication of quality seeds and increase in SRR. The Compound Annual Growth Rate (CAGR) during this period averaged at 8-10% although on a very narrow base. Then came National Policy on Seed Development (NPSD) 1988, that liberalised the seed sector by encouraging the seed industry to import seeds as well as technology. It also allowed the entry of multinationals and large Indian companies to establish research and infrastructure in seed sector. This resulted in rapid growth in demand and supply of seeds, primarily in hybrid sector as well as vegetable crops. The number of seed companies went up to almost 350-400 and the industry grew to a size of almost ₹ 2 000 crores by 2000 and ₹ 2 500 crores by 2002, thus having a growth rate of over 10% p.a. during this period (Dravid, 2011b). From 1991 to 2010, the seed production has more than quadrupled. During the last decade (2002-2011) the seed production has tripled with a robust growth of almost 11-15% p.a. during this period.

Production growth in various kinds of seed

The data with respect to crop-wise production of breeder, foundation and certified seed is available with the website of

Table 5 Trends in production growth in various kinds of seed

Phase	Period	Compound Annual Growth Rate		
		Breeder seed	Foundation seed	Certified seed
Phase I:	1991-2002	2.75	4.63	5.07
Phase II:	2002-2011	10.86	11.29	14.76
	Overall CAGR (1991-2011)	6.25	5.78	8.17

Ministry of Agriculture, Government of India for the period 1991-92 to 2010-11 (MoA 2011b). The same data was used to find out the CAGR for various kinds of seed over the years and is presented in Table 5.

The approval of Bt cotton for commercial cultivation in India in 2002 is considered as one of the milestones that helped in increased role of private seed industries in particular and Indian seed market in general. Therefore the year 2002 was taken as the landmark year to categorise the growth of seed industry into two phases. The CAGR for breeder, foundation and certified/quality seeds was roughly 3%, 5%, and 5% respectively showing a positive but modest growth for the period 1991–92 to 2001–02. But the production of seed tripled in the next decade (2002–03 to 2010–11) showing a spectacular compounded growth rate of 11%, 11% and 15% respectively for breeder, foundation and certified/quality seeds.

The growth drivers of seed industry in the last decade (2002-03 to 2010-11) are as follows:

i) Introduction of transgenic Bt cotton in 2002 resulted into switch over to Bt cotton hybrids, coupled with increase in area under cotton crop from 7.6 million hectares during 2002 to over 12 million hectares by 2011. Due to increased coverage under Bt cotton hybrids, the seed demand for hybrid cotton increased from 125 lakh packets to almost 400 lakh packets in terms of volume (220% growth) and in value terms from ₹ 375 crores to ₹ 3 200 crores (750% increase).

ii) Introduction of single cross hybrids in maize and increased coverage under hybrid maize from 25% to 60% resulted in increased demand for maize seeds. In terms of volume, it went up from 27 500 MT (260% growth) and by value from ₹ 60 crores to ₹ 720 crores (1200% growth). The Ministry of Agriculture, Government of India reported that between the years 2000 and 2008 the yields of corn in India went up by 60% from 1800 kg/ha mainly because of an increase of 46% in the acreage under hybrids during this period (MoA 2011b).

iii) There was rapid growth in hybrid rice markets particularly in UP, Bihar, Jharkand, Chattisgarh etc. resulting in almost 7-8 fold increase in volumes as well as value (Dravid 2011b). The SRR for paddy grow at a CAGR of 5% p.a. at national level but it was 10 to 17% in these states in the period 2001 to 2008.

iv) The markets for open pollinated varieties have also grown from ₹ 1 100 crores to ₹ 2 600 crores as a result of increase in seed replacement rate (Dravid 2011b). The SRR for wheat, bengal gram, greengram and groundnut increased at a CAGR of 13%, 19%, 6% and 14% p.a. respectively for the period 2001 to 2008 at the national level.

v) Increased usage of high value vegetable seeds also increased acreage under vegetable crops and the market has grown from ₹ 600 crores to ₹ 1 400 crores.

The rapid growth of seed markets, strengthening of IPRs and liberalised seed policies helped in the robust growth of seed industry in the last decade. These factors have not only helped in significant increase in production of certified/quality seeds, but also helped in significant growth of breeder and foundation seeds also.

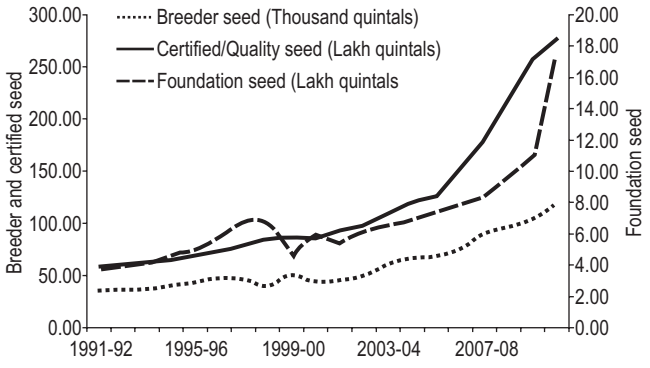

Fig 3 Trends in growth in production of breeder, foundation and certified seeds (1991 to 2011)

Sector-wise production growth in distribution of certified/quality seeds

The data is available with the Ministry of Agriculture Website (MoA 2011b) of Government of India regarding crop wise distribution of certified/quality seed for various sub-sectors like cereals, pulses, oilseeds, fibres and other miscellaneous crops for the period 1983–84 to 2010–11. The same data was used to calculate the CAGR to analyse the growth rates for various sub-sectors of seed industry over the years and is presented in Table 6.

The growth in the production and distribution of seeds for various subcomponents, viz. cereals, pulses, oilseeds, fibres and other crops has also seen a tremendous growth. This growth can be better understood in three phases. Two landmark events that led to the development of Indian seed industry to the present level have been taken as the beginning of the next phase. They are

i) New Policy on Seed Development 1988 that liberalised the seed industry for import of seeds and technologies along with investment in seed industry by MNCs and Indian companies.

Table 6 Sector-wise growth in distribution of certified/quality seeds

Phases	Period	Comound Annual Growth Rate					
		Cereals	Pulses	Oilseeds	Fibres	Other miscellaneous	Total
Phase I	1983–88	9.92	16.09	–0.22	–2.29	–1.76	6.09
Phase II	1991–2002	6.78	2.57	2.24	4.66	–0.05	5.07
Phase III	2002–2011	14.45	16.40	17.39	–0.87	15.40	14.85
	Overall CAGR (1983-2011)	7.79	8.66	8.53	2.16	0.13	6.98

Note: Data not available for the years 1988-89, 1989-90 and 1990-91

ii) Approval of Bt cotton for commercial cultivation in India in 2002 by Government of India.

Therefore years 1988 and 2002 have been taken as the landmark years to categorise the whole period into three phases as shown in Table 6.

Phase I: Until 1988

The growth was particularly high for cereal crops such as wheat, paddy, maize, sorghum and pulses such as bengal gram, red gram, and lentil (MoA 2011b). The growth for oilseeds showed a negative trend as these crops were neglected both in terms of development of new varieties and hybrids as well as promotion of cultivation of these crops. It is to be noted that data is available from 1983 onwards only and CAGR in this phase reflects the production growth for only 5 years. Therefore the CAGR in this phase do not reflect the growth in production of seed prior to this period.

Phase II: 1991–92 to 2001–02

The CAGR for cereals and pulses were positive but significantly less when compared to phase I. This could be called the transition phase since the area under HYVs of rice and wheat got saturated. But the modest growth in this phase was due to the development of hybrids and increased SRR. The CAGR for oilseeds and pulses took a positive trend mainly because of the special efforts of the government to promote the production of these crops. The schemes like Technology Mission on Oilseeds and Pulses (1986) along with National Seeds Project (Phase III: 1990-91) helped in increased quality seed production of oilseeds and pulses along with cereals. It is to be noted that the liberalisation of seed policy has led to the investment in seed industry by MNCs and Indian companies but the effect in terms of seed growth is much more visible in the next phase.

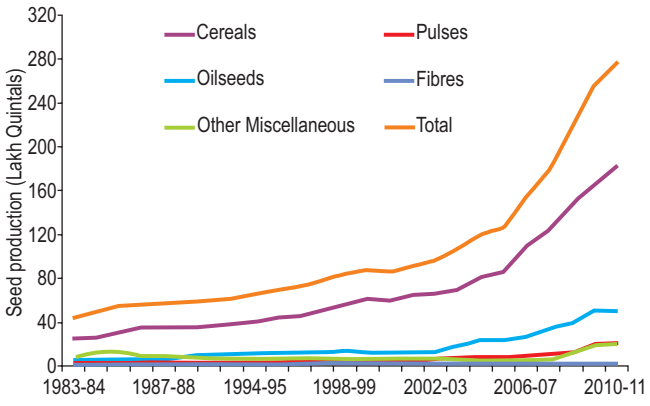

Fig 4 Trends in growth in distribution of certified quality seeds (1983 to 2011)

Phase III: 2002–03 to 2010–2011

The CAGR for cereals, pulses and oilseeds was spectacularly high. Fibres growth rate saw a negative trend. The overall growth rate was highest in this period at approximately 15% p.a. The growth drivers for the significant growth of seed industry for the last decade (2002-2011) were same as those for certified seed and have already been discussed above.

CONCLUSIONS

The Indian seed industry has come a long way since its inception with the establishment of National Seeds Corporation in 1963. The seed industry was dominated by the public sector during the first 25 years, i e till 1988. The growth drivers in this period were the ushering of green revolution and special government schemes to increase SRR through programmes like National Seed Project (1977). Thereafter, two landmark events that led to the growth of the Indian seed industry to the present level are the liberalisation of seed industry by passing New Policy on Seed Development 1988 and clearance of Bt cotton for commercial cultivation in 2002. The seed production has quadrupled from 1991–92 to 2010–11. The growth was more spectacular in the last decade (2001–02 to 2010–11) when seed production tripled with a robust CAGR of 15% p.a. The growth drivers in this period were the rapid growth of innovations (improved varieties, hybrids and proprietary technologies) and seed markets (especially for Bt cotton, single-cross maize hybrids, hybrid rice, vegetables and few self-pollinated crops), strengthening of IPRs and liberalised seed policies. The fact that from 1984 to 1995, 50-60% of the seed requirement was met by the private sector and in 2010 it was estimated that 80% of turnover in seed business came from private

companies establishes the dominance of private seed companies at present. The Indian domestic seed sector ranks fifth in the world with a turnover of US $ 2000 million, next only to the USA, China, France and Brazil. However, India's share in global seed export is less than 2%. The future growth drivers would be technological breakthroughs to mitigate biotic and abiotic stresses, favourable regulatory environment for GM crops, government policies to promote investment in seed R&D and infrastructure and providing access to international markets. The public sector seed industry has to be revitalised to address the present day challenges of competitiveness in R&D, development and protection of new varieties and efficient technology transfer systems.

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