

**गुणवत्तायुक्त बीज की उपलब्धता : बीज – नीति का
बहु-हितधारक विश्लेषण**

**Accessibility to Quality Seed:
A Multi-stakeholder Analysis of Seed Policy**

B. L. MANJUNATHA



**DIVISION OF AGRICULTURAL EXTENSION
INDIAN AGRICULTURAL RESEARCH INSTITUTE
NEW DELHI – 110012**

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Analysis of Seed Policy**

by

B. L. MANJUNATHA

**A Thesis Submitted to the Faculty of Post-Graduate School,
Indian Agricultural Research Institute, New Delhi
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This is to certify that the thesis entitled “*Accessibility to Quality Seed: A Multi-stakeholder Analysis of Seed Policy*” submitted to the Faculty of the Post-Graduate School, Indian Agricultural Research Institute, New Delhi, in partial fulfillment of the requirements for the degree of **Doctor of Philosophy in Agricultural Extension**, embodies the results of bonafide research work carried out by **Mr. B. L. Manjunatha** under my guidance and supervision, and that no part of this thesis has been submitted for any other degree or diploma.

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(B. L. Manjunatha)

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CONTENTS

SL. NO.	TITLE	PAGE NO.
1	INTRODUCTION	1 – 13
2	BACKGROUND	14 – 41
3	RESEARCH METHODOLOGY	42 – 56
4	RESEARCH PAPER I	57 – 81
5	RESEARCH PAPER II	82 – 103
6	RESEARCH PAPER III	104 – 142
7	RESEARCH PAPER IV	143 – 173
8	GENERAL DISCUSSION	174 – 182
9	SUMMARY AND CONCLUSION	183 – 194
10	REFERENCES	i – xi
11	ABSTRACT (ENGLISH)	
12	ABSTRACT (HINDI)	
13	APPENDIX I	i – iii
	APPENDIX II	i-v
	APPENDIX III	I
	APPENDIX IV	i – iii

LIST OF TABLES

Table No.	Title	Page No.
1.1	India's imports of food grains in 1940s	2
1.2	Import of Cereals by India	2
1.3	Import of Mexican dwarf wheat Seeds in 1960s by India	3
1.4	Import of Dwarf Rice Seeds during early 1960s by India	6
3.1	List of villages selected for interviewing farmers	44
4.1.1	Estimated value of the domestic seed market of top 10 countries	63
4.1.2	Exports of seed for sowing by top ten countries and India's position	64
4.1.3	Imports of seed for sowing by various countries and India's position	64
4.1.4	Trends in production of various classes of seed	66
4.1.5	Sector-wise growth in distribution of certified/quality seeds	69
4.1.6	Decade-wise growth of certified/quality seed distribution in India	71
4.1.7	Growth of SRR and Mean SRR (2001-2008)	72
4.1.8	National average SRR and the states with highest and lowest SRR for selected crops	73
4.1.9	Growth in the market value of seeds of proprietary hybrids and technologies	74
4.1.10	Number of commercially approved Bt. cotton varieties and hybrids in the market	75
4.1.11	Commercially approved events, their proprietors and number of varieties/hybrids developed using these events	76
4.1.12	Number of applications seeking PVP and number of CoR issued	77
4.1.13	Share of public and private sector in CoR issued	78
4.1.14	Share of public and private sector among new varieties issued CoR	79
4.1.15	Crop-wise issue of CoR	80

4.2.1	Farmers' perception on timeliness in availability of seeds	86
4.2.2	Farmers' perception on availability of seeds in adequate quantity	87
4.2.3	Farmers' perception on proximity to seed source	89
4.2.4	Farmers' perception on credibility of source of quality seeds	90
4.2.5	Farmers' perception on price of seeds	92
4.2.6	Farmers' perception on documentation and records	94
4.2.7	Farmers' perception on cultivation of improved cultivars of seeds	96
4.2.8	Farmers' perception on purity of seeds	97
4.2.9	Farmers' perception on crop performance	98
4.2.10	Farmers' perception on minimum standards in farm saved seeds	100
4.2.11	Frequency Distribution of farmer respondents on the scores of accessibility to quality seed	101
4.3.1	Agreement of stakeholders on Farmers' Rights	113
4.3.2	Agreement of stakeholders on Powers to state governments	116
4.3.3A	Agreement of stakeholders on Regulation of retail price of seed	119
4.3.3B	Cost of production, procurement and marketing prices of cottonseeds of three MNCs: (2001-2002)	119
4.3.4A	Agreement of stakeholders on Trait/Royalty fee regulation	120
4.3.4B	Market price and share of royalty on Bt. cotton seeds supplied by MMB	121
4.3.5	Agreement of stakeholders on Compensation issues	124
4.3.6	Agreement of stakeholders on Punitive and accountability clauses	127
4.3.7	Agreement of stakeholders on Registration and parentage issues	130
4.3.8	Agreement of stakeholders on Certification of seed	131
4.3.9	Agreement of stakeholders on Import of seeds	133
4.3.10	Agreement of stakeholders on Need for conserving biodiversity in seeds	134

4.3.11	Differences between the different stakeholders on the priorities through Kruskal Wallis H Test	139
4.3.12	Comparison of farmers with other stakeholders on critical contentious issues through Mann-Whitney U Test	140
4.4.1	Priorities of farmers	162
4.4.2	Priorities of NGOs	165
4.4.3	Priorities of ADOs	167
4.4.4	Priorities of Researchers	168
4.4.5	Priorities of Seed Dealers	170
4.4.6	Priorities of Private Seed Companies	171

LIST OF FIGURES

Figure No.	Title	Page No.
4.1.1	Trends in production of various kinds of seed (1991 to 2011)	67
4.1.2	Trends in growth in distribution of certified/quality seeds (1983 to 2011)	69

LIST OF BOXES

Box No.	Title	Page No.
4.3.1	Farmers' Rights	111
4.3.2	Seed Bill's incompatibility with other legislations	114
4.3.3	Powers to state governments	114
4.3.4	Regulation of retail price of seed	118
4.3.5	Trait/royalty fee regulation	120
4.3.6	Compensation issues	122
4.3.7	Punitive and accountability clauses	125
4.3.8	Registration and parentage issues	128
4.3.9	Certification of seed	130
4.3.10	Import of seeds	132
4.4.1	Salient Recommendations of the PSCA on Seed Bill 2004	150

LIST OF PLATES

Plate No.	Title	After Page No.
I	Researcher conducting interviews with farmers in Bihar and Andhra Pradesh	44
II	Researcher conducting interviews with other stakeholders	45

CHAPTER - I

INTRODUCTION

“India’s self sufficiency in food grains is one of the most outstanding achievements of the Post-Independence Era.”

- K. R. Narayanan, President of India

Addressing the Joint session of Parliament on the occasion of Golden Jubilee of India’s Independence in August, 1997, Honorable former President of India, Shri. K. R. Narayanan declared so. Indeed it was a great achievement, the fruits of Green Revolution, led by our farmers, agricultural scientists and the bureaucracy, and the policy makers of the day. It was all due to the policy shifts that were adopted by our national leaders right from the days of India’s independence. A brief look into our recent past, *i.e.*, contemporary history of India’s agriculture policy is warranted here.

“Everything else can wait but not agriculture”: these words of Pandit Jawaharlal Nehru, our first Prime Minister bear ample testimony to the concerns of our national leadership towards strengthening Indian agriculture.

But a nascent country like India, coming to terms with the aftermath of Freedom Movement and consequences of Partition, had a legacy of food imports in 1940s, especially after the World War I to sustain her starving population. At the time of India’s independence, the first and foremost challenge was to overcome food shortages through enhancement in domestic food production and minimum dependence on food imports. The table 1.1 would amply illustrate the grim situation of food shortage in the 1940’s in India.

While on one side there was an increasing food deficit and poor harvests and on the other side the population was growing uninterrupted. After partition, India’s population stood at 354 million in 1948-49 and the food production in that year amounted to 57 million tons, giving only 164 kg of food grains per head. During the

Table 1.1: India's imports of food grains in 1940s

Year	Quantity in '000 tones	Value in Crores of Rs.
1943-44	326	8.4
1944-45	327	15.8
1945-46	931	26.0
1946-47	2569	88.9
1947-48	2656	108.7
1948-49	2840	130.0

Source: Sen, 1974.

period, food grains imports alone accounted for no less than 65 percent of Rs.200 crores in 1948-49 (Sen, 1974). India's imports of food grains did not stop and the major focus of the country was to reduce dependence on imports for feeding her population. The data in the table 1.2 amply illustrates the continuous dependence of India on food aid even in 1950's.

Table 1.2: Import of Cereals by India *(in thousand metric tons)*

Year	Rice	Wheat and wheat flour	Other cereals	Total
1956	330	1113	--	1443
1961	384	3092	19	3495
1962	390	3250	--	3640
1963	483	4073	--	4556
1964	645	5621	--	6266
1965	783	6583	96	7462
1966	787	7833	1738	10358
1967	453	6400	1819	8672
1968	466	4766	482	5654
1969	487	3090	295	3872
1970 app.	200	3400	--	3630

Source: India, 1971 and Indian Agriculture in Brief, 11th ed., Ministry of Agriculture, New Delhi, 1971.

Throughout the Sixties, the import of food grains continued and gradually receded as the country could achieve self sufficiency in food through help from Dr. Norman Borlaug, who sent Mexican wheat seeds, for enhancing wheat yields in India. Severe droughts in two consecutive years have further helped in shaking away the

complacency of India's development bureaucracy. Ford Foundation Team's study report was also a major *epoch making* turning point in the policy shifts in agriculture. These policy shifts have indeed weaned away India from food imports and food aid and helped build her own research and extension systems in agriculture.

Advent of Dwarf Wheats

The dwarf wheats first arrived in India in 1963. By then, Indian agricultural scientists had been sufficiently intrigued by the possibility of growing the new Mexican wheats in India as direct transplant. Dr. Norman Borlaug, on the request of Rockefeller Foundation, visited India and saw no reason not to proceed with the '*direct transplant*' idea. The details of the import of seeds by India are given in the table 1.3.

Table 1.3: Import of Mexican dwarf wheat Seeds in 1960s by India

Year	Import of New Wheat Seeds	Quantity	Remarks
1963	Imported Mexican HYV wheats for experimental testing in India. Four dwarf and semi-dwarf varieties including <i>Lerma Rojo</i> and <i>Sonora 64</i> , for <i>direct transplant</i> , an idea approved by Prof. Borlaug and implemented by Dr. Swaminathan, Dr. George Varghese and others.	400 kg	Field tested in Delhi, Ludhiana (Punjab), Pusa (Bihar) and Kanpur (Uttar Pradesh).
1963	Promising Wheat Selections	613 kg	For field testing
1964	Summer crop grown in Nilgiri hills for seed multiplication.		For field testing in 155 locations under All India Coordinated Wheat Trials Programme of ICAR
1964	First Seed Village was started in Jaunti , Kanjhawala Block of Delhi with <i>Sonora 64</i> .	Record yield of 64 q/ha was obtained.	To meet the demands for seeds of Mexican dwarf wheat HYVs
1965	Summer crop grown in Nilgiri hills for seed multiplication.		For conducting 100 National Demonstrations in farmers' fields (within irrigated areas) by ICAR scientists.
1965	Seed Imports: High yielding Mexican dwarf wheat seed (<i>Lerma Rojo</i> and <i>Sonora 64</i>)	250 tons	For direct distribution by IARI to state seed farms and to 5000

			farmers for diffusion.
1966	Seed Imports: High yielding Mexican dwarf wheat seed (<i>Lerma Rojo</i> and <i>Sonora 64</i>)	18000 tons	Acreage covered under Mexican wheat HYVs sown on 400,000 hectares (1 million acres)
1967	IARI released six Indian varieties of dwarf wheat: Kalyan Sona, Sonalika, Safed Lerma, Choti Lerma, Sharbati Sonora, and PV 18	All were amber seeded and highly rust resistant.	Their food quality improved to suit Indian tastes and preferences.

Source: Dalrymple, 1968; quoted by Brown, 1970, IARI, 1968 quoted by Sen, 1974.

So, on his return, he promptly dispatched dwarf wheat seeds to both countries - India and Pakistan, to be tried out on an experimental basis (Sen, 1974).

Thus India received four dwarf and semi-dwarf varieties (100 kg each) and small samples of 613 promising selections. The material was grown and studied in all the main wheat-growing areas. At Delhi, Ludhiana, Pusa and Kanpur, two varieties – *Lerma Rojo* and *Sonara 64* – yielded over 4000 kg per hectare, as compared with an average per hectare yield of 800 kg over the previous three decades. A fivefold increase in wheat yield! The impact was immediate - and sensational (Sen, 1974).

Seed was multiplied at IARI Regional Station, Wellington, in Nilgiri hills in summer of 1964. In Rabi 1964-65, new wheats were field tested at 155 locations under All India Coordinated Wheat Trials Programme, which had meanwhile been organised by ICAR. The results were subjected to detailed evaluation and agronomic cultural practices were evolved to optimize yields. Again in summer 1965, seed was multiplied in Nilgiri hills. At the same time, a programme was launched by IARI for ‘*National Demonstrations*’, which were carried out by competent scientists at some 100 different locations within irrigated areas, all on farmers’ fields (Sen, 1974).

Jaunti, the First Seed Village

Indian Agricultural Research Institute was coordinating these trials and breeding work of new dwarf wheats. The imported new Mexican dwarf wheats (seeds) were given to farmers for direct planting in their fields; it made a positive impact on the farming community. The farmers were very anxious to adopt these varieties on a large scale

which created an unprecedented demand for new dwarf wheat seeds. Realizing the very good response from farmers and subsequent demand for seed, and shortage of resources at the Institute, a bold new concept – *seed village* was developed by IARI where in wheat seed of good quality and purity could be multiplied by the farmers themselves in sufficient quantities to meet the demands of Delhi farmers, under breeder's supervision. For this purpose, village *Jaunti* in Kanjhawala Block was selected. In November 1964, the yield potential of dwarf wheats was demonstrated by sowing the variety *Sonora-64* in Shri. Bhoop Singh's one acre plot. The farmer obtained a bumper harvest with wheat yields as high as 64 quintals per hectare.

Thus new wheat seeds have come to play a significant role in giving assured yields, thereby giving assurance on food security for the country.

Entry of Rice Variety TN-1

The first high-yielding variety of rice to be introduced in India was Taichung (Native) 1, or TN-1 for short, which was released in Taiwan in 1952. A cross between De-geo-woo-gen (literally “brown-tipped, short-legged”) and a tall drought-resistant indica variety, it was short-statured, fertilizer-responsive, and exceptionally high-yielding. Though grown quite widely within Taiwan, it did not spread to other Asian countries for quite a while. However, TN-1 found its way to IRRI soon after the Institute was established, and immediately became the centre of attraction because of its promising characteristics.

From IRRI, TN-1 was brought over to India in 1963, by the late Dr. G.V. Chalam, who was the then General Manager of the newly-established National Seeds Corporation of India. In that year, he visited IRRI in search of seeds of improved varieties of rice, felt deeply impressed by what he heard about TN-1, returned to India with two kilograms of its seed, and distributed it for cultivation at different places in *Rabi* season of 1964-65. The results created a *shock wave* – 8000 pounds (34.69 quintals) of paddy-in-the-husk were produced per acre, as against 1000 to 1200 pounds (4.34 to 5.2 quintals) per acre normally obtained by farmers from local varieties. Import of dwarf rice seeds during early 1960s by India is presented in table 1.4. Thus in another major cereal, *i.e.*, in rice too, ‘miracle seeds’ of high yielding varieties were demonstrated to the farmers, the breeders and the nation.

Table 1.4: Import of Dwarf Rice Seeds during early 1960s by India

Year	Import of New Paddy Seeds	Quantity/ Area	Remarks
1963	Dr. G.V. Chalam, General Manager, National Seeds Corporation (NSC) visited IRRI in Philippines and brought Taichung (Native)-1, TN-1 and distributed for cultivation in South India in Rabi 1964-65	2 kg	The results created a shock wave – 8000 pounds (34.69 quintals) of paddy-in-the-husk for TN-1, as against 1000 to 1200 pounds (4.34 to 5.2 quintals) per acre from farmers' local varieties.
1965	In June 1965, TN-1 seed was air freighted by IRRI to India	1 ton	Given to state seed farms for multiplication.
	In September 1965 TN-1 seeds arrived by ship from Taiwan	5 tons	Distributed to seed farmers and directly to farmers in the Rabi 1965-66 season.
1966	Taiwan made a handsome donation of TN-1 seeds to India	80 tons	Distributed directly to farmers in the two seasons of 1966-67 season.
1965-66	NSC multiplied and distributed TN-1 and 1,500,000 acres were sown with this new imported paddy variety, TN-1	1.5 million acres	Acreage under TN-1 represented 10,000 fold jump from 150 acres in one single season.
1966	IR8, a new dwarf rice variety released by IRRI arrived in India	For replacing TN-1.	Planted and tested on experimental basis, in many areas. Multiplication was done and covered 30 acres.
1967	In <i>Kharif</i> 1967, IR8 variety diffused all over the country and acreage increased.	0.25 million acres	The rice varieties spread with a rapidity that took the nation by surprise.
1968	In <i>Kharif</i> 1968, acreage under IR8 increased further.	4 million acres	Farmers in many places were dazed by the size of the crops they harvested.

Source: Sen, 1974.

Later, these new seeds formed part of the breeding programmes of the nation and new locally adapted high-yielding varieties were released every year for farmers' cultivation.

Dawn of a New Era

Wide acceptance and ardent adoption among farmers of high yielding varieties of two principal food crops of India, *i.e.*, wheat and rice, have indeed caused a Green Revolution in India. Indian agriculture entered a new phase of modernization with adequate increases in food production and thereby increase in agricultural incomes of farming community. This has catapulted into a new demand and clamor among farmers, for new dwarf wheat and rice seeds, who are ready to pay almost any price for them. Stirrings of a revolution can be seen in a new sprout of seed industry, spurt in fertilizer consumption, pesticides use, surge in the demand for farm machinery, rapid development of tube wells, expansion of area under HYVs, and growth in emphasis on multiple cropping and intensive cultivation.

As a result, the Fourth Five Year Plan (1969-74) envisaged a better focus on agriculture.

“The pace of development in the agricultural sector sets a limit to the growth of industry, of exports, and of the economy as a whole and constitutes a major condition for achieving economic and social stability and improving the levels of standard of living for the mass of the people. *The success of the Fourth Plan will be judged, above all, by performance in Agriculture.*”

Such a forthright declaration about agriculture would have been unthinkable only a few years earlier. It is a measure of the profound policy shift that has occurred in India. Three main factors converged to bring about this spectacular reversal of trends: a Ford Foundation study, two disastrous droughts in two consecutive years (Between 1965 and 1967) and the advent of the high yielding varieties of wheat and rice.

With this new policy shift, India started rebuilding and restructuring her agricultural systems and institutions in the country. Having understood the key role of new seeds in India's Green Revolution, Government of India and state governments have enacted various legislations for seed quality regulation in India. The seed quality regulation legislation over the years has addressed many issues that affect farming community. A brief history of seed regulatory system in the country is presented below.

History of seed legislation in India

The Seeds Act was enacted by the Parliament on 29th December 1966. The Seeds Rules were notified in 1968. The Act came into force throughout the country on 2nd October 1969. After 1969, the functions of the Central Varietal Release Committee were taken over by the Central Seed Committee and its constituents, viz. the Central Sub-committee on Crop Standard, Notification and Release of Varieties and also State Sub-committees established under the provisions of the Seeds Act. As per the need, amendments in the Seeds Act and Rules were made from time to time, i.e. in 1972, 1973, 1974 and 1981. Notification of kinds or varieties, as provided for in the Seeds Act, was started in 1969.

Seed was declared as an essential commodity under the Essential Commodity Act, 1955. Seed (Control) Order was issued in 1983. The Plants, Fruits and Seeds (Regulation of Import into India) Order was issued in 1989 and revised as Plant Quarantine (Regulation of Import into India), Order, 2003.

A New Policy on Seed Development (NPSD), which came into force from September 1988, was evolved with special emphasis on the areas such as: (i) import of high-quality seeds, (ii) a time-bound programme to strengthen or modernize plant quarantine facilities, (iii) effective observance of procedures for quarantine or post-entry quarantine, and (iv) incentives to encourage domestic seed industry. It was envisaged that the NPSD (1988) would help seed industry to grow, and the farmers will be benefited by getting access to the best seed and planting material available anywhere in the world. NPSD liberalized the Indian seed policy by allowing large scale investment in seed industry and import of technologies by the private sector. It helped in incentivizing the private sector participation.

The seed industry is also covered by a large number of other related legislations such as the Protection of Plant Varieties and Farmers' Rights Act, 2001; the Consumer Protection Act, 1986; the Biological Diversity Act, 2002; the Patents Act, 1970 (with amendments); the Geographical Indication of Goods (Registration and Protection) Act, 1999; the Environment Protection Act, 1986; Packaging Commodities Order, 1975; Standards of Weights and Measurements Act, 1976, etc.

Statement of Problem

Broadly, these legislations would ensure that adequate and good quality seed is supplied to farmers by the formal seed sector, or alternatively regulate/provide access, ownership and benefit-sharing over seed resources.

Before the green revolution period, farmers mainly depended on their farm saved seeds for sowing. During the green revolution period, public sector research organizations played a vital role in development of new varieties and hybrids. Other public organizations such as National Seed Corporation (NSC), State Seed Corporations (SSCs), State Department of Agriculture, State Seed Farms, State Seed Certification Agencies and Seed Testing Laboratories played their own role in multiplication, quality control and distribution of seed to the farmers. Yet the role of formal sector was limited to few crops in resource endowed green revolution areas. The role of private sector was also very limited till early 1990's.

However, over the last few decades, the formal seed industry has grown and began playing a great role in providing farmers with good quality seed. Now, several stakeholders are involved in the multi-crore seed industry. Seed companies- national and multinational, seed corporations, NGOs, farmers, seed producers, input agency-dealers, seed shop retailers, regulatory agencies, etc., all of them get involved in seed business. There are technology providers such as breeders and seed technologists from agricultural universities, agricultural research institutes, and R&D centers of Multi National Companies (MNCs) and domestic companies that provide necessary breeder seed and/ or foundation seed. Community seed banks are being raised and maintained by several Community Based Organizations (CBOs) and NGOs. Users of seeds, the farmers, too engage themselves in conserving, selecting, saving and exchanging seed among themselves. There are several informal seed germplasm conservation systems operating at grassroots level with support from local NGOs.

With multiple agencies working in seed sector, many new technologies, issues and problems emerged warranting the state and central governments to take new regulatory measures.

Recent developments

In 2004, a new Seed Bill was introduced by the central government and discussions started in parliament. However, many agencies raised serious objections to several clauses in the bill. The contentious issues in the bill from the perspective of various stakeholders are related to issues such as: 1) Farmers' rights, 2) Retail price regulation of seed, 3) Royalty or trait fee regulation, 4) Compensation issues, 5) Powers to state governments, 6) Punitive and accountability clauses, 7) Import of seeds, and 8) Registration and parentage issues among other issues. It is claimed that the bill is biased to favor private seed sector and has grossly violated the farmers' rights. Since farmers are the primary stakeholders in agriculture and the guardians of the seed for several centuries, it is of immense importance to look at the seed bill from the perspective of farming community and the agriculture.

Process of Legislation

A Bill is a draft of legislative proposal before the House. It becomes an Act only when passed by both the Houses of Parliament and assented to by the President of India.

A Bill while being considered has to undergo three stages in each House of Parliament. The *first stage* consists of the introduction of the Bill which is done on a motion moved by either a Minister or a member. During the *second stage*, any of the following motions can be moved: that the Bill be taken into consideration; that it be referred to a Select Committee of the House; that it be referred to a Joint Committee of the two Houses; or that it be circulated for the purpose of eliciting opinion thereon. Thereafter, the Bill is taken up for clause-by-clause consideration as introduced or as reported by the Select/Joint Committee. The *third stage* is confined to the discussion on the motion that the Bill be passed and the Bill is passed/rejected either by voting or voice vote.

The current Seed Bill 2004 concerns the Ministry of Agriculture. It has gone through first stage and is being revised again and again by the Ministry of Agriculture. It has been referred to the Parliamentary Standing Committee on Agriculture, which submitted its report of recommendations in 2006. Most of the recommendations could find place in the revised Bill, now called Seed Bill 2010 as agreement was achieved on some issues/clauses. Yet some contentious issues such as clauses on regulation of

retail price and royalty/trait fee over seeds, modus operandi of payment of compensation, punitive issues, etc. are still pending amendments.

Now, the Seed Bill 2010 is still being refined with additions/deletions/modifications in 2011 and appears to be ready for getting into third stage of enactment and being pushed vigorously by the Government backed by some lobbyists, while some Farmers' Organizations, NGOs and others were vehemently opposing some of the critical issues on the plea that they are anti-farmer in nature, principle and practice.

Hence, the research problem addresses at understanding the critical contentious issues in Seed Bill 2004 from the perspective of various stakeholders and how some of the issues have been resolved. It is also envisaged to analyze how the critical issues in the proposed seed bill seriously affect farmers' accessibility to quality seeds. Since seed accessibility has become a crisis for farmers in every season, farmers face many problems and incur heavy losses in farming. Timely availability of quality seed, price control, compensation, upholding farmers' rights, etc. are the key challenges at the farmers' level and need to be addressed in the seed bill.

Having understood the scenario of seed sector, an attempt needs to be made to analyze critical issues involved and to delineate actions for amelioration and redressal. Hence a research study has been planned to address the following critical research issues.

Research Issues:

1. What are the relevant policy-options regarding seed sector in the current scenario?
2. What are the perceptions of various stakeholders on the effects of the current seed regulations?
3. What are the opportunities, gaps and constraints in existing policy regarding seed sector and suggestions by various players?
4. What are the policy advocacy approaches adopted by various stakeholders for regulation of seed sector?

A research study was planned to address the research issues cited above. Since accessibility to quality seed is of prime importance, this study was planned with the broad objective of analyzing the lacunae or gaps in seed policies and find solutions to ameliorate the situation. Since many players are involved in seed sector, the study aims at understanding the perceptions of various stakeholders and their conflicting interests in order to arrive at possible and plausible solutions amicable to all involved, without jeopardizing farmers' access to quality seed, farmers' rights, and national food security. The present study is designed with the following specific objectives:

Specific Objectives:

1. To study the scenario of seed production and distribution with reference to the policies governing the seed sector over the years
2. To study the extent of accessibility of quality seed as perceived by the farmers
3. To analyze the gaps and constraints in policies regarding seed sector as perceived by various stakeholders and suggestions for amendments
4. To analyze the policy advocacy approaches of various stakeholders in seed quality control and regulation

Importance and scope of the study

The research study critically analyzed the shifts in seed policies since independence to the present time. The long-term trends in production of breeder, foundation and certified/quality seeds helped in understanding growth of seed sector in the context of changing policy priorities. The research study also explored the perception of various stakeholders on contentious issues in the Seed Bill 2004 which helped in understanding the gaps in seed policies and thereby suggesting measures to address and ameliorate these issues. The policy advocacy approaches adopted by various stakeholders for promoting/opposing various clauses in seed legislations were also studied. The present research on seed policies and its implications on various stakeholders in seed industry would be of immense use to the farmers, agricultural scientists, students, policy makers, and all those who are part of seed sector in particular and those associated with agriculture, directly or indirectly, in general.

Limitations of the study

As the study area is limited to four districts in the States of Andhra Pradesh and Bihar, generalization of the findings to the whole state and country would be a difficult task. This study is based on primary data collected from a small sample of farmers and other stakeholders. As most of the information they have given is from their own experience, there may be chances of human bias. However, the data were cross checked and supported by appropriate secondary sources to minimize the error. So, care has to be taken before generalizing the results to a larger area.

Presentation of the thesis

The thesis is presented in six chapters as follows:

- Chapter I: Introduction:** It provides the problem statement and discusses the relevance and limitations of the study along with the specific objectives.
- Chapter II: Background:** It lays the thematic foundation through discussion on different aspects of the research topic under study and reviews relevant past research literature.
- Chapter III: Research Methodology:** It covers the research design, sampling procedure, methods of data collection, measurement of variables and statistical tools used for carrying out the data collection and analysis.
- Chapter IV: Research Papers:** This chapter includes four research papers based on the four specific objectives of the study.
- Chapter V: General Discussion:** A comprehensive discussion of all key aspects of findings, linking all objectives, and their implications is presented here.
- Chapter VI: Summary:** The summary of the results of study is presented to draw specific conclusions. The references are given at the end. A set of relevant appendices are also added.

CHAPTER - II

BACKGROUND

Critical literature review within the specific field of research is one of the most essential steps of research. A comprehensive and critical review of the previous research studies provides a sound base for scientific investigation. An acquaintance with earlier pertinent studies is necessary to develop a good understanding of the research problem. It also lends support for the interpretation of the findings. Keeping the objectives of the study in mind, an attempt was made to review earlier studies and is presented under the following sections:

- 1. Importance of seed in agriculture and national economy**
- 2. Formal and informal seed supply systems**
- 3. Area under varieties, hybrids and proprietary technologies**
- 4. Growth of Indian seed industry**
- 5. Farmers' accessibility to quality seed**
- 6. International laws to regulate seed and agriculture**
- 7. Seed legislation in India**
- 8. Contentious issues in Seed Bill 2004**
- 9. Intellectual property including Farmers' rights**
- 10. Policy advocacy approaches regarding seed legislation**

2.1 Importance of seed in agriculture and national economy

The Royal Commission of Agriculture (established in 1928) was the first body to recognize the necessity of the high quality seed. In seeking to promote the agriculture, Royal Commission placed emphasis on the production and distribution of the quality seed (National Commission on Farmers, 2006).

Seed is the basic and most critical input for sustainable agriculture. The response of all other inputs depends on the quality of seeds to a large extent (Gadwal, 2003).

Described as the ‘embodiment of life’s continuity and renewability’, the seed has been not only stated to be the source of culture and history but also importantly, the ultimate symbol of food security. Whereas, the free exchange of seed among farmers have long been considered to be the very basis of maintenance of biodiversity as well as food security, it becomes essential to understand the implications of legislating on this very production and exchange (Shiva, 2001).

The importance of seed in crop production is known to human beings since Vedic period. There is clear mention in ancient literature *Yajurveda*: “May the seed viable; may the rains plentiful; and may the grains ripe days and nights” (Shiva, 2001).

The quality of seed and plant material significantly affects productivity, which in turn affects the cost of production and competitiveness in the market (Chand, 2002).

The Indian seed market is almost exclusively supplied by domestically produced seeds except for very little quantity of hybrid vegetables (Dravid, 2011a).

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 \$ 2000 million in 2011. However, India’s share in global seed export is less than 2 per cent (Tonopi. et.al, 2011).

It is estimated that the direct contribution of quality seed alone to the total production is about 15-20 percent depending upon the crop and it can be further raised up to 45 percent with efficient management of other inputs (Seed India Net Portal, 2012).

Mexican Dwarf Wheat seed Import and Wheat Revolution

India imported dwarf wheat seeds in 1961 from Mexico through Dr. Norman Borlaug for experimental testing and later for direct transplant in farmers' fields. The response from farmers was so good due to high yields and they came to be called as '*Miracle Seeds*'. In 1963, Dr. Borlaug, then on his first visit to New Delhi, expressed the view that India could double her wheat crop within a decade. This evoked cynical smiles from many, both in India and abroad. In 1971, while in New Delhi on one of his periodic visits, he recalled his earlier prediction, and felt gratified that it had come true within a shorter period than he had deemed feasible. Then he added confidently that India could, once again, double her wheat harvest within a similar period (Sen, 1974).

In 1968, India's wheat production leaped ahead to 16.5 million tonnes, or 4.5 million more than the previous high. A wheat revolution was clearly under way. The government issued a "Wheat revolution" stamp to commemorate the occasion (Sen, 1974).

There was much enough cause for thanks giving celebration. In less than a decade the wheat output had doubled; the biggest jump came just after two successive disastrous droughts, and it signaled the beginning of a new era, an era of rapid transition from dismally low to astonishingly high yield per hectare. In 1972, India harvested as much as 26 million tonnes of wheat. History has few parallels for such a rapid growth in grain production (Sen, 1974).

The green revolution was only possible with production of genetically pure seeds possessing such qualities namely, high vigor and high yield generation. Hence green revolution is in fact seed revolution (Sen, 1974).

2.2 Formal and informal seed supply systems

Need for Formal seed supply systems: First Indo-American Agriculture Production Team headed by Dr. Sherman E. Johnson of Ford Foundation was constituted to examine India's food production problems. The team presented a report of their study: "*India's Food Crisis and Steps to Meet It*" (January-April, 1959), which was an eye

opener for a major policy change in agriculture. With respect to enhancing farmers' accessibility to quality seed, the team made following suggestions:

1. Village, block and district level extension workers should be made responsible for educating farmers on use of improved seed.
2. State Agriculture Department should be made responsible for seed certification.
3. Co-operatives and private seed growers should be made responsible for seed supply.
4. Setting up of seed testing laboratories, and
5. Development of uniform seed certification standards and seed laws.

In spite of significant developments made, the desired progress could not be achieved during Second Five Year Plan (1956-61), due to following reasons:

1. Requisite quantities of breeder seed were not available.
2. Only important cereals such as hybrid maize and bajra (pearl millet) were included in seed programs.
3. Timely inspections for rouging of undesirable plants in seed plots were not made.
4. Marketing of improved seed was largely left to seed producers.
5. The seed procurement was unsatisfactory for want of adequate funds.
6. Seed processing was defective and there were large number of complaints regarding purity and germination of seeds.

Dick Leeuwrck, the Ford Foundation Expert on IADP, pointed out in April 1969 that India's wheat yields had been so low, "despite the excellent breeding work" that had been conducted for many years, at least partially because of failure to maintain "varietal identity". For, new varieties, in the absence of proper care to safeguard their purity, "soon retrogress to an 'average' type". (Leeuwrck, 1969)

Farm saved seed and Informal seed supply systems

Studies made by several researchers clearly indicate that with high-volume low-value seeds, such as wheat, groundnut, soybean and chickpea, 80 percent of the cropping area is sown with farm-saved seeds of old and obsolete varieties (Gadwal 2003, Patil *et al.*, 2004, Hanchinal *et al.*, 2007).

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 organizations also cater to a few kinds of seed only.

Navadanya (2012) put together the impact of GMO patented seeds across the world in a report named '*The GMO Emperor has no Clothes*'. The report lists out the impact of GMOs: The first impact is a seed monopoly and the disappearance of diversity. The second impact is increasing costs. The third impact is higher use of chemicals. The fourth impact is the denial to consumers of the right to know what they are eating. Multi-National Companies defined seed saving as a crime to establish seed slavery and force farmers to buy their seed and pay them royalties. They want every farmer in every season everywhere in the world to buy their seeds so they can collect royalties and super profits. Seed slavery is ethically important to address because it transforms the Earth family into corporate property. It is ecologically important because with seeds in the hands of five corporations, biodiversity disappears, and is replaced by monocultures of GMOs (genetically modified organisms). It is socially important because without seed sovereignty, there is no food sovereignty. After all, seeds are the first link in the food chain.

Role of Public and Private Sector in Seed Industry

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, 2102a).

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).

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).

About 50 percent of the total investment in agricultural research in developed countries is contributed by private sector (Chand and Pal, 2003).

The annual sale of seed by the Indian seed industry is worth nearly four thousand crore rupees (40 billion rupees). This is mainly from sales within the country and a small quantum of export of seed to other countries (value of exports is around one billion rupees). Indian seed exports market constitutes around 0.6% of world seed trade and around 0.4% of India's agricultural exports. The quantum of seeds distributed by the government and private sector is around 130 lakh quintals in the country, estimated to meet around 15% of the total requirement of the country. For maintaining quality of seed, there are more than 100 notified Seed Testing Laboratories and 20 State Seed Certification Agencies (by 1999-2000) (CSA, 2005).

When it comes to R&D efforts by the private sector, at the national level, the private players are concentrating on both field crops and vegetable seeds. Amongst field crops, the private sector has concentrated on maize, sunflower, sorghum, cotton, paddy and mustard. Amongst vegetables, focus was on cabbage, tomato, chilli and okra. The increase in research investment by the private seed sector has been from around 1.33 million dollars in 1984-85 to 4.93 million dollars in 1994-95. This was a decade ago. Now, with transgenic research entering the picture, the amounts would have shot up some more (CSA, 2005).

In the private sector, there are more than 500 companies having intra-state and interstate marketing. Out of these, more than 35 companies are having collaboration with various multinational companies. Uptil the advent of Genetically Engineered (GE) seeds in the form of Bt Cotton, it could be said that almost the entire seed industry of India was based on indigenous Research and Development (R & D) efforts (CSA, 2005).

AP has the highest seed replacement rates among all the states for many crops, ranging from 40-50 per cent in rice (varieties and not hybrids) to 80-100 per cent in hybrid crops such as maize, sorghum, sunflower and cotton. This means that the requirement of high quantities of seed production is higher in AP and concomitant with it is the need for a certain kind of infrastructure, regulation of players and so on.

2.3 Area under varieties, hybrids and proprietary technologies

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 percent growth) and in value terms from Rs. 375 crores to Rs. 3200 crores (750 percent increase) (Dravid, 2011b).

The markets for open pollinated varieties have also grown from Rs. 1100 crores to Rs. 2600 crores as a result of increase in seed replacement rate. Increased usage of high value vegetable seeds also increased acreage under vegetable crops and the market has grown from Rs. 600 crores to Rs. 1400 crores (Dravid, 2011b).

On one hand, there were reports of farmers' suicides owing to failure of crops, including Bt. cotton, and on the other, stories of farmers who found the highway to prosperity through the use of the same Bt. cotton. It is believed that this new technology has the potential to improve living standards, and as such, several powerful groups support the commercialization of such GM crops (especially Bt. cotton), including the Indian Council of Agricultural Research, Ministry of Environment & Forests, Government of India and the Federation of Indian Chambers of Commerce and Industry (FICCI) (Council for Biotechnology, 2011).

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 percent from 1800 kg/ha mainly because of an increase of 46 percent in the acreage under hybrids during this period (MoA, 2011b).

Anilkumar (2010) reported that Indian companies which entered into agreement with Mahyco Monsanto Biotech (MMB) had to pay upfront Rs. 50 lakhs and an amount annually fixed by MMB to get license to use its Bt. genes (event approved by Genetic Engineering Appraisal Committee) for few years. Indian companies were also asked to pay Rs. 1200 on every seed packet initially.

Apart from the success stories publicized by the Biotech industry to illustrate the success of their seeds, there are numerous stories of failed crops and economic ruin as well (Assadi, 2000).

Growth of Indian seed industry

While the New Seed Policy did set up huge seed processing plants in order to provide ‘certified’ seeds of food crops, mainly self-pollinating to farmers, most of these plants operated well below capacity and were stated to be examples of ‘faulty technology being pushed into India’ (Sharma, 1997).

In the last decade (2002-11) the major growth drivers of seed industry in India are the single cross maize hybrids, Bt. cotton hybrids, hybrid pearl millet, hybrid rice and hybrid vegetables developed by the private sector (Dravid, 2011c).

Andhra Pradesh in particular has the distinction of being the “Seed Capital” of India. AP has almost all the major companies of India engaged in seed production and marketing here. Companies produce both private bred and public bred varieties of cotton, sorghum, pearl millet etc. There are more than 440 companies/firms operating in Andhra Pradesh including public sector corporations like Andhra Pradesh State Seed Development Corporation (APSSDC) and NSC (National Seeds Corporation) Limited (CSA, 2005).

2.3 Farmers’ accessibility to quality seed

As is known, agriculture and its sustainability in the long run and viability in the short run depend a lot on the ready, affordable availability of diverse varieties of seeds in adequate quantities with reliable quality. For those farmers who depend on market-supplied seed, seed cost constitutes anywhere between 6% and 33% of cost of cultivation, depending on the crop. After having invested on this input, a farmer obviously expects to reap a lot of benefits from the input (CSA, 2005).

Just in the last forty five years or so, beginning with the advent of the Green Revolution, there have been tremendous changes in the seed sector in the country as well as in Andhra Pradesh. Erosion of number of crops and varieties available was accompanied by an erosion of farmers’ breeding skills and an erosion of their many rights related to agriculture. There used to be a time in Indian agriculture when all seeds required for agriculture were bred and produced by Indian farmers. Indian farmers’ breeding skills are testified by the thousands of varieties of paddy that they have bred over millennia to suit a variety of needs and preferences. Today, the private

sector dominates the scene with regard to research and breeding as well as seed markets. The private sector's increasing inroads into this sector are accompanied by changes in supporting legal and policy structures (CSA, 2005).

Since a nation's food sovereignty as well as farming communities' livelihoods is closely linked to seed sovereignty – who controls what seed is supplied, when, in what quantities, with what restrictions, at what prices and so on. This is closely connected to allowing most seed trade to be taken over by the private sector, coupled with legal regimes that allow for exclusive marketing rights in the hands of a handful of companies, along with monocultures encouraged of a few crops and few varieties even as farmers are encouraged to move away from their traditional systems of seed breeding, selection, saving and exchange. Policy makers and planners have to appreciate the intrinsic potential dangers of such a scenario; this is further borne out by the example of cotton seed in India, where an overwhelming majority of the market today is controlled by one large seed company in numerous ways; further, non-GM cotton seed is not available in the market and seed pricing has become a vexatious issue where state governments that want to protect farmers' interests are being confronted by the seed companies against any statutory framework that regulates price and are even threatening to stop supply of seed – meanwhile, physical seed stocks with farmers and others have disappeared during the period that they depended on company-supplied seed. This scenario is potentially possible with other crops too and Seed Sovereignty is an issue that the government has to take seriously (Kheti Virasat Mission, 2011).

Literature review indicates that the biggest issues with seed production and supply in Andhra Pradesh state seem to be huge shortfalls in seed production in the formal sector, thereby affecting supply and that of accountability towards quality seed supply. The shortfall is especially so in the case of certified seed. The production was around 2 million quintals in 2002-03, for instance, which was estimated to be just 40 percent of the total requirement for all crops (CSA, 2005).

A perusal of reports in the media indicates that farmers in this state have continually been agitating against lack of timely supply of seeds through the government channels. The mandal headquarters often do not get the indented seed even after the beginning of the season. There are also frequent allegations that seed to be supplied

on subsidy by the government is not distributed amongst farmers and instead finds its way to blackmarkets¹². On June 13th 2004, farmers in Anantapur attacked agricultural officers when the supply of groundnut fell short because the officials issued more coupons than the available stock. This situation arose when almost 90% of farmers wanted only one particular kind of variety – the TMV 2 variety (CSA, 2005).

As input costs on all fronts are rising for farmers in the state making investments into agriculture more and more difficult, seed prices is no exception. Between 1996 and 2004, seed prices for many crops have more than doubled. For instance, paddy seed prices are supposed to have gone up from Rs. 120/- an acre to Rs. 350/- an acre (CSA, 2005).

Most seed is available to the farmers at a time that they need it, in adequate quantities too. However, timely availability is indeed an issue when it comes to crops like cotton, especially of brands which are in great demand, according to the farmers. For the companies and traders there is also a ploy of creating an artificial or increased demand by spreading rumours through their “agents” that a particular variety of seed is being preferred by many farmers and that unless advance bookings are made, the seed may not be available during the season. Further, after having created a demand, during the sowing season, many farmers are turned away by dealers saying that there is a shortage supply. Assuming that the seed is indeed in great demand, farmers then are willing to buy the seed at greater prices in the black market. This was the case with Bt Cotton seed last year, where the seed instead of Rs. 1600/packet, was sold at Rs. 2500/- in the black market. Availability of seed is also an issue when farmers have to shift suddenly from planned crops (CSA, 2005).

Timely availability is the greatest issue again when it comes to government subsidised seed programmes (CSA, 2005).

2.4 International laws to regulate seed and agriculture

Devinder Sharma, a food and trade policy analyst, while critically analyzing the India’s New Seed Bill 2004 gave a comparative analysis of seed legislations of various developing countries in South Asia (Sharma, 2005).

INDIA: The Seed Act of 1966, which only regulated notified varieties, is proposed to be replaced by the Seed Bill, 2004; according to the Bill, all seed for sale must be registered on VCU criteria. Certification is optional. Transgenic varieties may too be registered subject to environmental clearance but there is a ban on terminator seeds. Express mention is made for the farmer's option to invoke consumer protection laws for liability on non-performance of seeds.

PAKISTAN: As per the Seeds Act, 1976 notified varieties of crops have to be registered and their sale, exchange & barter are subject to regulation. For all other varieties certification is optional. The registration of varieties with DUS testing is done by the Federal Seed Certification and Registration Department. Over 350 crop varieties have been registered and released as of now. The seed law is currently under revision.

BANGLADESH: First seed law was passed in 1977. Like India's existing law, Nepal, Pakistan, Sri Lanka and Thailand, only varieties notified by government are subject to regulation. Five notified crops (rice, wheat, sugarcane, potato and jute) are mainly handled by public institutions. Greater participation of the private sector is planned. Under the SAP & ESAP agricultural input markets were substantially liberalized. By the 1997 amendment act and the 1998 Seed Rules the private sector can import and market any non-notified seeds, while seeds of notified crops may be brought in for trials, tested for suitability and then multiplied and sold. More amendments to the seed law are being discussed in the Ministry of Agriculture.

CHINA: Has a history of several national & provincial level seed regulations. These include the regulation of seed management, 1989 which stipulated that the State protect germplasm resources and germplasm from foreign countries be registered, and quarantine regulations dating 1991. The Seed Law of 2000 has annulled the 1989 regulation. Now all commercial seed production has to be registered and certified for sale. Though there is a blanket exception for peasants to exchange and sell their seeds and they do not require a seed operation license to do so. It is important to note that the seed law passed in 2000 asserts State sovereignty over seed resources. In the seed law, changes were issued on August 28, 2004 in consideration of foreign seed companies in China & ASTA.

NEPAL: The Seeds Act of 1988 notified in 1989 & Seed Rules, 1996 prescribes limits of germination, purity, etc. for “listed” seeds and deal with the registration and release of 153 varieties of crops, vegetables, pulses and oil plants. The government can require minimum procedures for the barter, sale and exchange of seeds of specific varieties and species, just like Pakistan. Otherwise, people are free to do what they want. Amendments to the seed law are under discussion.

BHUTAN: Under the Seeds Act of Bhutan, 2000, the Royal Government of Bhutan regulates the seeds of notified kinds and varieties and certification is optional. The system is voluntary and there are no DUS criteria.

SRI LANKA: The Seed Act of 2003 requires anyone “causing a seed to be placed in the market in Sri Lanka” to be registered with the Director of Seed Certification in the Department of Agriculture. Any locally produced seed has to conform to the rules of production of certified seed before its description and sale as “certified seed”. Even though there is a blanket exception for farmer-to-farmer seed exchange and sale, if the farmer wishes to sell seed in the open market s/he too would have to produce and sell certified seed. FAO’s rehabilitation project post-tsunami focuses on certified seed production and upgradation of seed testing and certification procedures.

PHILIPPINES: Republic Act No. 7308 Seed Industry Development Act, 1992 was enacted to help develop the domestic seed industry. Farmers can exchange and sell their varieties without certification. As per Republic Act No.7607 Magna Carta of Small Farmers, “good seeds” are defined as “seeds that are the progeny of certified seeds so handled as to maintain a minimum acceptable level of genetic purity and identity and which is selected at the farm level”. The High-Value Crops Development Act of 1995 gives incentives to farmers to use non-traditional crops such as low-cost credit, tax exemptions & market linkages. Recommended varieties (similar to the ‘notified’ varieties of South Asian countries) must be registered and certified.

THAILAND: The Plant Act, 1992 envisages the regulation of notified kinds and varieties through a licensing system for “controlled seeds”, apart from the varieties and species that are controlled the rest are free from government control. Transgenic seeds are dealt with under the Plant Quarantine Law of 1964 amended in 1999, under which the Ministry of Agriculture has prohibited the import of GM seeds for use.

Import of transgenic material after due approval is only allowed for research & experimental purposes.

INDONESIA: The Government Regulation on Plant Seed Management was passed in 1995. It importantly says that farmers' varieties do not fall under the regulation (they are considered 'natural varieties' and as such not controlled by the government). The commercial use of GM seeds is regulated by Government Regulation No.44 of 1995 on Seeds for Crops dealing with import/export, breeding & release of new varieties, while Decree No.737 of 1998 deals with the testing, evaluation & release of new plant varieties. Biosafety aspects and requirements for the use of transgenics for food & fodder are dealt with under Decrees number 856 of 1997 & 998 of 1998.

AFGHANISTAN: The National Law on "Seed and Plant Quality" is being finalized by the Afghan Ministry of Agriculture, Animal Husbandry and Food. The government has been asked by FAO & ICARDA to set up a system for Seed Certification, Seed Testing, and Plant Quarantine in addition to setting standards of seed quality. According to the ICARDA draft law, for the formal sector registration and certification are mandatory for all crops. But there is an exemption from government control on seeds of the informal sector, as long as advertising and promotion are not indicative of commercial activity.

KYRGYZTAN: As in other CIS countries, new seed laws are in the process of being drafted often with foreign aid and assistance. For example the Regulation on certification of cereals seeds in Kyrgyz Republic, 2002; the USDA with funding through USAID programmes encouraged adoption of seed certification standards and the FAO also implemented a Technical Cooperation Programme on Seed Legislation and Plant Variety Protection.

Katherine and Torsekar (2011) reported that China significantly limits the market access of foreign firms, while India has liberalized its seed sector and permits foreign and domestic firms to participate on equal terms. However, price restrictions implemented by Indian state governments severely limit the ability of all firms to charge market prices for biotech seeds.

USCIB (2009) reported that even with significant price controls, however, India's seed market is more liberalized than that of China. Despite the enactment of a seed

law in 2000 creating a role for private firms, China continues to severely restrict foreign direct investment (FDI) and the trading of certain types of seeds.

2.6 Seed Legislation in India

Nearly 30 legislations govern seed production and marketing business in this country. There have been many stakeholders asking for a less cumbersome legal framework, including political parties and governments. However, the number of legislations only seems to be increasing and not decreasing. With absence of any streamlining, or lack of coordination between different departments and ministries in charge of enforcement of different legislations, things are getting more and more complicated for the players as well as the farmers (CSA, 2005).

While the Seeds Act 1966 might have met the regulation requirements in the situation that existed during that period, with farmers mostly depending on their own farm-saved seed for a variety of crops, with the seed trade itself being low, in the current situation related to Seed in Indian agriculture, this legislation and its provisions are grossly inadequate. The seed sector in India, especially within the private arena has grown tremendously and along with it farmers' dependence on seed suppliers external to their own farms. As the sector grew, the scope for more and more unscrupulous elements to enter the picture increased. In AP, just in the span of three months last year (2004), spurious seeds worth nearly seven crores of rupees were seized during raids all over the state. Further, the existing Seeds Act deals only with notified varieties and there are many varieties which are not yet notified but which get traded. Commercial crops and plantation crops are not covered by the current Seeds legislation. Certification is also voluntary and not mandatory. Further, there are no deterrents in the Law for offenders – the punitive clauses are very weak compared to the tremendous potential that exists to make quick money at the expense of seeds. There are also no compensatory mechanisms provided for farmers in case of failure of seed. In the current situation, the Seeds Act of 1966 needs a re-look also because several other seed related legislations have come into existence which include legal rights over seed resources in the form of breeder's rights and IPRs in the form of Patents (CSA, 2005).

The Seed (Control) Order, 1983 had allowed the unbridled import under open-general license of planting material and seeds of flowers, vegetables and horticultural crops.

This Order was exploited by unscrupulous seed trade and business to import plant materials without undergoing any rigorous phytosanitary and quality checks. Most of the importing agencies did not even deposit a sample of the imported seed with the National Bureau of Plant Genetic Resources. It is believed that the imports have come with a heavy load of pests and diseases posing serious damages to crop cultivation and to the country's food security. Many hitherto unknown pests have also entered the country (Sharma, 2010).

The NPSD aimed at enabling medium and large seed enterprises and companies with foreign/technical collaboration to start playing an increasing role in the development and marketing of high quality seed varieties thereby boosting agricultural production. Many national and multinational seed companies entered the business of seed production and marketing after this. In the 1980s and 1990s, it has also been seen that numerous small seed firms emerged on the scene in India, essentially due to the existence of a thriving merchant class according to some (Pal et al 1998). While farmers' varieties started experiencing an erosion earlier, public sector's role began to decline after this policy (CSA, 2005).

Pray, Ramaswami, and Kelley (2001) reported that until the late 1980s, private firm participation in the seed industry in India was limited by two factors: economy-wide policies that restricted foreign investment and licensing, and seed-specific policies that limited the sector to 'small scale' participants and severely restricted imports of research or breeder seeds. With India's implementation of the Seed Policy of 1988, the 'small scale' limitation was removed, large domestic and foreign firms were permitted entry, and import restrictions were substantially lifted. Economy-wide liberalization occurred in India in 1991, including the abolition of the industrial licensing system and the easing of restrictions on foreign direct investment (FDI).

Pray, Ramaswami, and Kelley (2001) found that as a result of the reforms, new foreign and domestic firms entered the market, competition increased, and private sector R&D expenditures grew rapidly as domestic firms spent more on technology to compete with the entry of new research-intensive foreign firms. Another important motivation for firms' increased R&D expenditures has been the market's transition away from open-pollinated varieties (OPVs), which farmers can save and reuse in subsequent years, to hybrids, which cannot be reused without a significant reduction

in yield and quality. Farmers' need to purchase seeds each year enables firms to recoup R&D investments.

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 percent of the seed requirement was met by the private sector and in 2010 it was estimated that 80 percent of turnover in seed business came from private companies.

The policy delineates some areas related to Import of Seeds and Planting Materials. "All import of seeds and planting materials, etc. will be allowed freely subject to EXIM Policy guidelines and the requirements of the Plants, Fruits and Seeds (Regulation of import into India) Order, 1989 as amended from time to time. Import of parental lines of newly developed varieties will also be encouraged", the policy says. In terms of export, the policy promises that the Government will evolve a long term policy for export of seeds with a view to raise India's share of global seed export from the present level of less than 1% to 10% by the year 2020. Special Seed Export Promotion Zones are mentioned in the policy (National seed policy, 2002).

Under Promotion of Domestic Seed Industry, the policy promises that Seed Industry will be provided with a congenial and liberalized climate for increasing seed production and marketing, both domestic and international. It also says that membership to associations like UPOV or WIPO will be encouraged. As other parts in this report would point out, this holds potential contradictions with legislations like PVPFR. Tax rebates and concessions are promised on R & D expenditure (National Seed Policy, 2012).

Dastagiri (2008) reported that seed laws in Asia, including India, benefitted private seed sector and provided better market access to foreign seed companies. These laws also enabled the shifting of rights from farmers to breeders and transnational corporations because hybrids are replacing selection/traditional farmers' varieties.

2.5 Contentious issues in Seed Bill 2004

The dominance of the public sector is blamed for the backwardness of Indian agriculture, and one of the stated aims of the National Seed Policy, 2002 was to

encourage more private participation in agriculture and seed production, specifically, to complement the existing structures and to replace them, when necessary. However, this is not to say that the seed policy is an insidious conspiracy to betray small and medium-scale farmers. Liberalization has been targeted towards certain components of national seed policies, retaining regulation of some components to safeguard national interests. Public and private sectors need to complement each other, perhaps on the basis of a division between cash crops and essential food crops. It is a fact that neither the private nor the public sector can fulfill India's agricultural requirements by itself. Only effective cooperation and coordination will allow farmers to have access to quality seed and thus contribute to sustainable agriculture and food security (FAO, 2004).

News of the Seed Bill, the National Seed Policy and new Seed Act being tabled in the Budget session of Parliament had evoked very mixed reactions. While one opinion on the proposed new legislations was that its presence would serve as a check on sale of spurious and poor quality seeds by making registration of all crops varieties compulsory before marketing, and hence this would "augur well for the industry as a whole", other more active reactions came from farmers and NGO representatives who opposed the bill (Syngenta 2006).

Mishra (2006) reported that the state government of Andhra Pradesh was the first to implement price restrictions on seed sales. Its 2006 directive capped prices for biotech cotton seeds at less than one-half the prevailing market price. Today, price caps have spread to important cotton-growing states throughout the country including Maharashtra, Gujarat, Tamil Nadu, Karnataka, Madhya Pradesh, and West Bengal.

There should be no registration but only licensing. Each such licensing should be reviewed after 3-5 years and renewal should be allowed based on actual performance and ICAR establishment should be used to conduct/supervise the initial trials as well as the review of performance (CSA, 2005).

In a letter to the Honorable Prime Minister, Government of India, representatives of farmer wings of different political parties, independent farmer organizations and NGOs working with farmers have quoted four cases citing the helplessness of government of Andhra Pradesh (AP) in regulating erring seed companies in the state. The delegation also sought various amendments in the Seed Bill 2004 (AP Farmers

Unions and NGO Coordination Committee, 2010). The letter can be seen in Appendix IV.

Nitish Kumar, the Honorable Chief Minister of Bihar, in his letter to the Union Agriculture Minister, Government of India, stated that the State exchequer faced an extra burden of Rs.61 crores as compensation to the farmers at the rate of Rs 10,000 per acre, because of non-formation of grain after maize farmers used hybrid seeds supplied by private companies in 61000 hectares in the rabi season of 2009-10. Yet, the private companies did not do anything to compensate to farmers (Times of India, 2011).

The bill is completely inadequate when it comes to compensation to farmers in the case of seed failure. The bill should take the opportunity to provide a mechanism for providing compensation to farmers in case of seed failure. Such compensation should be linked to a seed insurance system, the premium for which is paid by the seed trader. Compensation should also be calculated based on a formula that should be specified in the legislation itself. This should be the monetized value of the expected performance as well as coverage of costs of cultivation incurred and not just the seed cost. Expected performance should be taken as the promised performance specified on the leaflet in the given conditions (CSA, 2005).

The punitive and compensation clauses should apply to misbranding, selling at prices higher than specified prices/MRP, failure of germination, lack of genetic purity, etc. Misbranding should be defined to include failure to reveal or keep up promises made during marketing/propaganda by the company and should include failure to reveal or keep up promises on expectable performance under different conditions as per the MLTs as part of the packaging of the seed (CSA, 2005).

However, it is not clear whether the quantum of compensation awarded would cover only the cost of the seed but that of the crop as well (Madhavan and Sanyal, 2006).

The bill should not venture into regulating transgenic varieties and should leave this to other competent authorities. Once transgenic varieties receive environmental clearance and other biosafety clearances, then the seed bill should seek to regulate these varieties like any other seed varieties (CSA, 2005).

The registration will be valid for 15 years for annual/biennial crops and 18 years for long duration perennial crops. On expiry, the registration can be renewed for a similar period. This is a problematic proposition as usually IPRs are granted for a specific period, whereas in this case, the Registration sub-committee can renew the registration *ad infinitum* (Philippe, 2005).

What is most surprising is that the new Seed Bill seeks to update the Seed Act, 1966, but has major conflicts with a much more recent legislation. The Protection for Plant Variety and Farmers' Rights Act, 2001 addressed a number of issues that the new seed bill seeks to address. It was an effective legislation and was appreciated in many quarters. However, because of overlap between this Act and the new bill, complications are likely to arise which could possibly lead to a lot of litigation. As the National Commission on Farmers has observed, "The Farmers' Rights provisions of the Protection of Plant Varieties and Farmers' Rights Act (2001) should be enforced without further delay" (National Commission on Farmers, 2006).

Thus, the only exception to the rule is the exemption granted to farmers to use and sell seeds from their own farms, as long as such seeds are sold unbranded. However, such seeds will also have to meet the minimum standards set for registered seeds, a requirement which will obviously be hard to fulfill for a small farmer and probably as hard to detect for the enforcement authorities. This has been criticized as an assault on the freedom of farmers, a denial of their time-honored rights, as "an undermining of seed sovereignty of farming communities". Farmers care for their own seed quality more than a centralized authority can. Regulation of farmers' own seed varieties needs to be left to farmers. That is why we have established Community Biodiversity Registers and Jaiv Panchayats" (Shiva, 2004).

As such, the Seed Bill 2004 also seeks to address the concerns of the Seed Industry. The Seed Association of India and the Association of Seed Industries raised certain demands at the National Seeds seminar organized by them in 2005. They demanded a level playing field for the private sector, for subsidies and support to the private sector for R&D (specifically to facilitate exports). Another major demand was that seeds be taken out from the purview of the Consumer Protection Act, 1986 and that a scientific system of scrutinizing claims, along with a system of crop insurance, should be developed to study the causes of crop failure (The Hindu Business Line, 2005).

2.8 Intellectual property including Farmers' rights

As early as 1990, the World Bank reported the existence of massive evidence that appropriate legal protection acted as an incentive for productive research (World Bank, 1990).

According to the United Nations Conference on Trade and Development, intellectual property rights (IPRs) constitute an important element of trade negotiations (UNCTAD, 1991).

Ravishankar and Sunil (2000) stated that in the new millennium, the research paradigm would undergo a transformation, and suggested that 'the interplay of IPRs, technology development and technology transfer will determine the research contours and portfolios'.

Linton and Torsekar (2011) reported that market access, intellectual property rights and regulatory review processes are the three factors identified by industry sources as important to innovation in biotech seeds.

According to Pray and Nagarajan (2012), the dramatic growth in private sector R&D and innovations appears to have five major causes: market demand, policy liberalization, advances in basic science and engineering, intellectual property rights, and government investment in research and education.

Once GM crops are allowed entry into the market in a major way it becomes necessary to protect the Intellectual Property Rights (IPRs) of the organizations and industries which have patented such seeds. The Plant Variety Protection and Farmers' Rights (PVPFR) Act was passed in 2001 to take care of this need. The government has provided sufficient protection to the Intellectual Property Rights of the seed developers. It is possible that the implementation of the IPR regime will increase private sector activity. This would invariably lead to an increase in prices, which would adversely affect resource-poor farmers in marginal areas. Thus, the government will have to monitor the seed sector very closely and should effectively intervene if the market fails to serve the farmers. This requires more decentralization and flexibility in operations of public seed agencies (Brahmi, Saxena and Dhillon, 2004).

Farmers' Rights have to be recognized for one major reason; they are the original source of the germplasm. Under most IPR Regimes all over the world, farmers are not recognized as innovators, and it is the providers of technology who acquire Intellectual Property Rights (Patricia, 2003).

Issues of farmers' rights in India do not only have cultural undertones, but also massive economic implications, which can be related back to basic issues of survival. The National Seeds Policy of 2002, acknowledges these concerns and in acknowledging the pressures and opportunities for expansion that Globalization provide, also establishes as its main objective, "an appropriate climate for the seed industry to utilize available and prospective opportunities, safeguarding of the interests of Indian farmers and the conservation of agro-biodiversity" (National Seeds Policy, 2002).

The Amendments to the Patents Act in the form of Amendments in 2002 and in 2005 will have many implications for Indian farmers. In the case of Bt Cotton itself, the first GM crop to be commercialised in India, the price implications of proprietary rights where companies are paying huge amounts as license fees to Monsanto and are trying to recover the same from poor farmers in the country is apparent. While conventional hybrid seeds cost around Rs. 400/- to Rs. 450/- per acre, Bt Cotton seeds are sold at Rs. 1600/- per acre. The cost of production of Bt Cotton is not vastly different from hybrid cotton production – however, the high margins in Bt Cotton unseen earlier in the Indian cotton seed industry are a way of the companies recovering their investment in the form of license fees (CSA, 2005).

With patent protection being offered in Indian agriculture now, skewed research priorities is a distinct possibility. As it is, conventional breeding is taking a backseat in front of biotechnology related research because each research and academic body thinks that dabbling with "frontier technologies" is the in-thing to be done. Moreover, public sector research has diminished over the years and private sector research has taken over. Private sector would like to invest where returns are assured and protected through IPR legislations, especially in the case of large companies. Given this scenario, instead of research prioritising farmers' needs, especially those of small and marginal farmers, it would be focusing more based on commercial calculations (CSA, 2005).

Specifically so as to promote the encouragement for the development of new varieties of plants and to protect the rights of the farmers and breeders the Protection of Plant Varieties and Farmers' Rights Authority shall provide for registration of new and extant plant varieties, develop, characterize and document the registered varieties, create compulsory cataloguing facility for all varieties of plants, ensure that seeds of varieties registered under the act are available to farmers and provide for compulsory license, collect statistics with regard to plant varieties, including the contribution of any person at any time in the evolution or development of any plant variety and maintain National Register of plant varieties (Singh *et al.*, 2011).

Three farmers' varieties of rice viz. Indrasan, Hansraj, and Tilak Chandan were granted registration, thus making India the first country in the world to have done so (PVPFRA, 2010).

2.9 Policy advocacy regarding seed legislation

Advocacy is a strategy that is used around the world by non-governmental organizations (NGOs), activists, and even policy makers themselves, to influence policies. Advocacy is about creation or reform of policies, but also about effective implementation and enforcement of policies. Advocacy is a means to an end, another way to address the problems that we aim to solve through other programming strategies. Advocacy is the deliberate process of influencing those who make policy decisions (Sprechmann and Pelton, 2001a).

Advocacy can be useful within both the household livelihood security (HLS) framework and a rights-based approach. Holistic analyses such as recommended and promoted through HLS can help identify key causes of livelihood insecurity, including the policy dimensions of poverty. The ability of households to access and use resources is the cornerstone of the HLS approach. Advocacy is a strategy that can give households improved access and control of local resources. Using a rights-based approach, we can pay closer attention to political, social, and economic discrimination, and power relationships between households and authority structures. A key feature that distinguishes rights-based from needs based programming is that rights imply responsibilities and duties. All human beings have inherent rights and responsibilities to others. A rights-based approach therefore tries to determine who is responsible for human suffering and the denial of human rights. When policy makers

are not fulfilling their human responsibilities to others, advocacy can be used to hold them accountable. For example, advocacy is a strategy that can be used to expand and protect the rights of minorities and marginalized groups. When policies foster discrimination or citizens do not fulfil their obligations to each other, advocacy can be used to suggest concrete solutions to policy makers (Sprechmann and Pelton, 2001b).

The government failed to reach an agreement with the Members of Parliament, who moved for amendments to the Seeds Bill on the issue of price regulation and penalty for failure of seeds in a meeting convened by the Union Agriculture Minister Sharad Pawar here on Wednesday. On other amendments, the members either convinced the government or got convinced. The government will now consult the Ministry of Law on the two issues, Mr Pawar told the members (The Hindu, 2010).

During the meeting, which lasted for over two hours, the members unanimously demanded setting up a regulatory mechanism on pricing of seeds and royalty on genetically modified seeds. Members were also united on the proposal of D. Raja (CPI) to remove the distinction between 'minor' and 'major' offences, and to raise the penalty for it. A delegation of MPs from Andhra Pradesh, led by State Agriculture Minister N. Raghuveera Reddy, wanted the penalty clause to include fine with imprisonment (The Hindu, 2010a).

Mr. Pawar informed the members that the appellate committee, proposed to be appointed by the Centre to look into grievances, shall be quasi-judicial in nature. The meeting was attended by M.S. Swaminathan (nominated), D. Raja, M.Y. Myasura Reddy (TDP), Prabodh Panda (CPI) and MPs representing Andhra Pradesh. The members have moved more than 20 amendments to the Bill (The Hindu, 2010a).

The Seeds Bill, 2004, was introduced in Rajya Sabha and referred to the Standing Committee. The panel, chaired by Ram Gopal Yadav, gave its recommendation in 2006, several of which were incorporated in the proposed Bill, particularly the section providing farmers to save, re-sow and exchange seeds. The provision asking farmers to go to the consumer courts for redressal regarding performances of seeds was struck down on the suggestion of the panel (The Hindu, 2010a).

On the amendment on price regulation of seeds so that farmers get seeds at an affordable price, the government maintains that the intention of the Bill is to regulate

quality of seeds not prices. The best way to check prices is to introduce competition and to allow “market forces” to play. On the amendment to hold the seed developer responsible and accountable for contamination of non-GM farmers field, the government holds that the Bill provides for failure of seed only and other considerations come under the Genetic Engineering Approval Committee and the Environmental Protection Act, 1986 (The Hindu, 2010a).

At a meeting convened by Pawar to evolve consensus on the proposed Bill on Wednesday, Andhra Agriculture Minister N Raghuvendra Reddy, accompanied by many Congress MPs, demanded setting up of a regulator “to fix prices and royalty, taking into account intellectual property rights”. “You cannot have a free market situation without a regulator,” Reddy said after the meeting, which was also attended by agriculture scientist M S Swaminathan and CPI leader D Raja, among others. Pawar was said to be inclined to accommodate most of the demands, but the crucial issue of seed price regulation and penalty provision against “offences” by companies remained contentious. Pawar asserted pricing should be determined by “market forces”, and that it would be “difficult to ensure price control” (The Indian Express, 2010).

The Andhra Pradesh government has suggested various amendments to the bill, including regulation of prices, royalty on GM crop seeds, delegating powers to the states to decide compensation to the farmers, seeking tax returns by the seed companies, import of seeds and penalty to include both fine and imprisonment (The Asian Age, 2010).

The Seed Bill 2004 seeks to repeal and replace existing Seeds Act, 1966, for it does not deal with the quality control of GM seeds, as they are generally not notified. The legislation seeks to regulate the quality of seeds and planting materials, curb the sale of spurious and poor quality seeds, increase private participation in seed production and distribution, and liberalise imports of seeds. Provisions of labelling, seed health, expected performance and compensation to farmers have been included to ensure public accountability. Innovations include compulsory registration, enabling government to exclude certain varieties of seeds on ground of public health, environment, provision for expected performance, seed health and farmer’s compensation, etc. (The Wall Street Journal, 2010).

The Union Cabinet on Wednesday approved additional amendments to the Seeds Bill, 2004. The amendments however did not include the clause on price regulation of seeds that is being demanded by members of Parliament who have moved amendments to the Bill that may be introduced in this session. They wanted a regulatory mechanism on pricing of seeds so that seeds were available to farmers at affordable price and not left to “market forces.” This proposed amendment has not been accepted by the government. On the demand of the MPs and civil society groups, the government has approved an amendment to raise the maximum penalty for “misrepresentation/ or suppression of facts, procedural violation or non-performance of the seeds “without intention” to one year and Rs. 5 lakh. There was a provision for cancellation of registration as well, official sources told *The Hindu*. The additional amendments also provide for nomination on the proposed National Seed Committee of the chairpersons of the Protection of Plant Varieties and Farmers' Rights Authority and the National Bio-diversity Authority (The Hindu, 2010b).

A section of Congress is set to back the demand of chief ministers of BJP and other Opposition-ruled states to reject the Seeds Bill, 2010, in its present form. Bihar Chief Minister Nitish Kumar, spearheading the campaign against the bill, has told Prime Minister Manmohan Singh and Agriculture Minister Sharad Pawar that the bill, whose avowed purpose is to facilitate production and supply of seeds of quality, will put the peasantry at the "mercy of agri-businesses." This stand of Kumar found backing of a section within the Government and members of the National Advisory Council. Ministers like Jairam Ramesh are against rushing into the use of GM crops without adequate safeguards. In separate letters to the Prime Minister and Pawar, Nitish Kumar said the act should not be passed by Parliament without according the Seed Committee the power to decide on the price of the seed (The Economic Times, 2011a).

Observing that the proposed seeds bill and the Centre's "favourable stand" on genetically modified crops is detrimental to the agriculture sector, Bihar Chief Minister Nitish Kumar today vowed to oppose such moves if the government went ahead with its anti-farmer policies. There should be threadbare and open-ended discussion on the seeds bill and the GM crops, keeping in view the long-term prospect of the farm sector and the interests of the farmers, Kumar said here. The chief minister said the views of the state government's should also be taken into account

before formulating policies on the twin issues. Kumar described the proposed seeds bill as a serious issue and apprehended that the farmers will become heavily dependent on the multinational companies for availability of seeds if the bill in the present form was to be passed by Parliament. Similarly, the GM crops posed danger for human health having adverse impact on the environment and bio-diversity, Kumar said and claimed that these issues have not been addressed by the government as well as the scientists (The Economic Times, 2011b).

The biggest charge of those opposing the Bill is that it is loaded against the small and marginal farmers while it bends over backwards to provide legal and institutional protection to transnational seed companies including those dealing in GM (Genetically Modified) seeds. The new Bill makes it mandatory that all types of seeds and planting material be registered with the state governments before they are marketed. This means that on the one hand it makes it difficult for the small farmers to enter the seed business which they often do on the side while on the other it provides him no proactive compensatory mechanism or protection against crop failure (Except the Consumer Protection Act of 1986). The proposed amendments do provide for a compensation committee if the seeds fail to perform to expected standards, but that for many stops short of being proactive (Im4change, 2012).

Those opposing the (GM) crops believe that the Bill will make it easy for the private sector in general, and GM seed companies in particular, and would inevitably result in higher prices of seeds. Hence the Seed Bill seems to be more about providing industry status to the seed sector rather than about protecting the small farmers' interests. It may end up taking the seed away from the community for the advantage of the big business. The Bill marks the shift from agriculture research as a public good for the small and marginal farmer to a tool of monopoly for the plant breeders and patent holders (Im4change, 2012).

India has a vibrant and thriving heritage of seed saving and local seed breeding systems which continue to be the biggest knowledge assets of farming communities. Having continued access to the seed germplasm has allowed farmers to carry on their cultivation in the most trying of circumstances. The introduction of the Seed Bill systematically seeks to take away this sovereignty from farmers, by increasingly

making Seeds into mere “external input” linked with the tentative system of market supply and demand (SAGE, 2010).

We the members of South Against Genetic Engineering, a network of farmers, farmers organizations, scientists, NGOs and researchers fundamentally reject the very premise of such a legislation which is paving the way for a an organized shift of control into the hands of private sector seed companies, essentially promoting unethical and high risk technologies like genetic modification. The proposed seed bill allows the certification of imported seeds based on the trials done outside the country. It also brings in a system of seed inspectors with the explicit function of policing farming communities rendering the farming system to further externalized checks and balances. While accepting genetic modification in agriculture the proposed Seed bill also allows for royalties for use of GM seeds, most of which are controlled by few large corporations based in the USA (SAGE, 2010).

SAGE believes that the proposed Seed Bill is an extremely retrograde step that undermines India’s agricultural systems and farmers’ knowledge which have within them solutions to fight the food, farming and climate change crises in the country. With farmers losing control over seeds, the seed bill only bring in a death knell to the farmers who are yet to deal with the continual impacts of the green revolution, which Government of India seeks to take forward(SAGE, 2010).

We at SAGE believe that any bill addressing the concerns of seeds needs to build within it a solution which is based on autonomy farmer controlled farmer led systems which translate into seed sovereignty. In other words ecological bio diverse farming and seed systems which make farmers seed sovereign need to be in the centre of any legislation which seeks to govern and regulate seed systems of a country (SAGE, 2010).

Thus the research studies reviewed here have provided adequate background of the research problem and helped the researcher in developing a sound conceptual understanding of the study and data collection and case study analysis.

CHAPTER -III

RESEARCH METHODOLOGY

The purpose of this chapter is to describe the research methods and techniques followed in conducting this research. The various aspects included in this chapter have been organized under the following sub-heads:

- 3.1. Locale of the study**
- 3.2. Sampling procedure**
- 3.3. Variables and their measurement**
- 3.4. Data collection tools and procedures**
- 3.5. Research design**
- 3.6 Statistical analysis**

3.1. Locale of the Study

Two states namely Andhra Pradesh (AP) and Bihar were selected purposively for the study. AP in southern India has been the hub of seed companies in the country and is ‘so called the Seed Capital’ of India. Bihar has been selected from the northern India which has comparatively low Seed Replacement Rate (SRR) in many crops yet performing extremely well on agriculture sector in the last several years. Research was undertaken in Warangal and Anantapur districts of AP and Samastipur and Vaishali districts of Bihar. These districts were chosen purposively based on the

maximum number of stakeholders playing key roles in seed sector and the area under seed production. The capitals of these two states *viz.*, Hyderabad and Patna were visited to conduct interviews and discussions with officials of State Agriculture Departments, NGO personnel and scientists based in State Agricultural Universities and ICAR research stations. Some of the researchers, NGO personnel and private seed companies (PSCs) were interviewed in New Delhi also.

Selection of States

Andhra Pradesh: The contribution of AP to the Indian seed market ranges from 60 to 97 percent across different crops and therefore, it is aptly referred to as the “Seed Capital” of India. This state produces and supplies seeds of many crops including hybrid seeds of cotton, sorghum, maize, pearl millet, sunflower, rice and forage sorghum to other states in the country. Seeds of varieties of rice, pulses, and oilseeds are also produced and supplied to other States in India. AP has highest SRR for many crops. AP also has the highest concentration of private seed companies (PSCs) because of favorable climate for seed production, huge market potential for hybrid crops and liberalized policies of the state government for promoting seed industry. Many crop based Indian Council of Agricultural Research (ICAR) institutes are also located in Hyderabad *viz.*, Directorate of Rice Research, Directorate of Oilseeds Research, Directorate of Sorghum Research, Regional Station of Directorate of Maize Research, among others. There are also State Agricultural Universities developing new varieties and hybrids and supplying breeder seeds for various crops. The AP state government has infrastructure such as State Department of Agriculture, AP State Seed Development Corporation (APSSDC) and AP State Seed Certification Agency (APSSCA) and Seed Testing Laboratories.

Bihar: Bihar has low SRR for various crops when compared to AP (discussed in detail in Objective I) but has seen a tremendous growth rate in agriculture for last several years. The concentration of PSCs is less in the state compared to AP. Indian Agriculture Research Institute (IARI) has its regional station at Pusa in Samastipur district. The Bihar state government has infrastructure such as State Department of Agriculture, Bihar State Seed Corporation (Bihar Rajya Beej Nigam, BRBN) and Bihar State Seed Certification Agency (BSSCA) and Seed Testing Laboratories.

Selection of Districts

Two districts each in AP and Bihar were selected purposively based on the criteria of area under seed production and the maximum number of stakeholders operating in seed industry in the selected districts. Warangal and Anantapur districts of AP and Samastipur and Vaishali districts of Bihar were chosen purposively. All the stakeholders of seed industry viz., farmers, Agriculture Department Officials (ADOs), Seed Dealers, PSCs, and NGOs are actively engaged in these districts.

3.2. Sampling Procedure

States of AP and Bihar were selected purposively for the study. Anantapur and Warangal districts in AP and Samastipur and Vaishali district in Bihar were selected purposively. The study involved various stakeholders and the sampling procedure for each of the stakeholders is explained below.

Farmers: Two blocks/mandals in each district were selected randomly in each of the four districts. In each block, 2 villages were selected randomly. Fifteen farmers were selected randomly and interviewed in each village, thus making a total sample size of 120 farmers. The list of districts, blocks/mandals and villages from where farmers were interviewed are given in table 3.1. Some photographs illustrating the researcher interviewing farmers in Bihar and AP are provided in Plate I.

Table 3.1: List of villages selected for interviewing farmers

State	Districts	Blocks	Villages
AP	Anantapur	Vidapanakallu	Vidapanakallu, Gadekallu
	Warangal	Raghunathapally	Satyanarayanapuram, Cherla Thanda
Bihar	Samastipur	Pusa	Madhapur Chapra, Mahammada
	Vaishali	Hazipur	Dharampur Bindupur

Researchers: In total, 30 researchers were selected purposively from various ICAR institutes and SAUs. Only those scientists who had adequate experience in atleast one of the areas viz., seed production and distribution, seed legislation and Intellectual Property Rights were selected for the study. The scientists were interviewed from ICAR institutes located in New Delhi (IARI, NBPGR and NCAP), Hyderabad (DRR,

DSR, CRIDA and NAARM), Samastipur (IARI Regional Station) and SAUs in AP (ANGRAU, Hyderabad) and Bihar (RAU, Samastipur).

Agriculture Department Officials: In total, 30 ADOs from the State Departments of Agriculture (SDA) of AP and Bihar were selected purposively. Only those persons who had adequate experience in seed production and distribution, seed certification, seed testing and seed policy issues were selected purposively based on their job positions and experience in the SDA. The sample also included few Agriculture Officers (AOs) who worked at block level and below, who were the incharge of distribution of seed to farmers under subsidy schemes of the state government.

NGOs: A total of 30 NGO personnel were selected purposively for the study. Since there were very few NGOs who exclusively worked on seed policy research and extension, several respondents from Civil Society Organizations (CSOs), Farmers' Groups/Organizations (FGs/FOs) and Voluntary Organizations (VOs) who were actively involved in seed production, saving, distribution and seed policy deliberations at the state and central government were also included as the sample. The NGO personnel were interviewed in Hyderabad, Patna and New Delhi.

Seed dealers: In total, 30 seed dealers from AP and Bihar were selected randomly. Dealers were mostly interviewed from district headquarters of the districts selected for the study namely, Anantapur and Warangal in AP and Vaishali and Samastipur in Bihar.

Private Seed Companies: A total of 30 respondents from private seed companies (PSCs) were selected purposively and interviewed. Either the owner or the people in very senior positions who were actively involved in managing their seed company and seed policy deliberations at the state and central level were interviewed. PSCs were mainly interviewed from Hyderabad, Patna and New Delhi. Though some of the PSCs were based in the districts selected for the study, their head offices were in one of these metros and therefore PSCs were interviewed from these metros. Some photographs illustrating the researcher interviewing researchers, NGOs, dealers and PSCs in Bihar and AP are provided in Plate II.

3.3 Variables and their Measurement

The appropriate variables for the study were selected on the basis of extensive review of literature and consultation with experts. Keeping in view the objectives of the study, the specific variables to be measured were selected. Different approaches were adopted for studying different objectives, which are detailed below:

3.3.1 To study the scenario of seed production and distribution with reference to the policies governing the seed sector over the years

The purpose of this objective was to understand the long-term trends in the production of various kinds of seed and the reasons behind such trends in the context of changing seed policies and programmes in India. Hence, this study was undertaken based on secondary data from various sources. The scientific rationale behind this objective was to understand the Indian seed sector from historical perspective, so that it would form a strong foundation for the study of succeeding objectives (Objective 2, 3 and 4).

The published secondary data regarding India's domestic seed market and its' production of breeder, foundation and certified/quality seed have been collected and compiled from various sources including published secondary sources and websites of the Department of Agriculture and Cooperation (DAC), Ministry of Agriculture (MoA); Directorate of Economics and Statistics, MoA; ICAR; Protection of Plant Varieties and Farmers Rights Authority (PPVFRA); National Seed Association of India (NSAI); Seed India Net Portal; International Seed Federation and Centre for Sustainable Agriculture.

The production growth rates have been calculated using Compound Annual Growth Rate (CAGR) method. CAGR has been calculated separately for breeder, foundation and certified/quality seeds to study the growth trends. CAGR has been calculated to measure the sector-wise production growth rates for cereals, pulses, oilseeds, fibres and other crops. The growth drivers (facilitating factors) behind the growth of Indian seed industry in terms of technological advancements, development of new cultivars and their adoption, increase in SRR and policy initiatives have been critically analysed.

The growth in SRR was calculated using CAGR method. The mean SRR for several crops was calculated for India and two states (AP and Bihar). The IPR issues on seed have been studied in terms of number of patents (on biotech events) and plant variety protections (for varieties under PPVFR Act, 2001) granted so far in India. The share of public and private sector organizations in Intellectual Property Rights (IPRs) granted has been compared and analyzed.

3.3.2 To study the extent of accessibility of quality seed as perceived by the farmers

The study is based on primary data collected by interviewing 120 farmer respondents about their perception/opinion (based on actual experience) on various parameters of accessibility to quality seed.

Farmer's accessibility to quality seed was operationalized as the farmers' perception on various parameters of accessing quality seed. Ten parameters were included to measure accessibility to quality seed and each parameter was measured using a five-point rating scale of appropriate levels suited to the parameter. A schedule was prepared to measure the accessibility to quality seed in this study (Annexure I). Each of the parameters were worked out separately for the farmers of AP and Bihar and compared to understand the variation in two states on farmers' accessibility to quality seed. Finally, the composite scores were calculated for each of the respondent farmer. Based on these composite scores, the farmers were categorized into five levels of accessibility to quality seed such as very low, low, medium, high and very high levels of accessibility.

The '*t-test*' was employed for each of the 10 parameters and composite scores to see if there was any difference between the farmers of AP and Bihar and tested for statistical significance at 0.01 and 0.05 level of probability.

3.3.3 To analyze the gaps and constraints in policies regarding seed sector as perceived by various stakeholders and suggestions for amendments

In total, 270 respondents (120 farmers and 30 each from researchers, agricultural department officials, NGO personnel, seed dealers and private seed companies) formed the sample for studying this objective. The gaps in the earlier seed

legislations, contentious issues in the recent Seed Bill 2004 and the issues affecting seed sector from the perspective of various stakeholders were identified through extensive review of literature and discussion with experts and stakeholders during a pilot study. A semi-structured interview schedule containing these issues was developed and used to collect the opinion of six stakeholders in terms of their ‘*agreement or disagreement*’ on these contentious issues using personal interview method.

Then, all the contentious issues were merged into 12 important issues. The perception of all the stakeholders on these twelve critical issues was obtained using a five-point rating scale of importance that the respondent gives to each of the issues: ‘Most Important’, ‘Important’, ‘Somewhat Important’, ‘Less Important’, and ‘Least Important’ with a score of 4, 3, 2, 1 and 0 respectively. The Kruskal-Wallis H test (using chi-square statistics), *a non-parametric analog of one-way ANOVA*, was used to test if the six sets of stakeholders differed from one another in their perception of the various critical issues and clauses in the Seed Bill. Finally, Mann-Whitney U test was employed to measure statistics for all the twelve critical issues and for all sets of samples to test if the farmers differed from the other sets of stakeholders in their perception of the various critical issues and clauses in the Seed Bill. Both the tests were employed at 0.01 and 0.05 probability level to test if the differences among the stakeholders were statistically significant.

3.3.4 To analyze the policy advocacy approaches of various stakeholders in seed quality control and regulation

In total, 270 respondents (120 farmers and 30 each of researchers, agricultural department officials, NGO personnel, seed dealers and private seed companies) formed the sample for studying this objective.

This objective has been operationalized in two parts. The first part of the objective was to understand the policy advocacy approaches of various stakeholders. The sequence of events that led to the formulation of the Seed Bill 2004 and the actions and reactions of various stakeholders to it have been documented and critically commented. The contentious issues have been looked from the perspective of various stakeholders. Literature from mass media and various reports have been extensively used to support the amendments proposed by various stakeholders.

The second part of this objective dealt with identifying the priority issues of various stakeholders. The exhaustive list of issues was collected based on the extensive review of literature and discussion with experts and stakeholders during a pilot study. Then, the degree of importance the respondent attached to each of the issue was measured on a scale of five-point continuum of 'Most Important', 'Important', 'Somewhat Important', 'Less Important' and 'Least Important' with scores of 5, 4, 3, 2 and 1 respectively. Ten priority issues have been identified and ranked for all the stakeholders based on the maximum frequency of respondents favoring an issue.

3.3.5. Derivation of Hypothesis

Based on the review of past work done and the objectives of the study the following general hypotheses and empirical hypotheses were derived.

General Hypothesis (GH-I): There is difference in the farmers' accessibility to quality seed between the farmers of AP and Bihar.

Empirical Hypothesis (EH-I-1): There is no significant difference in the farmers' accessibility to quality seed between the farmers of AP and Bihar. *(Eleven individual empirical hypotheses were written; one for the variable of farmers' accessibility to quality seed and one for each of the ten components of farmers' accessibility to quality seed).*

General Hypothesis (GH-II): There is difference among the different stakeholders in their perception of the various critical issues and clauses in the Seed Bill.

Empirical Hypothesis (EH-II-1): There is no significant difference among the different stakeholders in their perception of the various critical issues and clauses in the Seed Bill. *(Twelve individual empirical hypotheses were written for each of the critical issues and clauses in the Seed Bill).*

General Hypothesis (GH-III): There is difference between farmers and all the other stakeholders in their perception of the various critical issues and clauses in the Seed Bill.

Empirical Hypothesis (EH-III-1): There is no significant difference between farmers and all the other stakeholders in their perception of the various critical issues

and clauses in the Seed Bill (*Twelve individual empirical hypotheses were written for each of the critical issues and clauses in the Seed Bill*).

These hypotheses were put to test and the results will be discussed in the appropriate research papers.

3.3.6. Measurement of variables used in the study

Value of domestic seed market: It was operationalized as the monetary value of the organized Indian seed industry by the end of the agricultural year 2010-11. It was measured in million US \$.

Exports and imports of seed:

Exports of seed refer to the seed produced on Indian soil and sent out of Indian borders for sowing in other countries. It was measured in million US \$.

Imports of seed refer to the seed produced on foreign soils and imported into India for sowing purpose. It was measured in million US \$.

Seed Production growth:

Production growth of Certified seeds: The production growth rate of certified seeds for each decade was worked out by calculating the Decadal Growth Rate (DGR) using the following formula:

$$\text{Decadal Growth Rate} = \frac{(\text{End Value} - \text{Beginning Value})}{\text{End value}} \times 100$$

Where, End Value = Production at the end of the decade (Lakh quintals)

Beginning Value = Production at the beginning of the decade (Lakh quintals)

Decadal growth rate gives the growth rate of the production over a decade. The unit is expressed in % values.

Growth rate in production of breeder, foundation and certified seeds:

The production growth rate was worked out using Compound Annual Growth Rate (CAGR) method. The formula used is given below.

$$\text{Compound Annual Growth Rate (t}_0, \text{t}_n) = \frac{(V(t_n))}{V(t_0)^{1/t_n-t_0}} - 1$$

Where, $V(t_n)$ = Start value (value at the beginning of the year)

$V(t_0)$ = Finish value (value at the end of the year)

$t_n - t_0$ = Number of years

The CAGR is calculated by taking the n^{th} root of the total percentage growth rate, where n is the number of years in the period being considered. CAGR gives year-over-year growth rate of production in seed over a specified period of time.

Growth rate in production of seeds of cereals, pulses, oil seeds, fibres and miscellaneous crops:

The production growth rate was worked out using Compound Annual Growth Rate method. The formula used is same as discussed before. CAGR was worked out separately for cereals, pulses, oilseeds, fibres and miscellaneous crops.

Shift from varieties to proprietary hybrids and technologies:

The monetary value of proprietary hybrids and technologies was collected from various sources from 1988 to 2011. The percent increase in share of monetary value of proprietary hybrids and technologies in the total monetary value of domestic seed sector was calculated.

Growth in Seed Replacement Rate (SRR):

The growth in SRR was worked out using Compound Annual Growth Rate method. The formula used is same as discussed before.

Intellectual Property Rights (IPRs):

It was operationalized in terms of number of Bt. Events commercially approved by Genetic Engineering Appraisal Committee (GEAC) and the number of Plant Variety Protections (PVP) secured in the form of Certificates of Registration (CoR) issued from Plant Variety Protection and Farmers' Rights Authority (PVPFRA).

The percent share of public and private sector seed industry in the number of events approved was calculated.

Plant Variety Protection:

The information regarding the number of applications filed, number of applications granted certificates of registration (CoR) was compiled from the annual reports of PVPFRA from 2007 to 2012. The PVPFRA works under the Ministry of Agriculture and one of its mandates is to grant PVP to the original breeder of new varieties and hybrids by issuing CoR. The percent share of new varieties, farmers' varieties, extant varieties and essentially derived varieties was calculated among the total number of PVP applications. The percent share of farmers' varieties, public and private varieties which received CoR were also calculated. The % share of public and private seed companies in new varieties which received CoR was also calculated. Finally, the crop-wise % share of CoR was also found out.

Accessibility to quality seed

Accessibility to quality seed is defined as the extent of access that a farmer has to the quality seed in terms of its timely availability, availability in adequate quantity, of good quality seed at affordable/reasonable prices from a reliable and credible source with assured crop production and returns. In other words, '*value for money*' is at the core of accessibility.

Farmer's accessibility to quality seed was operationalized as the farmers' perception on various parameters of accessing quality seed. Ten parameters were included to measure accessibility to quality seed and each parameter was measured using a five-point rating scale of appropriate levels suited to the parameter. A schedule was prepared to measure the accessibility to quality seed in this study (Appendix I).

Components of accessibility to quality seed

Ten parameters were included to measure the farmers' accessibility of quality seed, viz., (i) timeliness in availability, (ii) physical availability in desired quantities, (iii) proximity of seed source, (iv) seed source credibility, (v) price of seeds, (vi) records keeping and documentation, (vii) improved cultivar, (viii) purity of seed, (ix) crop performance, and (x) maintenance of minimum standards for farm saved seed (Appendix I).

Timeliness in availability of seeds

Farmers' perception of timely availability of quality seed was measured on a five-point rating scale of seed being available '*well in advance*', '*available before one week of sowing*', '*available within three days of sowing*', '*late (when the sowing is in full swing)*' and '*very late (available in the fag end of sowing season)*' and were given scores of 5, 4, 3, 2, and 1 respectively.

Availability of seeds in adequate quantity

Availability of seeds in adequate quantities was measured using a five-point rating scale of seed being available in '*adequate*' quantity, in '*adequate quantity but have to be procured early*', in '*moderate*' quantity, in quantities that were '*scarce*' and '*very scarce*', and were given scores of 5, 4, 3, 2, and 1 respectively.

Proximity to seed source

Farmer's perception of proximity to seed source is measured on a five-point rating scale of seed being available '*locally in the village*' or '*in nearby block/tehsil/town*', or '*in district headquarters*', or '*in select cities or towns*' or '*in cities quite far away from one's residence*' and were given scores of 5, 4, 3, 2, and 1 respectively.

Credibility of source of seeds

Farmer's perception of credibility of source of quality seeds is measured using a five-point rating scale of the source of seed being '*highly credible*', '*credible*', '*somewhat credible*', '*less credible*' and '*least credible*' and were given scores of 5, 4, 3, 2, and 1 respectively.

Price of seeds

Farmer's perception of price of seeds was measured using a five-point rating scale of the seed being '*affordable*', '*moderately expensive*', '*costly*', '*very costly*', and '*too costly to be beyond one's reach*' and were given scores of 5, 4, 3, 2, and 1 respectively.

Documentation and records

Farmer's perception of record keeping of seed transactions is measured using a five-point scale of maintaining records '*always*', '*often*', '*sometimes*', '*rarely*', and '*very rarely*' and were given scores of 5, 4, 3, 2, and 1 respectively.

Cultivation of improved cultivars of seeds

Farmer's perception of use of quality seed of improved cultivar was measured using a five-point scale of '*latest HYVs/hybrids (released in last 5 years)*', '*popular variety (best varieties still in seed production chain)*', '*good variety but old (removed from seed production chain)*', '*very old variety (variety released 20 years ago)*' and '*farmers' old variety*' and they were given scores of 5, 4, 3, 2, and 1 respectively.

Purity of seeds

Farmer's perception of purity of seeds was measured using a five-point rating scale of seeds being '*very pure*', '*pure*', '*moderately pure*', '*less pure*' and '*least pure*' and were given scores of 5, 4, 3, 2, and 1 respectively.

Crop performance

Farmer's perception of crop performance of seeds was measured using a five-point rating scale of seeds giving '*very good*', '*good*', '*moderate*', '*poor*' and '*very poor*' crop performance and were given scores of 5, 4, 3, 2, and 1 respectively.

Minimum standards in farm saved seeds

Farmer's perception on maintenance of minimum standards in farm saved seeds was measured using a five-point rating scale of such seeds possessing '*very good standards*', '*good standards*', '*minimum standards maintained*', '*poorly maintained*' and '*doubtful standards*' and were given scores of 5, 4, 3, 2, and 1 respectively.

Agreement or disagreement on contentious issues

The contentious issues related to the Seed Bill 2004 were first enlisted through extensive review of literature and discussion with experts. The list of contentious issues and sub-issues for each main issue were enlisted. The opinion of various stakeholders was elicited on nominal scale in terms of agreement or disagreement for

each of these issue and sub-issue. A schedule was prepared to measure the opinion of various stakeholders on contentious issues (Appendix II). The reasons behind agreement or disagreement were also recorded.

The agreement or disagreement for an issue was worked out using frequency and percentage method for each of the stakeholder.

Several contentious issues related to the Seed Bill 2004 have been grouped into twelve main issues. The stakeholders were asked to rate the perceived degree of importance of these contentious issues related to the seed bill on a five-point continuum scale. The numerical coding procedure was as follows:

Degree of importance of issue	Code
Very important	4
Important	3
Not so important	2
Less important	1
Least important	0

3.3 Data collection tools and procedures

The data were collected from the respondents through personal interviews with the help of semi-structured and pre-tested structured interview schedule specially constructed for the purpose of this study, keeping in view the objective and variables. Necessary precautions were taken to ensure that the questions in the schedule were unambiguous, clear, concise, complete, and comprehensive. The respondents were contacted in person mostly at their office, residence or fields. The assistance of the scientists of ICAR research stations, State Agricultural Universities and KVKs located in the study areas was taken especially to develop rapport with farmer respondents to collect information. Farmers were interviewed individually and in groups whereas remaining stakeholders have been interviewed only individually.

3.4 Research Design

Research design is the entire process of planning and carrying out research. Kerlinger (1978) defined “Research design as the plan, structure and strategy of investigation so as to obtain answers to research questions and to control variance”. The plan is the overall scheme or programme of research.

For this study, *ex-post facto* design was used. This is systematic empirical enquiry in which the scientist does not have direct control over the variables because their manifestations have already occurred or because they are inherently cannot be manipulated. A survey approach was adopted to collect both qualitative and quantitative data through personal interviews and group discussions.

3.6 Statistical Analysis

The data collected for the study was tabulated, processed and analyzed using SPSS (Statistical Package for Social Sciences). The Statistical methods used in this study were frequencies (*f*), percentages (%), arithmetic mean (AM), standard deviation (SD), and non-parametric tests like Kruskal-Wallis H test (a non-parametric analog of One-way ANOVA), Mann-Whitney U test, 't' test, and chi-square test.

Research Paper-I

Scenario of seed production and distribution with reference to the policies governing the seed sector over the years

Abstract

Seed is the most important input in agriculture and it is central to food security of the nation and livelihood security of millions of farmers in this country. Shifts in seed policy priorities and programmes has led to a gradual shift from using farm saved seed to High Yielding Varieties (HYVs) to hybrids and proprietary technologies from pre-green revolution era to post-green revolution period. It has various implications for the farming community and the nation as a whole in terms of accessibility to quality seed and seed sovereignty of the nation. In this context, it was envisaged to study important issues such as status of Indian domestic seed market and its position in world market; production growth of various classes of seed for various groups of crops such as cereals, pulses, oilseeds, fibres, etc.; growth in Seed Replacement Rate; and the dynamics of Intellectual Property Rights over seed and new cultivars. This study is completely based on secondary sources and appropriate analysis has been done to draw meaningful insights and conclusions.

The establishment of National Seeds Corporation (NSC) in 1963 marked the beginning 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 i.e. till 1988. The growth drivers in this period were the ushering of green revolution and development of institutions and infrastructure 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 seed 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 in 2010 around 50-60% of the seed requirement and 80% of turnover in seed business came from private companies establishes the dominance of private seed companies at present. The quality 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 Annual Growth Rate (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 coupled with liberalised seed policies. There has been an increase in SRR for most of the crops though wide variation exists among different states in India. Private sector has dominated in getting IPRs (patents over biotech events and plant variety protection for new varieties). The future growth drivers of Indian seed industry would be technological breakthroughs to mitigate biotic and abiotic stresses including climate change, 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: Breeder seed, CAGR; Certified seed; Foundation seed; Growth drivers; Plant Variety Protection; Production growth; Public and private seed sector; Seed industry; Seed market; Seed Replacement Rate.

Introduction

Seed is the basic and most critical input for sustainable agriculture (Gadwal, 2003). The response of all other inputs depends on the quality of seeds to a large extent. It is estimated that the direct contribution of quality seed alone to the total production is about 15-20% depending upon the crop and it can be further raised up to 45% with efficient management of other inputs (Seed India Net Portal, 2012). Improved seed is the carrier of technological innovations and serves as an engine for agricultural development when available in the required quantities and of the right quality. As the first input in the cropping process, high-quality seed coupled with high genetic yield potential results in higher productivity and crop production. The quality of seed and plant material significantly affects productivity, which in turn affects the cost of production and competitiveness in the market (Chand, 2002). Seed being a commodity of trade, its production, supply and quality are serious source of concern to all the countries for food security. The domestic and international trade in seed is subject to bilateral and/or multilateral agreements. 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 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. NSC was established to undertake production of foundation and certified seeds. At present, it is undertaking production of certified seeds of nearly 600 varieties of 60 crops through its registered seed growers. There are about 8000 registered seed growers all over the country who are undertaking the seed production programmes in different agro-climatic conditions. NSC played a key role in the implementation of various schemes of the Government of India like 'Integrated Scheme for Oil seeds, Pulses, Oil Palm & Maize' (ISOPOM), 'National Food Security Mission (NFSM)' and 'National Horticulture Mission' (NHM). It also provides technical support to the seed producing agencies including State Seed Corporations by imparting training of personnel engaged in the production of seeds in that organization. NSC is the nodal agency for the implementation of the

Central Sector Scheme to create infrastructure facilities for establishment of processing plants and storage godowns in different states in the private sectors. The seed bank maintained by the Corporation holds larger quantity of seeds of different crops/varieties that are meant to meet the demand that arises during natural calamities like flood, drought etc. NSC also takes care to meet the demand for quality seed of the farmers in the interior parts of the country like North Eastern States & other hilly regions. With the launching of the National Seed Project (NSP) in 1974, NSC was assigned the lead role to develop the seed industry in the country on sound lines. The NSP of India's National Seed Program was aimed at increasing the availability of high quality seed to farmers. Project components included: reorganization of the National Seeds Corporation (NSC) to carry out its major responsibilities for overall coordination and development of India's seed industry and interstate seed marketing; expansion of seed storage capacity and establishment of a reserve stock; development of large scale farms for certified seed production; development of university facilities for foundation seed production, processing and storage; improvement of breeder seed production facilities at agricultural universities and ICAR institutes; development of seed technology research programs at agricultural universities; provision of equipment and other facilities for private seed processing corporations; expansion of quality control and certification facilities; and provision of training and technical assistance. At present 15 State Seeds Corporations and 2 National level seeds Corporations (National Seeds Corporation of India & State Farms Corporation of India) are functioning in the country. Besides, significant quantities of seeds are also produced by the State Departments of Agriculture, where the State Seeds corporations are not in existence.

National Agricultural Research System (NARS: ICAR and SAUs) has played a pivotal role in developing new crop varieties and hybrids with superior performance. All India coordinated research projects in various crops such as rice, wheat, cotton, maize, pearl millet, sorghum, pigeon pea, chick pea, groundnut, rapeseed, mustard, linseed, sunflower, arid legumes, pulses, forage crops and horticultural crops including potato have led to the development of superior varieties and hybrids. AICRPs were initially started for the improvement of agricultural crops but later extended to other crops and all aspects of crop husbandry. The first AICRP was started at IARI on maize in 1957. For the first time, ICAR, SAUs and state

departments of agriculture were brought to work together as a team to address research problems of the crop at national level. Many of the AICRPs have been now upgraded to the status of Project Directorates. Hence, public seed sector played a significant role in development of new cultivars as well as their multiplication and distribution.

The Mega seed project, entitled “Seed Production in Agriculture crops and Fisheries” was launched in 2005-06 and is carried out through 86 centres in India including SAUs and ICAR centers, with the objectives of providing reliable quality seed directly to the farmer's to achieve self-sustenance. From 2005 to 2007 infrastructure development was undertaken. Mega seed unit (Field crops) was established in September 2008 to facilitate these objectives.

The Government of India has also enacted various seed legislations from time to time to meet the changing needs of the seed sector. The Seeds Act, 1966 provided for the first time a formal system of seed quality control in India. Seeds were declared as an essential commodity under Essential Commodities Act, 1955 and the Seed (Control) order was issued in 1983. It has provisions such as compulsory licensing of the seed dealers, price control, seed movement control and submission of the information about the procurement and sale of seed. However, the liberalisation of seed law 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. This policy governs the imports of seeds of wheat and paddy; coarse cereals, oilseeds and pulses; vegetables, flowers and ornamental plants; tubers and bulbs of flowers; cuttings/saplings etc. of flowers; and seeds/planting materials of fruits. The laws and policies thereafter such as National Seed Policy 2002, Export-Import Policy on Seed (2002-07) and Seed Bill 2004 (it has undergone various amendments and not yet enacted as of now) 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). While comparing the seed laws of Asian countries, Dastagiri (2008) noted that Asia (particularly India and China) is emerging as the largest seed market in the world for the European Union and the USA. India as a member of WTO and signatory to the TRIPS enacted the

‘Protection of Plant Varieties and Farmers’ Rights Act, 2001’ for which Rules were notified in 2003. The PPVFRA Act aimed at protection of plant varieties in India by integrating the rights of breeders, farmers and village communities.

This paper examines the changes in Indian seed sector in the context of various policies and programmes discussed in the preceding section on such issues as the status of domestic seed market of India and its position in the world seed market, the trends in production of various classes of seed, growth drivers behind such growth, changes in Seed Replacement Rate (SRR) in various crops, shifts from varieties to hybrids and proprietary technologies, and Intellectual property rights in seed (patents and protection of varieties under PPVFRA).

The specific objectives of the study are:

- To assess the status of Indian seed industry and its position in the world seed market.
- To study the trends in production of various classes of seed in the last three decades and the growth drivers behind such a trend.
- To examine the sector-wise growth of seed industry for cereals, pulses, oilseeds, fibres and other crops.
- To find out the growth in Seed Replacement Rate (SRR) in various crops
- To understand the share of public and private players in Intellectual Property Rights (IPRs) over seed and new cultivars

Data and methodology

This research paper is entirely based on analysis of secondary sources. The secondary data regarding production of breeder, foundation and certified/quality seeds and monetary value of India’s domestic seed market have been compiled from various sources including published secondary sources and websites of Department of Agriculture and Cooperation (DAC), Ministry of Agriculture (MoA); Directorate of Economics and Statistics, MoA; National Seeds Corporation; ICAR; Seed India Net Portal; PPVFRA; National Seed Association of India (NSAI); International Seed Federation (ISF); and Centre for Sustainable Agriculture. Since the study was aimed to understand the growth trends in seed production of various kinds of seed, all the available long term secondary data were used. The drivers (facilitating factors) behind

the growth trends of Indian seed industry in terms of technological advancements, development of new cultivars, increase in SRR and policy initiatives have been analysed. The growth in seed production has been analysed using Compound Annual Growth Rate (CAGR) method. The CAGR was worked out separately for breeder, foundation and certified/quality seeds for the period from 1991 to 2011. The analysis of growth trends in certified/quality seed production for various subsectors like cereals, pulses, oilseeds, fibres and other crops was done using CAGR for the period 1983 to 2011. The decade-wise trend in production of certified/quality seed in India has also been analysed using decadal growth rate for the period 1953 to 2011.

The growth in SRR was calculated using CAGR method. The IPR issues on seed have been studied in terms of number of patents and plant variety protections granted. The share of public and private sector organizations in IPRs granted has been compared and analyzed.

Results and Discussion

The results have been presented and discussed under the following sub-heads:

1. India's position in global seed market scenario
2. Indian domestic seed production scenario
3. Trends in production of various kinds of seed
4. Sector-wise growth in distribution of certified/quality seeds
5. Decade-wise growth of certified/quality seed production in India
6. Increase in Seed Replacement Rate (SRR)
7. Shifts from varieties to proprietary hybrids and technologies
8. Intellectual Property Rights (IPRs)
9. Plant Variety Protection under PPVFRA

Each of the sub-heads is discussed in detail in the following sections.

1. India's position in global seed market scenario:

The estimated value of the world seed market as shown in table 4.1.1 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 \$ 2000 million, next only to the USA, China, France and Brazil.

Table 4.1.1: Estimated value of the domestic seed market of top 10 countries (March, 2011)

Rank	Country	Value (US \$ Million)
1	USA	12000
2	China	6000
3	France	2400
4	Brazil	2000
5	India	2000
6	Japan	1400
7	Germany	1261
8	Italy	780
9	Argentina	600
10	Canada	550
	Total (World)	37098

Source: ISF (2011a) and NSAI (2011).

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 \$ 2000 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 per cent (Tonopi. et.al, 2011).

India's position in export and import of seeds

The top ten countries of the world with highest value of seed export and import in field, vegetable and flower crops along with position of India are presented in table 4.1.2 and 4.1.3 respectively. The close examination revealed that India's

Table 4.1.2: Exports of seed for sowing by top ten countries and India's position (Calendar Year 2011)

Rank	Country	Quantity (Metric Tonnes)				Value (US \$ Million)			
		Field Crops	Vegetable Crops	Flower Seed	Total	Field Crops	Vegetable Crops	Flower Seed	Total
1	France	534826	8700	170	543696	1232	366	18	1616
2	Netherlands	119862	10426	2911	133199	256	1146	74	1476
3	USA	354040	17853	1032	372925	813	507	74	1394

4	Germany	100752	1691	359	102802	638	73	34	745
5	Hungary	128168	2200	--	130368	374	18	--	392
6	Chile	50125	1847	28	52000	218	131	31	380
7	Italy	94722	10827	127	105676	198	118	3	319
8	Denmark	130044	6985	324	137353	232	46	2	280
9	Canada	182950	148	--	183098	256	3	--	259
10	Romania	93400	--	--	93400	214	--	--	214
27	India	n.a.	6200	--	6200	30	29	--	59
	Total (World)	2630351	117144	6456	2753951	6379	3309	299	9987

Source: ISF (2011b); Note: n.a. = Not Available

Table 4.1.3: Imports of seed for sowing by various countries and India's position (Calendar Year 2011)

Rank	Country	Quantity (Metric Tonnes)				Value (US \$ Million)			
		Field Crops	Vegetable Crops	Flower Seed	Total	Field Crops	Vegetable Crops	Flower Seed	Total
1	USA	157432	15562	464	173458	523	318	67	908
2	Germany	195159	5913	520	201592	595	97	22	714
3	France	125701	4389	277	130367	522	150	11	683
4	Netherlands	140899	12253	796	153948	250	330	48	628
5	Italy	186203	5856	66	192125	231	177	9	417
6	Russian federation	47221	3691	77	50989	312	70	5	387
7	Spain	153174	6462	400	160036	185	195	4	384
8	Mexico	n.a.	1728	--	1728	123	215	--	338
9	Ukraine	56495	463	--	56958	298	30	--	328
10	United Kingdom	49061	5627	261	54949	209	83	16	308
31	India	n.a.	2023	5	2028	19	47	4	70
	Total (World)	1884985	132752	6110	2023847	5681	3152	265	9098

Source: ISF (2011c); Note: n.a. = Not Available

export of seeds in case of vegetable and field crops is very negligible (less than 1%) both in terms of quantity and value.

Imports of seed into India are also negligible both in terms of quantity (less than 1%) and value (less than 1%). This clearly establishes that India's domestic demand for

seed is mostly met by domestic production with very less dependence and participation in international market.

2. Indian domestic 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. In general, public sector deals with crops such as wheat, rice, maize, barley, oats, green gram, red gram, chickpea, groundnut, sunflower, soybean, sesamum, etc. 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, 2102a). 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 such as NPSD 1988 attracted more investments in R&D by private players. The fact that in the year 2010 around 50-60% of the seed requirement and 80% of turnover in seed business came from private companies establishes the dominance of private seed sector especially in crops where the return margins are very high.

3. Trends in production of various kinds of seed

The data with respect to crop-wise production of breeder, foundation and certified/quality seed is available in the website of Ministry of Agriculture, Government of India for the period 1991-92 to 2010-11 (MoA, 2011a). The same data

was compiled and used to work out the CAGR for various classes of seed over the years and is presented in table 4.1.4.

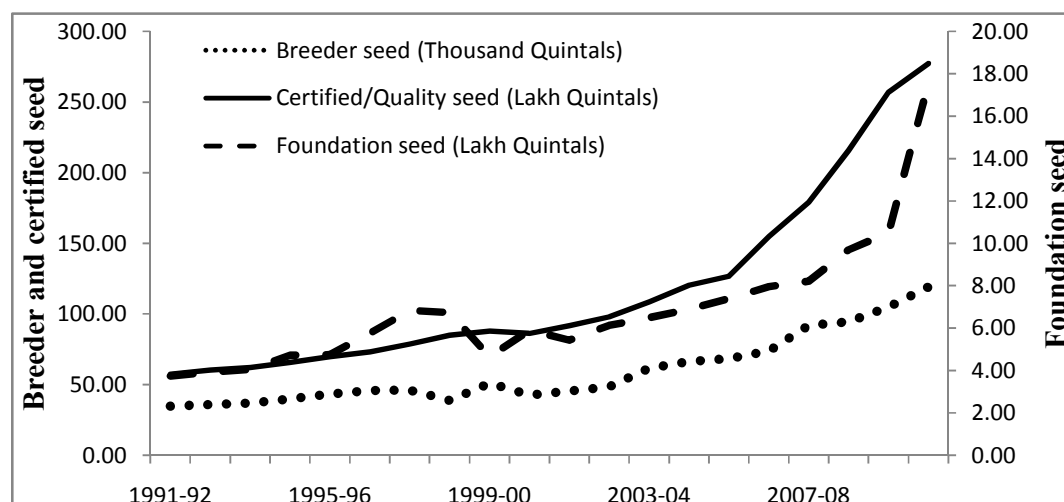
Table 4.1.4: Trends in production of various classes of seed

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

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 transition period to categorise the growth of seed industry into two phases. The CAGR for breeder, foundation and certified/quality seeds was 3%, 5%, and 5% per annum (p.a.) respectively showing a positive but modest growth for the period 1991-92 to 2001-02. But the growth in production of seed in the next decade (2002-03 to 2010-11) was spectacular with a CAGR of 11%, 11% and 15% p.a. respectively for breeder, foundation and certified/quality seeds. The figure 1 gives the trends in seed production of breeder, foundation and certified/quality seed for the period 1991 to 2011.

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

Fig.4.1.1: Trends in production of various kinds of seed (1991 to 2011)

cotton increased from 125 lakh packets in 2002-03 to almost 400 lakh packets in 2010-11 in terms of volume (220% growth) and in value terms from Rs. 375 crores to Rs. 3200 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 Rs. 60 crores to Rs. 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 from 1800 kg/ha to 2880 kg/ha (60% growth) 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 grew 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 grown from Rs. 1100 crores to Rs. 2600 crores as a result of increase in seed replacement rate (Dravid, 2011b). The SRR for wheat, bengal gram, green gram 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 value for vegetable seeds in 2011 was at 900 crores.

The rapid growth of domestic seed markets (from 3500 crore rupees in 2002 to 10000 crore rupees in 2011), strengthening of IPRs and liberalised seed policies helped in the robust growth of seed industry in the last decade. These factors have helped in significant increase in production of breeder, foundation and certified seeds.

4. Sector-wise growth in distribution of certified/quality seeds

The data 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 is available with the Ministry of Agriculture Website (MoA, 2011c) of Government of India. The same data was compiled and used to calculate the CAGR for various sub-sectors of seed industry over the years and is presented in table 4.1.5.

The growth in the production and distribution of certified/quality seeds for various categories *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 transition years. They are

- i) New Policy on Seed Development 1988 that liberalised the Indian seed industry for import of seeds and technologies along with investment in seed industry by MNCs and Indian companies.
- 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 transition years to categorise the whole long term data into three phases as shown in 4.1.5.

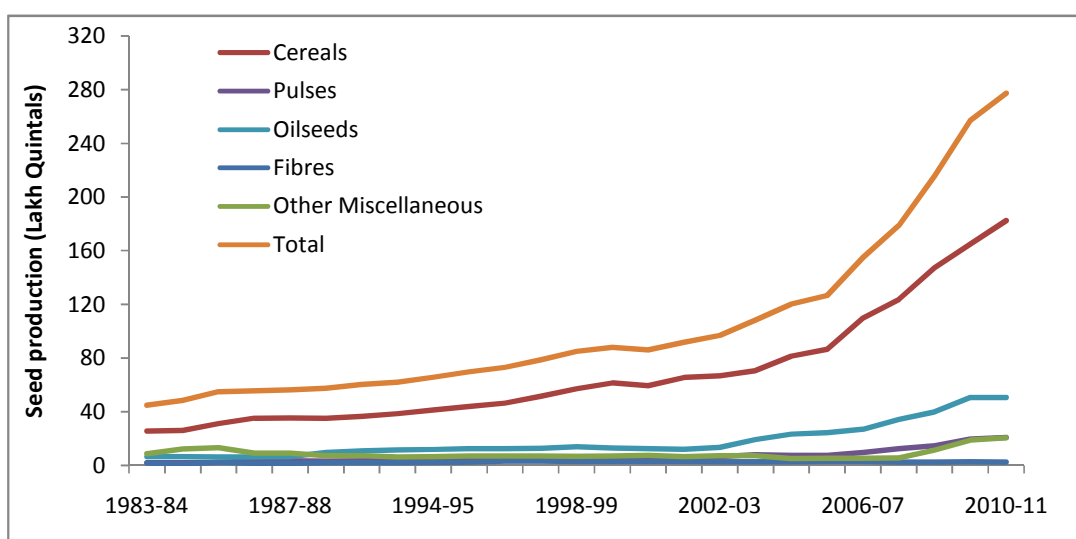
Table 4.1.5: Sector-wise growth in distribution of certified/quality seeds

Phases	Period	Compound Annual Growth Rate					
		Cereals ¹	Pulses ²	Oilseeds ³	Fibres ⁴	Miscellaneous ⁵	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.

¹Cereals: wheat, paddy, maize, jowar, bajra, ragi and barley; ²Pulses: bengal gram, lentil, peas, green gram, red gram, cowpea and others; ³Oilseeds: groundnut, rapeseed and mustard, sesamum, soybean, linseed, castor, safflower and others; ⁴Fibres: cotton, jute, mesta and others; ⁵Miscellaneous: potato and others.

The trends in growth in production of cereals, pulses, oilseeds, fibres and other crops have been given in figure 4.2.

**Fig. 4.1.2: Trends in growth in distribution of certified/quality seeds (1983 to 2011)****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, 2011c). The CAGR 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. The growth drivers in this phase were the ushering of green revolution, the development of superior varieties and hybrids under AICRP schemes and the NSP (phase I and II).

Phase II: 1991-92 to 2001-02

The CAGR for cereals and pulses were positive but significantly less when compared to phase I (32% reduction for cereals and 84% reduction for pulses in terms of CAGR 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 superior varieties and hybrids and increased SRR. The NSP (phase III) initiated in 1991-92 also helped in strengthening of infrastructure related to seed industry. 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 NSP helped in increased quality seed production of oilseeds and pulses along with cereals.

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 increase in growth of certified/quality seed for the last decade (2002-2011) have been already discussed under table 4.1.4.

5. Decade-wise growth of certified/quality seed production in India

The decade-wise growth of the certified/quality seeds production in India since 1950s is given in table 4.1.6. The certified/quality seed production in the country till 1960's was almost negligible and it increased to 58 lakh quintals by 1991-92. 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 Compound Annual Growth Rate (CAGR) of certified/quality seeds during this period averaged at 8-10% p.a. The (NPSD) 1988, 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.

Table 4.1.6: Decade-wise growth of certified/quality seed distribution in India

Year	Quantity (Lakh Quintals)	% Decadal Growth in Production
1953-54	1.83	-
1970-71	5.16	64.53
1981-82	29.80	82.68
1991-92	57.50	48.17
2000-01	86.27	33.34
2010-11	277.34	68.89
% Growth for Overall Period (1953 to 2011)		99.34

Source: Centre for Sustainable Agriculture (2005d) and MoA (2011a).

The number of seed companies went up from 25 in 1988 to almost 350 by 2002 and more than 500 in 2011. The value of seed industry grew from a meagre 600 crores in 1988 to a size of almost Rs. 3750 crores by 2002 and Rs. 10000 crore by 2011. The growth rate was 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.

6. Growth in Seed Replacement Rate (SRR)

Increase in SRR is an indicator for higher accessibility of quality seed by farmers and their adoption of improved varieties and hybrids. The data available with the Seed India Net Portal (2012) was collected and compiled. The data was available only for the period between 2001 and 2008. The CAGR and mean SRR were worked out for India and the two study areas (namely Andhra Pradesh and Bihar) and are presented in table 4.1.7. The table showed that the mean SRR was higher in crops where hybrids and HYVs were available such as jowar, bajra, sunflower and cotton. In Andhra Pradesh, the CAGR in SRR was almost 100% for hybrids in crops such as sunflower and cotton. In self-pollinated crops like wheat, bengal gram and groundnut the CAGR

Table 4.1.7: Growth of SRR and Mean SRR (2001-2008)

Crop	India		Andhra Pradesh		Bihar	
	CAGR	Mean	CAGR	Mean	CAGR	Mean
Wheat	12.57	16.64	-	-	14	12
Paddy	4.73	22.91	8	60	17	11
Maize	15.54	27.3	9	53	18	43
Jowar	-0.14	21.19	3	49	-	-
Bajra	1.80	52.84	58	58	-	-
Bengal gram	19.32	5.87	62	32	43	6
Green gram	6.38	16.57	26	26	-67	20
Red gram	7.82	11.02	29	29	5	5
Groundnut	14.20	7.24	28	24	-	-
Rapeseed and mustard	6.23	46.76	-	-	9.39	36
Soybean	20.53	17.21	84.62	85	-	-
Sunflower	36.46	22.71	23/100*	37	-	-
Cotton	-3.78	23.39	23/100*	26	-	-
Jute	2.47	33.46	-	-	-	-

*Varieties/hybrids

in SRR was impressive but the mean SRR was below 20%. For crops like paddy, maize, rapeseed and mustard the CAGR in SRR was higher in Bihar than Andhra Pradesh yet the mean SRR was higher in Andhra Pradesh. It is because of the fact that private seed industry is already well established in Andhra Pradesh since late 90's whereas PSCs have entered Bihar market very recently. Table 4.1.8 gives the SRR for India (by the end of agricultural year 2008-09) and the states with highest and lowest SRR for various crops.

It was evident that the average SRR for various crops was higher in states like Andhra Pradesh, Karnataka and Gujarat where PSCs are well established. In such states, the SRR was 100 per cent in case of crops where hybrids are available such as cotton, sunflower, maize, jowar and bajra. The SRR was lower in states where PSCs are not well established as in case of Jharkhand, Chattisgarh, Orissa, Madhya Pradesh and Jammu and Kashmir. The mean SRR also varied significantly between the states having very high and very low SRR.

Table 4.1.8: National average SRR and the states with highest and lowest SRR for selected crops

Crop	National Average SRR	Highest SRR		Lowest SRR	
		%	State	%	State
Wheat	25	47	Assam	9	Jharkand
Paddy	26	73	AP	4	J&K
Maize	44	100	Karnataka, AP, Gujarat	2	Orissa
Jowar	20	100	Gujarat	5	Rajasthan
Bajra	49	100	Gujarat	28	Karnataka
Bengal Gram	12	56	AP	3	Jharkhand
Green Gram	22	57	UP	1	Orissa
Red Gram	16	41	West Bengal	2	Chattisgarh
Groundnut	14	36	AP, West Bengal	0.16	MP
Rapeseed & Mustard	59	78	Rajasthan	8	J&K
Soybean	33	100	AP	13	Rajasthan
Sunflower	63	100	AP	3	MP
Cotton	15	100	AP	0.33/100*	MP
Jute	33	72	West Bengal	6	Assam

*Varieties/hybrids

7. Shift from varieties to proprietary hybrids and technologies

Before the green revolution period, farmers used farm-saved seeds in majority of the crops. During the green revolution period, public sector organizations bred and multiplied HYVs of rice and wheat. Later on, especially since the liberalization of seed sector in 1988, the role of private sector has increased. Though public sector had developed hybrids in certain crops such as jowar, maize and cotton, private sector started developing hybrids in low-volume and high value crops such as vegetables, flower crops and certain cereals like maize, where the market is very large. Of late, genetically engineered (GE) crops have also entered the market. However, Bt. cotton is the only GE crop allowed for commercial cultivation in India. Hence, it was found important to understand the shifts in the markets of HYVs and proprietary

technologies. Shifts in market value of proprietary hybrids and technologies are presented in table 4.1.9.

Table 4.1.9: Growth in the market value of seeds of proprietary hybrids and technologies

Year	Value of domestic seed industry (Crore Rupees)	Value of proprietary hybrids and technologies (Crore Rupees)	Share of value of proprietary hybrids and technologies in the value of domestic seed industry (%)
1988	600	100	16.66
1999	2250	636	28.26
2011	10000	6000	60.00

Source: Compiled by the researcher from various sources (Agarwal, 1988; Agrawal, 2011; Anand, 2011; Angadi, 2011; Dravid, 2011; MoA, 2012, NSAI, 2011; Rao, 2011)

Public sector dominated the seed industry till 1988 with development of high yielding varieties in crops such as paddy, wheat and pulses. In 1961, four maize hybrids were released. In 1988, the share of hybrids was estimated at Rs. 100 crores. It was mainly contributed by hybrids in 4 crops such as sorghum, pearl millet, maize and cotton. In 1999, the share of hybrids in market value increased to Rs. 636 crores. In 2002, Bt. cotton was approved for commercial cultivation in India. Since 2002, the share of hybrids and proprietary technologies (Bt. cotton) increased dramatically to Rs. 6000 crores by 2011 with a share of 60 % of total market value of the Indian domestic seed sector. The share of Bt. cotton was alone estimated at Rs. 3300 crores constituting 33% of the Indian seed market value. Hence, in the organized seed sector, it was very clear that there has been a gradual shift from using HYVs to hybrids and proprietary technologies. These shifts have following repercussions for the farmers and the seed industry:

- a. There is a need for farmer to buy seed every year since he cannot save and reuse hybrid seeds.
- b. There is a significant increase in the price of the hybrid seeds when compared to varieties. It is more so in case of Bt. cotton seeds because of inclusion of royalty/trait fee in the seed price. Exclusive marketing rights over patented technologies has led to monopoly and the need for regulation of price by the central and state governments

- c. Dependence of farmers on markets for seeds. The accessibility of quality seed by farmers from market has become a serious issue. This has led to the demand from various stakeholders for enacting a seed legislation that addresses these issues in the interest of farming community.

8. Intellectual Property Rights (IPRs)

IPRs have gained great attention since the establishment of World Trade Organization. The IPRs related to seed include patents on certain biotech events (specific set of genes that have been placed in specific plant background material, for instance, Cry1AC gene used in breeding Bt. cotton) and obtaining plant variety protection under PPVFRA, 2001. Since Bt. cotton is the only GE crop approved for commercial cultivation in India, the biotech events which are approved and the varieties and hybrids developed using such events and approved for commercial cultivation in India have been shown in table 4.1.10. The new events and the varieties and hybrids containing these events have to be registered and require approval from Genetic Engineering Appraisal Committee (GEAC) that works under the Ministry of Environment and Forests (MoE&F).

Table 4.1.10: Number of commercially approved Bt. cotton varieties and hybrids in the market

Year	Number of events approved	Number of Bt. cotton varieties/ hybrids approved by GEAC
2002-03	1	3
2003-04	-	3
2004-05	-	4
2005-06	-	20
2006-07	3	42
2007-08	-	63
2008-09	1	132
2009-10	1	244
2010-11	-	211
2011-12	-	106
Total	6	828

The details on biotech events approved, their proprietors and the number of varieties and hybrids developed using these events are given in table 4.1.11.

Table 4.1.11: Commercially approved events, their proprietors and number of varieties/hybrids developed using these events

Sl. No.	Name of the event and gene	Year of approval	Proprietor	Proprietor Type	Number of hybrids/ ^a varieties	% Share of hybrids /varieties
1	Mon531 (Cry1Ac)	2002	Mahyco	Private	205	33
2	Mon15985 (Cry1Ac + Cry2Ab)	2006	Mahyco	Private	309	50
3	Event 1 (Cry 1Ac)	2006	J. K. Agri Genetics Ltd.	Private	33	5
4	GFM event (Cry1Ab + Cry Ac)	2006	Nath Seeds	Private	69	11
5	BNLA 106 (Cry 1Ac)	2008	CICR* & UASD**	Public	1	0.16
6	Event 9124 (Cry 1Ac)	2009	Metahelix Life Sciences	Private	2	0.32
	Total				619	100

*Central Institute for Cotton Research, located at Nagpur in Maharashtra state; **University of Agricultural Sciences Dharwad located in Karnataka state.

As on March 2011, six events have been commercially approved by GEAC. Out of them, 5 are registered by the private companies and only one from the public sector research institution. Various hybrids and varieties of cotton have been developed using these events by the private and public research organisations. At present, 890 Bt. cotton hybrids inclusive of one variety BN Bt. cotton developed by Central Institute for Cotton Research (CICR), Nagpur have been approved by GEAC for commercial cultivation in states of Haryana, Punjab, Rajasthan, Gujarat, Madhya Pradesh, Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu. The area under coverage has increased from 0.29 lakh hectares in 2002-03 to 93.36 lakh hectare in 2010-11 (MoA, 2012). It is to be noted that all hybrids have come from private sector contributing for almost 100 per cent share of Bt. cotton cultivars. Out of all the Bt. cotton cultivars in market, 85% of them have been developed using event 1 and event 2 developed by MMB. Hence, it is very clear that MMB is dominating the Bt. cotton market. It sells its cultivars directly or through some other PSCs which have entered into licensing with it to use the genes in their hybrids. It is very clear that PSCs were

selling Bt. cotton seeds only in the form of hybrids as farmers need to purchase new seeds every season/year.

9. Plant Variety Protection under PPVFRA

PPVFRA provides protection to varieties developed by the breeders, farmers and farming communities by granting them exclusive rights in the form of Plant Variety Certificates or Certificates of Registration. Hence, it was also envisaged to examine in detail how the act has influenced the plant variety protection (PVP) in India after the authority has started implementing the act.

Applications received for Plant Variety Protection (PVP)

Once notified, applications may be filed for registration of varieties of the particular crop species under the categories of new plant varieties, Essentially Derived Varieties (EDV), extant varieties (notified under the Seeds Act, 1966), extant (Variety of Common Knowledge) and farmer's varieties. At present, the registration is open for 57 crops. The number of applications filed for registration of varieties under the act and the number of CoR granted has been given in table 4.1.12.

Table 4.1.12: Number of applications seeking PVP and number of CoR issued

Items	New varieties	Extant varieties	Farmers' varieties	EDVs	Total
Number of PVP applications received ^a	1104	1737	1141	02	3984
% Share to total PVP applied	27.71	43.59	28.63	0.05	100
Number of Certificates of Registration granted ^b	38	443	06	-	487
% Share to total Certificates of Registration granted	7.80	90.96	1.23	0.00	100

Source: Compiled by the researcher from PVPFRA annual reports for the year 2008-09, 2009-10, 2010-11, minutes of the meeting, issues of Plant Variety Journal of India and website.

^a As on 24 September 2012; ^b As on 3 October 2012.

The first application was filed on 21 May 2007. The authority has so far received 3984 applications as on 24 September 2012 for registration of plant varieties including open pollinated varieties, hybrids, parental lines and transgenic varieties from different stakeholders such as farmers, public and private sector including multinational seed companies. Out of those, Certificates of Registration (CoR) were

issued for 487 plant varieties as on 3 October 2012. The first CoR was issued on 12 February 2009. The maximum number of applications was received under the category of extant varieties followed by farmers' varieties and new varieties. It is interesting to note that farmers' varieties formed 29 percent of all the applications received and were in higher number than the new varieties. However, farmers' varieties formed only 1 percent of the varieties issued CoR, whereas new varieties contributed for almost 8 percent. Maximum number of CoR (91 percent) was under the extant varieties' category.

Share of public and private sectors

The share of public and private sector in CoR issued is given in table 4.1.13. The public sector's share among CoR issued was 83 percent whereas private sector's share was 16 percent. The farmers' varieties contributed for only 1 per cent. ICAR alone contributed for 67 percent which was due to its efforts in getting all its varieties notified under Seeds Act, 1966 being applied for PVP.

Table 4.1.13: Share of public and private sector in CoR issued (as on 3 October 2012)

Sl. No.	Sector		Number	% Share
1	Private		78	16.01
2	Public	ICAR ^a	324	66.52
		SAUs ^b	78	16.01
3	Farmers' Varieties		7	1.43
	Total		487	100

Source: Compiled by the researcher from PVPFRA annual reports for the year 2008-09, 2009-10, 2010-11, minutes of the meeting, issues of Plant Variety Journal of India and website.

^aICAR = Indian Council of Agricultural Research; ^bSAU = State Agricultural University

Share of public and private sector in new varieties

The share of public and private sector among new varieties issued CoR is given in table 4.1.14. It was very interesting and ironical to note that though the public sector contributed to 83 per cent of total varieties issued CoR, its share in new varieties was only 11 per cent. On the other hand, private sector dominated with 89 percent contribution in case of new varieties which received CoR. It reflected the general trend in the growth of the Indian seed sector wherein private seed companies have been bringing more innovations in the form of new varieties, hybrids and proprietary

technologies in the last two decades. In the last decade (2002-11) the major growth drivers of seed industry in India are the single cross maize hybrids, Bt cotton hybrids, hybrid pearl millet, hybrid rice and hybrid vegetables developed by the private sector (Dravid, 2011). Dastagiri (2008), while comparing the seed laws of Asian countries noted that in India, the Seed Bill, 2004 makes it compulsory for registration of seeds for sale and the new law benefits the private sector. According to Pray and Nagarajan (2012), the dramatic growth in private sector R&D and innovations appears to have five major causes: market demand, policy liberalization, advances in basic science and engineering, intellectual property rights, and government investment in research and education. In case of public sector, ICAR received 3 CoR for its maize hybrids and Dr. Panjabrao Deshmukh Krishi Vidyapeeth (SAU in Maharashtra state) received 1 CoR for its diploid cotton hybrid.

Table 4.1.14: Share of public and private sector among new varieties issued CoR (as on 3 October 2012)

	Private	Public		Total
		ICAR	SAUs	
Number of new varieties	34	3	1	38
% Share	89.47	7.89	2.63	100

Source: Compiled by the researcher from PVPFRA annual reports for the year 2008-09, 2009-10, 2010-11, minutes of the meeting, issues of Plant Variety Journal of India and website.

Crop-wise issue of Certificates of Registration

The crop-wise share of CoR is outlined in table 4.1.15. The new varieties received CoR only in six crops namely maize (14), cotton (11), pearl millet (5), sorghum (5), bread wheat (2) and rice (1). These 6 crops together got 364 CoR in all categories which accounted for 75 percent of all CoR issued. Thus, it could be concluded that as on 3 October 2012, cereals and cotton have dominated among those varieties which have received CoR.

Table 4.1.15: Crop-wise issue of CoR (as on 3 October 2012)

Crop	New Variety	Extant Variety	Farmers' Variety	Total
Maize	14	80	-	94
Bread wheat	2	72	2	76
Cotton	11	50	-	61

Rice	1	53	4	58
Pearl millet	5	36	-	41
Sorghum	5	29	-	34
Chick pea	-	21	-	21
Green gram	-	21	-	21
Pigeon pea	-	16	-	16
Field pea	-	15	-	15
Black gram	-	10	-	10
Jute	-	10	-	10
Lentil	-	10	-	10
Garden pea	-	5	-	5
Sesame	-	3	-	3
Castor	-	3	-	3
Kidney bean	-	3	-	3
French bean	-	2	-	2
Rapeseed	-	2	-	2
Black gram	-	1	-	1
Small cardamom	-	1	-	1
Total	38	443	6	487

Source: Compiled by the authors from PVPFRA annual reports for the year 2008-09, 2009-10, 2010-11, minutes of the meeting, issues of Plant Variety Journal of India and website.

Conclusions and policy implications:

The Indian seed industry has evolved tremendously since the establishment of National Seed Corporation in 1963. The contribution of NARS in the development of Indian seed industry was immense since 1960s. The All India Coordinated Research Projects on various crops led to the development of superior varieties and hybrids in various crops. National Seed Project (undertaken in 3 phases) led to the development of institutions and infrastructure to produce, certify and test the seeds in various states of India. These efforts have led to the tremendous growth in the production of breeder, foundation and certified seeds for various crops in the country. The growth in breeder, foundation and certified/quality seeds in the last decade (2002 to 2011) was at 11, 11 and 15% p.a. respectively. The growth in seed production for cereals, pulses and oilseeds in the last decade was more impressive at 15, 16 and 17% respectively.

The policy initiatives 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 to 2011) 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, strengthening of IPRs and liberalised seed policies. However, private sector has concentrated more in seed production and marketing in crops such as Bt. cotton, hybrids in maize, rice, vegetables and horticultural crops. The shifts from HYVs to hybrids and proprietary technologies have led to significant increase in price of seeds and farmers dependence on markets for seed. These issues highlight the need for regulation of seed industry to see that farmers have accessibility to quality seed with affordable prices and stringent accountability measures. The public seed sector could be supplemented by the efforts of private seed sector but it should not allow itself to be substituted by private seed industry. The NARS has to aim for the coordinated efforts of all agencies involved in seed production in achieving seed security and sovereignty that is efficient, effective and sustainable.

The future growth drivers of Indian seed industry would be technological breakthroughs to mitigate biotic and abiotic stresses, government policies to promote investment in seed R&D and infrastructure. 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.

Research Paper-II

Studies of the extent of accessibility of quality seed as perceived by the farmers

Abstract

Seed is the most important input in agriculture and other inputs play a supporting role in harnessing the genetic potential inherent in the seed. However, accessibility to quality seed has become a serious issue for farmers in the context of shifts in Indian seed policy towards privatization of seed sector. Hence, it was envisaged to study the extent of farmers' accessibility to quality seed. The study was undertaken in Samastipur and Vaishali districts of Bihar and Warangal and Anantapur districts of Andhra Pradesh (AP) covering 120 farmers using a pre-tested structured interview schedule. Ten parameters were included to measure the extent of farmers' accessibility to quality seed. The study found that higher percentage of farmers of AP had access to timely availability of quality seed in adequate quantities from credible sources when compared to the farmers of Bihar. The higher percentage of farmers of AP maintained records of seed transactions compared to the farmers of Bihar. Majority of farmers in both Bihar and AP procured seeds from the nearby block/tehsil/town headquarters. However, majority of farmers in AP expressed that price of seeds was costly whereas farmers of Bihar found it to be moderate. There was no significant difference between the perception of farmers on purity of seed procured, and the cultivation of improved cultivars in both the states. Interestingly, it was found that more than 95 percent of farmers in Bihar and AP followed scientific practices and took all the precautionary measures in collecting, saving, storing and exchange of farm saved seeds in certain crops where the farmers are not dependent on market for seed. The composite scores indicated that the level of accessibility to quality seed for two-thirds of the farmers in both the states was medium and only around 20 per cent of the farmers found it to be high.

It is evident that variation exists in the states of Bihar and AP in terms of specific parameters of accessibility to quality seed to farmers. However, overall accessibility to quality seed to farmers needs to be improved in both the states. The Seed Bill 2004, which is pending in the Parliament to be passed into an act, needs to address the problems of farmers such as timely availability of quality seed in adequate quantities at reasonable prices. The purity of seed was a cause of concern in both the states and requires the attention of central and state governments in addressing the gaps in infrastructure and manpower in public sector seed system. There is a strong need to build awareness among the farmers regarding record keeping of seed transactions. This is crucial for farmers in settling economic and legal issues related to compensation, insurance and other consumer rights. Informal seed sector (farmers' own farm saved seed) needs to be promoted as an alternative to the formal seed

sector to protect the farmers, especially the small and marginal farmers, in indulging in distress purchase of spurious seeds from the open market.

Key Words: Accessibility; Andhra Pradesh; Availability; Bihar; Credibility; Farm-saved seed; Price; Purity; Quality; Seed; Seed Bill; and Source.

Introduction

Seed is the most crucial among all inputs in agriculture and all other inputs play a supporting role in harnessing the genetic potential already inherent in the seed and thereby achieving higher crop yields. As the first input in the cropping process, high-quality seed coupled with high genetic yield potential results in higher productivity and crop production. The quality of seed and plant material significantly affects productivity, which in turn affects the cost of production and competitiveness in the market (Chand, 2002). Before the green revolution period, Indian farmers mainly depended on farm-saved seed. However, over a period of time, there has been a gradual shift from using farm saved seeds to purchasing high yielding varieties (HYVs) and hybrids from sources outside of their farm and community. During the green revolution period, seeds of HYVs of rice and wheat were bred and supplied by public sector institutions at affordable prices to the farmers. The farming community and the nation as a whole were benefitted by these HYVs. Later on, various other stakeholders entered the seed industry as a result of policy reforms in seed sector in particular and Indian economy in general. These policy shifts aimed at liberalization, privatization and globalization of Indian industries including seed industry. For instance, New Policy on Seed Development (NPSD) 1988, allowed for private domestic and multinational seed companies for import of seeds and technologies as well as investment in seed research and development. The analysis of Indian seed policy also suggests that laws and policies thereafter have encouraged private sector participation, benefitted private seed companies and provided better market access to foreign seed companies (Pray, Ramaswami, and Kelley, 2001). As a result of effects of all these policies, the seed replacement rate of various crops has increased (Seed India Net Portal, 2012). At the same time, the dependence of farmers on market for seeds has increased. Except in case of few self-pollinated crops where public sector organizations are serving farmers with good quality seeds, farmers are completely dependent on private seed companies (PSCs) for various other field crops, vegetable

crops, etc. for quality seed. PSCs have acquired great control over the market of hybrids and proprietary technologies.

At the same time, accessibility to quality seed has become a crisis for farmers in every season. The farmers face many problems in acquiring quality seed and incur heavy losses in farming when the seeds purchased turn out to be spurious seeds of low genetic purity. Therefore quality assurance, timely availability and price control are the key issues that need attention at policy making level as well as at the farmers' level.

In this context, it was of very immense importance to understand the perception of farmers on accessibility to quality seed. Since farmers are the primary stakeholders of farming and they are involved in production, collection, saving, bartering, purchasing from market and using them, this study was aimed at measuring the extent of farmers' accessibility to quality seed. The study gains further importance in the present context that new Seed Bill 2004 (renamed as Seed Bill 2010) is under the process of enactment in the Parliament. Various contentious issues in the Seed Bill 2004 have stalled it from being passed in the Parliament. Therefore, identifying farmers' difficulties in accessing quality seeds and addressing such issues in the Seed Bill would be of paramount importance.

Data and methodology

The study is based on primary data collected by interviewing 120 farmer respondents about their perception/opinion on various parameters of accessibility to quality seed using pre-tested structured interview schedule. Several published secondary sources like reports of organizations, websites and news stories were also used to substantiate the primary data. An *ex-post facto* and survey research design was adopted.

Sample: Two states namely Andhra Pradesh (AP) and Bihar were selected purposively for the study. Two districts from each state namely, Warangal and Anantapur districts in AP and Samastipur and Vaishali districts in Bihar were selected to interview farmers. These districts were chosen purposively based on the maximum number of stakeholders playing key roles in seed sector. A total of 120 farmers (30 from each district) were randomly selected and interviewed.

Farmer's accessibility to quality seed was operationalized as the farmers' perception on various parameters of accessing quality seed. Ten parameters were included to measure accessibility to quality seed and each parameter was measured using a five-point rating scale of appropriate levels suited to the parameter. A schedule was prepared to measure the accessibility to quality seed in this study (Appendix I). Each of the parameters were worked out separately for the farmers of AP and Bihar and compared to understand the variation in two states on farmers' accessibility of quality seed. Finally, the composite scores were calculated for each of the respondent farmer. Based on these composite scores, the farmers were categorized into five levels of accessibility to quality seed such as very low, low, medium, high and very high levels of accessibility. The '*t-test*' was employed for each of the 10 parameters and composite scores to see if there was any difference between the farmers of AP and Bihar and tested for statistical significance at 0.01 and 0.05 level of probability.

Results and Discussion

Accessibility to quality seed

Accessibility to quality seed is defined as the extent of access that a farmer has to the quality seed in terms of its timely availability, availability in adequate quantities, of good quality seed at affordable/reasonable prices from a reliable and credible source with assured crop production and returns. In other words, '*value for money*' is at the core of accessibility.

Components of accessibility to quality seed

Ten parameters were included to measure the farmers' accessibility of quality seed, viz., (i) timeliness in availability, (ii) physical availability in desired quantities, (iii) proximity of seed source, (iv) seed source credibility, (v) price of seeds, (vi) records keeping and documentation, (vii) improved cultivar, (viii) purity of seed, (ix) crop performance, and (x) maintenance of minimum standards for farm saved seed. The perception of farmers on each of the ten parameters of accessibility to quality seed is discussed below in detail.

Timeliness in availability of seeds

Seed is a biological entity and has to be stored in ambient temperature and humidity conditions to prolong its genetic potential. Since farmers have become dependent on sources outside their farm and farming community for quality seeds for majority of the crops, farmers run around the markets (both public and private seed sector included) to purchase seeds just before the sowing season (in irrigated conditions) or immediately after the rains (in case of dry land conditions). There would be a great rush in the market and only few farmers would be successful in acquiring quality seed from authentic sources in time. Hence, timely availability of quality seed itself is one of the critical factors that affect farming. Farmers' perception of timely availability of quality seed was measured on a five-point rating scale of seed being available '*well in advance*', '*available before one week of sowing*', '*available within three days of sowing*', '*late (when the sowing is in full swing)*' and '*very late (available in the fag end of sowing season)*' and were given scores of 5, 4, 3, 2, and 1 respectively. The opinion of farmers on the timely availability of seeds is presented in table 4.2.1.

Table 4.2.1: Farmers' perception on timeliness in availability of seeds

Timely Availability	Andhra Pradesh (n=60)		Bihar (n=60)	
Mean	3.82		3.20	
Standard Deviation	0.948		0.819	
Range	1-5		1-5	
Mean Difference	0.62			
‘t’ test value	3.813**			
Categories	Frequency	Percent	Frequency	Percent
Well in advance	10	17	5	8
Available before 1 week of sowing	38	63	10	17
Available within 3 days of sowing	6	10	39	65
Late	3	5	4	7
Very late	3	5	2	3
Total	60	100	60	100

** Significant at 0.01 level of probability

The study showed that higher per cent of farmers had access to timely availability of seeds in AP when compared to Bihar. This could be attributed to the fact that many

private seed companies and public agricultural research institutions have their base in AP. Moreover, AP has become a hub for seed production in the country for many crops because of favourable climatic conditions in many parts of the state along with favourable policy environment for private seed companies. In case of Bihar, 65 per cent of the respondents felt that seeds were available only three days before the time of sowing where as 63 per cent of farmers in AP opined that they got seeds one week before sowing. The frequency distributions were skewed in different directions of early-late spectrum of timeliness in availability of quality seed. Mean difference in timeliness in availability of seed to farmers between AP and Bihar was found to be statistically significant (at 0.01 level of probability) indicating that the differences were considerable in farmer's accessibility to quality seed in terms of their timely availability.

Availability of seeds in adequate quantity

Along with timeliness, availability in adequate quantities to meet the requirement of sowing is also an important factor that affects the productivity and income of the farmers. Availability of seeds in adequate quantities was measured using a five-point rating scale of seed being available in '*adequate*' quantity, in '*adequate quantity but have to be procured early*', in '*moderate*' quantity, in quantities that were '*scarce*' and '*very scarce*', and were given scores of 5, 4, 3, 2, and 1 respectively. The opinion of farmers on the availability of seeds in adequate quantity required by them is presented in table 4.2.2.

Table 4.2.2: Farmers' perception on availability of seeds in adequate quantity

Available in quantities	Andhra Pradesh (n=60)		Bihar (n=60)	
Mean	3.93		3.42	
Standard Deviation	0.778		1.109	
Range	2-5		1-5	
Mean Difference	0.517			
‘t’ test value	2.954**			
Categories	Frequency	Percent	Frequency	Percent
Adequate	11	18	3	5
Adequate but have to be procured early	39	65	37	62
Moderate	5	8	10	17

Scarce	5	8	2	3
Very scarce	0	0	8	13
Total	60	100	60	100

** Significant at 0.01 level of probability

The study indicated that only 18 percent of farmers in AP and only 5 per cent in Bihar could have access to seed in adequate quantities whereas 65 percent farmers in AP and 62 percent in Bihar felt that they have to make extra efforts to acquire seeds well in advance. Thirteen percent of the farmers in Bihar opined that good quality seeds were very scarce and rarely did they purchase such good quality seeds from the market or other sources. This highlights the fact that though seeds may be available in the market but to procure quality seeds in required quantities was always a challenge for the famers. The frequency distributions were skewed in different directions of adequate-scarce spectrum of availability of quality seed in adequate quantities.

Mean difference in availability of seed in adequate quantities to farmers between AP and Bihar was found to be statistically significant (at 0.01 level of probability) indicating that the differences were considerable in farmer's accessibility to quality seed in terms of their availability in adequate quantities.

Proximity to seed source

The proximity of seed source affects the procurement of quality seed by the farmers, especially the marginal and small farmers. If the quality seed is not available in the nearby towns, large and entrepreneurial farmers travel to distant cities where they are available and procure it since they can afford travel and shipment charges. But in such cases, marginal and small farmers either purchase locally, which may be of substandard quality, or they change the crop in extreme conditions of unavailability. Hence, farmer's proximity to seed source also affects accessibility to quality seed. Farmer's perception of proximity to seed source is measured on a five-point rating scale of seed being available '*locally in the village*' or '*in nearby block/tehsil/town*', or '*in district headquarters*', or '*in select cities or towns*' or '*in cities quite far away from one's residence*' and were given scores of 5, 4, 3, 2, and 1 respectively. The perception of farmers on the proximity of source of seeds is given in table 4.2.3.

The study showed that majority of the farmers, both in AP and Bihar procured seeds in the nearby block//tehsil/town headquarters. Interestingly, none of the farmers in Bihar went outside of their district headquarters to purchase seeds. However, some entrepreneurial farmers in AP went to faraway places to procure high quality seeds. For instance, few large entrepreneurial farmers from Anantapur (study area) and nearby districts went to Central Arid Zone Research Institute located in Jodhpur in Rajasthan to purchase the quality seeds of cluster bean. Of late, cluster bean has been in great demand in market and the farmers get very high prices for this produce. Such farmers travelled by air to procure the seeds.

Table 4.2.3: Farmers' perception on proximity to seed source

Proximity to seed source	Andhra Pradesh (n=60)		Bihar (n=60)	
Mean	3.87		3.93	
Standard Deviation	0.724		0.516	
Range	1-5		3-5	
Mean Difference	- 0.067			
‘t’ test value	0.581 ^{NS}			
Categories	Frequency	Percent	Frequency	Percent
Locality /village	7	12	6	10
Nearby block/town	42	70	44	73
District HQ	8	13	10	17
Select cities/towns	2	3	0	0
Cities far away	1	2	0	0
Total	60	100	60	100

^{NS} Not Significant statistically

The study highlighted that for procuring of seeds of regular crops (which are already part of the existing cropping system of the region) proximity was not a major issue, but for a new crop (either completely new to the region or the crop is grown in the region after a gap of several years because of sudden increase in market prices of its produce), it may be necessary to go to faraway places to procure the seeds.

The frequency distributions of both samples of respondents appeared to be similar in terms of their perception of proximity to the source of quality seed. Mean difference in proximity of source of availability of seed to farmers between AP and Bihar was found to be not statistically significant indicating that the differences were not there in

farmer's accessibility to quality seed in terms of their proximity to the source of quality seed.

Credibility of source of seeds

The farmers accord various degrees of credibility to various sources of seed based on their experiences over a period of time. Sources of seed might be public, private, NGO/CBO, fellow farmer or his own saved seed. For each crop, the farmer has a preference for certain source of seed over others because of purity of seed and high genetic potential maintained by the source. Farmer's perception of credibility of source of quality seeds is measured using a five-point rating scale of the source of seed being '*highly credible*', '*credible*', '*somewhat credible*', '*less credible*' and '*least credible*' and were given scores of 5, 4, 3, 2, and 1 respectively. The farmers' perception on the credibility of source of seeds is presented in table 4.2.4.

Table 4.2.4: Farmers' perception on credibility of source of quality seeds

Credibility of source of quality seeds	Andhra Pradesh (n=60)		Bihar (n=60)	
Mean	3.98		2.93	
Standard Deviation	0.770		0.954	
Range	2-5		1-5	
Mean Difference	1.050			
‘t’ test value	6.633**			
Categories	Frequency	Percent	Frequency	Percent
Highly credible	13	22	5	8
Credible	37	62	7	12
Somewhat credible	6	10	30	50
Less credible	4	7	15	25
Least credible	0	0	3	5
Total	60	100	60	100

** Significant at 0.01 level of probability

The study showed that 62 percent of farmers in AP said that their source of seed was credible whereas only 12 percent of farmers in Bihar found so. In addition, 22 percent of farmers in AP opined that their source of seed was highly credible whereas only 8 percent of farmers in Bihar reported so. In case of Bihar, fifty percent of farmers

procured seeds from somewhat credible sources, whereas 25 percent of farmers procured seeds from less credible sources and 5 percent of farmers from least credible sources like open markets in unpackaged (farmers call it “*loose*” seeds) form. Hence it is evident that farmers in Bihar were purchasing seeds from dealers/retailers and other sources even though they were not sure of the source. Though farmers preferred to purchase seeds from highly credible sources, they were forced to purchase from less/least credible sources because of lack of options. For instance, in case of Bihar, the farmers accorded high degree of credibility to wheat seed produced by IARI regional station, Pusa but because of limited quantities of seed produced by this institute, all farmers in the region could not procure these seeds. Hence, they opted for other sources which they consider credible such as seeds produced by Rajendra Agricultural University (RAU) or the seeds of Tarai Development Corporation (TDC). Even the seeds of RAU and TDC are not available to all the farmers because of limited stock. Finally, majority of the farmers have the only option of purchasing seeds from either National Seeds Corporation (NSC) or Bihar State Seeds Corporation (BSSC). Farmers in the study region accorded very low credibility to NSC and BSSC for wheat seeds; yet they were forced to purchase from these sources because of lack of options.

The frequency distributions were skewed in different directions of ‘*highly credible-least credible*’ spectrum of credibility of the source of quality seed. Mean difference in credibility of source of availability of seed to farmers between AP and Bihar was found to be statistically significant (at 0.01 level of probability) indicating that the differences were considerable in farmer’s accessibility to quality seed in terms of credibility of the source of quality seed.

Price of seeds

The ability to purchase quality seeds by a farmer is directly affected by the price of seeds. The prices of seeds of HYVs developed by public sector agencies have always been affordable to farmers. The prices of seeds of hybrids and proprietary technologies such as Bt. cotton seeds have been significantly higher than non-hybrids because of inclusion of royalty/trait fee component in the prices of hybrids and Bt. cotton seeds. The prices of Bt. cotton seeds in the initial years of its release were so high that Government of AP had to intervene and regulate the price of seeds by fixing

MRP of Bt. cotton seeds. Hence, price of seed was an important component determining the farmers' accessibility to quality seeds. Farmer's perception of price of seeds was measured using a five-point rating scale of the seed being '*affordable*', '*moderately expensive*', '*costly*', '*very costly*', and '*too costly to be beyond one's reach*' and were given scores of 5, 4, 3, 2, and 1 respectively. The opinion of farmers on the price of seeds is presented in table 4.2.5.

The study showed that 73 percent of farmers in Bihar found the price of seeds to be moderate, where as 63 percent of farmers in AP found the seeds to be costly. Further, 20 percent of the farmers in AP found the seeds to be very costly and another 7 percent felt that the prices of seeds were beyond their reach. The reason was being that most of the farmers in AP used HYVs and hybrids of PSCs which were costly. Further, the Bt. cotton crop was widely grown in AP. The Bt. cotton seeds are costlier than non-Bt. cotton hybrids since royalty/trait fee component is included in the price of seeds of Bt. cotton. One more factor that added to the high price of Bt. cotton seeds in AP was the black marketing of Bt. cotton seeds. It was found during the study that Bt. cotton seeds of few PSCs were very popular among farmers because of high genetic potential and good quality.

Table 4.2.5: Farmers' perception on price of seeds

Price of seeds	Andhra Pradesh (n=60)		Bihar (n=60)	
Mean	2.82		3.87	
Standard Deviation	0.833		0.596	
Range	1-5		2-5	
Mean Difference	- 1.050			
‘t’ test value	7.939**			
Categories	Frequency	Percent	Frequency	Percent
Affordable	3	5	5	8
Moderate expensive	3	5	44	73
Costly	38	63	9	15
Very costly	12	20	2	3
Beyond reach	4	7	0	0
Total	60	100	60	100

** Significant at 0.01 level of probability

However, artificial shortage conditions were created in the market and the seeds of these companies were available only in black markets at very higher prices than the MRP. It is to be noted here that the price of Bt. cotton seeds are regulated in all the major Bt. cotton growing states in India. Mishra (2006) reported that the state government of Andhra Pradesh was the first to implement price restrictions. Its 2006 directive capped prices for biotech cotton seeds at less than one-half the prevailing market price. Today, price caps have spread to important cotton-growing states throughout the country including Maharashtra, Gujarat, Tamil Nadu, Karnataka, Madhya Pradesh, and West Bengal.

The price fixed by Government of AP for the crop year 2011-12 was Rs. 930/- for Bt-II seeds for a packet of 450gms. However, the farmers in AP said that Bt. cotton seeds of few companies were available in prices in the range of Rs. 2000 to 3000/- per packet of 450gms in the black market. In case of Bihar, the seeds for principal crops such as wheat and rice were procured from public organizations such as regional station of IARI at Pusa, RAU, TDC or the NSC. Though there was a great degree of variation in quality of these seeds, the prices were moderate to the farmers. However, the seeds of maize and vegetable crops were procured by the outlets of PSCs, which were costly.

The frequency distributions were skewed in different directions of '*affordable-beyond reach*' spectrum of prices of quality seed. Mean difference in prices of seeds for farmers between AP and Bihar was found to be statistically significant (at 0.01 level of probability) indicating that the differences were considerable in farmer's accessibility to quality seed in terms of their prices.

Documentation and records

Some farmers in India have the habit of keeping the records related to farming enterprise, whereas majority of the farmers do not do so. In this study, record keeping habit of farmers with special reference to seed transactions was measured. The receipts of seed purchased are very important because in case of seed failure, farmer cannot claim for compensation unless the receipt of seed purchased from a dealer/retailer is presented to the compensation authority. Therefore, receipts of seed purchased are very important in ensuring the procurement of quality seeds at MRP prices and in availing compensation, insurance and other consumer rights whenever

there is a crop failure due to spurious seeds. Farmer's perception of record keeping of seed transactions is measured using a five-point scale of maintaining records '*always*', '*often*', '*sometimes*', '*rarely*', and '*very rarely*' and were given scores of 5, 4, 3, 2, and 1 respectively. The perception of farmers about the habit of record keeping related to seed is presented in table 4.2.6.

The study showed that 53 percent of farmers in AP often kept the records related to seed transactions, whereas only 7 percent of farmers in Bihar did so. However, 27 percent of farmers in AP and 35 percent of farmers in Bihar rarely and very rarely kept the records related to seed transactions. It was because either the farmers did not insist for the receipt of purchase of seeds or the dealer/retailer did not issue the receipt to the farmers. Sometimes, the farmers procured seeds from the open market where receipts are not at all issued. Sometimes, though the farmers get receipts for their purchases, they don't keep it safely at home till the end of the crop season.

Table 4.2.6: Farmers' perception on documentation and records

Documentation and Records keeping	Andhra Pradesh (n=60)		Bihar (n=60)	
Mean	3.12		2.68	
Standard Deviation	1.121		1.049	
Range	1-4		1-5	
Mean Difference	0.433			
‘t’ test value	2.186*			
Categories	Frequency	Percent	Frequency	Percent
Always	0	0	4	7
Often	32	53	4	7
Sometimes	12	20	31	52
Rarely	7	12	11	18
Very rarely	9	15	10	17
Total	60	100	60	100

* Significant at 0.05 level of probability

The study highlighted that there is an urgent need to build awareness among farmers about the importance of record keeping in general and receipts of seed purchased in particular. The receipts are compulsorily needed for settling the economic and legal

issues related to compensation, insurance and other consumer rights in case of seed failure.

The frequency distributions were skewed in different directions of '*always-very rarely*' spectrum of maintenance of records and documentation seed transactions. Mean difference in habit of record keeping between farmers of AP and Bihar was found to be statistically significant (at 0.05 level of probability) indicating that the differences were considerable in farmer's habits of record keeping and documentation of seed transactions.

Cultivation of improved cultivar of seeds

The HYVs and hybrids give better yield performances compared to old and traditional varieties. Only few progressive and entrepreneurial farmers keep watch of the latest released varieties and they go to the extent of procuring seeds from the organization headquarters that released the new variety or hybrid. However, majority of the farmers purchase the seeds of popular varieties which would be ruling for years in the region. Sometimes, for the lack of availability of seeds, farmers continue to grow old varieties. Some farmers also grow traditional varieties even though they yield less. The worst situation was the condition wherein farmer neither has his farm saved seed (atleast the source is credible) nor he gets the good quality seed in the market. Some farmers face this kind of situation whenever there is a shortage of good quality seed in the market during the sowing season. In such conditions, farmers were forced to purchase seeds from unauthenticated sources such as open markets and his crop yields are sacrificed. Farmer's perception of use of quality seed of improved cultivar was measured using a five-point scale of '*latest HYVs/hybrids (released in last 5 years)*', '*popular variety (best varieties still in seed production chain)*', '*good variety but old (removed from seed production chain)*' '*very old variety (variety released 20 years ago)*' and '*farmers' old variety*' and they were scores of 5, 4, 3, 2, and 1 respectively. The perception of farmers on cultivation of improved cultivar of seeds is presented in table 4.2.7.

The study showed that majority of farmers both in AP and Bihar (67 and 62 percent respectively) cultivated 'popular varieties' which were ruling for many years in the region. Interestingly, slightly higher percentage of farmers in Bihar was cultivating recently released varieties when compared to the farmers of AP. The reason was that

there was more diversity in terms of number of crops grown in Bihar when compared to AP. Therefore, farmers growing maize and vegetables in Bihar always preferred latest hybrids of PSCs. The frequency distributions of both samples of respondents appeared to be similar in terms of their perception of use of quality seeds of improved cultivars.

Table 4.2.7: Farmers' perception on cultivation of improved cultivars of seeds

Improved Cultivar of seeds	Andhra Pradesh (n=60)		Bihar (n=60)	
Mean	3.82		3.80	
Standard Deviation	0.854		0.935	
Range	1-5		1-5	
Mean Difference	0.017			
‘t’ test value	0.102 ^{NS}			
Categories	Frequency	Percent	Frequency	Percent
Latest HYVs/hybrids	8	13	10	17
Popular variety	40	67	37	62
Good variety but old	7	12	6	10
Very old variety	3	5	5	8
Farmers’ old variety	2	3	2	3
Total	60	100	60	100

Mean difference in use of quality seeds of improved cultivars by farmers between AP and Bihar was found to be not statistically significant indicating that the differences were not there in farmer's accessibility to quality seed in terms of their use of quality seeds of improved cultivars.

Purity of seeds

Though farmers purchase the seeds of HYVs and hybrids, sometimes they fail to give expected yields even under congenial climatic and appropriate management conditions because of low genetic purity and physical purity. Therefore establishment of genetic and physical purity of seed is very important. Farmer's perception of purity of seeds was measured using a five-point rating scale of seeds being '*very pure*', '*pure*', '*moderately pure*', '*less pure*' and '*least pure*' and were given scores of 5, 4, 3, 2, and 1 respectively. The opinion of farmers on the purity of seeds they purchased is presented in table 4.2.8.

It is evident from the study that almost three-quarters of farmers both in AP and Bihar (72 percent each) perceived the purity of seeds they purchased to be medium. Only 20 percent of farmers in AP and 13 per cent in Bihar found their seeds to be of pure quality whereas only 7 percent of farmers in Bihar expressed that their seeds were very pure while none of the respondents in AP reported so. Eight percent of the farmers both in Bihar and AP opined that the seeds they procured was of less purity. The facts highlighted the extent to which it is difficult to procure quality seeds by the farmers because of shortage of such high quality seeds or the incredibility of the source of the seed. Farmers in Bihar shared that same variety performed in different ways depending on the source of the seed. For instance, the seed of a variety purchased from IARI regional station, Pusa performed extremely well, whereas same variety of seed procured from NSC or BSSC performed dismally because of admixtures and poor genetic purity. However, only few farmers could procure the seeds of IARI regional station owing to limited stock. Therefore majority of farmers were forced to buy seeds from NSC or BSSC even though they knew that seeds were not of appropriate quality. Likewise, farmers preferred the seeds of RAU. It was interesting to note that for each crop, the farmers had a preference of one source over the other. For instance, in case of wheat seeds, the farmers' first preference was IARI regional station. Their next preference was the seeds from RAU or TDC. The last preference was that of NSC or BSBC. However, the most preferred seeds were always in shortage and they were forced to purchase seeds from the less preferred sources.

Table 4.2.8: Farmers' perception on purity of seeds

Purity of seeds	Andhra Pradesh (n=60)		Bihar (n=60)	
Mean	3.12		3.18	
Standard Deviation	0.524		0.676	
Range	2-4		2-5	
Mean Difference	0.067			
‘t’ test value	0.604 ^{NS}			
Categories	Frequency	Percent	Frequency	Percent
Very pure	0	0	4	7
Pure	12	20	8	13
Moderately pure	43	72	43	72
Less Pure	5	8	5	8

Least pure	0	0	0	0
Total	60	100	60	100

The frequency distributions of both samples of respondents appeared to be similar in terms of their perception of purity of quality seeds. Mean difference in perception of purity of quality seeds among farmers between AP and Bihar was found to be not statistically significant indicating that the differences were not there in farmer's accessibility to quality seed in terms of the purity of quality seeds.

Crop performance

Sometimes, it also happens that seeds procured from highly authenticate sources fail to give expected yields even under congenial climatic and appropriate management conditions. The germination percentage may be very less and uneven; the crop stand might be poor; and the grain formation may be very low. All these kinds of failures might be attributed to spurious seeds. Therefore, farmers were asked about their experiences in getting expected crop performances from the seeds they have procured and sown in the last few years. Farmer's perception of crop performance of seeds was measured using a five-point rating scale of seeds giving '*very good*', '*good*', '*moderate*', '*poor*' and '*very poor*' crop performance and were given scores of 5, 4, 3, 2, and 1 respectively. The perception of farmers on the crop performance is presented in table 4.2.9.

Table 4.2.9: Farmers' perception on crop performance

Crop Performance	Andhra Pradesh (n=60)		Bihar (n=60)	
Mean	3.60		3.17	
Standard Deviation	0.960		0.785	
Range	1-5		1-5	
Mean Difference	0.433			
‘t’ test value	2.707*			
Categories	Frequency	Percent	Frequency	Percent
Very good	5	8	4	7
Good	37	62	11	18
Moderate	11	18	37	62
Poor	3	5	7	12
Very poor	4	7	1	2

Total	60	100	60	100
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* Significant at 0.05 level of probability

It was evident from the study that 70 percent of farmers in AP felt that yields they got were good or very good, whereas only 25 percent of farmers in Bihar perceived so. Majority of farmers in Bihar (62 percent) opined that their crop yields were moderate. However, 12 percent of farmers in AP and 14 percent of farmers in Bihar felt that the crop performed poorly or very poorly because of spurious seeds in the last 5 years.

The frequency distributions were skewed in different directions of '*very good–very poor*' spectrum of crop performance from the quality seeds accessed by farmers. Mean difference in crop performance from the seeds among farmers between AP and Bihar was found to be statistically significant (at 0.05 level of probability) indicating that the differences were considerable in farmer's perception of crop performance from the quality seeds accessed by them.

Maintenance of minimum standards in farm saved seeds

In India, even today, the organized sector (including both private and public sector companies) account for about only 15 to 20 percent of the total seed distributed in the country (MoA, 2102). However, remaining 80-85 per cent of seed requirement is met from unorganized sector consisting of informal sources such as farm saved seed, farmer-to-farmer exchanges, community based seed production, storage and distribution systems of NGOs and CBOs etc. The core component of informal source of seed is that the seed is farm saved seed. Hence, it is of vital importance to understand whether the farmers follow scientific principles in collecting, saving, storage, bartering and exchange of such farm saved seed. Farmer's perception on maintenance of minimum standards in farm saved seeds was measured using a five-point rating scale of such seeds possessing '*very good standards*', '*good standards*', '*minimum standards maintained*', '*poorly maintained*' and '*doubtful standards*' and were given scores of 5, 4, 3, 2, and 1 respectively. The perception of farmers on following minimum standards in farm saved seeds is presented in table 4.2.10.

It was very surprising and heartening to note that 91 percent of farmers in AP and 83 percent of farmers followed scientific practices to see that the farm saved seeds (in certain crops where the farm saved seeds are used) are of good and very good

standards in terms of genetic and physical purity. Further, 8 percent farmers in Bihar and 12 percent farmers reported that they follow minimum standards in ensuring that farm saved seeds is of good quality. Only 5 percent of the farmers in Bihar said that their farm saved seed were of poor quality (the reasons could be attributed to lack of minimum appropriate storage conditions at homes of some poor farmers and extreme weather conditions and not the negligence on the part of the farmers) whereas none of the farmers from AP expressed so. Hence it is clearly established that farmers take all the precautionary measures in selecting, saving, storage and exchange of seeds among themselves to maintain genetic and physical purity in certain crops where they use farm saved seeds.

Table 4.2.10: Farmers' perception on minimum standards in farm saved seeds

Minimum Standards in Farm Saved Seeds	Andhra Pradesh (n=60)		Bihar (n=60)	
Mean	4.15		3.97	
Standard Deviation	0.547		0.712	
Range	1-5		2-5	
Mean Difference	0.183			
‘t’ test value	1.581 ^{NS}			
Categories	Frequency	Percent	Frequency	Percent
Very good standards	14	23	11	18
Good standards	41	68	39	65
Minimum standards maintained	5	8	7	12
Poorly maintained	0	0	3	5
Doubtful standards	0	0	0	0
Total	60	100	60	100

The frequency distributions of both samples of respondents appeared to be similar in terms of their perception of maintenance of minimum standards of farm saved seeds. Mean difference in maintenance of minimum standards of farm saved seeds among farmers between AP and Bihar was found to be not statistically significant indicating that the differences were not there in farmer's perception of maintenance of minimum standards of farm saved seeds.

Composite scores of accessibility to quality seed

There were wide variations (as evident from statistically significant differences) among the farmers of Bihar and AP on several parameters of accessibility to quality seed. It would be useful to develop one composite score for each farmer by clubbing the values of all the 10 parameters selected for the study to measure the overall accessibility to quality seed. Hence, such composite scores were calculated for each farmer and they were categorized into five categories of accessibility to quality seed viz., very low, low, medium, high and very high. The distribution of farmers of Bihar and AP on composite scores of accessibility to quality seed is presented in table 4.2.11.

Table 4.2.11: Frequency Distribution of farmer respondents on the scores of accessibility to quality seed

Accessibility to Quality Seed	Andhra Pradesh (n=60)		Bihar (n=60)	
Mean	72.43		68.30	
Standard Deviation	5.598		4.477	
Range of scores	56 – 82		54 – 76	
Mean Difference	4.133			
‘t’ test value	4.467**			
Categories	Frequency	Percent	Frequency	Percent
Very Low (Below Mean-2SD)	2	3.3	1	1.7
Low (Between Mean-1SD & Mean-2SD)	9	15.0	5	18.3
Medium (Between Mean-1SD & Mean+1SD)	44	73.3	42	70.0
High (Between Mean+1SD & Mean+2SD)	5	18.3	12	20.0
Very High (Above Mean+2SD)	0	0.0	0	0.0
Total	60	100	60	100

** Significant at 0.01 level of probability

It was evident from the study that none of the farmers in Bihar and AP had very high level of accessibility to quality seed, whereas only 20 percent of farmers in Bihar and 18 percent of farmers in AP perceived that they had high level of accessibility to quality seed. However, nearly two-thirds of the farmers in Bihar and AP (70 and 73 percent respectively) found that their level of access to quality seed was medium.

Further, 18 percent of farmers in Bihar and 15 percent in AP perceived their level of access to quality seed as low, whereas 2 percent of farmers in Bihar and 3 percent of farmers in AP felt their level of accessibility to quality seed as very low.

The frequency distributions were skewed in different directions of '*very high-very low*' spectrum of accessibility of quality seed to farmers. Mean difference in accessibility to quality seed between farmers of AP and Bihar was found to be statistically significant (at 0.01 level of probability) indicating that the differences were considerable in farmer's accessibility to quality seed in terms of all the ten parameters of farmer's accessibility of quality seed.

Conclusions and policy implications:

The Seed Bill 2004 is under the process of enactment in the Indian parliament. However, it has been stalled since 2004 for various contentious issues in the seed bill from the viewpoint of various stakeholders. This study looks at the major issues to be addressed in the seed bill from the view point of farmers. Farmers are the primary stakeholders of agriculture and they were the custodians of seed for several centuries since the human beings started cultivating the crops. Hence, this study addressed the most important problem for the farmer with respect to seed, i.e., his accessibility to quality seed. Ten parameters were included to measure the extent of accessibility to quality seed to farmers. The study found that higher percentage of farmers of AP had access to timely availability of quality seed in adequate quantities from credible sources when compared to the farmers of Bihar. The higher percentage of farmers of AP maintained records of seed transactions than the farmers of Bihar. Majority of farmers in both Bihar and AP procured seeds from the nearby block/tehsil/town headquarters. However, majority of farmers in AP expressed that price of seeds was costly whereas farmers of Bihar found it to be moderate. There was no significant difference between the perception of farmers on purity of seed procured, and the cultivation of improved cultivars in both the states. Interestingly, it was found that more than 95 percent of farmers in Bihar and AP followed scientific practices and took all the precautionary measures in collecting, saving, storing and exchange of farm saved seeds to maintain genetic and physical purity in certain crops where they used farm-saved seed. The composite scores indicated that the level of accessibility to quality seed for two-thirds of the farmers in both the states was medium and only around 20 per cent of the farmers found it to be high.

It was evident that variation existed in the states of Bihar and AP in terms of specific parameters of accessibility to quality seed to farmers. However, overall accessibility to quality seed to farmers needs to be improved in both the states. The Seed Bill 2004, which is pending in the Parliament to be passed into an act, needs to address the problems of farmers such as timely availability of quality seed in adequate quantities at reasonable prices. The purity of seed was a cause of concern in both the states and requires the attention of central and state governments in addressing the gaps in infrastructure and manpower in public sector seed system. There is a strong need to build awareness among the farmers regarding record keeping of seed transactions. This is crucial for farmers in settling economic and legal issues related to compensation, insurance and other consumer rights. Informal seed sector (farmers' own farm saved seed) needs to be promoted as an alternative to the formal seed sector to protect the farmers, especially the small and marginal farmers, in indulging in distress purchase of spurious seeds from the open market.

Research Paper III

Analysis of the gaps and constraints in policies regarding seed sector as perceived by various stakeholders and suggestions for amendments

Abstract

India is basically an agrarian country and farmers are aptly called as its backbone. The agrarian situation in India is unique with 85% of the operational land holdings being marginal and small (less than 1 and 2 hectares respectively). Hence, any agricultural legislation must take into consideration the challenges that these marginal and small farmers face and should aim at improving their standard of living. It is more so in case of seed legislations since seed is central to agriculture and national security. The Seed Bill 2004 is the recent legislation which overtly aimed at making quality seeds accessible to farmers. The Seed Bill, which seeks to replace the existing Seed Act 1966, was introduced in parliament in 2004. However, various stakeholders raised objections to several clauses in the bill and are seeking amendments. The extent of disagreement and dissent among various stakeholders is evident from the fact that the bill is not yet enacted (into an Act), even after 8 years of its first introduction. The bill is also one of the most widely debated agricultural policies in the recent times among various sections of the society. Hence, it was envisaged to study the contentious issues in the seed bill and the opinion of various stakeholders on such issues. In the process, it was envisaged to identify the gaps in the Indian seed legislation and to suggest suitable amendments based on the study.

The study was conducted in Andhra Pradesh and Bihar states covering 120 farmers and 30 respondents each from NGOs, Agriculture Department Officials (ADOs), researchers, seed dealers and Private Seed Companies (PSCs) with a total sample size of 270. The study found that the most contentious issues in the bill were related to upholding farmers' rights, regulation of retail price and royalty/trait fee, powers to state governments and compensation and punitive clauses. Farmers, NGOs, ADOs, researchers and seed dealers strongly demanded for upholding farmers' rights and regulation of retail price and trait/royalty fee over seeds, especially in case of proprietary technologies such as Bt. cotton. The study indicated that PSCs charged royalty fee as high as 70 percent of retail price of seeds until government intervened and fixed the prices. PSCs argued that only market forces should determine the sale price of seed. However, market forces did not operate in case of proprietary technologies because of monopolistic or oligopolistic market conditions. Farmers, NGOs, ADOs, researchers and seed dealers strongly advocated that state governments should be given authority to regulate seed industry including powers to regulate retail price and royalty fee of seed, to compensate farmers in case of seed failure, to regulate erring companies, etc. since agriculture is a State subject under Constitution in India and farmers have service access to State Department of Agriculture (SDA) rather than the Central government. It was evident that state governments were helpless in regulating the PSCs while maintaining the interests of farmers. PSCs stated that Central government should have the

authority to regulate erring companies since they have pan-Indian business operations. Simple and farmer-friendly redressal mechanism in the form of compensation committee has to be provided in the bill itself. Stringent punitive and accountability clauses are called for since the spurious seed trade is worth several millions of rupees. The other contentious issues in the bill were related to self-certification of seed, disclosure of parentage of varieties for commercial sale before registration, import of seeds and incompatibility of certain clauses of bill with the other laws related to agriculture and environment. The Kruskal Wallis H Test indicated that all the stakeholders differed from one another in the perception of importance of all the twelve critical issues in the Seed Bill. Further, the comparison of farmers with other stakeholders on critical contentious issues through Mann-Whitney U Test revealed that farmers' perception of importance varied on all the twelve issues with PSCs whereas they varied with NGOs on only one issue.

Keywords: Bt. cotton; Certification; Compensation; Farmers' rights; Price regulation; Proprietary technology; Punitive measures; PVPFR Act; Registration; Royalty/trait fee; State government; State subject; and Seed Bill.

Introduction

India possesses only 11 percent of world's arable land but it has to feed about 18 percent of world population. Agriculture is still the livelihood option for more than 60% of Indian population. The agrarian situation of India is also unique with 85% of the operational land holdings being marginal (less than 1ha.) and small (1 to 2 ha.). Semi-medium (2 to 4 ha.) and medium (4 to 10 ha.) holdings constitute 14% and the large holdings (more than 10 ha.) make for the remaining 1% (Agricultural Census, 2010-11). Hence, any agricultural policy should take into consideration the challenges faced by these marginal and small farmers and must aim at improving their standard of living. The legislations should aim at providing access to various resources and services to farmers and equip them in achieving national agricultural development goals of food security, sustainable use and management of natural resources, environmental protection and adaptation to climate change. However, the national interests should not subsume the livelihood security of farmers at the individual, family and community levels. For instance, India has achieved food security at the national level but more than 30% of its population is still below the poverty line. The malnutrition rate among children aged below 5 years is upto 50%. This situation has raised serious concerns about the way the national agricultural development goals are achieved by jeopardizing the livelihood security of vulnerable sections like marginal and small farmers, women farmers and landless labourers. Hence, any agricultural legislation should have the dual aim of national interest and the interest of the primary stakeholders, i.e., farmers (especially, the marginal and small). It is more so in case of

seed legislations since seed is central to agriculture and the national food security. Moreover, historically, the seed was primarily the common property of the farmers and they were actively involved in selecting, improving, saving, using, reusing, bartering and exchanging of seeds for centuries. Therefore any seed legislation must aim to uphold farmers' rights over seed along with providing them access to resources and services that enhance the productivity of the seed and income of the farmers. The seed legislations and the recent Seed Bill have been looked from this perspective in this study.

Seed is the basic and most critical input for agriculture. The response of all other inputs depends on the quality of seeds to a large extent. It is estimated that the direct contribution of quality seed alone to the total production is about 15-20% depending upon the crop and it can be further raised up to 45% with efficient management of other inputs (Seed India Net Portal, 2012). The quality of seed and plant material significantly affects productivity, which in turn affects the cost of production and competitiveness in the market (Chand, 2002). India has enacted seed legislations from time to time to address the challenges of production and distribution of quality seed. The Seeds Act, 1966 provided for a formal system of seed quality control in India for the first time. Seeds were declared as an essential commodity under Essential Commodities Act, 1955 and the Seed (Control) order was issued in 1983. It has provisions such as compulsory licensing of the seed dealers, price control, seed movement control and submission of the information about the procurement and sale of seed. New Policy on Seed Development (NPSD) 1988 liberalised Indian seed industry. Pray, Ramaswami, and Kelley (2001) reported that until the late 1980s, private firm participation in the seed industry in India was limited by two factors: economy-wide policies that restricted foreign investment and licensing, and seed-specific policies that limited the sector to 'small scale' participants and severely restricted imports of research or breeder seeds. With India's implementation of the Seed Policy of 1988, the 'small scale' limitation was removed, large domestic and foreign firms were permitted entry, and import restrictions were substantially lifted. Economy-wide liberalization occurred in India in 1991, including the abolition of the industrial licensing system and the easing of restrictions on foreign direct investment (FDI). Pray, Ramaswami, and Kelley (2001) found that as a result of the reforms, new foreign and domestic firms entered the market, competition increased, and private

sector R&D expenditures grew rapidly as domestic firms spent more on technology to compete with the entry of new research-intensive foreign firms. Another important motivation for firms' increased R&D expenditures has been the market's transition away from open-pollinated varieties (OPVs), which farmers can save and reuse in subsequent years, to hybrids, which cannot be reused without a significant reduction in yield and quality. Farmers' need to purchase seeds each year enables firms to recoup R&D investments. Signing of WTO in 1995 further paved the way for private research and development of varieties. The Protection of Plant Varieties and Farmers' Right Act was formulated in the year 2001 for protection of plant varieties in India by integrating the rights of breeders, farmers and village communities.

Seed industry in India at present is regulated through Seed Act 1966, Seeds (Control) Order 1983 and the NPSD 1988. However, far reaching changes have taken place in the national economy and agricultural scenario and in the international environment since the enactment of these legislations. Biotechnology sector came up with promises of extremely productive genetically modified (GM) crops. In 2002, Government of India approved Bt. cotton for commercial cultivation in India. National Seed Policy was thus formulated in the year 2002, to provide an appropriate climate for the seed industry to utilize available and prospective opportunities, safeguarding the interests of farmers and conservation of the biodiversity. Liberalization has been targeted towards certain components of the policy retaining regulation to some components to safeguard national interests. Katherine and Torsekar (2011) reported that China significantly limits the market access of foreign firms, while India has liberalized its seed sector and permits foreign and domestic firms to participate on equal terms. However, price restrictions implemented by Indian state governments severely limit the ability of all firms to charge market prices for biotech seeds. USCIB (2009) reported that even with significant price controls, however, India's seed market is more liberalized than that of China. Despite the enactment of a seed law in 2000 creating a role for private firms, China continues to severely restrict FDI and the trading of certain types of seeds.

The aims of National Seed Policy such as development of infrastructure, ensuring supply of good quality seeds and facilitating the international seed trade are sought to be addressed through the proposed Seeds Bill, 2004, which seeks to repeal and replace the existing Seed Act, 1966. The Seed Bill 2004 was introduced in the

Parliament on 9 December, 2004 and many agencies raised serious objections to several provisions made in the bill. Various stakeholders have different and contradictory views on the clauses in the bill regarding several issues such as: 1) Farmers' Rights, 2), Incompatibility with other legislations, 3) Powers to Government, 4) Retail price of seed, 5) Trait fee/Royalty fee, 6) Compensation Issues, 7) Punitive and Accountability Clauses, 8) Registration and Parentage Issues, 9) Certification of seed, 10) Import of seeds, and 11) Seed bio-diversity. Hence, the bill was referred to Parliamentary Standing Committee on Agriculture chaired by Prof. Ramgopal Yadav to study and submit its report. The Committee submitted its report on 20th November 2006 and recommended for major changes in the original Bill.

This research paper examines in detail the perception and opinion of various stakeholders of seed industry regarding the controversial issues in the bill. The specific objectives of the research paper are:

- a. To identify the contentious issues related to the Seed Bill;
- b. To examine the opinion of various stakeholders about these contentious issues;
- c. To test the differences among different stakeholders on their perception of various critical issues in Seed Bill;
- d. To test the differences between farmers and other stakeholders on their perception of various critical issues in Seed Bill; and
- e. To suggest amendments to the bill to address the various gaps.

Methodology

The study is based on primary data collected by interviewing 270 respondents about their perception/opinion on various issues related to Seed Bill using pre-tested structured interview schedule. Several published secondary sources like reports of organisations, websites, letters and news stories were also used to support and substantiate the primary data. An *ex-post facto* and survey research design was adopted.

The gaps in the earlier seed legislations, contentious issues in the recent Seed Bill 2004 and the issues affecting seed sector from the perspective of various stakeholders were identified through extensive survey of literature and discussion with experts and stakeholders during a pilot study. A semi-structured interview schedule containing

these issues was developed and used to collect the opinion of various stakeholders in terms of their '*agreement or disagreement*' on these contentious issues using personal interview method (Appendix II).

Then, all the contentious issues were merged into 12 important issues. The perception of all the stakeholders on these twelve critical issues was obtained using a five-point rating scale of importance that the respondent gives to each of the issues: 'Most Important', 'Important', 'Somewhat Important', 'Less Important', and 'Least Important' with a score of 4, 3, 2, 1 and 0 respectively. The Kruskal-Wallis H test (using chi-square statistics) was used to test if the six sets of stakeholders differed from one another in their perception of the various critical issues and clauses in the Seed Bill. Finally, Mann-Whitney U test was employed to measure statistics for all the twelve critical issues and for all sets of samples to test if the farmers differed from the other sets of stakeholders in their perception of the various critical issues and clauses in the Seed Bill. Both the tests were employed at 0.01 and 0.05 probability level to test if the differences among the stakeholders were statistically significant.

Sample: Two states namely Andhra Pradesh and Bihar were selected purposively for the study using criteria such as presence of various stakeholders, seed accessibility and seed replacement rate. Warangal and Anantapur districts in Andhra Pradesh and Samastipur and Vaishali districts in Bihar were selected to interview farmers. These districts were chosen purposively based on the maximum number of stakeholders playing key roles in seed sector. A total of 120 farmers (30 from each district) were randomly selected and interviewed.

A total of 30 respondents belonging to various Non Governmental Organizations (NGOs: include Civil Society Organizations (CSOs) and farmers' organizations (FOs0), which are actively engaged in seed policy research and extension were also interviewed. A total of 30 respondents belonging to state agricultural departments of Andhra Pradesh and Bihar, involved in seed production, certification, testing and distribution were interviewed. A total of 30 researchers from various state (State Agricultural Universities) and central research organizations (Indian Council of Agricultural Research Institutes) were interviewed. The researchers were selected purposively based on their experience in either or the combination of seed production, distribution, seed policy and IPR issues. A total of 30 seed dealers from AP and Bihar

were also interviewed. A total of 30 respondents from various private seed industries located in AP, Bihar and Delhi were interviewed.

Results and Discussion

The study addressed the perception of various stakeholders on the various critical issues in the Seed Bill that warranted immediate amendment to serve the interests of farmers, those who feed our nation. During several debates and protests these issues were highlighted by all the stakeholders and argued for their points of views. The extensive review of literature and discussion with experts was also done to list the contentious issues. Here the results concerning these contentious issues are presented under the following sub-heads:

1. Farmers' Rights
2. Incompatibility with other legislations
3. Powers to State Governments
4. Regulation of retail price of seed
5. Regulation of trait fee/royalty fee
6. Compensation issues
7. Punitive and accountability clauses
8. Registration and parentage issues
9. Certification of seed
10. Import of seeds
11. Seed bio-diversity

The various issues in the Seed Bill 2004 on which various stakeholders agreed or disagreed and their perception on each of these issues are discussed below.

1. Farmers' Rights

Farmers have been engaged in cultivation from many centuries and they had been saving seed for growing crops; so, they have the fundamental right to seeds for cultivation. In fact all the germplasm that breeders use today belongs to farmers who have been collecting and improving seed through selections and breeding. So, any legislation should uphold the fundamental and inalienable rights of farmers. When the Seed Bill 2004 contained some clauses and words that seemed to be impinging on the farmers' rights, they were pointed for amendment and most of the issues were resolved as can be seen in Box 4.3.1 below.

Box 4.3.1: Farmers' Rights

Clause	Provision in Seed Bill 2004	Amendment Proposed	Present Status
Clause 1	Act shall apply to— (a) every dealer; and (b) every producer of seed except when the seed is produced by him for his own use and not for sale.	Substituted (b) every producer of seed, other than farmer, except when the seed is produced by him for his own use.	Accepted
Clause 1	Absent	Inserted “Provided that nothing contained in this Act shall restrict the right of the farmer to grow, sow, re-sow, save, use, exchange, share or sell his farm seeds and planting material except when he sells such seed or planting material under a brand name”.	Accepted
Clause 2	(19) "producer" means a person, group of persons, firm or organisation who grows or organizes the production of seeds	Inserted “but does not include a farmer”.	Accepted
Clause 22	(1) Every person who desires to carry on the business of selling, keeping for sale, offering to sell, bartering , import or export or otherwise supply any seed by himself, or by any other person on his behalf shall obtain a registration certificate as a dealer in seeds from the State Government.	Deleted Word “bartering”	Accepted
Clause 25	No person shall himself, or by any other person on his behalf, carry on the business of selling, keeping for sale, offering to sell, bartering , import or export or otherwise supply any kind of seed of any registered kind or variety.	Deleted Word “bartering”	Accepted
Clause 28	(1) Any person selling, keeping for sale, offering to sell, bartering or otherwise supplying any seed of any registered kind or variety may, if he desires to have such seed certified by the State Seed Certification Agency, apply to that Agency for the grant of a certificate for the purpose.	Deleted Word “bartering”	Accepted
Clause 44	Absent	Inserted Seed developer shall be held accountable in the event of contamination of traditional varieties	Not Accepted

		or farmers' varieties of seeds by transgenics even during experimental trials and the compensation in such case shall be fixed by the Committee.	
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So in this Seed Bill, the fundamental rights of farmers to grow, sow, re-sow, save, use, exchange, share or sell his farm seeds and planting material were upheld by inserting these words at appropriate places in the clauses. As these rights of farmers find no mention in the proposed Seed Bill, they were suggested as an amendment and were duly accepted by the Ministry of Agriculture. Similarly, farmers can barter their seeds with other farmers and as this has been an age-old practice, this word 'bartering' was deleted from the appropriate clauses 22, 25 and 28 as bartering is different from sale.

As the Seed Bill provides for allowing transgenics, a clause was proposed for inclusion in the seed bill for holding the seed developer accountable and responsible for any possible inadvertent contamination of traditional varieties of farmers. But this proposed amendment was not accepted by the drafters of the Seed Bill.

Now, the opinion/perception of all the stakeholders was sought with respect to this critical issue of farmers' rights and the results are given in table 4.3.1. Approval of the stakeholders for allowing farmers' rights to bartering of registered seeds was given by all stakeholders. Similarly restricting them to sell seeds under any brand name was also approved by all. But on the question of farmers conforming to minimum standards of registration and certification, all stakeholders (except private seed companies) did not approve, saying farmers barter seeds among themselves informally on faith and need not conform strictly to the minimum standards prescribed by any formal agency. But representatives of private seed companies argued against this issue, saying that any farmer who barter or sells his seed in an informal way also need to follow certain prescribed minimum standards. Thus, all the stakeholders unanimously approved that bartering of seeds including registered seeds should be allowed for farmers since it is their traditional right. All the stakeholders agreed that restriction for farmers to sell under brand name was acceptable.

Table 4.3.1: Agreement of stakeholders on Farmers' Rights

N o.	Farmers' Rights and related issues	Agreement of stakeholders											
		Farmers		NGOs		Researchers		ADOs		Dealers ¹		PSCs	
		<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>F</i>	%
1.	Bartering of registered seeds by farmers	120	100	30	100	30	100	30	100	30	100	30	100
2.	Conforming to minimum standards of Seed Certification	0	0	0	0	0	0	0	0	0	0	30	100
3.	Restriction to sell under brand name	120	100	30	100	30	100	30	100	30	100	30	100

¹ Dealers refer to seed dealers and retailers

The Seed Bill asks farmers to compulsorily register themselves as seed dealers if they are engaged in saving and exchanging seeds. The bill also states that farmers have to conform to the minimum standards of seed laid down through this bill. All the stakeholders except PSCs argued that both these provisions are in violation of farmers' rights as they existed and interpreted in PVPFR Act 2001. Hence, it is recommended to protect farmers' rights and harmonize Seed Bill with other related legislations including PVPFR Act 2001. Farmers' rights upheld in one law cannot be taken away unduly through another law. Hence farmers' rights over seed need to be upheld for public interest.

2. Incompatibility with other legislations

The close examination of various clauses of Seed Bill and opinion of various stakeholders on several contentious issues also revealed that certain clauses in the Bill are in violation of the clauses of other laws related to agriculture and environment. They are presented in box 4.3.2. Some farmers' associations and civil society organizations also feared that the proposed Seed Bill may make an attempt at infringing upon Essential Commodity Act (ECA), 1955 by taking 'seeds' out of the list of 'essential commodities'. Hence, it has to be ensured that various laws related to seed, agriculture and environment are in harmony with each other before passing the bill.

Box 4.3.2: Seed Bill's incompatibility with other legislations

1. Registration of varieties under the Seed Bill will create a parallel system to the registration under the system PVPFR Act 2001. Ownership/parentage in the context of IPRs could be claimed by the legitimization provided by the bill and would be a serious infringement of farmers' rights. *De facto* breeder rights could be appropriated and exclusive marketing rights obtained. It could result in multiple, confusing registrations.
2. The Seed Bill proposes the creation and maintenance of a national register of seeds. There is no mention in the Bill of any linkages between such a register and similar mechanisms proposed under the Biological Diversity Act 2002.
3. The proposal of provisional registration of transgenic varieties for two years, even before it is assessed for biosafety and environmental clearance is a clear violation of the Environment Protection Act with its rules 1989 that govern Genetically Modified Organisms (GMOs) and their clearance. How can such varieties are called back if there is no environmental clearance granted after the provisional registration? This provision is unscientific and ignorant of the consequences of genetic engineering of crops.

3. Powers to state governments

Some issues concerning the power of the state governments are given in the Box 4.3.3. Although some minor changes with respect to the role of state governments in registration of seed developers, producers, seed processing plants, and supervising their operations, etc., were accepted in the proposed amendments to Seed Bill, many crucial issues were not at all agreed upon, say on price regulations, regulation of trait/royalty fee, regulating erring companies, and compensation mechanisms in case of crop failures. As the state governments would be implementing the Seed Bill (after enactment), they were asking for some powers to regulate the private seed companies.

Box 4.3.3: Powers to state governments

Clause	Provision in Seed Bill 2004	Amendment Proposed	Present Status
Clause 21	(1) No producer shall grow or organize the production of seed unless he is registered as such by the State Government under this Act.	Substituted “under this Act by the State Government in which he grows or organizes such production”.	Accepted
	(2) No person shall maintain a seed processing unit unless such unit is registered by the State Government	Substituted “under this Act by the State Government in which he	Accepted

	under this Act.	processes the seed”.	
	(6) Every seed producing unit and every seed processing unit shall furnish periodic returns on the quantity of seeds of different kinds or varieties produced or processed by it to the Seed Certification Agency in such form and at such time as may be prescribed.	Inserted after the word “the” “State Government and the”	Accepted
Clause 27	(1) The Committee may, in consultation with the State Government and the State Seed Committee, accredit— (a) organizations to carry out certification, on the fulfilment of such criteria, as may be prescribed, or (b) individuals or seed producing organisations to carry out self-certification, in such manner as may be prescribed.	Substituted (1) The State Government may, with the prior approval of the Central Government, accredit the organizations owned or controlled by the Central Government or the State Governments to carry out certification, on the fulfilment of such criteria, as may be prescribed.	Accepted
	(3) The accreditation may be withdrawn by the Committee , for reasons to be recorded in writing and after giving to the concerned organisation or individual, as the case may be, a reasonable opportunity of being heard.	Substituted Word “Committee” by “State Government”	Accepted

The opinion of various stakeholders about the powers to be given to state governments in regulation of seed industry is outlined in table 4.3.2.

All the ADOs, NGO personnel and farmers unanimously approved that state governments should be given authority to regulate retail price and trait fee of seeds, to award compensation to farmers in case of seed failure, to regulate erring companies, to conduct trials for GE crops and for registration of seeds for sale in the respective states since agriculture is a State subject under Constitution in India and farmers have service access to State Department of Agriculture rather than the Central government. The bill proposes the creation and maintenance of a National Register of seeds. This seeks to centralize registration by taking away the authority of states to approve varieties that are suitable for their locations. CSA (2005) recommended that there should be no registration but only licensing. Each such licensing should be reviewed after 3-5 years and renewal should be allowed based on actual performance and ICAR establishment should be used to conduct/supervise the initial trials as well as the review of performance. Majority of researchers agreed for powers to state government in regulating sale price of seed and awarding compensation but they added that

regulation of trait fee, conduct of trials for Bt. /GE crops and registration of seeds for sale should be done by central government as they are issues of national interest.

Table 4.3.2: Agreement of stakeholders on Powers to state governments

N o.	Issues related to Powers to state governments		Agreement of stakeholders											
			Farmers		NGOs		ADOs		Researchers		Dealers		PSCs	
			<i>f</i>	%	<i>F</i>	%	<i>F</i>	%	<i>f</i>	%	<i>f</i>	%	<i>F</i>	%
1	Regulation of retail price of seed	State	120	30	0	30	100	100	18	60	25	83	0	100
		Centre	0	0	0	0	0	0	5	17	0	0	0	0
		Both	0	0	0	0	0	0	2	7	0	0	0	0
2	Regulation of trait/royalty fee	State	120	30	0	30	100	100	11	37	25	83	0	100
		Centre	0	0	0	0	0	0	17	57	0	0	0	0
		Both	0	0	0	0	0	0	2	6	0	0	0	0
3	Awarding compensation		120	100	30	100	30	100	30	100	30	100	0	0
4	Regulate erring companies	State	120	30	0	30	100	100	12	40	25	83	0	0
		Centre	0	0	30	0	0	0	18	60	5	13	100	100
5	Conduct MLTs	State	0	30	0	0	0	0	0	0	0	0	0	0
		Centre	0	0	0	0	0	0	0	0	0	0	0	0
		Both	120	0	30	30	100	100	30	100	30	100	100	100
6	Conduct trials for Bt/GE ^a crops	State	120	30	0	30	100	100	16	53	0	0	0	0
		Centre	0	0	30	0	0	0	11	37	0	0	100	100
		Both	0	0	0	0	0	0	3	10	30	100	0	0
7	Registration of seeds	State	120	30	0	0	0	100	6	20	0	0	0	0
		Centre	0	0	30	0	0	0	22	73	0	0	100	100
		Both	0	0	0	30	100	0	2	7	30	100	0	0

^a Genetically Engineered crops

PSCs were against the interference of government (both central and state governments) in regulation of sale price and trait fee of seed and awarding compensation. They suggested that central government should be the authority to regulate erring companies, to conduct trials for Bt. /GE crops and to register seed for sale. They advocated for both public and private sector involvement in conducting Multi Location Trials (MLTs).

Many instances wherein state governments have failed to regulate the erring companies because of absence of provisions in the seed legislations and consequent absence of powers to state governments have been reported. In a letter to the

Honorable Prime Minister, Government of India, representatives of farmer wings of different political parties, independent farmer organizations and NGOs working with farmers (AP Farmers Unions and NGO Coordination Committee, 2010) have quoted following four cases citing the helplessness of government of AP in regulating erring seed companies in the state.

1. In 2005, after establishment of large scale cotton seed failure in Warangal district, State government asked Mahyco to pay compensation. This company refused to pay and moved to AP high court on paying compensation saying state government is harassing them. AP High court orders also were in favour of Mahyco and till date the company has not paid the compensation
2. In 2006, after Monopolistic and Restrictive Trade Practices (MRTP) Commission's ruling to reduce the Bt. cotton seed price, AP government reduced the cotton seed prices to Rs. 650 and Rs. 750 for Bollgard I and II respectively. Challenging this, MMB moved to Delhi high court on this issue. The case is still pending in the court.
3. In 2007, when Agriculture Officers in Warangal district found that Mahyco Bt. hybrids were being sold in Warangal market, they raided and seized the shop. Mahyco challenged that cotton seed was removed from Essential Commodities Act 1955, hence Seed Control Order which draws powers from ECA does not apply to cotton. At this juncture, AP government made a new act to regulate transgenic cotton seed in the state. However, all these Acts, including Seed Control Order 1983, will be repealed once the Seed Bill 2004 is passed, thereby taking away the rights of the farmers and also the powers of the State government.
4. In 2010, Monsanto filed case in AP High Court requesting to stop state government from reducing the royalty arguing that it does not have any power to do so. The case is still pending in the court.

Shri. Nitish Kumar, the Honorable Chief Minister of Bihar, in his letter to the Union Agriculture Minister, Government of India, stated that the state exchequer faced an extra burden of Rs.61 crore as compensation to the farmers at the rate of Rs 10,000 per acre, because of non-formation of grain after maize farmers used hybrid seeds

supplied by private companies in 61000 hectares in the rabi season of 2009-10. Yet, the private companies did not do anything to compensate to farmers (TOI, 2011).

It is clear that in the existing legal framework, state governments have no powers and they are finding it difficult to regulate the seed industry in their respective states. Even in Seed Bill 2004, powers to State governments are inadequate. Hence, state governments should be given powers to regulate seed prices and royalties, to evolve a simple mechanism to pay adequate compensation and to award punishment for offenses with adequate fine.

With respect to regulation of retail price of seed, the Seed Bill drafters did not accept any amendment, even though the Parliamentary Standing Committee on Agriculture recommended in its report. State governments need to possess some discretionary powers to regulate retail seed prices for safeguarding farmers from exploitation by private seed companies and Multi-National Corporations. The status of price regulation of seed in the bill is given in box 4.3.4.

Box 4.3.4: Regulation of retail price of seed

Clause	Provision in Seed Bill 2004	Amendment Proposed	Present Status
No Clause	Absent	<i>Regulation of seed prices through a statutory body or a Committee for the fixation of price of seed can be incorporated in Clauses 5, 11, 15, 22 and 25.</i>	Not accepted

The opinion of various stakeholders on the regulation of retail price of seed is given in table 4.3.3A. The bill is completely silent on seed pricing. All the ADOs, NGO personnel, farmers and majority of researchers unanimously argued that price regulation was necessary since PSCs are charging exorbitantly high on seeds, especially on hybrids and proprietary technologies as in case of Bt. cotton. They argued that price regulation mechanism (PRM) should be included in the Bill itself. The PSCs argued that government should not interfere in fixing the price of seeds and strongly believed that only market forces such as demand and supply and farmers' preference should decide the price of seeds. They also opined that PRM would curtail the competition among seed producing agencies to develop new innovations and it would harm farmers in the long run by limiting their access to quality seed. PSCs also warned that PRM would deincestivise them in investing in R&D and seed business. They defended the high price of seeds in case of proprietary technologies on the

ground that lot of money was invested in R&D to develop those innovations and that lot of money needs to be further invested in developing new innovations.

Table 4.3.3A: Agreement of stakeholders on Regulation of Retail Price of Seed

No.	Regulation of retail price of seed		Agreement of stakeholders											
			Farmers		NGOs		ADOs		Researchers		Dealers		PSCs	
			<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%
1	A strong felt need		120	100	30	100	30	100	24	80	25	83	0	0
2	Mechanism	Within Seed Bill	120	100	30	100	30	100	18	60	0	0	0	0
		Outside Seed Bill	0	0	0	0	0	0	6	20	25	83	0	0
3	Authority	State	120	100	30	100	30	100	15	50	25	83	0	0
		Centre	0	0	0	0	0	0	9	30	0	0	0	0

The strongest argument made by the supporters of PRM is the very low share of seed producing farmer in retail price of Bt. cotton seeds. The procurement price and market price of Bt. cotton seeds of three companies is given in table 4.3.3B.

Table 4.3.3B: Cost of production, procurement and marketing prices of cottonseeds of three MNCs: (2001-2002)

Name of Company (seed brand name)	Cost of production for farmers (Rs./kg)	Procurement price from farmers (Rs./kg)	Marketing Price (Rs./kg)	Farmers' share* in the market price (%)
HLL (Brahma)	220	290	1100	26
Syngenta (Sandocot 35)	220	290	1000	29
MMB (Bollgard Bt cotton)	220	250-300	3550	7 – 8

Source: Venkateswarlu, D (2003); * Figures rounded off to the nearest value.

It is very clear from the table that farmers' share was below 30 percent and it was less than 10 percent in case of Mahyco-Monsanto Biotech (MMB). The reason behind such exorbitant high prices of seed is the higher share of royalty. The close analysis revealed that market forces did not operate in case of Bt. cotton seed market because of monopolistic and oligopolistic market conditions. Three hybrids of Bt. cotton were introduced in India by MMB in 2002. The prices were fixed at Rs. 1800 per packet of 450 gram which can be used to sow in an acre. It was evident that MMB enjoyed monopoly for several years in Bt. cotton seed market in India. In 2005 Rasi and Ankur Seeds (PSCs) which also developed Bt. cotton in license agreement with MMB

also got approval for their Bt. hybrids. As on 2011, six different Bt. cotton events have been commercially approved in India. They include 2 events from MMB, 1 each from JK Agri-Genetics Limited, Nath seeds, CICR-UAS Dharwad, and Metahelix Life Sciences. Hence, it is recommended that PRM is necessary under monopolistic and oligopolistic conditions especially for proprietary technologies.

5. Regulation of Royalty Fee

In case of Bt. cotton, when new traits are included in the seeds, the MNCs charge extra fees on account of royalty fee they claim over a patented trait(s). This royalty fee has become a bone of contention between the state governments and the MNCs who sell such seeds. This is an important clause that was missing in the Seed Bill and when asked for a proposed amendment, the drafters of the Seed Bill did not accept as can be seen in Box 4.3.5.

Box 4.3.5: Trait/royalty fee regulation

Clause(s)	Provision in Seed Bill 2004	Amendment Proposed	Present Status
Clause 5, 11, 15, 22 and 25	Absent	Procedure for fixing royalty over proprietary technologies should be provided	Not accepted

The perception of various stakeholders about the regulation of trait/royalty fee is outlined in table 4.3.4A.

Table 4.3.4A: Agreement of stakeholders on Trait/Royalty fee regulation

No.	Trait/Royalty fee regulation		Farmers		NGOs		ADOs		Researchers		Dealers		PSCs	
			<i>f</i>	%	<i>F</i>	%	<i>f</i>	%	<i>f</i>	%	<i>F</i>	%	<i>F</i>	%
1	Need		120	100	30	100	30	100	30	100	25	83	14	47
2	Mechanism	Within Seed Bill	120	100	30	100	30	100	6	20	25	83	0	0
		Outside Seed Bill	0	0	0	0	0	0	24	80	0	0	14	47
3	Authority	State	120	100	30	100	30	100	0	0	25	83	0	0
		Centre	0	0	0	0	0	0	30	100	0	0	0	0

Majority of the PSCs (53%) argued that there is no need to regulate trait fee. However, it was interesting to note that remaining companies (47%) advocated in favour of trait fee regulation and the reason they cited for this was that proprietary

technologies have benefitted only MNCs and large scale Indian companies. The small scale seed companies have to pay a large sum to get licensing and sub-licensing to acquire these patented technologies even for few years. Anilkumar (2010) reported that there was a license agreement between Indian companies and MMB according to which Indian companies had to pay upfront Rs. 50 lakhs and an amount annually fixed by MMB for using the patented gene developed by MMB in development of Bt. cotton seeds. Indian companies were also asked to pay Rs. 1200 on every seed packet (of 450gm each) initially. So, trait fee regulation would benefit small-scale companies to emerge and compete with MNCs and large scale Indian companies. However, all those PSCs who argued in favour of trait fee regulation believed that such mechanism should be outside the framework of the bill and that the percent of royalty charged be negotiable between the technology developers and the central government.

All the researchers, ADOs, NGO personnel and farmers strongly advocated in favour of regulation of royalty fee since private companies are setting exorbitantly higher prices especially for proprietary technologies as in case of Bt. cotton seeds because of higher share of royalty fee. The retail price and share of royalty of Bt. cotton seeds supplied by MMB in AP is given in table 4.3.4B.

Table 4.3.4B: Market price and share of royalty on Bt. cotton seeds supplied by MMB

Year	Type of seed	Market price of seed for 450 gram packet (Rs.)	Share of royalty (Rs.)	% share of royalty in market price of seed	Andhra Pradesh Government's intervention
2002	Bt. I	1800	1250	69.44	Nil
2006	Bt. I	750	n.a.	n.a.	MRP of seed was fixed
	Bt. II	925	n.a.	n.a.	
2008	Bt. I	650	150	23.07	MRP of seeds further reduced
	Bt. II	750	225	30.00	
2012	Bt. I	830	n.a.	n.a.	MRP of seeds increased
	Bt. II	930	n.a.	n.a.	

Source: Anilkumar (2010); Information pertaining to the year 2012 was added by the researcher; n.a. = Not available

It is very clear that MMB enjoyed royalty share as high as 70 per cent for few years in the beginning when Bt. cotton was approved for commercial cultivation in India in 2002. However, AP government filed a case with MRTP Commission and fixed the price of Bt. cotton seeds in 2006 at Rs. 750 and 925 respectively for Bt. I and Bt. II seeds. AP government further reduced the prices to Rs. 650 and 750 respectively for

Bt. I and Bt. II seeds. Mishra (2006) reported that the state government of Andhra Pradesh was the first to implement price restrictions. Its 2006 directive capped prices for biotech cotton seeds at less than one-half the prevailing market price. Today, price caps have spread to important cotton-growing states throughout the country including Maharashtra, Gujarat, Tamil Nadu, Karnataka, Madhya Pradesh, and West Bengal.

All the researchers, ADOs, NGO personnel and farmers also felt that the bill should include a clause to regulate royalty fee. Majority (80%) of the researchers believed that trait fee regulation mechanism should be outside the framework of the bill and argued that central government should be the authority to regulate trait fee since seed companies have a pan-Indian business operations and it would be highly inappropriate to fix different trait fee by different states. Hence, it is recommended that trait fee regulation is necessary under monopolistic and oligopolistic market conditions especially for proprietary technologies involving royalty component.

6. Compensation to farmers in case of crop failure

In case of seed failure and subsequent crop failure due to spurious seed, farmers incur losses and there is no adequate mechanism for giving compensation to them in previous seed laws. Experiences of farmers incurring losses due to seed failure were accumulating over years and needed policy makers' attention. This is one of the contentious issues in the seed bill and its status can be seen in box 4.3.6.

Box 4.3.6: Compensation issues

Clause(s)	Provision in Seed Bill 2004	Amendment Proposed	Present Status
Clause 20	Where the seed of registered kind or variety is sold to a farmer, the producer, distributor or vendor, as the case may be, shall disclose the expected performance of such kind or variety to the farmer under given conditions, and if, such registered seed fails to provide the expected performance under such given conditions, the farmer	Substituted “20. (1) Where the seed of a registered kind or variety is sold to a farmer, the producer, distributor or vendor, as the case may be, shall disclose the expected performance of such kind or variety to the farmer under given conditions and if, such registered seed fails to provide the expected performance under such given conditions, the farmer may claim such compensation from the producer, dealer, distributor or vendor, as may be determined by a compensation committee. (2) the central government may prescribe,- (a) the composition and experience of the members of the Compensation Committee;	Accepted

	may claim compensation from the producer, dealer, distributor or vendor under the Consumer Protection Act, 1986.	(b) the procedure to be followed by such Compensation Committee; (c) the manner of giving compensation by such Compensation Committee to the farmer; (d) the time within which the compensation so determined shall be paid to the farmer.	
Clause 20		Substituted (3) Any compensation determined by the Compensation Committee under sub-section (1) if not paid to the concerned farmer, shall be recovered as an arrear of land revenue. (4) Any farmer aggrieved from the decision of the Compensation Committee may prefer an appeal to the prescribed authority which shall dispose off the appeal within such time and in such manner as may be prescribed”.	
Clause 46	Absent	Inserted “(sub-clause ja) the composition and experience of the members of the Compensation Committee, the procedure to be followed by it, the manner of giving compensation and the time within which the compensation so determined is to be paid to the farmer under subsection (2) of section 20; (jb) the authority to whom appeal may be preferred and time and manner for making appeal under subsection (4) of section 20;”	Accepted
Clause 20	Absent	Compensation may be awarded within 30 days of the filing of the claim	Not Accepted
	Absent	Establish state and district level compensation committees	Not Accepted
	Absent	Such compensation is not less than the monetary value of the expected performance plus costs incurred by the farmer for cultivation	Not Accepted
	Absent	The concerned state government should prescribe composition etc. of the committee and not the GOI.	Not Accepted
	Absent	Seed crop insurance scheme should be reintroduced by incorporating a suitable provision in the bill	Not accepted

The opinion of various stakeholders regarding various issues related to compensation mechanism is presented in table 4.3.5.

Table 4.3.5: Agreement of stakeholders on Compensation issues

N o.	Issues related to Compensation		Agreement of stakeholders											
			Farmers		NGOs		ADOs		Research ers		Dealers		PSCs	
			<i>F</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%
1	Need for CC ¹		120	100	30	100	30	100	30	100	30	100	30	100
2	CC	Within Seed Bill	120	100	30	100	30	100	22	73	20	67	0	0
		Outside Seed Bill	0	0	0	0	0	0	8	27	10	33	30	100
3	Authority	State	120	100	30	100	30	100	30	100	30	100	0	0
		Centre	0	0	0	0	0	0	0	0	0	0	0	0
4	Manner of paying compensation	SDA ²	120	100	30	100	30	100	25	83	0	0	0	0
		Insurance	0	0	0	0	0	0	5	17	30	100	30	100
5	Appellate Authority	Need	120	100	30	100	30	100	27	90	30	100	0	0
	Mechanism	Within Seed Bill	120	100	30	100	30	100	24	80	20	67	0	0
		Outside Seed Bill	0	0	0	0	0	0	3	10	10	33	0	0
6	Need for seed crop insurance		120	100	30	100	30	100	30	100	30	100	30	100

¹ CC = Compensation Committee; ² SDA= State Department of Agriculture

The bill states that farmers can claim compensation through consumer forums under the Consumer Protection Act 1986. But it is difficult for farmers in this country, who are mostly illiterate, to access and successfully obtain redressal through these consumer forums. All the stakeholders unanimously agreed for the need for establishment of compensation committee (CC) to decide on matters related to compensation to farmers in case of failure of seed to give expected yield. They expressed that CC should be a technically competent body and have representatives from SDA, central government, private seed companies, farmers, and insurance companies. However, all the ADOs, NGO personnel, farmers and majority of researchers (73%) preferred that CC should be included in the framework of bill itself. PSCs advocated that CC should be outside the framework of the bill. All the ADOs, NGO personnel, farmers and researchers felt that disbursement of compensation should be through SDA. PSCs argued that insurance companies should pay to the farmers directly. It is to be noted that at present there is a mechanism for crop insurance (for general crop production) in India but it is absent for seed crop.

Therefore, all the stakeholders strongly advocated for the need of seed crop insurance and demanded that government should initiate the process of formulating guidelines in this direction.

CSA, (2005) argued that the bill is completely inadequate when it comes to compensation to farmers in the case of seed failure. The bill should take the opportunity to provide a mechanism for providing compensation to farmers in case of seed failure. Such compensation should be linked to a seed insurance system the premium for which is paid by the seed trader. Compensation should also be calculated based on a formula that should be specified in the legislation itself. This should be the monetised value of the expected performance as well as coverage of costs of cultivation incurred and not just the seed cost. Expected performance should be taken as the promised performance specified on the leaflet in the given conditions.

All the ADOs, NGO personnel, farmers and majority of the researchers (90%) argued that there should be an Appellate Authority (AA) as a final authority to receive appeal from aggrieved farmers who are not satisfied with the decision of the CC in matters related to compensation. They also advocated for including AA in the bill itself. PSCs expressed that there is no need for AA at all. So, it is recommended that simple and farmer-friendly redressal mechanism in the form of compensation committee to be provided in the bill itself.

Punitive and accountability clauses

Previous seed legislations have clauses to punish the seed industry for violating the provisions of the seed bill. However, many argued that the fines are flat (fixed value irrespective of volume of spurious sale of seed) and even the punishment to deter in indulging in production and sale of spurious seed was weak. The clauses and amendments related to punitive and accountability clauses in the bill are provided in box 4.3.7.

Box 4.3.7: Punitive and accountability clauses

Clause(s)	Provision in Seed Bill 2004	Amendment Proposed	Present Status
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Clause 38	<p>(1) If any person—</p> <p>(a) contravenes any provision of this Act or any rule made thereunder; or</p> <p>(b) imports, sells, stocks or exhibits for sale or barter or otherwise supplies any seed of any kind or variety deemed to be misbranded; or</p> <p>(c) imports, sells, stocks or exhibits for sale or barter, or otherwise supplies any seed of any kind or variety without a certificate of registration; or</p>		
	<p>(d) obstructs the Committee, Registration Sub-Committee or Seed Certification Agency or Seed Inspector or Seed Analyst or any other authority appointed or duly empowered under this Act in the exercise of its powers or discharge of their duties under this Act or the rules made thereunder, he shall, on conviction, be punishable with fine which shall not be less than five thousand rupees but which may extend to twenty-five thousand rupees.</p>	Substituted “twenty-five thousand rupees which may extend to one lakh”	Accepted
Clause 38	<p>(2) If any person sells any seed which does not conform to the standards of physical purity, germination or health or does not maintain any records required to be maintained under this Act or the rules made thereunder he shall, on conviction, be punishable with fine which shall not be less than five thousand rupees but which may extend to twenty-five thousand rupees.</p>	Substituted “twenty-five thousand rupees which may extend to one lakh”	Accepted
Clause 38	<p>(3) If any person furnishes any false information relating to the standards of genetic purity, misbrands any seed or supply any spurious seed or spurious transgenic variety or sells any non-registered seeds he shall, on conviction be punishable with imprisonment for a term which may extend to six months or with fine which may extend to fifty thousand rupees or with both.</p>	Substituted “one year or with fine which may extend to five lakh”	Accepted
Clause 38	Absent	A fine in proportion to the damage caused, quantity of seeds supplied or stocked with malicious/negligent intent and therefore, X-times the real loss or potential loss incurred by the farmers.	Not Accepted

The perception of various stakeholders about the punitive measures on offences is given in table 4.3.6.

Table 4.3.6: Agreement of stakeholders on Punitive and accountability clauses

N o.	Issues related to Punitive and accountability caluses		Agreement of stakeholders											
			Farmers		NGOs		ADOs		Researc hers		Dealers		PSCs	
			<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>F</i>	%
1	Nature of monetary penalty	Flat/Fixed	0	0	0	0	0	0	0	0	0	0	30	100
		Formula	120	100	30	100	30	100	30	100	30	100	0	0
2	Other measures in case of repeated and serious offences (Imprisonment, blacklisting, etc.)		120	100	30	100	30	100	30	100	30	100	30	100
3	Mechanism	Within Seed Bill	120	100	30	100	30	100	24	80	20	67	0	0
		Outside Seed Bill	0	0	0	0	0	0	6	20	10	33	30	100
4	Authority	State	120	100	30	100	30	100	18	60	30	100	0	0
		Centre	0	0	0	0	0	0	12	40	0	0	30	100

The penalty clauses provided in the bill for offences are very mild and not deterrent enough. Given that spurious seed trade is worth crores of rupees, the small penalties being proposed are not any deterrent to the offenders. All the stakeholders except PSCs agreed that there should be a formula specified in the bill itself for calculating the penalty applicable. For instance, the penalty should be based on the quantity of seed supplied or stocked with malicious/negligent intent and therefore, X-times (may be 5 to 10 times) the real loss or potential loss incurred by farmers and not a fixed amount irrespective of the magnitude of the offence. Majority of the PSCs stated that punitive measures should be based on the nature of offence and the provisions of the Seed Act 1966 should be followed in this aspect. CSA (2005) recommends that punitive and compensation clauses should apply to misbranding, selling at prices higher than specified prices/MRP, failure of germination, lack of genetic purity etc. Misbranding should be defined to include failure to reveal or keep up promises made during marketing/propaganda by the company and should include failure to reveal or

keep up promises on expectable performance under different conditions as per the MLTs as part of the packaging of the seed.

Hence, it is recommended to make punitive measures more stringent and should take into account the nature and volume of seed transaction.

Registration and parentage issues

The contentious issues with respect to registration of varieties and disclosure of parentage are presented in box 4.3.8.

Box 4.3.8: Registration and parentage issues

Clause	Provision in Seed Bill 2004	Amendment Proposed	Present Status
Clause 12	For the purposes of this Act, a register of all kinds and varieties of seed to be called the National Register of Seeds shall be kept by the Registration Sub-Committee wherein all specifications, as may be prescribed, shall be maintained.	Inserted “Provided that the farmers shall not be required to register the farmers’ varieties of seeds in the said register”.	Accepted
Clause 13	(1) No seed of any kind or variety shall, for the purpose of sowing or planting by any person, be sold unless such seed is registered under sub-section (2) by the Registration Sub-Committee in such manner as may be prescribed.	Inserted “except the farmers’ variety”	Accepted
Clause 13	(4) A registration made under this Act shall be valid for a period of fifteen years in the case of annual and biennial crops, and eighteen years for long duration perennials.	Substituted ten years in the case of annual and biennial crops, and twelve years for long duration perennials.	Accepted
Clause 13	(5) At the expiry of the period granted under sub-section (4), the kind or variety of seeds may be re-registered for a like period by the Registration Sub Committee on the basis of information furnished by the producer on the results of such trials as may be prescribed under sub-section (2) to re-establish performance of the kind or variety of seeds.	Delete provision for re-registration of seed for a like period	Not Accepted
Clause 15	(1) Notwithstanding anything contained in section 14, no seed of any transgenic variety shall be registered unless the applicant has obtained a		Accepted

	clearance in respect of the same as required by or under the provisions of the Environment (Protection) Act, 1986: Provided that the Registration Sub-Committee may, subject to clearance under the said Act, grant provisional registration, for a period not exceeding two years on the basis of information furnished by the producer on the results of multi-locational trials conducted in the prescribed manner.		
Clause 46	Absent	Inserted “(sub-clause zfa) the manner of conducting multi-locational trials under section 36”.	Accepted
Clause 13	Absent	Grant of right to any person under clause 12 (5) to question a registration granted to a variety and apply for cancellation of the registration and have the right to raise pre-grant and post-grant objections within the committee	Not Accepted
Clause 14	Absent	Application for registration under Clause 14 should include a disclosure of the origin of the seed by the applicant/ complete passport data of parental lines	Not Accepted
Clause 19	The committee may, for conducting trials to assess performance, accredit centers of the Indian Council of Agricultural Research, State Agricultural Universities and such other organizations fulfilling the eligibility requirements as may be prescribed, to conduct trials to evaluate the performance of any kind or variety of seed	Trials to assess the performance to be conducted by the ICAR/SAUs and government/semi-government organization only. Private organizations should not be allowed to evaluate performance.	Not Accepted

The perception of stakeholders about the issues related to registration and parentage is outlined in table 4.3.7. All the stakeholders agreed for the inclusion of a clause in the bill which allows the public access to information related to the registration of varieties as well as provision for opposition to registration of certain varieties if there is a reason to believe that the variety is not what it is claimed. The bill allows for registration of seed varieties without disclosing the origin/parentage of seed while granting rights of commercialization. All the NGO personnel, majority of researchers

and ADOs argued that origin and parentage of varieties registered for sale should be disclosed and they believed that otherwise it would lead to bio-piracy and would constitute clear infringement of farmers' rights as breeders since all varieties that exist now have their origin in farmers' varieties. However, majority of PSCs (77%) argued against the disclosure of origin and parentage on the ground that it is their trade secret and disclosure would allow unscrupulous companies to exploit their varieties/hybrids.

Table 4.3.7: Agreement of stakeholders on Registration and parentage issues

Sl. No.	Registration and parentage issues	Farmers		NGOs		ADOs		Researchers		Dealers		PSCs	
		<i>f</i>	%	<i>F</i>	%	<i>F</i>	%	<i>F</i>	%	<i>f</i>	%	<i>F</i>	%
1	Pre-grant opposition	30	100	30	100	30	100	30	100	30	100	23	77
2	Disclosure of parentage for registration	30	100	30	100	26	87	18	60	20	67	7	23
3	Provisional registration of GE crops	0	0	0	0	0	0	0	0	0	0	0	0

The seed bill proposed for provisional registration of transgenic varieties for two years, even before a transgenic variety is assessed for its bio-safety and environmental clearance. This is a clear violation of the Environment Protection Act (EPA) 1986 that govern GMOs and their clearance. All the stakeholders agreed that this clause in the bill be withdrawn. CSA (2005) recommends that the bill should not venture into regulating transgenic varieties and should leave this to other competent authorities. Once transgenic varieties receive environmental clearance and other biosafety clearances, then the seed bill should seek to regulate these varieties like any other seed varieties.

Certification of seed

There are arguments around who should certify the seeds, whether self-certification be allowed and to what extent private players be allowed for certification. These can be seen in box 4.3.9.

Box 4.3.9: Certification of seed

Claus e(s)	Provision in Seed Bill 2004	Amendment Proposed	Present Status
Clause	Absent	Regarding labelling, it is	Not

6		suggested that a seed mark, or symbol on the lines of Agmark to denote quality of the seed should be introduced and the labelling provisions under the Seed Act should be harmonised with the provisions of other acts such as weights and Measurement Act, Package Act, etc.	accepted
Clause 30	The Central Government may, on the recommendation of the committee by notification, authorise any seed certification agency established in a territory outside India, for such purposes as may be specified therein.	Seed certification agency established in any foreign country is recognised only if the seed certified by it is tested on Indian soil	Not accepted
Clause 32	32 (2) The State Government may by notification, establish one or more State Seed Testing Laboratories or declare any Seed Testing Laboratory in the Government or non-Government sector as a State Seed Testing Laboratory where analysis of seed of any kind or variety shall be carried out, under this Act in the prescribed manner	Non-governmental laboratories may not be allowed to test seed under the act. It is proposed that the words non-government should substitute semi-government	Not accepted
	32 (2) The State Government may by notification, establish one or more State Seed Testing Laboratories or declare any Seed Testing Laboratory in the Government or non-Government sector as a State Seed Testing Laboratory where analysis of seed of any kind or variety shall be carried out, under this Act in the prescribed manner	Non-governmental laboratories may not be allowed to test seed under the act. It is proposed that the words non-government should substitute semi-government	Not accepted

The opinion of stakeholders on issues related to certification of seed is presented in table 4.3.8.

Table 4.3.8: Agreement of stakeholders on Certification of seed

No.	Item		Farmers		NGOs		ADOs		Researchers		Dealers		PSCs	
			<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>F</i>	%	<i>f</i>	%	<i>F</i>	%
1	Authority	Public	120	100	30	100	30	100	30	100	0	0	0	0
		Private	0	0	0	0	0	0	0	0	0	0	0	0
		Both	0	0	0	0	0	0	0	0	30	100	30	100
2	Need for private participation		0	0	0	0	12	40	27	90	20	67	27	90
3	Need for self-certification		0	0	0	0	22	73	29	92	20	67	30	100

The opinion of various stakeholders about the certification of seed is given in table 4.3.8. Under the bill, the accredited individuals and institutions will be able to provide certification. The provision of self-certification is also allowed. All the researchers, ADOs, NGO personnel and majority of farmers argued that only the public sector organisations viz., State Seed Certification Agencies should have the authority to certify the seeds. Majority of the PSCs (90%) and researchers (90%) felt that self-certification is needed since it is already in practise and they are sold in market as truthfully labelled (TL) seeds. However, NGO personnel opposed this move. Farmers said option of TL seeds should be there but they should not be sold as certified seeds. Hence, the provision of self-certification (as ‘Certified Seeds’) should be withdrawn and the current system of third party certification be continued with more accountability measures.

10. Import of Seeds

A special provision is being made to import seed for different MNCs and big domestic seed companies under this Seed Bill. The issues of concern relevant to import of seed are presented in box 4.3.10.

Box 4.3.10: Import of seeds

Clause(s)	Provision in Seed Bill 2004	Amendment Proposed	Present Status
Clause 36	(I) All import of seeds— (c) shall be subject to registration as may be granted on the basis of information furnished by the importer on the results of multi-locational trials for such period as may be prescribed to establish agronomic performance.	Substituted “Multi-locational trials conducted in such manner and”	Accepted
	Absent	Inserted “Provided that all import of seeds of transgenic varieties shall also be subject to the provisions of the Environment (Protection) Act, 1986 or any other law for the time being in force”.	Accepted
	Absent	The multi-locational trials to be conducted in India. Multi-locational trials to be conducted by ICAR/State	Not Accepted

		Agricultural Universities	
	The Central Government may, on the recommendation of the Committee and by notification, recognise any seed certification agency established in any foreign country, for the purposes of this Act.	Substituted The Central Government may, on the recommendations of the Committee, by notification, recognize any seed certification agency established in a territory outside India, for such purposes as may be specified therein.	Accepted

The opinion of stakeholders regarding various issues related to import of seed is outlined in table 4.3.9.

Table 4.3.9: Agreement of stakeholders on Import of seeds

No.	Import of seeds		Agreement of stakeholders											
			Farmers		NGOs		ADOs		Resear chers		Dealer s		PSCs	
			<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%
1	Authority to conduct MLTs	Only public sector	120	100	30	100	30	100	27	90	15	50	0	0
		Only private sector	0	0	0	0	0	0	0	0	0	0	0	0
		Both	0	0	0	0	0	0	3	10	15	50	30	100
2	Permit to import seeds based on the information given by importer		0	0	0	0	8	27	21	70			30	100

All the ADOs, NGO personnel, farmers and majority of researchers (90%) argued that imported seeds should be allowed for commercial sale in the country, only after the establishment of agronomic performance by public sector research organisations under Indian conditions even if the seed is approved by international seed certification agencies. However, PSCs argued that import of seeds should be allowed based on the information given by the importer since such imported seeds carry ISTA/OECD certificates approving their quality. It is therefore recommended that imported seeds should be allowed based on pest risk analysis and establishment of agronomic performance inside the country.

11. Biodiversity

Biodiversity is an essential principle underlying the harmony of nature. Biodiversity in an area depicts the sustainability of an ecosystem. It is true in case of cropping systems also. Monocropping will lead to imbalance in use of natural resources and hence seed legislation should promote biodiversity by incentivizing multicropping

and use of different types of varieties of the same crop. However, the bill is completely silent on any aspect related to biodiversity. The opinion of the respondents on the need for promoting biodiversity in seeds is presented in table 4.3.10.

Table 4.3.10: Agreement of stakeholders on Need for conserving biodiversity in seeds

No.	Biodiversity in seeds	Farmers		NGOs		ADOs		Researchers		Dealers		PSCs	
		<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>F</i>	%
1	Need to save biodiversity in seeds	120	100	30	100	30	100	30	100	26	87	05	17

It is very clear from the table that all the stakeholders except PSCs strongly agreed for inclusion of clauses in the bill to promote biodiversity in seeds for cultivation of crops. Certain countries like USA, China and Australia have clauses in their seed legislation which aim at preservation and conservation of seed germplasm. Hawaii restricts Bt. cotton cultivation in any area/region to less than 80 percent of the area.

Differences among various stakeholders on some critical issues

The results have already been presented to show how the various stakeholders agreed or disagreed on some of the clauses and the contentious issues thereof in each clause. The results have amply illustrated the differences among the stakeholders.

However, statistical tests were employed to test the following questions and the resultant hypotheses:

1. Did the stakeholders differ from one another in their perception of the various critical issues and clauses in the Seed Bill?

Null hypothesis: The stakeholders did not differ from one another in their perception of the various critical issues and clauses in the Seed Bill

Alternate hypothesis: The stakeholders differ from one another in their perception of the various critical issues and clauses in the Seed Bill

2. Did the farmers differ from the other sets of stakeholders in their perception of the various critical issues and clauses in the Seed Bill?

Null hypothesis: The farmers did not differ from the other sets of stakeholders in their perception of the various critical issues and clauses in the Seed Bill

Alternate hypothesis: The farmers differ from the other sets of stakeholders in their perception of the various critical issues and clauses in the Seed Bill

To answer the questions, the perception of all the stakeholders on the critical issues was obtained using a five-point rating scale of importance that the respondent gives to each of the issues: 'Most Important', 'Important', 'Somewhat Important', 'Less Important', and 'Least Important' with a score of 4, 3, 2, 1 and 0 respectively. In all, twelve most critical issues were considered for the measurement of perception of respondents.

As the measurement done was on an *ordinal* level, appropriate non-parametric tests were used. For this, Kruskal-Wallis H test is used. The Kruskal-Wallis H test is the nonparametric analog of one-way analysis of variance and detects differences in distribution location. One-way analysis of variance helps in telling whether the samples of respondents differed on the specific variable or not. The Kruskal-Wallis H test requires that the tested samples be similar in size. So to meet this requirement, 15 farmer respondents from each of the two states were picked up using random numbers table to make the size of sample of farmers be 30 in similarity with the sample sizes of other stakeholders.

Hence such a non-parametric test was done for the six independent samples of 30 for all the stakeholders. The test was repeated for each of the twelve critical issues under consideration. The results are given in table 4.3.11, in which the mean ranks are given for all critical issues and for all the stakeholders. The Kruskal-Wallis H statistics are given as chi-square at 5 degrees of freedom, which is the statistic of significance.

As the results in the table 4.3.11 revealed, all the chi-square statistics were significant statistically at 0.01 level of probability. So the null hypothesis that '*the stakeholders are not different from one another in their perception of importance given to each of the twelve critical issues in Seed Bill*' can be rejected. The alternate hypothesis that the samples of stakeholders are different from one another can be accepted.

It can be inferred that all the stakeholders were different from one another in the perception of importance of all the twelve critical issues in the Seed Bill. Hence, the first question that *‘Did the stakeholders differ from one another in their perception of the various critical issues and clauses in the Seed Bill?’* was answered in the affirmative, thereby meaning that they did differ from one another in their perception of critical issues in the Seed Bill.

Then in order to answer our next question: *‘Did the farmers differ from the other sets of stakeholders in their perception of the various critical issues and clauses in the Seed Bill?’*, the data were subjected to another non-parametric test called Mann-Whitney U test, which compares two samples and answers this question. Here the sample of farmers was compared with each of the other five samples of stakeholders on their perceptions of importance given to each of the twelve critical issues in the Seed Bill. The Mann-Whitney U statistics for all the twelve critical issues and for all sets of samples are presented in table 4.3.12. Any statistic that is significant statistically at 0.05 or 0.01 level of probability tells that there is a significant difference between the two samples for the particular critical issue under consideration. In such cases null hypothesis that the samples are not different from each other can be rejected and the alternate hypothesis accepted. Discussion of each set of comparisons is given below.

Farmers vs. NGOs: Among all the stakeholders, NGOs (including Civil Society Organizations and Farmers’ Organizations) shared a great degree of similarity with farmers on the issues of seed policy. NGOs were the first group to raise serious objections on the anti-farmer clauses in the Seed Bill 2004. They took very active role in bringing various contentious issues in the bill to the mainstream discussion among farmers, policy makers, academicians and media. Hence, farmers’ issues were the priority issues for NGOs as is evident from the results in the table. The important issues such as upholding farmers’ rights, strengthening of informal seed sector, granting powers to State governments, price and royalty fee regulation were the priority issues for both the farmers and NGOs. On the issue of self-certification, NGOs and farmers differed significantly. Farmers’ view was that self-certification is already in practice in the form of truthfully labelled seeds. However, NGOs were very sceptical about misusing this practice of self-certification by PSCs and they argued that only third party certification by state seed certification agencies should be

followed. NGOs want to uphold the sanctity and authority of the state seed certification agencies for certifying seeds produced by all types of seed producers including private companies.

Farmers vs. ADOs: The two samples of farmers and ADOs appear to be similar only on seven issues and differ on five critical issues in the Seed Bill. ADOs had similar views with farmers with respect to issues such as farmers' rights, strengthening informal seed sector, granting powers to state governments, and compensation issues. However, ADOs perceived that strengthening of public sector seed system (research, development of new cultivars, quality seed production, multiplication and distribution) as more important issue than regulating seed prices and royalties. They argued that issues of price and royalty regulation are the outcome of weakening of public sector seed systems (and domination of seed market by private seed companies) and they argued that as long as the public sector has a dominant role in seed production and distribution of high quality seeds to farmers, the price and royalty regulation are not priority issues.

Farmers vs. Researchers: The two samples of farmers and researchers appear to be quite dissimilar on eight issues and similar only on four critical issues in the Seed Bill. On the issue of farmers' rights, researchers agreed with farmers. However, there was a great mismatch between the priorities of farmers and researchers on several issues. For researchers, strengthening of public seed sector was more important than strengthening of the informal seed sector and issues of price and royalty regulation. Majority of the researchers also considered liberalization of seed policy as the most important issue whereas for farmers it was the least priority issue. Researchers believed that liberalization of seed policy is helpful in import of superior germplasm and development of new cultivars. It would help in greater investment in R&D by seed companies and developing a competitive market for seed industry. They also added that liberalization should be seen as one of the component/strategy of strengthening Indian seed sector and it is not a panacea for all problems. They opined that liberalization of Indian seed market along with strengthening public seed sector was the better option.

Farmers vs. Seed Dealers: The two samples of farmers and seed dealers appear to be quite dissimilar on eight issues and similar only on four critical issues in the Seed Bill. Interestingly, dealers were in synchrony with farmers on issues such as granting

powers to State governments, compensation issues and stringent punitive and accountability clauses. Dealers opined that granting powers to State governments will help in having a better monitoring of PSCs and settling compensation issues to farmers in case of seed failure. However, issues such as farmers' rights, price regulation mechanism, strengthening of informal and public seed sector were not important priorities for dealers as much as they were for farmers. It was understandable that dealers get higher percent of profit margins by selling private sector seeds to farmers when compared to profit gains from sale of public sector seeds. Hence, on many issues they had more similarity of perception with PSCs than with the farmers.

Farmers vs. Private Seed Companies: On all the twelve issues, PSCs were in disagreement with farmers. PSCs considered issues such as liberalization of seed sector (and making it pro-private sector), acquiring germplasm from public sector (since public sector has a great repository of germplasm in their gene banks), self-certification (so that they can approve their own seed without the need for certification from certification agencies) and registration and parentage issues were more important. The only concern of PSCs was to promote their business interests in the country and increase their role/dominance in seed sector. PSCs agenda was to make farmers completely dependent on market for seeds which is in their control. Production and distribution of quality seeds to farmers was a means for them to make profits and not an end in itself. PSCs were also against upholding farmers' rights and price and royalty regulation over seeds. PSCs were also apprehensive about revealing the parentage of their seed materials for registration and certification purposes, hence they argue for self-certification. Thus, it could be seen that farmers' priorities were completely opposite to those of PSCs.

Thus it can be concluded that the results of differential perception of various stakeholders revealed that the farmers' perception of priorities and concerns differed greatly with those of PSCs, Dealers and moderately differed with those of Researchers and ADOs. But with NGOs, farmers have agreement on almost all the issues of seed policy.

Table 4.3.11: Differences between the different stakeholders on the priorities through Kruskal Wallis H Test (N=30)

No.	Contentious Issues	Mean Ranks						Chi Square
		Farmers	NGOs	ADOs	Researchers	Dealers	P SCs	
1.	Farmers' rights	127.25	125.22	94.83	79.53	86.97	29.20	78.659**
2.	Strengthening informal seed supply system	126.18	113.72	106.95	87.48	56.42	52.25	54.990**
3.	Powers to State governments	118.45	104.57	108.50	63.52	113.53	34.43	73.872**
4.	Price regulation mechanism	117.72	121.80	98.37	89.00	73.72	42.40	52.595**
5.	Trait/royalty fee regulation	116.60	116.65	89.32	72.62	91.57	56.25	35.190**
6.	Strengthening of the public sector seed system	110.23	111.07	110.23	111.07	37.35	63.05	76.492**
7.	Compensation issues	109.42	111.40	105.23	76.90	101.97	38.08	50.916**
8.	Punitive and accountability clauses	107.85	118.15	102.18	78.27	88.17	48.38	36.920**
9.	Self-certification of seed	79.83	47.67	83.73	102.08	106.75	122.93	39.728**
10.	Registration and parentage issues	78.52	70.28	110.18	71.03	99.30	113.68	22.657**
11.	Sharing of germplasm by public sector	72.77	48.00	93.62	95.92	111.45	121.25	40.983**
12.	Liberalization of seed policy	68.60	46.58	106.35	122.87	88.55	110.05	47.345**

** Significant at 0.01 level of probability

Table 4.3.12: Comparison of farmers with other stakeholders on critical contentious issues through Mann-Whitney U Test (N=30)

No.	Contentious Issues	Mann-Whitney U Test Statistics between samples of farmers and other stake holders					No. of other stakeholders with whom farmers differ
		vs. NGOs	vs. ADOs	vs. Researchers	vs. Dealers	vs. P SCs	
1.	Farmers' rights	448.0	450.0	448.0	206.5**	97.5**	2
2.	Strengthening informal seed supply system	447.0	335.5	240.0**	258.0*	147.0**	3
3.	Powers to State Governments	373.5	392.0	151.5**	422.5	72.0**	2
4.	Price Regulation Mechanism	442.0	280.5**	179.0**	222.5**	23.5**	4
5.	Trait/Royalty Fee regulation	446.0	316.5*	216.0**	293.5*	187.0**	4
6.	Strengthening of the public sector seed system	412.0	249.0**	171.5**	158.5**	160.5**	4
7.	Compensation Issues	428.5	422.0	273.5**	412.5	103.0**	2
8.	Punitive and Accountability Clauses	403.5	425.0	290.0*	342.5	175.5**	2
9.	Self Certification	240.5**	429.0	327.0	297.5*	217.0**	3
10.	Registration and parentage issues	394.0	270.5**	392.5	341.5	265.5*	2
11.	Sharing of germplasm by public sector	317.0	330.0	323.0	247.0*	235.0**	2
12.	Liberalization of Seed Policy	189.0	238.5*	313.5**	247.5*	331.5**	4
	Number of contentious issues that farmers differ with others	1	5	8	8	12	

* and ** Significant at 0.05 and 0.01 level of probability respectively.

Conclusions and policy implications

The study found that the most contentious issues in the bill were related to upholding farmers' rights, regulation of retail price and royalty/trait fee, powers to state governments to regulate seed industry and compensation and punitive clauses. Farmers, NGOs, ADOs, researchers and seed dealers strongly demanded for regulation of retail price and trait/royalty fee of seeds especially in case of proprietary technologies like Bt. cotton. The study revealed that PSCs charged royalty fee as high as 70 percent of the retail price of the seeds until government intervened and fixed the prices. It was found that market forces did not operate in case of proprietary technologies because of monopolistic or oligopolistic market conditions. Farmers, NGOs, ADOs and researchers strongly advocated that state governments should be given authority to regulate seed industry including powers to regulate retail price and royalty fee of seed, to compensate farmers in case of seed failure, to regulate erring companies, etc. since agriculture is a State subject under Constitution in India and farmers have service access to State Department of Agriculture (SDA) rather than the Union Ministry of Agriculture. It was evident from several cases that state governments were helpless in regulating the PSCs while maintaining the interests of farmers. All the stakeholders agreed for the establishment of compensation committee. However, PSCs argued that compensation mechanism should be outside the framework of the bill whereas remaining stakeholders insisted that it should be included in the bill itself. All the stakeholders except PSCs demanded for stringent punitive clauses and argued against the flat fixed fine since the spurious seed trade was worth several millions of rupees. The provision for self-certification of seeds as 'Certified Seeds' by PSCs was disapproved by other stakeholders but they approved to sell seeds as truthfully labelled seeds as is the practice at present. All the stakeholders except PSCs agreed upon disclosure of origin and parentage of seeds before registration of such varieties for commercial sale. All the stakeholders except PSCs agreed that imported seeds should undergo multi-location trials (MLTs) by public sector research organisations to prove agronomic performance in India even if they are certified by the international certification agencies.

The Seed Bill in the original form favours MNCs and large domestic seed companies at the expense of farmers (especially the marginal and small) and informal seed

systems that account for more than 80 percent of the total seed distributed in the country. Hence it is recommended that the bill should strive at achieving farmer-level seed self-sufficiency with a right to access to good quality, affordable seeds and stringent accountability and liability clauses. The bill should uphold the rights of farmers and national seed security rather than the commercial interests of the seed industry.

Research Paper - IV

Analysis of the policy advocacy approaches of various stakeholders in seed quality control and regulation

Abstract

The new Seed Bill, though introduced in Parliament in 2004, is not yet enacted. Various stakeholders have reacted very strongly to the contentious issues in the bill and are seeking amendments. In this context, it was envisaged to document the policy advocacy approaches of various stakeholders in the seed industry. The study traces the events that led to the formation and introduction of the seed bill, the reactions of various stakeholders in proposing amendments and the present status of the bill. It was also planned to identify the priorities of various stakeholders to be addressed in seed bill. The study was conducted in Andhra Pradesh and Bihar states covering 120 farmers and 30 respondents each from NGOs, Agriculture Department Officials (ADOs), researchers, seed dealers and Private Seed Companies (PSCs) with a total sample size of 270.

The Protection of Plant Varieties and Farmers' Rights Act (PPVFRA), 2001 upholds farmers' traditional rights to save, use, re-use, barter and exchange seeds. PPVFRA goes further in recognizing farmers as breeders and gives exclusive rights over farmers' varieties by granting them plant variety certificates. Some seed policy experts and Civil Society Organizations (CSOs) argue that this legislation didn't go down well with multinational and Indian Private Seed Companies (PSCs), who would like to possess exclusive rights over seed germplasm in terms of its use, development of new innovations and their marketing. The lobby of PSCs was clearly evident in the first draft of the Seed Bill (2004 version) as it snatched away most of the farmers' rights and the bill was more appeasing to the commercial interests of PSCs. However, the anti-farmer stand of the bill was severely criticized by various other stakeholders. The bill was so anti-farmer that various stakeholders came together irrespective of their political and professional affiliations to seek amendments in the bill. This was evident from the fact that the attack on the anti-farmer provisions in the Seed Bill came from Members of Parliament (MPs) belonging to various political parties, including members of the ruling party. The CSOs, farmers' organizations (FOs), media, academia and other stakeholders contributed in proposing various farmer-friendly amendments and putting constant pressure on central government in accepting and incorporating them in the final draft. The fact that Parliamentary Standing Committee on Agriculture (PSCA) in its report included all of the amendments proposed by MPs, CSOs and FOs bears testimony to the fact that the seeds bill 2004 was completely anti-farmer. Though many of the amendments

proposed have been accepted in the final draft of the bill (2010 version), yet some important issues such as price and royalty/trait fee regulation, compensation issues, powers to state government and stringent punitive and accountability clauses are yet to be accepted by the government for incorporating them in the final draft of the bill. The bill has not been enacted yet and it is in the interest of farming community and the nation's food security to see that these amendments are also incorporated in the final draft of the bill.

Key Words: Civil Society Organizations; Compensation; Farmers' Rights; Plant variety protection; Power; Price regulation; PVPFRA; Punitive and accountability measures; Royalty/trait fee; Seed Bill; Stakeholders.

Introduction

A nation's food sovereignty and the livelihoods of the farming community are closely linked to seed sovereignty. Issues such as who controls what seed is supplied, when, in what quantities, with what restrictions, at what prices and so on affect the seed sovereignty and consequently the food sovereignty of a nation (Kheti Virasat Mission, 2011). Any seed legislation first needs to be looked from the stand point of farmers since they are the primary stakeholders of agriculture. At the same time, seed legislation should not only regulate the quality of seed, but should also uphold the traditional and inalienable rights of farmers to save, use, re-use, barter and exchange seeds. The Protection of Plant Varieties and Farmers' Rights Act (PPVFRA), 2001 upholds these farmers' rights over seeds. PPVFRA goes further in recognizing farmers as breeders and gives exclusive rights over farmers' varieties by granting them plant variety certificates (also called Certificates of Registration) in the same manner as breeders are given Plant Breeders' Rights over the plant varieties developed by them. It is indeed heartening to note that India is the first country in the world to grant plant variety protection to farmers' varieties. However, recognizing and upholding farmers' rights in a law was not taken well by certain groups, especially MNCs in seed sector. They perceived it as a threat to their agenda of obtaining exclusive rights over the seed germplasm, its use in development of innovations and their marketing. Some seed policy experts and CSOs believe that upholding farmers' rights in PVPFRA was the strong precursor to the addition of various anti-farmer clauses in Seed Bill 2004. The vested interests wanted to snatch the farmers' rights provided in PPVFRA by putting various restrictions in the Seed

Bill that grossly violated farmers' rights. It also seems to be true given the fact that many of the farmers' rights upheld in PVPFRA have been violated in Seed Bill 2004. For instance, the bill (2004 version) restricted farmers from bartering of seeds; made registration of varieties compulsory even for farmers' varieties; put restriction on farmers to sell seeds under brand name, to name only a few. The anti-farmer stand of the bill was very clear since its introduction in the parliament and various stakeholders raised serious objections to such anti-farmer clauses. They used various policy advocacy strategies and suggested various amendments to be incorporated in the final draft of the bill.

The new Seed Bill, though introduced in Parliament in 2004 is not yet enacted. It is therefore very important to understand how various stakeholders pushed their own agenda and jeopardized the farmers' basic right over seed. It is also essential to understand the policy advocacy approaches followed by each of the stakeholders while promoting their own interests. The specific objectives of this research paper are to document the sequence of events that led to the formulation of Seed Bill 2004, the role played by various stakeholders in bringing suitable amendments on various contentious issues and to identify the priority issues of various stakeholders to be addressed in the bill.

Methodology

This research paper is organized into two parts. The first part of the research paper has been written in a narrative style to focus on the contentious issues in the seed bill. The sequence of events that led to the formulation of seed bill and the actions and reactions of various stakeholders to it have been documented and critically commented. The contentious issues have been looked from the perspective of various stakeholders. Literature from mass media and various reports have been extensively used to support the amendments proposed by various stakeholders.

The second part of this research paper deals with identifying the priority issues of various stakeholders. The exhaustive list of issues was collected based on the extensive review of literature and discussion with experts and stakeholders during a pilot study. Then, the degree of importance the respondents attached to each of the issue was measured on a scale of five-point continuum of 'Most Important',

‘Important’, ‘Somewhat Important’, ‘Less Important’ and ‘Least Important’ with scores of 5, 4, 3, 2 and 1 respectively (Appendix III). Ten priority issues have been identified and ranked for all the stakeholders based on the maximum frequency of respondents favoring an issue.

Sample: Two states namely Andhra Pradesh (AP) and Bihar were selected purposively for the study. Two districts from each state namely, Warangal and Anantapur districts in AP and Samastipur and Vaishali districts in Bihar were selected to interview farmers. These districts were chosen purposively based on the maximum number of stakeholders playing key roles in seed sector. A total of 120 farmers (30 from each district) were randomly selected and interviewed. Thirty respondents each from NGOs (includes Civil Society Organizations and Farmers’ Organizations), State Department of Agriculture of AP and Bihar, researchers from ICAR institutes and SAUs located in AP, Bihar and Delhi; and representatives of Private Seed Companies located in AP, Bihar and Delhi were also interviewed. The total number of respondents is 270. The study is based on primary data collected by interviewing respondents. Several published secondary sources like media reports, reports of organizations, websites and news stories were also used to substantiate the primary data.

Result and Discussion

The Seed Act 1966, Seeds (Control) Order 1983 and the New Policy on Seed Development (NPSD) 1988 are the legislations governing the seed sector in India as of now. However, far reaching changes have taken place in the national economy and agricultural scenario and in the international environment since the enactment of these legislations. Biotechnology sector came up with promises of extremely productive genetically modified (GM) crops. In 2002, Government of India approved Bt. cotton for commercial cultivation in India. National Seed Policy was thus formulated in the year 2002, to provide an appropriate climate for the seed industry to utilize available and prospective opportunities, safeguarding the interests of farmers and conservation of the biodiversity. Liberalization has been targeted towards certain components of the policy retaining regulation on some components to safeguard national interests. The aims of National Seed Policy such as development of infrastructure, ensuring supply of good quality seeds and facilitating the international seed trade are sought to

be addressed through the proposed Seeds Bill, 2004. In the meanwhile, the PVPFR Act was passed in 2001. India has adopted the *sui generis* system for protection of plant varieties and enacted a legislation that explicitly provides for farmers' rights in addition to plant breeders rights. While formulating PPVFRA, it has been taken into account that millions of Indian farmers rely mutually on each other for procuring or exchanging seed material.

The CSOs, FOs, few seed policy experts, large section of political class, academia and media argue that there were many motivations behind the formulation of new Seed Bill 2004. The overt objective was to regulate the quality of seed as well as to address the deficiencies found in the previous seed legislations. However, there were many covert and hidden objectives such as making seed legislation more favorable to MNCs and Indian private seed companies as well as snatching away of farmers' rights provided and upheld in PVPFRA 2001.

Introduction of Seed Bill 2004

Advocacy is a strategy that is used around the world by non-governmental organizations (NGOs), activists, and even policy makers themselves, to influence policies. Advocacy is about creation or reform of policies, but also about effective implementation and enforcement of policies. Advocacy is a means to an end, another way to address the problems that we aim to solve through other programming strategies. Advocacy is the deliberate process of influencing those who make policy decisions (Sprechmann and Pelton, 2001a). Policy advocacy involves application of various approaches of active, covert, or inadvertent support by various stakeholders in a society for a particular policy. Here the usual approaches would be lobbying, meetings, open letters, memoranda, representations, debates, press releases, posters, internet propaganda, and even protests and agitations for or against some particular aspects of a policy under consideration by the legislature. In this study, an attempt has been made to highlight the key issues of contention and the various policy advocacy methods adopted by different stakeholders. One farmer fighting against big MNC says thus:

“We have to, now a days, go two ways; one is to defend ourselves and the other to take the movement forward.”

- Dave Henson, organic farmer for 25 years
protesting against Multi-National Companies.

The objective of Seed Bill 2004, as stated in the bill is the farmers' accessibility to quality seed at reasonable prices with assured yield benefits. Though it is the stated objective, many clauses within the bill are contentious among various stakeholders and accusations and counter-accusations crop up between them in the process. While the private sector seed industry was interested in hybrids and specific trait-loaded seeds for higher crop production, the farmers were wary of their own farm saved seeds and their rights. While breeders worry about the plant breeders' rights, seed companies worry about their annual sale revenues. The concerns and priorities of each stakeholder may be different and they act according to what matters to them, than worrying about others.

The Seed Bill 2004 was introduced by the Minister of Agriculture, Government of India in Rajya Sabha on 9th December, 2004. The Seed Bill envisaged introducing radical changes in the seed sector. The proponents of the new Seed Bill list a number of supposed deficiencies in the 1996 Seeds Act to be fixed, including:

- To make the registration of varieties obligatory (previously it was voluntary)
- Creation of a comprehensive National Register of Seeds
- To regulate (make easier) the imports and exports of seeds
- New regulations on Genetically Modified (GM) crops
- To improve market conditions for private seed companies

Seed Bill 2004 itself has a six year history. Constituted in 1998, a Seed Policy Review Group in India recommended a long-awaited shake-up and reform of the Indian seed laws; a new seed law would need to be passed that would replace the current 1966 Seeds Act. The Seed Policy Review Group was an initiative of the Ministry of Agriculture. The Seed Association of India (SAI) is one of the major seed industry associations, and represents medium to large foreign and domestic firms. SAI actively engaged in debates with the Ministry on the new seed law (Sharma, 2005).

India's Ministry of Agriculture itself explains that

“(i)n response to the changes that have taken place in the seeds sector, the existing Seeds Act, 1966 is proposed to be replaced by a suitable legislation to, inter alia, create an enabling climate for growth of the seed industry, enhance the seed replacement rates for various crops, boost the export of

seeds and encourage the import of useful germplasm...” (MoA, 2009).

The justification given for the new law was that the government needs to strengthen the regulatory regime to be able to keep a check on seed quality since farmers complain about spurious seeds, mislabelled products and non-performance of planting material as advertised.

Parliamentary Standing Committee on Agriculture (PSCA)

Usually a bill passes through several stages and gets redrafted again and again and ultimately with the consensus or by way of majority gets passed and becomes an Act. This Seed Bill is also undergoing the same process. The Seed Bill was introduced in Rajya Sabha and thereupon referred to PSCA chaired by Prof. Ramgopal Yadav to study and submit its report.

The public notice issued by the Parliamentary Committee inviting suggestions on the Seed Bill states that “(t)he proposed legislation aims to liberalize import of seeds and planting materials compatible with the World Trade Organization (WTO) commitments”.

Various farmers’ groups, CSOs and NGOs responded proactively and submitted their representations to the Standing Committee seeking suitable amendments in the bill. The Government of Andhra Pradesh (the former Minister of Agriculture along with MPs of the state) had also met Union Minister of Agriculture and submitted a Memorandum for amendments in Seed Bill 2004.

The PSCA submitted its report on 20th November 2006 and recommended for major changes in the original Bill. Some of the important amendments recommended are presented in Box 4.4.1.

Then Ministry of Agriculture decided to redraft the bill based on the recommendations of PSCA and memorandums for over 100 amendments from several MPs, the government of Andhra Pradesh and farmers groups.

Box 4.4.1: Salient Recommendations of the PSCA on Seed Bill 2004

1. The Plant Variety Protection and Farmers' Right Act 2001 be made fully operative before the Seed Bill 2004 is passed.
2. The Bill should not impose a condition that the farmers seeds also must conform to the minimum standards required to be maintained by the commercial producers for registering their seeds. Such a restriction imposed in the Bill will seriously affect the rights of the farmers.
3. Private participation in the Seed Certification should be discouraged since it is in conflict with the interests of the farmers who practice traditional system of exchange and sale of seeds. Deletion of the self certification provisions is recommended.
4. Introduction of price regulatory mechanism in the Bill to ensure that the farmers should not be charged with arbitrary prices by the seed producers and sellers.
5. Enhancement of the penalties mentioned in the Bill. The Committee suggests to increase the penalty for contravention of provisions of law to a fine of Rs.50,000/- which may be extended up to Rs.2,00,000/- and imprisonment which may be extended up to 3 months. Likewise, the penalty for supply of spurious and misbranded seeds must be an amount of Rs. 2,00,000/- which may be extended up to Rs.10,00,000/- and imprisonment of three months which may be extended up to one year.
6. Introduction of provisions banning the misleading pictures and print on seed packages which may inspire and attract the innocent farmers to buy the said seeds and ultimately land in losses due to nil production.
7. Introduction of machinery to deal with the compensation matters in the Bill itself. The Committee found fault with entrusting the task of dealing with compensation matters to the Consumer Forums constituted under the Consumer Protection Act.
8. Introduction of Seed Crop Insurance for providing compensation to the farmers whose seeds do not give the desired yield. The compensation to the farmers should be based on the expected performance as mentioned by the seed producers on the label of the seed package and that the said certification agency should also be made liable in the compensation process, in case the seeds fail to give the promised results.
9. There should be atleast one state representative from each of agro climatic zones instead of geographical zones on rotation basis and that number of farmers' representatives must be increased to five and one from each of the different geographical zones.
10. The seed testing includes seed germination and yield testing and there should be a pre-registration requirement. The Committee further recommends that the Bill should include provision for declaring the origin of the variety and its parental details by the person seeking for registration to ensure that farmers exempted variety should not be misused by the said companies.
11. The foreign seed certification agency should be recognized only if the seeds certified by the said agency are tested on Indian soil to confirm to the minimum requirements.

Government of India accepted some of the amendments to the Seeds Bill 2004 and notified the Seed Bill 2010 draft on 13th April, 2010. Later on 23rd April 2010, the Ministry tried to place the revised and newly redrafted Seed Bill 2010 in Rajya Sabha but could not do so.

The Seed Bill has been drafted several times in the past six years. Ministry sources say the current draft has come into being after several discussions and deliberations by farmers groups and civil society organizations, and is based on the recommendations of the PSCA. The Union Ministry of Agriculture is confident that the Seed Bill will make it through Parliament this winter session. But opposition parties, and some MPs from the ruling Congress Party, are getting ready to corner the ministry over legislation (Sood, 2010).

Since seed legislation is concerned directly or indirectly with many and diverse stakeholders, the Seed Bill 2004 attracted much wider attention from all quarters of the society and media also played a role in its wider publicity by debating on its pros and cons. The Bill has come under severe criticism countrywide from all sectors of society, including farmers' groups and numerous NGOs. The reactions to the Seed Bill 2004 ranged from a demand for complete withdrawal of the proposed bill, to the recognition of farmers' absolute rights over seeds. Widespread debates and mass campaigns continue to be planned at the village and district levels. Farmers are directing their ire at what they regard as restrictions on their time-honored sovereignty over seed. They also see the bill as an erosion of their rights to sell seeds and are dissatisfied with the lack of provision for corporate liability, be it for Indian or foreign seed companies (Sharma, 2005).

Policy Advocacy Measures

Here the results are presented with respect to each contentious issue and the reactions of various set of stakeholders. Since the Government of India is the principal stakeholder, the actions and concerns are presented already in the previous section.

India is seen as one of the biggest markets for seed in the world and as a result there is huge pressure on the government to adopt the Seed Bill and to pass it into an Act. The Seed Bill is just one of the legislative changes in India to open up its markets and

harmonize its laws with rich countries. These include amendments to the country's patent law and the model Agricultural Produce Marketing laws (Sharma, 2005).

Centre – State Relations

Many are concerned that the Seed Bill will move decision-making away from the state level, (*i.e., from the place of its implementation*). Under the Indian constitution, agriculture is under the jurisdiction of the state, (with the exception of cotton and oil seeds, which are on the Concurrent List of the Constitution of India on which both State and Centre can make laws) and tradable commodities on the Union List (on which only the Centre has the power to make laws). The central government treats seed as a “*tradable commodity*” to constitutionally justify its lawmaking on the subject (Sharma, 2005). In fact, it is highly objectionable to remove ‘seed’ from ‘agriculture’ for purposes of law making, which affects the largest community of farmers in India.

This concern was raised by Bhartruhari Mahtab, Lok Sabha member and a leader of Biju Janta Dal, the ruling party in Orissa, who said, “*Our party has long demanded the mechanism to control seed trade be left to state governments because agriculture is a state subject*” (Sood, 2010). Nitish Kumar, the Chief Minister of Bihar, in a letter to Prime Minister and Agriculture Minister strongly expressed his dissent that “*the Centre's attempts to intervene in an area that falls under state's domain - agriculture is a state subject - is unacceptable. State governments should have the authority to fix the retail seed price and royalty charges. State governments should also be empowered to register seeds that are locally suitable and appropriate*”. He added that “*In addition, authorization of seed production, processing, storage, distribution and sale should be with the state government. If seeds have to be registered with the National Register of Seeds, it is imperative that state governments must be given the authority to decide on which of these registered seeds can be licensed to be used in their state*” (Economic Times, 2011).

Prior to all these actions, the Government of Andhra Pradesh (AP) had drafted a Seed Bill in 2004 itself incorporating the necessary amendments required in Seed Act of 1966. This was the “*AP Seeds Regulation Bill 2004*”, cleared by the AP assembly in October, 2004 and sent to the Union government for concurrence. “*The Union*

Minister for Agriculture, Shri. Sharad Pawar, complimented us for a very well drafted bill," recalled N. Raghuvendra Reddy, AP Agriculture Minister. He further said, "Unless it is accepted *in-toto*, we'd be doing a great injustice to the farming community. While it resembles the draft of national Seeds Bill, its punitive and compensation clauses are harder. AP's civil society labeled the AP Seeds Regulation Bill as '*progressive*'" (Sood, 2010).

Yet this is not the first time that a state has moved in this direction. Karnataka and Maharashtra were dissuaded from doing the same earlier by Minister of Agriculture; and they were told a Central legislation was on the cards. So since the Seeds Bill 2004 is with Parliament, the AP Seed Bill did not stand a chance of approval. The Parliamentary committee has looked into the AP Bill for clauses that can be brought into the Seeds Bill 2004 (Sood, 2010).

Contentious Clauses in Seed Bill

Though revised and redrafted many times, the Seed Bill 2010 is just a slightly altered version of the Seed Bill 2004. It is ostensibly about keeping a check on seed quality. In fact, it will protect the interests of big seed business firms, keeping farmers' seeds out of the market and discouraging small seed dealers and producers.

There are several issues on which agreement could not be reached and Central Agricultural Ministry could not be convinced. The main grouse was that the bill did not have provisions to monitor seed prices nor did it talk adequately about compensation and hold companies liable in case of seed failure.

Reacting to the rejection of pleas by Ministry of Agriculture, in 2010, representation on Seed Bill 2010 was made, through a letter sent to Hon'ble Prime Minister, Government of India from Andhra Pradesh Farmers' Unions and NGOs Coordination Committee. This can be seen in Appendix IV.

Seed Bill 2010 is biased towards Private Seed Companies

The seed industry is currently pushing for a second Green Revolution in agriculture. It is in a position to demand a favourable law and policy environment for its operations worldwide. The push for hybrid seeds is central to this move.

The Seed Bill 2010 is based on the premise that seeds from ‘outside’ of farmers’ own fields, be it from formal breeders, seed corporations or private companies, are of *good* quality from the viewpoint of increasing production. The original source of seeds - the farmers themselves - is now treated as end-users/consumers. Bihar Chief Minister, Shri. Nitish Kumar strongly criticized the proposed Seeds Bill 2011, saying that: *“its provisions were tilted heavily in favor of the multi-national companies and against the interests of the farmers”* (Times of India, 2012). Even Gujarat State Agriculture Minister Dilip Sanghani strongly opposed the provisions in the bill thus: *“We have decided to oppose any effort of the foreign countries to impose their seeds technology through this Bill”* (Sage, 2011).

Hybrids cannot be saved by farmers

Hybrids, with diminishing yields in second year, if sown, work as a physical prohibition against saving seeds. Saving seeds of hybrid varieties is pointless for farmers, as they offer high yields only for one generation. Under ideal growing conditions, hybrid crops give very high yields, but for a single generation. Saving these seeds therefore is fairly useless, which is what makes them so attractive to the private sector. So, even if the law expressly allows farmers to save seed or exchange it amongst themselves, their freedoms are rendered meaningless by sheer technical limitations.

“The seed industry seems to believe that their returns can be maximized and their R&D efforts rewarded only if exclusive ‘ownership’ rights are conferred, linked to marketing rights of course. Civil society groups including farmers’ organizations believe that this is antithetical to the very culture of agriculture in India, which thrived for thousands of years due to the open sharing of resources including knowledge” (Kheti Virasat Mission, 2011).

Farmers’ Rights

Seed Bill spells a clear message to small farmers to stay out of the formal seed market. According to the proposed section in the Bill, farmers’ ‘rights’ cease if they sell their seed or planting material under a brand name. Thus, no farmer can brand his/her seeds and enter the seed trade. If s/he does, then s/he must register as a seed dealer and comply with the same rules as the industry is required to for registration

and sale of seed. The very definition of ‘*farmer*’ in the Bill refers to a person other than *any individual, company, trader or dealer who engages in procurement and sale of seeds on a commercial basis*. Sure, farmers are free to exchange, grow and harvest any seed they want to. But selling their own seed will now be restricted.

A farmer has the right to grow, sow, re-sow, save, use, exchange, share or sell his/her farm seeds and planting material. As long as traditional varieties and farmers’ seeds are supported, the freedoms of farmers can hope to stay alive. Even Bihar Chief Minister in a letter to Prime Minister and Agriculture Minister wrote that “the bill, whose avowed purpose is to facilitate production and supply of seeds of quality, will put the peasantry at the "mercy of agri-businesses" (Times of India, 2012).

A United Nations paper which analyses Seed policies from the perspectives of the Right to Food and farmers’ human rights notes: “*The right to food requires that we place the needs of the most marginalized groups, including in particular smallholders in developing countries, at the centre of our efforts*” (UNO, 2009).

Farmers’ Saved Seeds

As long as farmers continue to save and breed their own seeds, it is difficult for seed companies to sell their seed. In reality, under the proposed law, only formal breeders and big businesses can get their seeds registered, produce and sell. The effect of prescribing variety registration and seed certification and ‘*seed quality that meets industry standards*’ is that it keeps farmers’ seeds out of the market.

Small seed dealers

Seed Bill 2010 also discourages small seed dealers and producers who may not be able to meet the costs of prescribed registration and certification.

Price Control Regulations

Many believe that seed prices will go up. Private companies would need to recover the costs of registration which would be passed onto farmers (Sharma, 2005).

Many Members of Parliament were unhappy with the way the Seed Bill 2010 is being pushed without considering fundamental amendments suggested. For instance,

“The Standing Committee had recommended amendments to 80 per cent clauses of the 2004 draft bill. The agriculture ministry considered the suggestions, but did not include the ones calling for changes in price-control mechanism and compensation to farmer. For example, there is no provision for the government to determine and control seed prices.”

said, Basudeb Acharia, Lok Sabha member and a leader of CPI (M). Unless the government has the power, there would be no ceiling on the price of the seed. Just five companies, including USA’s Monsanto and DuPont, control the entire seed trade across the globe. In the absence of a ceiling, these multinationals would charge exorbitantly and can hike prices arbitrarily. In fact, we need a seed liability bill on the lines of the Nuclear Liability Bill, said Acharia, adding that his party has decided to oppose the bill unless the ministry includes all recommendations of the Standing Committee on Agriculture (Sood, 2010).

“The MPs were clear that the Bill should protect the interests of farmers and not of multi-national companies and big business houses. They demanded a price regulatory mechanism so that seeds were available to farmers at affordable prices and not left to “market forces.” The AP delegation gave the example of Bt. cotton seeds that were introduced in the country at high prices and were lowered on orders of the State High Court” (The Hindu, 2010).

Price Controls

The government's point that the earlier law - Seed Control Order, 1983, which the Seed Bill will replace, did not have any provision for price control either is specious (or false), said G. V. Ramanjaneyulu, executive director of the Centre for Sustainable Agriculture, an NGO based in Hyderabad which focuses its work on agricultural policy research. *"It is clear that the government's objective now is to encourage private seed trade"* (Jishnu, 2010).

A Middle Path!

Noted agriculture scientist, Dr. M. S. Swaminathan said: *"I hope better counsel will prevail."* Now a member of the Rajya Sabha, Swaminathan, too, has been demanding for price regulation in the bill.

"I have said there should be price regulation where appropriate, not everywhere. The government should have the authority to use price controls in certain situations, but not to usurp the role of the market" (Jishnu, 2010).

The scientist, who is referred to as the Father of India's Green Revolution, worries that lack of price control could have disastrous consequences for the Indian farmer in accessing new technology. *"High seed prices and trait fees," he warned, "will come in the way of social inclusion on technology access—and social inclusion is fundamental to growth of the sector" (Jishnu, 2010).*

Compensation in case of Crop Failure

Rajya Sabha member M. V. Mysura Reddy elaborated on Acharia's concern.

"The current draft mentions compensation for the amount of seed lost. But for sowing seeds, a farmer also invests in fertilizers, water, manure, pesticides and labour. All these should be included while computing seed loss. Besides, the bill holds seed companies responsible only till the germination of seed. What if the seed germinates but fails to yield crop? There should not be a cap on maximum compensation",

added the leader from Telugu Desam Party, the opposition party in Andhra Pradesh (Sood, 2010).

Compensation in case of crop failure

During 1997-98, when crops failed, it was found that one reason for crop failures was spurious seed. This led the state government of Andhra Pradesh, then under the Telugu Desam Party leader N. Chandrababu Naidu, to create a system of signing Memorandum of Understanding (MoU) with seed companies to ensure accountability -- this was the biggest admission of the fact that the Consumer Protection Act, 1986 was failing to provide liability. Then in *kharif* 2004, one company did not pay to farmers Rs.4.5 crores in damages and hence the seed company was black-listed in the state. In another case in *kharif* 2005, another seed company obliged the MoU and paid to the tune of Rs.20 lakhs and replaced 8000 packets of cotton seed (Sood, 2010).

Regulation of Seed Trade

Accessibility to seed itself may get jeopardized. *“Government has no mechanism to control prices. Seed suppliers are under no obligation to ensure reasonable seed supply to farmers.”*

“But several concerns remain unaddressed. The government should promote quality seeds under vigilance. The current draft overlooks our long-standing demand for a regulatory mechanism to oversee seed trade, just like the telecom regulatory authority. BJP won’t vote for the bill until the ministry introduces the provision.”

said Prakash Javadekar, Rajya Sabha member and the spokesperson of opposition Bharatiya Janta Party (BJP) (Sood, 2010).

Let Market Forces decide Prices !

Many of the recommendations of the Parliamentary Standing Committee on Agriculture, which gave its report in 2006, have been incorporated in the 2010 version of the Seed Bill, but price regulation stubbornly stays out of its ambit. The agriculture ministry's stance is clear.

"A free and competitive market environment will spur the growth of the seeds industry. Therefore, price is better left to market forces rather than to artificial controls" (Jishnu, 2010).

The government incorporated most of the concerns in the amended bill to be presented to Parliament. But on the question of price regulation, the minister was unwilling to budge. A note circulated by the agriculture ministry at the meeting held on 28th July 2010, was categorical that the bill does not envisage any "provision for price control" and was intended purely to regulate the quality of seeds. According to several invitees (about 40 Members of Parliament and state leaders) to the meeting, the agriculture minister told them that "the Prime Minister is against any price control". This leaves a big question mark hanging over the Seed Bill since opposition to it shows no signs of a let-up (Jishnu, 2010).

Opposition to the Seed Bill 2010

Many fear that the Bill will hand over the seed business to transnational seed corporations. Leading farmers' organizations accuse the Central government of selling out the farmer to multinationals. Krishan Bir Chaudhary, president of the Bharatiya

Krishak Samaj, believes the bill *"is to protect the interests of multinational seed companies like Monsanto"*, which, he insists, are trying to capture the seed market in India. There are other outfits like the All India Kisan Sabha which voice similar worries and concerns (Jishnu, 2010).

Congress-ruled Andhra Pradesh is the biggest opponent of the bill and its Agriculture Minister N. Raghuveera Reddy has been campaigning ceaselessly for significant changes in the proposed law. Reddy, who participated in the 28th July 2010 meeting told 'Down to Earth' that

"States must have the power to fix the price of seed and trait value (the royalty paid on patented seeds) whenever necessary."

As he sees it, the system should involve both the Centre and the states.

"We would like an independent body similar to CERC (the Central Electricity Regulatory Commission fixes tariffs and other issues related to the power sector), which oversees state regulatory commissions. Otherwise, the seed companies will squeeze the farmer" (Jishnu, 2010).

Shri. Raghuveera Reddy, who has the full backing of his Chief Minister Shri. K. Rosaiah, points out, *"You simply cannot have a free market without a statutory regulator"* (Jishnu, 2010).

Opposition to Seed Bill from within Ruling Party

While this backdrop is essential to understand the politics of the Seed Bill, there is another factor: the differences within the Congress high command on the issue of price regulation. While Pawar has been pushing the Seeds Bill since 2004, the Congress has always had reservations about it. In an October 2005 letter, Sonia — in her capacity as NAC chairperson — had suggested several changes. "There is a growing perception that the Seeds Bill, 2004 is anti-farmer and that it favours the seed industry and large seed breeders, including MNCs," she had stated. (In the Bill) Government has no mechanism to control prices... Seed suppliers are under no obligation to ensure reasonable seed supply to farmers" (The Indian Express, 2010).

The future is not clear!

It is unlikely, that this '*mess of locked horns*' ever gets solved easily, as the stakes are high for all stakeholders. Though the real picture will emerge only two years after the bill is passed and the rules are notified. But the notification of rules depends on the clarity in the legislation. Even if the punitive clauses are made harder than what they are at present, how will the liability of the company be established? The AP case of companies not paying compensation shows that even when the government has the political will to penalize offending seed companies, the law doesn't allow the accountability to be fixed.

The registration process the bill proposes lacks clarity. The drafting is vague and it doesn't lay down criteria to register. If registration requirements aren't clear, it becomes difficult to fix liability in case of failure of seed a company sells. Even if the liability clause was clear, compensation, if any, is left under the Consumer Protection Act, 1986.

Typically, consumer laws work only when there is awareness among consumers about their rights and about the evidence they are required to produce. Given the literacy levels in rural India, to leave the farmer to the consumer court is tantamount to leaving them at the seed companies' mercy. A consumer forum expects the farmer to produce proof of purchase of seed from authorized dealers with full details on the bill, and with reports from an agriculture scientist or official connecting losses due to poor germination or performance to the quality of seed sold. It is well known that seed dealers in India double up as creditors and extension agents, with indebted farmers under their thumb. Receipts are almost never given for seeds sold on credit. Even if a farmer takes all precautions, a consumer forum relies on some kind of credible mechanism/report to verify the farmer's claim - field visits and laboratory testing, for instance. This has to be laid down in the Seeds Act. Even after liability is established in a consumer court and the farmer gets compensation, there are no penal measures to deter future violations. The moot question, therefore, is: if the farmer has to go to a consumer court, why have a Seeds Act?

Hence, it is very important to address the fundamental deficiencies in the Seed Bill before incorporation of other suggestions and amendments. Amendments relating to providing farmers their traditional and inalienable rights have already been accepted by the ministry. Some other amendments which are yet to be accepted are related to

pricing of seeds including regulation of trait/royalty fee, powers to state governments, compensation and stringent punitive and accountability clauses.

Priority issues of various stakeholders

It is very clear from the preceding discussion that there are various clauses in the bill on which there is a dissent among the stakeholders. One important reason behind the dissent is that the priorities of all the stakeholders differ from each other. What each stakeholder expects from the seed bill is different. Hence, it would be very useful to understand the priorities of each stakeholder with respect to their expectations from the seed bill. It is also important to understand the degree of importance each of the stakeholder attaches to these priorities. This would help us in knowing which group of stakeholders have same or similar priorities as well as which groups are at the loggerheads. Based on this study, it would be possible to delineate the most important issues to be addressed in the seed bill considering the viewpoints of all the stakeholders without compromising the interests of national security and the Indian farming community. The ten important priorities for farmers, NGOs, ADOs, researchers, seed dealers and Private Seed Companies are presented in table 4.4.1, 4.4.2, 4.4.3, 4.4.4, 4.4.5 and 4.4.6 respectively.

Farmers:

Farmers are the principal stakeholders of agriculture. Any law that affects agriculture needs to be first and foremost looked from the viewpoint of farmers. It is more so

Priority issues for various stakeholders

Table 4.4.1: Priorities of farmers

N = 120

Sl. No.	Issue	Most Important		Important		Some What Important		Less Important		Least Important		Rank
		<i>f</i> ¹	% ²	<i>F</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	
1	Upholding farmers' rights	110	92	8	7	2	2	0	0	0	0	I
2	Availability of quality seed in sufficient quantities	105	88	12	10	3	3	0	0	0	0	II
3	Strengthen informal seed supply systems	102	85	11	9	5	4	2	2	0	0	III
4	Price regulation mechanism	101	84	12	10	5	4	2	2	0	0	IV
5	Check malpractices in the market	101	84	12	10	4	3	3	3	0	0	V
6	Compensation issues	101	84	15	13	3	3	1	1	0	0	VI
7	Powers to state governments	94	78	14	12	9	8	3	3	0	0	VII
8	Stringent punitive and accountability measures	80	67	22	18	12	10	6	5	0	0	VIII
9	Seed crop insurance	33	26	77	64	6	5	4	3	0	0	IX
10	Strengthen public sector seed agencies	27	23	87	72	4	3	2	2	0	0	X

¹ Frequency; ² % values are rounded off to the nearest value

Note: The ranks were worked out based on the descending order of the frequency (or the per cent values) of respondents choosing an issue as 'Most Important', 'Important', 'Somewhat Important', 'Less Important' and 'Least Important' in that order. If there was a tie for frequency under this category, next degree of importance was considered.

with the seed legislations since seed has traditionally been the property of farming community. Recognizing and upholding farmers' rights over seed without any legal hindrance was the most important issue for farmers. This issue occupies more significance in the present context wherein seed germplasm of traditional communities has been misappropriated by various MNCs by getting exclusive rights over these materials through patents and Intellectual Property Rights. There has been an erosion of farmers' varieties over the decades with the advent and adoption of high yielding varieties and hybrids.

Though availability of seeds of various crops has increased in the market, quality assurance is still an issue. There are no mechanisms to ensure that the seed purchased from market gives expected performance as promised by the seed supplying organizations. The farmers in Bihar complained that seeds of some crops such as wheat, paddy, maize, etc., were available in plenty since many stakeholders were involved in seed production of these crops, but seeds were always in shortage for some groups of crops like pulses, oil seeds and forage crops. Hence, the Seed Bill should also incorporate provisions to strengthen the institutional mechanisms to address such issues. The shortage of seeds in some groups of crops and complete dependence on market for some other groups of crops highlights the lack of planning and coordination among various seed producing organizations in the formal seed sector. Farmers and farmers' organizations believed that the answer to this problem lied in strengthening the informal seed systems. It is important to note that even in the present scenario, the formal seed sector (including both private and public sector companies) meets only 15-20% of the seed requirement of the farmers (MoA, 2102). Remaining 80-85% seed requirement is taken care by informal and farmer-to-farmer seed exchange mechanisms. It is in this context that strengthening of informal seed supply systems have to be encouraged and incentivized. Surprisingly, the Seed Bill is completely silent on these issues.

Higher prices of seeds, especially in case of Bt. cotton seeds were also reported by majority of the farmers in AP. Farmers of both Bihar and AP agreed that they were ready to pay higher prices if the seed is pure and gives better yields. However, they added that they incur heavy losses if the seed is spurious. Since farmers invest in cost of cultivation along with the costly seed, failure of seed puts a heavy financial burden

on them. It is more so for small and marginal farmers (they constitute 85% of the operational land holdings in India, according to Agricultural Census, 2010-11) who normally purchase seeds and other inputs on credit with higher interest rates. The situation gets aggravated with the lack of strong mechanism for compensation in such cases. CSA reports that for farmers who depend on market-supplied seed, seed cost constitutes anywhere between 6% and 33% of cost of cultivation, depending on the crop (CSA, 2005). Further, use of hybrids also makes farmers to purchase seeds every year. The component of royalty/trait fee has also increased the price of seeds in case of Bt. cotton seeds.

It was found that seeds of Bt. cotton were sold in much higher prices than the MRP in Andhra Pradesh. Though seeds were available in plenty, they were available in black markets on a price three times higher than the MRP. In case of Bihar, farmers expressed that misbranding of seeds was a serious problem. Wheat seeds produced and supplied by *Tarai Development Corporation* (TDC) were popular among farmers (farmers refer them as '*Pantnagar seeds*') because of high quality and better yields. But various unscrupulous agents were selling seeds using the brand name of TDC seeds. There was no mechanism for farmers to ensure if the seeds were original or the misbranded. On the other hand there was lack of regulation by government on such unscrupulous agents. Farmers reported that they experienced yield loss of 30 to 60% by using such misbranded seeds. Closely related to this issue was compensation mechanism. Even when seeds failed to germinate or give expected yields, farmers never received compensation. In some cases, PSCs replaced seeds to the farmers but by then farmer has incurred losses and the season was lost. Some seed dealers in Bihar reported that even public seed organizations including State Department of Agriculture never paid compensation to farmers in case of seed failure.

Non Governmental Organizations:

It was not surprising that even NGOs considered upholding farmers' rights and strengthening informal seed supply mechanisms as the most important issues. In fact, it was at the insistence and pressure of many NGOs that various amendments related to farmers' rights have been accepted by the government. NGOs argued that giving powers to state governments would address many issues such as pricing of seeds, regulation of seed trade in the respective states and speedy compensation to farmers.

Table 4.4.2: Priorities of NGOs

N = 30

Sl. No.	Issue	Most Important		Important		Some What Important		Less Important		Least Important		Rank
		<i>f</i> ¹	% ²	<i>f</i>	%	<i>F</i>	%	<i>F</i>	%	<i>f</i>	%	
1	Upholding farmers' rights	26	87	3	10	1	3	0	0	0	0	I
2	Strengthen informal seed supply systems	25	83	3	10	2	7	0		0	0	II
3	Powers to state governments	23	77	4	13	2	7	1	3	0	0	III
4	Price regulation mechanism	22	73	5	17	2	7	1	3	0	0	IV
5	Compensation issues	20	67	9	30	1	3	0	0	0	0	V
6	Stringent punitive and accountability clauses	19	63	9	30	1	3	0	0	0	0	VI
7	Availability of quality seed in sufficient quantities	17	57	12	40	1	3	0	0	0	0	VII
8	Government investment in infrastructure and public R&D	15	50	13	43	2	7	0	0	0	0	VIII
9	Check malpractices in the market	15	50	10	33	5	17	0	0	0	0	IX
10	Development of innovations	8	27	15	50	6	20	1	3	0	0	X

¹ Frequency; ² % values are rounded off to the nearest value

NGO personnel also believed that various problems farmers face such as spurious seed, higher prices, complete dependence on markets, etc. were because of the decreasing role of the public sector in production and supply of quality seeds. This was further aggravated by the huge shortage of manpower and infrastructure in seed production, certification and testing in public sector. Hence, they strongly advocated for revival of public sector seed agencies by investing in infrastructure, man power and seed R&D. Compensation linked to seed crop insurance, stringent punitive clauses and building institutional mechanisms to ensure availability of quality seeds to farmers in sufficient quantities were the other important issues.

Agriculture Department Officials:

ADOs expressed that shortage of man power and infrastructural gaps have to be addressed so that State Department of Agriculture can fulfill its mandate (one of the mandates) of producing and supplying quality seeds of various crops in sufficient quantities. Even ADOs felt that farmers' rights are to be upheld at any cost. ADOs also shared the view that state governments should be given enough powers to regulate seed industry in the state.

Coordination among public and private seed producing agencies was necessary to address the problem of excess supply of seed in certain crops and huge shortage in some other crops. They endorsed the view of farmers and NGOs such as compensation linked to seed crop insurance, stringent punitive clauses, pricing of seeds and regulating malpractices in the sale of seed in the market.

Researchers:

It was interesting to note that even researchers considered upholding farmers' rights as central to the seed policy. Development of new cultivars with improved yield performance and tolerance to various biotic and abiotic stresses was quoted by majority of researchers as the most important issue. Strengthening infrastructure and institutional mechanisms to boost seed R&D, seed multiplication and distribution system was the other most important issue for researchers. They also strongly advocated for strengthening of the informal seed supply systems. They endorsed price

Table 4.4.3: Priorities of ADOs

N = 30

Sl. No.	Issue	Most Important		Important		Some What Important		Less Important		Least Important		Rank
		<i>f</i> ¹	% ²	<i>F</i>	%	<i>F</i>	%	<i>F</i>	%	<i>F</i>	%	
1	Strengthening public sector seed agencies by addressing human resource and infrastructure shortage	24	80	4	13	1	3	1	3	0	0	I
2	Production and supply of adequate quantity of quality seed	20	67	9	30	1	3	0	0	0	0	II
3	Upholding farmers' rights	16	53	10	33	3	10	1	3	0	0	III
4	Powers to state governments	16	53	9	30	4	13	1	3	0	0	IV
5	Compensation issues	16	53	9	30	2	7	3	10	0	0	V
6	Seed crop insurance	15	50	10	33	3	10	2	7	0	0	VI
7	Stringent punitive and accountability clauses	15	50	9	30	4	13	2	7	0	0	VII
8	Price regulation mechanism	15	50	9	30	2	7	4	13	0	0	VIII
9	Check malpractices in the market	15	50	8	28	6	20	1	3	0	0	IX
10	Coordinated planning in seed production by various public and private seed producing organizations	15	50	7	23	5	17	3	10	0	0	X

¹ Frequency; ² % values are rounded off to the nearest value

Table 4.4.4: Priorities of Researchers

N = 30

Sl. No.	Issue	Most Important		Important		Some What Important		Less Important		Least Important		Rank
		<i>f</i> ¹	% ²	<i>f</i>	%	<i>F</i>	%	<i>F</i>	%	<i>F</i>	%	
1	Upholding farmers' rights	22	73	7	23	1	3	0	0	0	0	I
2	Development of innovations	21	70	7	23	1	3	1	3	0	0	II
3	Availability of quality seed in sufficient quantities	20	67	9	30	1	3	0	0	0	0	III
4	Strengthen informal seed supply systems	17	57	12	40	1	3	0	0	0	0	IV
5	Government investment in infrastructure to boost public R&D	16	53	9	30	4	13	1	3	0	0	V
6	Price regulation mechanism	11	37	15	50	0	0	0	0	4	13	VI
7	Compensation issues	11	37	14	47	4	13	1	3	0	0	VII
8	Check malpractices in the market	11	37	12	40	4	13	3	10	0	0	VIII
9	Powers to state governments	11	37	9	30	4	13	0	0	6	20	IX
10	Stringent punitive and accountability clauses	9	30	14	47	3	10	0	0	4	13	X

¹ Frequency; ² % values are rounded off to the nearest value

regulation mechanism, granting powers to state governments and stringent punitive clauses as the important issues to be addressed in the Seed Bill.

Seed Dealers

The production and supply of sufficient quantity of quality seed will serve the interests of not only farmers but also that of seed dealers. The richer harvests reaped out of seeds bought from a dealer will make the farmer return to the same dealer in the next season. If the seed fails, the dealer will lose his credibility among the farmers even though he has nothing to do with the purity of seed and its productivity.

Seed dealers strongly advocated for checking malpractices in the market such as misbranding and black marketing. They said that those who indulge in such activities are normally not the registered dealers but the some miscreants who take the advantage of sudden demand in seed during sowing season. Strict monitoring by the government would help registered dealers.

Majority of the seed dealers were also of the view that seed price should be regulated in the interest of the farmers. They opined that compensation should be linked to insurance. They added that in case of seed failure, dealers should have a say in paying compensation to farmers since farmers generally approach dealers, from whom they purchased seeds, rather than the producer of the seed. Seed dealers also endorsed for strong punitive and compensation measures, uplifting farmers' rights, coordinated planning and production of seeds and strengthening public sector seed agencies.

Private Seed Companies:

Since price regulation practice is already under operation in case of Bt. cotton seeds, PSCs feared that it would be extended to other crops also. Hence, their main priority was to deregulate the pricing of seeds. They endorsed for liberalization of seed policy that allowed easier import of seeds and technologies; providing incentives to PSCs to invest in seed R&D and infrastructure; providing for self-certification and testing of seeds; and least regulation of markets.

PSCs also expressed the view that seed germplasm available with them was very limited and called for public institutions like National Bureau of Plant Genetic

Table 4.4.5: Priorities of Seed Dealers

N = 30

Sl. No.	Issue	Most Important		Important		Some What Important		Less Important		Least Important		Rank
		<i>f</i> ¹	% ²	<i>F</i>	%	<i>f</i>	%	<i>F</i>	%	<i>f</i>	%	
1	Availability of good quality seed in sufficient quantities	25	83	3	10	2	7	0		0	0	I
2	Check malpractices in the market	24	80	4	13	2	7	0	0	0	0	II
3	Price regulation mechanism	22	73	7	23	1	3	0	0	0	0	III
4	Compensation issues	20	67	7	23	2	7	1	3	0	0	IV
5	Powers to state governments	19	63	9	30	1	3	0	0	0	0	V
6	Stringent punitive and accountability measures	17	57	12	40	1	3	0	0	0	0	VI
7	Seed crop insurance	16	53	10	33	3	10	1	3	0	0	VII
8	Upholding farmers' rights	16	53	9	30	2	7	3	10	0	0	VIII
9	Coordinated planning in seed production by various public and private seed producing organizations	15	50	8	28	6	20	1	3	0	0	IX
10	Strengthen public sector seed agencies	12	40	16	53	2	7	0	0	0	0	X

¹ Frequency; ² % values are rounded off to the nearest value

Table 4.4.6: Priorities of Private Seed Companies

N = 30

Sl. No.	Issue	Most Important		Important		Some What Important		Less Important		Least Important		Rank
		<i>f</i> ¹	% ²	<i>F</i>	%	<i>f</i>	%	<i>F</i>	%	<i>f</i>	%	
1	Deregulation of price over seeds	30	100	0	0	0	0	0	0	0	0	I
2	Liberalization of seed policy	24	80	4	13	2	7	0	0	0	0	II
3	Development of new varieties and hybrids	22	73	7	23	1	3	0	0	0	0	III
4	Sharing of germplasm by public sector	20	67	7	23	2	7	1	3	0	0	IV
5	Availability of good quality seed in sufficient quantities	14	47	12	40	4	13	0	0	0	0	V
6	Self-Certification of seed	12	40	16	53	2	7	0	0	0	0	VI
7	Public Private Partnership in development of innovations	12	40	16	53	1	3	1	3	0	0	VII
8	Government investment in infrastructure to boost seed R&D	10	33	15	50	5	17	0	0	0	0	VIII
9	Single window mechanism to oversee the regulation of biotech crops	7	23	19	63	2	7	2	7	0	0	IX
10	Strengthen quarantine system	7	23	9	30	6	20	8	27	0	0	X

¹ Frequency; ² % values are rounded off to the nearest value

Resources (NBPGR), ICAR institutes and SAUs to share their germplasm with them. They said it would help in development of superior innovations from private sector. They also called for public-private partnership in development and marketing of innovations. They opined that public sector has the advantage of resources in terms of rich and diverse germplasm, better research facilities and huge infrastructure. They said that strengths of public seed sector coupled with strengths of private seed sector such as efficiency of use of resources and market access would supplement and complement the efforts of the both.

As of now, Bt. cotton is the only transgenic crop commercially approved for cultivation in India. But there are many other transgenic crops in various stages of development. The moratorium on Bt. brinjal by the government is considered as a greatest setback by PSCs. They opined that approval of transgenic crops in India is lengthy and cumbersome involving approvals from various departments for biosafety and environmental clearance. They expressed a strong appeal to government to establish a single-window mechanism to oversee the approval and release of transgenic crops.

Some PSCs also stated that quarantine facilities in India are outdated and have led to very slow and lengthy procedures to import seeds and technologies. Since seed is a biological entity, delaying entry for weeks or months would adversely affect its longevity and performance. They argued in favor of strengthening quarantine facilities. Some of them even suggested the idea of private quarantines.

Hence, it is clear that farmers, NGOs, ADOs, researchers and even seed dealers were unanimous in upholding the farmers' rights and strengthening informal seed supply systems. There was general agreement among farmers, NGOs, ADOs and researchers about strengthening the role of public sector seed agencies, pricing of seeds, trait fee regulation, compensation issues, stringent punitive and accountability clauses and powers to state governments. However, priorities of PSCs were completely different and were even against the opinion of other stakeholders.

Conclusion:

The study found that the Seed Bill 2004 was strongly criticized by all sections of the society for its anti-farmer clauses. The bill was positively biased towards MNCs and Indian seed companies and there were attempts to snatch the farmers' rights recognized and upheld in PPVFRA, 2001. The reactions of various stakeholders were so strong that the PSCA and even the Union Ministry of Agriculture had to accept the majority of the recommendations. However, certain pro-farmer clauses such as price regulation, trait/royalty fee regulation, better and strong compensation mechanism and strict punitive and accountability measures need to be accepted. The bill is also silent on many important issues such as strengthening institutional mechanisms (or developing innovative alternate mechanisms) to see that farmers have access to quality seed in sufficient quantities; strengthening of informal and farmer-to-farmer seed supply mechanisms; and revitalizing public sector seed infrastructure.

The analysis of priority issues of various stakeholders suggested that there was a broad consensus among farmers, NGOs, ADOs, researchers and seed dealers on issues such as upholding farmers' rights, regulation of seed prices and trait fees, need for effective compensation mechanism and strengthening informal and public sector seed system. Hence, it is recommended that government should consider these issues for incorporation in the final draft of the Seed Bill before its enactment. Strengthening of quarantine system as suggested by PSCs should be considered. Some of the other issues raised by private seed sector such as sharing of germplasm and public-private partnership in development and marketing of innovations needs to be extensively debated and then formalities and procedures could be worked out. Finally, it is expected by the nation to enact such a legislation that would aim at improving the standard of living of farmers, including the marginal and small, by recognizing their rights and providing them with access to quality seed and supporting services. This would also enable the country to achieve seed security and sovereignty leading to food security.

CHAPTER - V

GENERAL DISCUSSION

An attempt is made here to present a holistic view of all the research findings of the study by critically analyzing and synthesizing the discussion through relating with relevant literature. Such an attempt would help in putting the results in the right theoretical framework of past studies.

5. Trends in seed production and distribution with reference to the policies governing the seed sector over the years

During the review of literature on the research topic, the researcher found that there were no scientific studies on the long term trends in seed production in India. Though many reports were available that critically analyzed the Indian seed policy, there was a research gap in linking policy changes with the trends in seed production and distribution. In this context, it was planned to study the trends in seed production, present status of Indian seed market, India's position in export and import of seeds, share of informal and formal seed sectors, changes in Seed Replacement Rate and the Intellectual Property Rights issues. The results found through the study were discussed under various subheads in the following sections.

Indian domestic seed industry: The estimated value of the world seed market in 2011 was approximately US \$ 42 billion (approximately Rs. 9274500 crores) of which the USA stands first with US \$ 12,000 million (approximately Rs. 60000 crores). The Indian domestic seed sector ranks fifth in the world with a turnover of US \$ 2000 million (approximately Rs. 10000 crores), with little more than 5% share of

the world seed market. 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 \$ 2000 million in 2011 (ISF, 2011a). 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 and import is less than 1 per cent (Tonopi. *et.al*, 2011).

Growth in production of certified/quality seeds: The certified/quality seed production in the country from organized sector till 1960's was almost negligible. The establishment of National Seeds Corporation (NSC) in 1963 heralded the beginning of formal seed sector in the country. The seed industry was dominated by the public sector during the first 25 years reaching a turnover of about Rs. 600 crores by 1987. The key growth drivers during this period was the 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 through schemes such as National Seed Project in 1977 also helped in building infrastructure leading to rapid multiplication of quality seeds and increase in SRR. The Compound Annual Growth Rate (CAGR) during this period (1963 to 1988) averaged at 8-10% p.a. The New Policy on Seed Development (NPSD) 1988, liberalized Indian 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 infrastructure and R&D in seed sector. This resulted in rapid growth in production of seeds of high yielding varieties in self-pollinated crops and hybrids in cross pollinated crops. From 1991 to 2011, the production of certified/quality seed has more than quadrupled. During the last decade (2002-2012) it has tripled with a robust CAGR of almost 11-15% p.a.

Growth in production of various kinds of seed

The CAGR for breeder, foundation and certified/quality seeds was roughly 3%, 5%, and 5% p.a. respectively showing a positive but modest growth for the period 1991 to 2001. But the production of seed tripled in the next decade (2002 to 2012) showing a spectacular CAGR of 11%, 11% and 15% p.a. respectively for breeder, foundation and certified/quality seeds. Pray and Nagarajan (2012) expressed that 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.

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

The analysis of Indian seed policy by various researchers (Linton and Torsekar 2011; Pray and Basant, 2011; Pray and Nagarajan, 2012) indicated that the effect of two events were very phenomenal in transforming the Indian seed sector to the present status. Those two events were: enacting of New Policy on Seed Development (NPSD) in 1988 and allowing Bt. cotton for commercial cultivation in India in 2002. NPSD initiated the process of liberalization, privatization and globalization in seed sector in India and allowing for Bt. cotton for commercial cultivation further paved the way for domination of private sector in Indian seed industry. The Indian seed sector has gradually shifted from using farm saved seeds in the pre-green revolution period to using HYVs and hybrids bred by public sector institutes during green revolution period to using hybrids and proprietary technologies developed by private sector in the last two decades. This process has been expedited by these two events. Hence, these two years namely, 1988 and 2002, were taken as the transition period to understand the trends in growth of certified/quality seeds in various phases.

Phase I: Until 1988

The growth was particularly high for cereals 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. The main growth driver in this period was the ushering of green revolution. Public sector research institutions such as ICAR and State Agricultural Universities (SAUs) had played a great role in developing new varieties and hybrids. Other public organizations such as NSC, State Seed Corporations (SSCs), State Department of Agriculture, State Seed Farms, State Seed Certification Agencies and Seed Testing Labs also played their role in multiplication, quality control and distribution of seed to farmers. The role of private sector in this phase was very minimal because of restrictions in Foreign Direct Investment (FDI) by national economy in general and seed sector in particular.

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 liberalization of seed policy in 1988 had led to the investment in seed industry by MNCs and Indian companies in this period but the effect in terms of growth in seed production was not much visible in this phase. It is to be noted that though private sector had emerged in this phase because of liberalization, still more than 60% of the seed market was contributed by the public sector. This phase is a transition period in the sense that role of private sector had gradually increased along with the gradual decline of public sector seed systems.

Phase III: 2002-03 to 2010-2011

The CAGR for cereals, pulses and oilseeds was spectacularly high in this phase. The growth rate for fibres took 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 in this period were the rapid growth of seed market, development of new HYVs, hybrids and Bt. cotton.

National Seed Association of India estimated that the value of Indian domestic seed sector increased from Rs. 600 crores in 1988 to Rs. 3750 crores in 2002 to Rs. 10000 crores in 2011. The growth of Indian seed industry was closely associated by the growth of the private seed industries in their number and share of business. There were approximately 24 companies immediately after the liberalization of seed industry in the year 1988 and their number rose to 350 in the year 2000 and 550 in the year 2011 (NSAI, 2011).

NSAI also observed that the Indian seed market at present is dominated by proprietary hybrids and technologies. Bt. cotton alone contributed for 33% of the total seed

market value. Private sector share in case of Bt. cotton was almost 100%. The hybrids in various crops and Bt. cotton contributed for more than 60 percent of the total Indian domestic seed market (NSAI, 2011).

The study also found that the SRR was 100% in case of crops like maize, jowar, bajra, sunflower and cotton where hybrids were available. Majority of the hybrids especially in crops like cotton, maize, rice and vegetables came from the private sector. For self-pollinated crops like wheat and pulses, SRR ranged from 5 to 20%. In case of rice, the SRR was 23 and 93% respectively for varieties and hybrids. The SRR for various crops was higher in states like Andhra Pradesh, Karnataka and Gujarat where private seed industry was well established and it was found to be lowest in states like Orissa, Chhattisgarh, Madhya Pradesh and Jammu and Kashmir.

The study indicated that private seed sector also dominated in getting IPRs (both patents and plant variety protections). Out of 6 Bt. events commercially approved, 5 were from private sector and only one was from public sector. Out of total number of Bt. cotton varieties/hybrids approved for commercial cultivation, more than 99 percent were from private sector and the contribution of one multinational company (MNC) i.e., Mahyco-Monsanto-Biotech (MMB) alone was at 83 percent. It highlights the shift of seed germplasm from being a community good (in case of farmer-to-farmer exchanges and public institutions) to a proprietary right with exclusive marketing rights in the hands of few MNCs. Patricia (2003) argued that Farmers' Rights have to be recognized for one major reason; they are the original source of the germplasm. Under most IPR Regimes all over the world, farmers are not recognized as innovators, and it is the providers of technology who acquire Intellectual Property Rights. CSA (2005) also argued that public sector research has diminished over the years and private sector research has taken over. Private sector would like to invest where returns are assured and protected through IPR legislations, especially in case of large companies. Given this scenario, instead of research prioritising farmers' needs, especially those of small and marginal farmers, it would be focusing more based on commercial calculations.

Accessibility to quality seed by farmers

The study found that most of the farmers purchased seeds from the tehsil/block headquarters in both AP and Bihar. Higher percentage of farmers in AP had access to timely availability of quality seed from credible sources. This was because of the relatively well established private and public seed systems in AP. However, the farmers in AP found the seeds to be costly when compared to the farmers of Bihar. The majority of farmers in AP used HYVs and hybrids developed by the private sector which were comparatively costlier over public sector bred HYVs and hybrids. Moreover, Bt. cotton was vastly grown in AP wherein cent percent of seed used for sowing comes from the private companies. Bt. cotton seeds were found to be many times costlier over non-Bt. cotton hybrids because of involvement of royalty/trait fee in the price of Bt. cotton seeds.

Higher percentage of farmers in AP maintained records related to seed transactions than the farmers in Bihar. However, there was no significant difference between the farmers of Bihar and AP in terms of cultivation of improved cultivars and purity of seeds. The purity of seeds was found to be medium by the two-thirds of the farmers in both Bihar and AP. Majority of the farmers in AP experienced better crop performances in the recent few years from the seeds procured from the market when compared to the farmers in Bihar.

It was interesting to note that more than 90 percent of farmers in both Bihar and AP maintained good standards in case of farm saved seeds. It highlights the fact that farmers care very much for their own seed much better than any outside agencies. Even Shiva (2004) argued that farmers care for their own seed quality more than a centralized authority can. Regulation of farmers' own seed varieties needs to be left to farmers. That is why we have established Community Biodiversity Registers and Jaiv Panchayats".

The difference in overall accessibility to quality seed by farmers in Bihar and AP was found to be statistically significant. However, the larger issue of making quality seed available to farmer in adequate quantities in affordable prices is common in both the states. Further, the issue of compensating farmers in case of crop failure because of spurious seeds is a general issue.

Gaps and constraints in seed policies with special reference to Seed Bill 2004

The Seed Bill, which seeks to repeal and replace the existing Seed Act 1966, was introduced in the Parliament in 2004. Various stakeholders raised objections to several clauses in the bill and are seeking amendments. The most contentious issues in the bill were related to the upholding of farmers' rights, regulation of retail price and royalty/trait fee, powers to state governments and compensation and punitive clauses.

The study found that the Seed Bill 2004 had grossly violated farmers' rights upheld in the Protection of Plant Varieties and Farmers Rights Act (PPVFRA) 2001. The bill was inadequate on various counts and silent on many other issues. The issues such as compensation mechanism, stringent punitive and accountability measures were not fully addressed in the bill. The bill was completely silent on issues such as regulation of seed prices and royalty fees, and mechanisms to strengthen public and informal seed sector. The certain clauses of the bill were also found to be incompatible with legislations related to biodiversity conservation and environment protection.

The study found that farmers, NGOs, ADOs, researchers and seed dealers strongly demanded for regulation of retail price and trait/royalty fee of seeds especially in case of Bt. cotton. The PSCs charged royalty fee as high as 70 percent of retail price of seeds until government intervened and fixed the prices. It was also found that market forces did not operate in case of proprietary technologies because of monopolistic or oligopolistic market conditions. USCIB (2009) reported that even with significant price controls, however, India's seed market is more liberalized than that of China.

Farmers, NGOs, ADOs, researchers and seed dealers strongly advocated that state governments should be given authority to regulate seed industry including powers to regulate retail price and royalty fee of seed, to compensate farmers in case of seed failure, to regulate erring companies, etc. since agriculture is a State subject under Constitution in India and farmers have easy and better service access to State Department of Agriculture (SDA) rather than the Union Ministry of Agriculture. AP Farmers Unions and NGOs Coordination Committee (2010) in AP had written a letter to Honorable Prime Minister of India seeking powers to state governments while citing various case studies highlighting that state governments were helpless in regulating the PSCs while maintaining the interests of farmers.

Simple and farmer-friendly redressal mechanism in the form of compensation committee has to be provided in the bill itself. Stringent punitive and accountability clauses are called for since the spurious seed trade is worth several millions of rupees.

The other contentious issues in the bill were related to self-certification of seed, disclosure of parentage of varieties for commercial sale before registration, import of seeds and maintenance of seed biodiversity on farmers' fields. The proposal for self-certification by PSCs was disapproved by other stakeholders. All the stakeholders except PSCs opined that imported seeds must undergo Multi-Location Trials by public research organizations (ICAR and SAUs) for establishing agronomic performance in India even if such seeds are certified by international agencies like ISTA and OECD.

The Seed Bill 2004 (first draft) favoured MNCs and large domestic seed companies at the expense of farmers and informal seed systems that account for more than 80 percent of the total seed distributed in the country. Instead, the bill should strive at achieving farmer-level seed self-sufficiency with a right to access to good quality, affordable seeds and stringent accountability and liability clauses. The bill should uphold the rights of farmers and national seed security and sovereignty rather than the commercial seed business.

Policy advocacy approaches of various stakeholders in seed quality control and regulation

The study found that the Seed Bill 2004 was strongly criticized by all sections of the society for its anti-farmer clauses. The bill was positively biased towards multinational and Indian seed companies and there were attempts to snatch the farmers' rights recognized and upheld in PPVFRA, 2001. The reactions of various stakeholders were so strong that the Parliamentary Standing Committee on Agriculture and even the Union Ministry of Agriculture had to accept the majority of the recommendations. However, certain pro-farmer clauses such as price regulation, trait/royalty fee regulation, better and strong compensation mechanism and strict punitive and accountability measures need to be accepted yet for inclusion in the final draft of the Seed Bill before its enactment. The bill is also silent on many important issues such as strengthening institutional mechanisms (or developing innovative alternate

mechanisms) to see that farmers have access to quality seed in sufficient quantities; strengthening of informal and farmer-to-farmer seed supply mechanisms; and revitalizing public sector seed infrastructure.

The analysis of priority issues of various stakeholders suggested that there was a broad consensus among farmers, NGOs, ADOs, researchers and seed dealers on issues such as upholding farmers' rights, regulation of seed prices and trait fees, need for effective compensation mechanism and strengthening informal and public sector seed system. Strengthening of quarantine system as suggested by PSCs should be considered. Some of the other issues raised by private seed sector such as sharing of germplasm and public-private partnership in development and marketing of innovations needs to be extensively debated and then formalities and procedures could be worked out. Finally, it is expected by the farming community and the nation to enact such a legislation that would aim at improving the standard of living of farmers, including the marginal and small, by recognizing their rights and providing them with access to quality seed and supporting services. This would also enable the country to achieve seed security and sovereignty leading to food security.

CHAPTER - VI

SUMMARY AND CONCLUSIONS

Seed is the basic and most critical input for sustainable agriculture. The response of all other inputs depends on the quality of seeds to a large extent.

It is estimated that the direct contribution of quality seed alone to the total production is about 15-20% depending upon the crop and it can be further raised up to 45% with efficient management of other inputs. Seed being a commodity of trade, its production, supply and quality are serious source of concern to all the countries for their food security and national sovereignty. The seed trade is one of the most regulated in all the countries, including in India, with a plethora of seed laws, testing and certification procedures. The establishment of National Seeds Corporation (NSC) in 1963 was the first step in building formal and organized seed sector in India. The Seeds Act, 1966 provided for a formal system of seed quality control in India for the first time. Seeds were declared as an essential commodity under the Essential Commodities Act, 1955 and the Seed (Control) order was issued in 1983. It has provisions such as compulsory licensing of the seed dealers, price control, seed movement control and submission of the information about the procurement and sale of seed. The analysis of seed production of various kinds revealed that the Indian seed industry was dominated by the public sector during the first 25 years of establishment of NSC, i.e. till 1987. The New Policy on Seed Development (NPSD) 1988 liberalized Indian seed industry and eventually opened the doors for domestic and multinational seed companies for import of seeds and technologies as well as investment in seed research and development. The analysis of Indian seed policies by various authors has illustrated that the laws and policies thereafter have encouraged

private participation, benefitted private seed companies and provided better market access to foreign seed companies. Signing of WTO in 1995 further paved the way for private research and development of varieties. Further, far reaching changes have taken place in the national economy and agricultural scenario and in the international environment since the enactment of these legislations. Biotechnology sector came up with promises of extremely productive GM crops. In 2002, Government of India approved Bt. cotton for commercial cultivation in India. National Seed Policy was thus formulated in the year 2002, to provide an appropriate climate for the seed industry to utilize available and prospective opportunities, safeguarding the interests of farmers and conservation of the biodiversity. Liberalization has been targeted towards certain components of the policy retaining regulation to some components to safeguard national interests. The aims of National Seed Policy such as development of infrastructure, ensuring supply of good quality seeds and facilitating the international seed trade are sought to be addressed through the proposed Seed Bill, 2004. It seeks to repeal and replace the existing Seed Act, 1966. The Seed Bill 2004 was introduced in the Parliament on 9 December, 2004. However, various stakeholders raised serious objections to several provisions made in the bill since each of them has different and contradictory views on these clauses. The contentious issues in the bill are: 1) Farmers rights, 2) Powers to state governments, 3) Compensation and punitive clauses, 4) Retail price regulation and 5) Royalty or trait fee regulation, 6) Import of seeds, 7) Certification and other issues.

The accessibility to quality seed has become a crisis for farmers in every season and they face many problems and incur heavy losses in farming. Availability of seed in adequate quantities from credible sources, quality assurance, price control and compensation in case of crop failure because of spurious seed are the key issues that need attention by policy makers and all other stakeholders. The farmers' accessibility to quality seed gains further attention in the context of Central government trying to pass Seed Bill 2004 in the Parliament. It would be of paramount importance to understand the problems faced by farmers in accessing quality seed and to find ways and means to address these problems in the bill. Hence, this study was undertaken to study the extent of farmers' accessibility to quality seed, the production and distribution of various kinds of seed over a period of time in the context of various seed laws, the contentious issues and gaps in seed policies and to find amicable

solutions to address these challenges. The study aimed at understanding the perceptions of various stakeholders and their conflicting interests in order to arrive at possible and plausible solutions amicable to all involved, without jeopardizing farmers' rights and national seed and food security. An attempt was made to analyze the critical contentious issues in the bill and to delineate actions for amelioration and redressal. Hence a research study was planned to address these critical research issues. In this context, the present study made an attempt to study the following research objectives.

Specific Objectives

6. To study the scenario of seed production and distribution with reference to the policies governing the seed sector over the years
7. To study the extent of accessibility of quality seed as perceived by the farmers
8. To analyze the gaps and constraints in policies regarding seed sector as perceived by various stakeholders and suggestions for amendments
9. To analyze the policy advocacy approaches of various stakeholders in seed quality control and regulation

Research Methodology

The Warangal and Anantapur districts in Andhra Pradesh (AP) and Samastipur and Vaishali districts in Bihar were selected purposively as study area. In total, 270 respondents (120 farmers and 30 representatives each from researchers, Agriculture Department Officials (ADOs), NGO personnel, seed dealers and Private Seed Companies (PSCs)) were included in the study.

The growth rate in the production of breeder, foundation and certified/quality seeds for various subsectors like cereals, pulses, oilseeds, fibres and other crops were worked out using Compound Annual Growth Rate (CAGR) method. The growth in Seed Replacement Rate (SRR) for various crops was also worked out using CAGR method. The share of public and private sector in securing Intellectual Property Rights (IPRs) over seed was measured in terms of number and percentage of Genetically Engineered (GE/Bt.) events commercially approved by Genetic Engineering

Appraisal Committee (GEAC) and the Plant Variety Protections issued for various kinds of varieties by Plant Varieties Protection and Farmers' Rights Authority (PPVFRA).

The perception of farmers on accessibility to quality seed was measured using a schedule developed for the purpose. The difference in the perception of farmers of Bihar and AP on each of the parameter included to measure accessibility to quality seed was statistically tested using t-test. The composite scores of farmers of Bihar and AP on accessibility to quality seed was also statistically tested using t-test.

All the 270 respondents were personally interviewed to elicit their opinion on controversial issues related to seed bill using pre-tested structured interview schedule. The Kruskal-Wallis H test was used to test whether various stakeholders differed from one another in their perception of the various critical issues and clauses in the Seed Bill. The Mann-Whitney U test was used to test whether the farmers differed from the other sets of stakeholders in their perception of the various critical issues and clauses in the Seed Bill.

The exhaustive list of issues to be addressed in the Seed Bill 2004 from the perspective of various stakeholders was collected based on the extensive review of literature and discussion with experts. The degree of importance of each of these issues as perceived by various stakeholders was measured on a scale of five levels. Finally, ten important priority issues for each of the stakeholders were found out. Several published secondary sources like reports of organizations, websites, letters and news stories were also used to substantiate the primary data. An ex-post-facto and survey research design was adopted.

MAJOR FINDINGS

Objective: I. To study the scenario of seed production and distribution with reference to the policies governing the seed sector over the years

- At present, 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. Remaining 80 to 85 percent of the seed requirement is met by

informal seed systems comprising farmer saved seeds, farmer-to-farmer exchanges, seed banks of various Community Based Organizations, etc.

- Shifts in Indian seed policy priorities and programmes since 1960s has led to a gradual shift from using farm saved seed in the pre-green revolution era to High Yielding Varieties (HYVs) in the green revolution era to hybrids and proprietary technologies in the post-green revolution period.
- The formal/organized seed sector in India was dominated by the public sector during the first 25 years (from 1963 to 1988) since the establishment of National Seed Corporation in 1963. 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 and 1978).
- Thereafter, two landmark events that led to the growth of the organized seed industry in India to the present level are the liberalization of seed industry by passing New Policy on Seed Development 1988 and clearance of Bt. cotton for commercial cultivation in 2002.
- The certified/quality seed production in India has quadrupled in the span of 20 years from 1991 to 2011. The growth was more spectacular in the last decade (2001 to 2011) when certified/quality seed production tripled with a robust Compound Annual Growth Rate (CAGR) of 15% p.a. The growth in production of Breeder and foundation seeds was also spectacular with a CAGR of 11% p.a. in this decade (2001-2011). The growth drivers in this period were the rapid growth of innovations (improved varieties, hybrids and Bt. cotton) and seed markets, strengthening of IPRs and liberalized seed policies.
- 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 1%.
- There has been an increase in SRR for most of the crops though wide variation exists among different states in India. SRR was 100% in case of crops like maize, jowar, bajra, sunflower and cotton where hybrids are available. For

self-pollinated crops like wheat and pulses, it ranged from 5 to 20%. In case of rice, the SRR was 23 and 93% respectively for varieties and hybrids. The SRR for various crops was higher in the states like Andhra Pradesh, Karnataka and Gujarat where private seed industry was well established.

- Private sector has dominated in getting IPRs (in terms of securing patents over biotech events and plant variety protection certificates for new varieties).

Objective: II. To study the extent of accessibility of quality seed as perceived by the farmers

- Majority of farmers in both Bihar and AP procured seeds from the nearby mandal/tehsil headquarters. The higher percentage of farmers in AP had access to timely availability of quality seed in adequate quantities from credible sources when compared to the farmers in Bihar.
- Majority of farmers in AP expressed that price of seeds was costly whereas farmers in Bihar found it to be moderate. There was no significant difference between the perception of farmers on purity of seed procured, and the cultivation of improved cultivars in both the states.
- It was found that more than 95 percent of farmers in Bihar and AP followed scientific practices and took all the precautionary measures in collecting, saving, storing and exchange of farm saved seeds in certain crops where such seed is used.
- The higher percentage of farmers in AP maintained records of seed transactions compared to the farmers in Bihar. The maintenance of records (especially, the receipts of seed purchased) related to seed transactions is crucial for farmers in settling economic and legal issues related to compensation, insurance and other consumer rights.
- The composite scores indicated that the level of accessibility to quality seed for two-thirds of the farmers in both the states was medium and only around 20 per cent of the farmers found it to be high. The difference in the overall

accessibility to quality seed between the farmers of AP and Bihar was found to be statistically significant at 1% probability level.

Objective: III To analyze the gaps and constraints in policies regarding seed sector as perceived by various stakeholders and suggestions for amendment

- The most contentious issues in the seed bill were related to upholding farmers' rights, regulation of retail price and royalty/trait fee over seeds, powers to state governments and compensation issues and stringent punitive and accountability measures. The other contentious issues were related to self-certification of seed, disclosure of parentage of varieties for commercial sale before registration, import of seeds and incompatibility of certain clauses of bill with the other laws related to agriculture and environment.
- Farmers, NGOs, ADOs, researchers and seed dealers strongly demanded for regulation of retail price and trait/royalty fee over seeds especially in case of proprietary technologies as in Bt. cotton.
- The study indicated that PSCs charged royalty fee as high as 70 percent of the retail price of seeds until government intervened. PSCs argued that only market forces should determine the sale price of seed. However, the study also found that market forces did not operate in case of proprietary technologies because of monopolistic or oligopolistic market conditions.
- Farmers, NGOs, ADOs, researchers and seed dealers strongly advocated that state governments should be given authority to regulate seed industry including powers to regulate retail price and royalty fee over seed, to compensate farmers in case of seed failure, to regulate erring companies, etc. since agriculture is a State subject under Constitution in India and farmers have easier service access with State Department of Agriculture than the Union Ministry of Agriculture. Various case studies also illustrated that at present the state governments were helpless in regulating the PSCs while maintaining the interests of farmers.
- All the stakeholders agreed for the establishment of compensation committee. However, PSCs argued that compensation mechanism should be outside the

framework of the bill whereas remaining stakeholders insisted that it should be included in the bill itself.

- All the stakeholders except PSCs demanded for stringent punitive clauses and argued against the flat fixed fine since the spurious seed trade was worth several millions of rupees.
- The Kruskal Wallis H Test indicated that all the stakeholders differed from each other in the perception of importance of all the twelve critical issues in the Seed Bill.
- The Mann-Whitney U Test revealed that farmers' perception of importance on critical contentious issues varied on all the twelve issues with PSCs whereas they varied with NGOs on only one issue.

Objective: IV To analyze the policy advocacy approaches of various stakeholders in seed quality control and regulation

- The first draft of the Seed Bill (2004 version) snatched away most of the farmers' rights upheld in PVPFRA and the bill was more appealing to the commercial interests of PSCs. However, the anti-farmer stand of the bill was severely criticized by various stakeholders. The bill was so anti-farmer that various stakeholders came together irrespective of their political and professional affiliations to seek amendments in the bill.
- The Parliamentary Standing Committee on Agriculture in its report included all of the amendments proposed by Members of Parliament, CSOs and Farmers' Organizations. Though many of the amendments proposed have been accepted in the final draft of the bill (2010 version), yet some important issues such as price and royalty/trait fee regulation, compensation issues, powers to state government and stringent punitive and accountability clauses are yet to be accepted by the government for incorporating them in the final draft of the bill.
- The priority issues for farmers were upholding of farmers' rights, availability of quality seed in sufficient quantities, strengthening informal seed systems,

regulation of retail price and trait fee of seeds, adequate and quick compensation in case of seed failure and checking malpractices in the market like black marketing and misbranding.

- The priority issues for Researchers were upholding of farmers' rights, development of new varieties and hybrids, availability of quality seed in sufficient quantities, strengthening of informal seed systems and strengthening of infrastructure and manpower in public sector to boost seed R&D.
- The priority issues for ADOs were strengthening of the public sector seed agencies, production of supply of adequate quantity of quality seed, upholding of farmers' rights and giving powers to state governments.
- The priority issues for NGOs were upholding of farmers' rights, strengthening informal seed systems, powers to state governments and regulation of retail price and trait fee of seeds.
- The priority issues for seed dealers were the availability of good quality seed in sufficient quantities, to check malpractices in the market, price regulation mechanism, compensation issues and giving powers to state governments.
- The priority issues for PSCs were deregulation of retail and trait fee, liberalization of seed policy, development of new varieties and hybrids and sharing of germplasm by public sector.
- The analysis of priority issues of various stakeholders suggested that there was a broad consensus among farmers, NGOs, ADOs, researchers and seed dealers on issues such as upholding farmers' rights, regulation of seed prices and trait fees, need for effective compensation mechanism and strengthening informal and public sector seed system.

Implications of the study

- ✓ It is evident that even today more than 80% of seed requirement in the country is being met by informal seed sector. This highlights the need for strengthening informal seed sector by incentivizing seed production by farmers. Unfortunately, the seed bill is completely silent on this issue.

- ✓ The study has highlighted the shifts in seed policies and programmes over a period of time. The public sector had played a pivotal role in developing and distributing quality seed to farmers since green revolution period. However, private sector has emerged as a major player in formal seed sector in many crops. Hence, there is a need for investment in public sector seed systems to address huge infrastructure and manpower shortages to revitalize their role. There is also a need to invest in seed R&D to boost the development of innovations. Private sector seed systems can only supplement the public sector seed systems but it cannot replace the role of public sector seed systems.
- ✓ The study has highlighted that farmers' accessibility to quality seed is poor in both the study areas of AP and Bihar. Though both the states varied on various parameters of accessibility to quality seed by farmers, it was evident that purity of seed was a serious issue in both the states. The seed bill and the seed system should ensure that farmers have access to quality seed in adequate quantities in affordable prices from credible sources. The study highlights that some of the genuine issues at the farmers' level go unaddressed at the policy level.
- ✓ The study has highlighted that the Seed Bill 2004 had snatched away the farmers' rights upheld in PPVFRA. The opinion of various stakeholders indicated that final draft of the seed bill should uphold farmers' rights, regulate sale price and royalty/trait fee over seeds, provide for easy and simple compensation mechanism and stringent accountability clause for offenders.
- ✓ Various case studies have highlighted the fact that state governments were completely powerless to regulate the erring seed companies, though agriculture is a state subject under Indian constitution. It is in the interest of farmers and agriculture as whole to grant states with powers to regulate seed industry in their respective states. The central government should have the role of policy making, coordinating and incentivizing agriculture sector in the states. Even the National Commission on Farmers headed by Dr. M. S. Swaminathan has recommended to include agriculture in the concurrent list of constitution. The role of states and the centre needs to be clarified in case of regulating seed industry in the country.

- ✓ The Seed bill 2004 favors multinational and large scale domestic seed companies at the cost of farmers. The bill should uphold the rights of the farmers and aim at achieving farmer-level seed self-sufficiency, national seed security and sovereignty rather than the commercial interests of the private seed sector. Hence, the bill should recognize farmers as the principal stakeholders of agriculture and aim at improving their standard of living.
- It is very heartening to note that various sections of the society came together to seek amendments in the seed bill irrespective of their political and professional affiliations. The strong pressure of all the stakeholders has been successful in bringing certain pro-farmer amendments in the seed bill. However, there is a need for concerted and prolonged efforts to see that few remaining amendments are also accepted by the government.

Suggestions for future research

- ✓ Research studies can be taken up to understand the seed legislations of various countries to protect the farmers' rights and to incentivize the informal seed sector.
- ✓ Research studies can be taken up to understand the share of and shifts in the informal and formal sector seed systems in various countries and its effect on agricultural development.
- ✓ Research studies can be taken up to study the role and effectiveness of public and private sector seed systems in various countries and the shifts in their roles in the context of changing seed legislations.
- ✓ Research studies can be taken up to compare the seed laws of various developing and developed countries in the world to understand the best practices and methods in the regulation of seed industry.
- ✓ Research studies can be taken up to explore the reasons behind the vast difference in SRR of various crops in different regions of India.

- ✓ Studies can be taken up to find out the reasons behind the declining role of public sector seed agencies and to suggest ways and means to make them more competitive in research and development of innovations as well as market share.
 - ✓ Studies can be taken up to assess the role of informal seed supply systems in different regions of the country and to understand the efforts of various communities and organizations in making quality seed accessible to farmers.
 - ✓ Research studies can be taken up to understand the role of various indigenous communities including women in conservation of seed germplasm and biodiversity.
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Abstract

Seed is the most important input in agriculture and all other inputs play a supporting role in harnessing the genetic potential already inherent in seed. Since time immemorial, farming community has played a vital role in conserving, selecting, saving, using and bartering of seeds. Farmers' livelihood and even the nation's food security and sovereignty are dependent on seed security. However, in the last few decades, farmers' dependence on market for seed has increased. Consequently, they face various problems in each season in procuring quality seed from credible sources. This issue has gained more attention in the backdrop of Union Ministry of Agriculture trying to enact Seed Bill 2004. In this context, it was envisaged to study the extent of accessibility to quality seed by farmers, the problems they face in procuring seeds and the gaps in the seed laws with special reference to the recent Seed Bill 2004. The study was conducted in Andhra Pradesh (AP) and Bihar involving 120 farmers and 30 representatives each from researchers, NGOs, Agriculture Department Officials (ADOs), seed dealers and Private Seed Companies (PSCs), with a total sample size of 270 respondents.

The study found that the Compound Annual Growth Rate (CAGR) in production of both breeder and foundation seeds in the last decade (2001-11) was at 11% p.a. The production of certified/quality seed has increased by 4 folds from 1991 to 2001 and the production tripled in the last decade with a CAGR of 15% p.a. The CAGR in seed production for cereals, pulses and oilseeds in the last decade was more impressive at 15, 16 and 17% p.a. respectively. The average SRR for various crops was higher in states like Andhra Pradesh, Karnataka and Gujarat where PSCs are well established. In such states, the SRR was 100 per cent in case of crops where hybrids are available such as cotton, sunflower, maize, jowar and bajra. The SRR was found to be lower in states such as Jharkhand, Chhattisgarh, Orissa, and Madhya Pradesh. The private sector dominated in securing Intellectual Property Rights (IPRs) over seeds in terms of patents over the Bt. cotton events (5 out of 6) and Plant Variety Certificates/Plant Breeder's Rights issued by Protection of Plant Varieties and Farmers' Rights Authority (PPVFR) for new varieties and hybrids (approximately 90%).

The analysis of the seed policy highlighted that there has been a gradual shift from farmers using farm saved seeds during pre-green revolution era to HYVs and hybrids bred by public organizations during the green revolution period to using hybrids and proprietary technologies developed by private sector in the last few decades. New Policy on Seed Development (NPSD) 1988 liberalized Indian seed industry and paved the way for private sector participation. Various laws thereafter have encouraged private participation, benefitted private seed companies and provided better market access to foreign seed companies. Allowing Bt. cotton for commercial cultivation in 2002 has further expedited this process. Various studies suggest that at present, private sector is dominating the Indian seed market by concentrating only on developing and marketing of proprietary hybrids in selected high-value crops.

Study found that higher percentage of farmers in AP had access to timely availability of quality seed from credible sources than the farmers in Bihar. The farmers in AP found the seeds to be costlier than in Bihar. However, there was no difference in both the states in cultivation of improved cultivars. It was interesting to note that more than 90% of farmers in both the states maintained very good standards in farm saved seeds. Though there was difference in extent of accessibility to quality seed by farmers in

both the states, issues such as timely availability of quality seed from credible sources in affordable prices were the major common challenges.

Though the Seed Bill was first introduced in the Parliament in 2004, it is not yet enacted because of several contentious issues from the perspective of various stakeholders. The analysis of the bill found that it had taken away the farmers' rights recognized and upheld in Protection of Plant Varieties and Farmers' Rights Act (PPVFRA) 2001. Farmers, NGOs, researchers, ADOs, and seed dealers strongly favoured for the regulation of retail price and trait/royalty fee over seeds; granting powers to State governments; simple but robust compensation mechanism; and stringent punitive and accountability clauses. The bill was also found to be inconsistent with certain clauses of other laws related to biodiversity conservation and environment protection.

The bill was positively biased towards PSCs and so anti-farmer that various stakeholders came together irrespective of their professional and political affiliations to put pressure on the government in bringing various pro-farmer amendments. The Parliamentary Standing Committee on Agriculture (PSCA) also recommended all the amendments sought by civil society groups. The government accepted and brought amendments in certain clauses in the recent drafts. However, the important issues such as seed price and trait fee regulation, compensation issues, powers to state government and stringent punitive and accountability measures are yet to be accepted and included in the final draft of the bill before its enactment. It is recommended that the bill should strive at achieving farmer-level seed self-sufficiency by incentivizing informal seed systems and revitalizing public sector seed system. The bill should uphold the rights of farmers and national seed security rather than the commercial interests of the seed industry.

सार

यद्यपि कृषि में सभी निवेशों में से बीज को सार्वधिक मूलभूत एवं बहुत महत्वपूर्ण समझा जाता है किन्तु वर्तमान परिपेक्ष में अच्छी गुणवत्ता वाले बीज तक किसान की पहुँच का महत्व अस्पष्ट दिखाई पड़ता है। क्योंकि उसका रुढ़ान अधिकतर निजी क्षेत्र की बीज कम्पनियों की ओर होता है जिसमें नियमन के उपाय लगभग ना के बराबर हैं। इसलिए एक समझने योग्य विस्तृत बीज विधान की आवश्यकता महसूस की गई और एक नए बीज नीति का मसौदा तैयार कर संसद के समक्ष 2004 रखा गया जो अभी तक विचारधीन है। कई हितधारकों ने इस बिल की कई धाराओं के प्रति गंभीर विरोध व्यक्त किया है और वे इनमें संशोधन चाहते हैं। इस अध्ययन में अनेक हितधारकों की दृष्टि से इस बीज नीति का विश्लेषण किया गया है। यह अध्ययन आंध्र प्रदेश एवं बिहार राज्यों में किया गया जिसमें व्यक्तिगत साक्षात्कारों, दस्तावेजों के विश्लेषण के माध्यम नीति संबंधी प्रकाशित-द्वितीयक आँकड़ों तथा बीज कृषि विभाग के, हितधारकों जिन्हें से किसान 270 से विभिन्न प्रकार के कुल इन - गैर सरकारी संस्थाएँ एवं निजी क्षेत्र के बीज कम्पनियाँ, शोधकर्ता, अधिकारी सबके साथ कि किए गए अध्ययन का समावेश था।

अनेक फसलों में विगत वर्षों के दौरान किसान के लिए बीज की उपलब्धता तो बढ़ी है किन्तु इस से जुड़ी कुछ गंभीर समस्याएँ हैं जैसे कि बीज की गुणवत्ता एवं, संकर एवं ट्रॉसजेनिक बीजों का अनुचित, प्रदर्शन का आश्वासन न होना-इसके उपज ब्रैंड क, अधिक मूल्यी बीजों के अपर्याप्त दावे तथा जाली बीज विक्रय से निपटने के लिए कठोर दंडात्मक अपाय एवं मिआवजे का प्रवधान न होना। सन तक 1988 भारतीय बीज उद्योग में निजी क्षेत्र अत्याधिक प्रभावशाली रहा था। किन्तु इसके बाद उ-पर नीति पारित कर बीज 1988 बीज विकास - दो बड़ी घटनाओं-उद्योग के उदारीकरण तथा 2002, में वाणिज्यिक उत्पदनार्थ बीटीकपास अनुमति जारी करने - तक बीज उत्पादन 2011 से 1991 का किसानों पर कई प्रकार से प्रभव पड़ा है। सन में तीनगुणा होने से योगिक (2011-2001) चौगुणा हो गया तथा इसके विगत दशक प्रतिशत प्रत 15 वार्षिक वृद्धि दर-िवर्ष हो गई। भारतीय घरेलू बीज क्षेत्र का बाजार मान सन 600.में रु 1988करोड़ से बढ़ कर 3750 .में रु 2002करोड़ तथा 2011 10,000 .में रुकरोड़ तक पहुँच गया। नवीन प्रवर्तनों तथा (किस्में एवं प्रोप्रेटरी संकरों) दोनो, पेटेंट तथा पादप किस्म संरक्षणों) .आर.पी.आई.की दृष्टि से निजी बीज क्षेत्र (वी रहा।अधिक प्रभा

इस बिल की सर्वाधिक विवादास्पद बातें खुदरा मूल्य , किसानों की अधिकारों , मुआवज़े तथा , राज्य सरकारों के अधिकारों (गुण फीस) के नियमन एवं रॉयल्टी फीस किसानों , दण्ड संबंधी धाराओं के संबंध में थीं। कुल मिलकर यह बिल के बीज बचाने प्रदान के अधिकारों का -उसके आपस में आदान बदलने एवं , पुनः उपयोग करने , विशेष रूप से ट्रॉसजिनक , फीस-उल्लंघन करता है। बीजों के खुदरा मूल्य एवं गुण एवं , गैर सरकारी संस्थाओं , नियमन हेतु किसानों , के संदर्भ में (कपास-बीटी) बीजों शोधकर्ताओं ने दृढ़तापूर्वक अपनी माँग रखी हैं। इस अध्ययन ने दर्शाया कि निजी बीज कम्पनियों ने बीजों के खुदरा मूल्य के प्रतिशत अधिक तक रॉयल्टी फीस 70 चार्ज की जब तक कि सरकार ने इसमें इस्तक्षेप कर मूल्यों का नियत नहीं किया। कपास के विषय में बाजार ताकतों का एकाधिकृत एवं स्वल्पाधि-बीटीकृत बाजार - कृषि , गैर सरकारी संस्थाओं , परिस्थितियों के कारण प्रचालन नहीं हो सका। किसानों उद्योग -अधिकारियों एवं शोधकर्ताओं ने इस बात की दृढ़तापूर्वक वकालत की कि बीज सरकारों को दिया जाना चाहिए और इसमें बीज के -के नियमन का अधिकार राज्य खुदरा मूल्य एवं रॉयल्टी फीस के नियमन , बीज के अंकुरित न होने की स्थिति में , कम्पनियों के नियमन आदि के अधिकार का समावेश होना , किसान को मुआवज़ा देने , सरकार से जुड़ विषय है-राज्य , चाहिए। यद्यपि भारत के संविधान के अंतर्गत कृषि सरकारें असहाय थे-फिर भी निजी बीज कम्पनियों के नियमन में राज्यीं। इस बिल में स्वयं हीमित्र मुआवज़े की क्रियाविधि का प्रावधान होना चाहिए। -सरल और कृषक , व्यापार को रोकने के लिए कड़ी दण्डात्मक धाराओं एवं -कई करोड़ रुपए के जाली बीज , तंत्रों-उत्तरदायित्व संबंधी धाराओं की आवश्यकता है। किसानों तथा अनौपचारिक बीज जो कि देश में कुल वितरित बीज के , की अनदेखी कर , प्रतिशत से भी अधिक है 80 , 2004 बीज बिलबहुराष्ट्रीय कम्पनियों तथा बड़ी बीज कम्पनियों के पक्ष में जाता है। इसलिए यह संस्तुति की जाती है कि इस बिल को किसान स्तर पर बीज की आत्मनिर्भरता हेतु प्रयत्न करना चाहिए और इस में किसान को यह अधिकार होना चाहिए कि उसको अच्छी गुणवत्ता युक्त बीज उपलब्ध हो सके जिसका समुचित मूल्य हो और इसमें कड़ाई से जवाबदेही एवं उत्तरदायित्व संबंधी धाराओं का समावेश होना चाहिए। इस बिल किसानों के अधिकारों की सुरक्षाराष्ट्रीय बीज संरक्षा एवं , प्रभुसन्ता की रक्षा होनी चाहिए न कि बीज उद्योग के व्यावसायिक हितों की रक्षा की - जानी चाहिए।

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Appendix I
Interview schedule to measure Farmer's Accessibility to quality seed

Date: _____

Respondent No.: _____

General Information

1) Name: _____ 2) Age: _____ years 3) Village: _____

4) Tehsil/mandal: _____ 5) District: _____ 6) State: _____

7) Education: _____ 8) Family size: _____ 9) Family type:
 Nuclear/Joint

9) Occupational status:

Agriculture only	Agriculture + Allied enterprises	Agriculture + Business	Agriculture + Services	Other

10) Experience in farming: _____ years

11) Land Holding:

Irrigated	Non-irrigated	Total	Remarks

12) Annual income:

Agriculture	Allied Enterprises	Business	Service	Other	Total

13) Crops grown:

Kharif	
Rabi	
Summer	

The scale used to measure farmer's accessibility to quality seed

(The respondent farmer's level of agreement with each of the 10 parameters was measured)

1. Timeliness of availability:

Statement	Score
Well in advance	5
Available before one week of sowing	4
Available within 3 days of sowing	3
Late (when the sowing season is in full swing)	2

Very late (available in the fag end of sowing season)	1
---	---

2. Availability in adequate quantities:

Statement	Score
Adequate	5
Adequate but have to be procured early	4
Moderate	3
Scarce	2
Very scarce	1

3. Proximity to seed source:

Statement	Score
Locality /village	5
Nearby block/town	4
District HQ	3
Select cities/towns	2
Cities far away	1

4. Price of seeds:

Statement	Score
Affordable	5
Moderate expensive	4
Costly	3
Very costly	2
Beyond reach	1

5. Purity:

Statement	Score
Very pure	5
Pure	4
Moderately pure	3
Less Pure	2
Least pure	1

6. Crop performance:

Statement	Score
Very good	5
Good	4
Moderate	3
Poor	2
Very poor	1

7. Source Credibility:

Statement	Score
Highly credible	5
Credible	4
Somewhat credible	3
Less credible	2
Least credible	1

8. Care taken in following minimum standards in case of farm saved seed:

Statement	Score
Very good standards	5
Good standards	4
Minimum standards maintained	3
Poorly maintained	2
Doubtful standards	1

9. Documentation of records:

Statement	Score
Always	5
Often	4
Sometimes	3
Rarely	2
Very rarely	1

10. Cultivation of improved cultivar

Statement	Score
Latest HYV/hybrid	5
Popular variety (best varieties still in seed production chain)	4
Good variety but old (removed from seed production chain)	3
Very old variety (variety released more than 20 years ago)	2
Farmers' old variety	1

Appendix II

Interview Schedule

(To study the opinion of various stakeholders on contentious issues in the Seed Bill 2004)

Date: _____

Respondent No.: _____

1) Name: _____ 2) Age: _____ years 3) Designation: _____

4) Department: _____ 5) Organization: _____

Seed Policy: What is your opinion on these issues in Seed Bill?

1) Regulation of Sale Price of Seed

- a) Need for fixing total MRP
- b) Need for fixing maximum Royalty/Trait fee
- c) Composition of Price Regulation Authority-Who should be its members?
- d) Procedure to be followed in fixing MRP and Trait/Royalty fee
- e) Who should be authorized? Central govt. /State govt./MNCs/?

2) Compensation Mechanism

- a) The bill states that the farmers can claim compensation from the producer, distributor or vendor under the Consumer Protection Act, 1986. There is a need for compensation provision to be included in the Bill itself through specially designated Arbitration Tribunal/Compensation Committee.
- b) Composition of Compensation Committee-Who should be its members?
- c) Experience of members of Compensation Committee
- d) Procedure followed to calculate compensation: Compensation should be based on the expected performance as mentioned by the seed producer on the label of the seed package

- e) Manner of giving compensation
- f) Time within which the compensation to be paid
- g) Establishment of state and district level Compensation Committees
- h) Roles of Panchayats in certifying failures or losses
- i) Authority to which farmer can appeal in case he is aggrieved from the decision of the Compensation Committee
- j) Seed crop insurance can be one of the solutions in providing compensation to the farmers whose seeds have not given the desired yield. What is your opinion on the feasibility of this mechanism?

3) Import of Seeds

- a) In your opinion who should be empowered to conduct multi-location trials (MLTs) and why?
 - a. Public sectors
 - b. Private sectors
 - c. Both (a) and (b)
 - d. Any other
- b) Should the import of seed be permitted on the basis of information given by the importer of the results of MLTs?
- c) What precautions need to be taken to monitor seed export and import?
- d) In case of any pest-outbreak due to seed export/import by a Seed Company, what liability should be imposed on the importer/exporter company?

4) Punitive Measures in case of offence (when Seed Bill mandatory provisions are violated)

- a) Fine (only in monetary terms): Minimum fine
- b) Imprisonment up to one year with a minimum sentence of six months

5) Royalty fee

- a) Not more than 20% of the cost of the bare seed in the first 3 years of innovation or grant of patent, and 5% of the cost of the bare seed subsequent to the period of 3 years.
- b) Royalty fee should not exceed 5% of the total cost of the seed for all traits put together

6) Powers to State Governments (Agriculture being a State Subject)

- a) Regulate sale price of seeds and royalty/trait fee
- b) Award adequate compensation to farmers in case of seed failures
- c) Regulate erring companies in imposing fine and imprisonment
- d) Multi-Location Trials in the state before permitting import of seeds
- e) Conduct of trials for Bt/GE crops

7) Seed production and distribution system

- a) Technical problems
- b) Infrastructural problems
- c) Financial problems
- d) Operational problems

8) Seed certification system and quality control

- a) What role can seed certification agency play in providing compensation to farmer in case of seed/crop failure?
- b) Technical problems
- c) Infrastructural problems
- d) Financial problems
- e) Operational problems

9) Farmers' Rights and Breeders' Rights

The registration made under this act was valid for a period of 15 years for annual and biennial crops 18 years for long duration perennials. There was also a provision for re-registration. However as per the amendments recommended by the standing committee the duration of registration period has been reduced to 10 years for annual and biennial crops 12 years for long duration perennial. And the provision for re-registration has been deleted.

- a) What is your opinion on the proposed amendment?
- b) Is the provision for re-registration necessary?
- c) If yes, why and doesn't this provision pave way for seed monopoly
- d) The Bill does not restrict farmers' right to use or sell his farm seeds and planting material, provided the seeds and planting material sold by farmers conform to the minimum standards applicable to registration of seeds. The provision of conforming to minimum standards will restrict the rights of the farmer. What is your opinion on this?
- e) The bill makes it compulsory for every seed dealer to register and regulates the sale of registered seeds. It also prohibits bartering of registered seeds. But bartering is the traditional way of mutual exchange of seeds in the Indian farming community. So, what is your opinion on this?

10) Pre-Grant Opposition

- a) A suitable provision containing pre-grant opposition to Registration of a new variety of seed is needed. What is your opinion on this?

11) PVPFRA requires declaration of parentage and pedigree of seeds whereas the Seed Bill does not.

- a) Disclosure of parentage
- b) The new seed bill restricts farmers from selling seeds/ material under the brand name.

12) What deficiencies do you feel in the Seed Bill 2011?**13) What amendments do you expect in the Seed Bill 2011?****14) What is your opinion on the effectiveness of seed act in the country? How is it helpful to farmers? How is it helpful to agri-business companies?****15) The Standing Committee has proposed to delete the provision for provisional registration of transgenic varieties of seeds. What impact will this have on companies producing such seeds?****16) Certification of seed**

- a. Who should do it? Public/private or both
- b. Private participation in seed certification and testing
- c. Should provision of self-certification be allowed?

17) Coordination between various agencies producing and distributing seeds

- a. Public organizations like NSC, SFCL, State Department of Agriculture, ICAR Institutes, SAUs, etc.
- b. Private seed companies
- c. CBOs

Appendix III

Interview schedule to elicit priority issues of various stakeholders

Response of each respondent for each issue was measured on a five point rating as shown below.

No.	Issues	Most important	Important	Somewhat important	Less important	Least important
1.	Upholding farmers' rights					
2.	Availability of quality seed in sufficient quantities					
3.	Strengthen informal seed systems					
4.	Price regulation mechanism					
5.	Check malpractices in the market					
6.	Compensation issues					
7.	Powers to state governments					
8.	Stringent punitive and accountability measures					
9.	Seed crop insurance					
10.	Strengthening public sector seed agencies					
11.	Government investment in infrastructure and public R&D					
12.	Development of new varieties and hybrids					
13.	Coordinated planning in seed production by public and private seed producing organizations					
14.	Deregulation of price					
15.	Seed legislation conducive for private seed companies (Liberalization of seed policy)					

16.	Sharing of germplasm by public sector					
17.	Self-Certification of seed					
18.	Public Private Partnership in development of innovations					
19.	Single window mechanism for regulation of biotech crops					
20.	Strengthen quarantine system					

Appendix IV

Letter to Hon'ble Prime Minister, Government of India from AP Farmers Unions and NGOs Coordination Committee on seeking amendments to Seed Bill 2004

To
Hon'ble Prime Minister
Government of India

30th April, 2010

Ref: **Seed Bill, 2010**
Subject: Seeking amendments to Seed Bill, 2010, given the
experience with seed regulation in the last six years

Dear Sir/Madam,

As you are aware, Andhra Pradesh is considered as the Seed Capital of India which has concentration of Seed Companies and most of the seed is produced in the State. AP has large area under commercial crops and most of the farmers are dependent on the companies for seed. As the Seed Bill 1966 was inadequate to address the issues and problems faced by the farmers, Government earlier has introduced a Memorandum of Understanding (MoU) system. However it was questioned for its legal status. To overcome this problem, the current Government has introduced a draft 'AP Seed Bill 2004' which was not approved by the Centre as 'Seed Bill 2004' proposed by it was pending at that time. In the absence of a regulatory Act, farmers in the State, and Farmers Organisations have been facing several problems with regard to the Seed Quality, Seed Prices and adequate Compensation for the losses caused by bad quality seeds.

In the last five years, even the AP State Government has faced serious problems with the Seed Companies in regulating the Seed sale in the state in fulfilling its objective of helping farmers to have timely access to good quality seed in adequate quantities.

5. In 2005, after establishment of large scale cotton seed failure in Warangal dist, State government asked Mahyco to pay compensation. This company refused to pay and moved to AP high court on paying compensation saying state govt is harassing them. AP High court orders also were in favour of Mahyco and till date the company has not paid the compensation
6. In 2006, after MRTP commission's ruling to reduce the Bt. cotton seed price, AP government reduced the cotton seed prices to Rs. 650 and Rs. 750 for bollgard I and II. Challenging this, MMB moved to Delhi high court on this issue.
7. In 2007, when Agriculture officers in Warangal district found that Mahyco Bt hybrids are being sold in Warangal market, they raided and seized the shop.

Mahyco challenged that cotton seed was removed from Essential Commodities Act; hence Seed control order which draws powers from EC Act does not apply to cotton. At this juncture, AP government made a new act to regulate transgenic cotton seed in AP. However, all these Acts, including Seed control order, will be repealed once the 2010 bill is passed, thereby taking away the rights of the farmers and also the powers of the State government.

8. In 2010, Monsanto filed case in AP High Court requesting to stop state govt from reducing the royalty arguing that it does not have any power to do so. The case is still pending in the court.

In many other situations, including the above mentioned four issues, it is clear that in the existing legal framework, State governments have no powers and they are finding it difficult to regulate the prices (and/or royalty) and get adequate compensation be paid to farmers when crop fails. Unfortunately, in Seed Bill 2010, powers to State governments are inadequate - almost nothing.

In this situation, we (representatives of farmer wings of different political parties, independent farmer organisations and NGOs working with farmers) had a series of discussions, wherein a consensus emerged that the Seed Bill, 2010, requires a few important changes. We seek the following amendments to the Seed Bill 2004 in addition to some of the very useful Amendments suggested by Hon'ble Minister for Agriculture Shri. Sharad Pawar:

States should have powers to regulate seed prices and royalties, evolve a simple mechanism to pay adequate compensation (on the crop loss rather than just the seed price) and award punishment for offenses with adequate fine (in proportion to the damage caused, rather than just blanket 30,000 as mentioned in the bill).

Please find enclosed Clause-wise amendments sought in the Seed Bill 2004.

With best Regards

Yours Truly

For AP Farmers Unions and NGOs Coordination Committee

<i>Represented by</i>	
Farmers Unions	
Andhra Pradesh Kisan and Mazdoor Congress	
Telugu Rythu	
Andhra Pradesh Rytu Sangam (CPM)	
Andhra Pradesh Rytu Sangam (CPI)	
Bharatiya Kisan Morcha	
Others	
Sri. Vadde Shobanadreeswara Rao Former Minister for Agriculture, AP, and Former Member of Parliament	

Sri. Yerneni Nagendranath Rytanga Samakya	
Independent Organisations working with Farmers	
Centre for Sustainable Agriculture	
Chetana Society	

RAJYA SABHA
AMENDMENTS SOUGHT IN THE SEEDS BILL, 2004

CLAUSE 5

1. That at page 5, line *after* line 38 the following be *inserted*
 'ba) procedure for fixing the seed prices and royalty over proprietary technologies'

CLAUSE 11

2. That at page 6, line 43 *new line* be *inserted*;
 'aa) to collect data, review and fix prices of seeds registered and sold after their approval'.

CLAUSE 20

1. That at page 9, *for* lines 5 to 10, the following be substituted, namely,-
 "20. (1) Where the seed of a registered kind or variety is sold to the farmer, the producer, distributor or vendor, as the case may be, shall disclose the expected performance of such kind or variety to the farmer under given conditions and if. Such registered seed fails to provide the expected performance. Under such given conditions, the farmer may claim such compensation from such producer, dealer, distributor or vendor as may be determined by a Compensation Committee.
- Compensation
to farmers
20. (2) The Central Government may prescribe;
 - a) the composition and experience of the members of the Compensation Committee;
 - b) the procedure to be followed by such Compensation Committee;
 - c) the manner of giving compensation by such Compensation Committee to the farmer;
 - d) the time within which the compensation so determined shall be paid to the farmer.
 - e) establishment of a state and district level compensation committees their composition and procedure for determining compensation.
 - f) roles for Panchayats in certifying failures or losses
 20. (3) Any compensation determined by the Compensation Committee under sub-section (1) if not paid to the concerned farmer, shall be recovered as an arrear of land revenue.
 20. (4) Any farmer aggrieved from the decision of the Compensation Committee may prefer an appeal to the prescribed authority which shall dispose off the appeal within such time and in such manner as may be prescribed.

CLAUSE 36

3. That at page 13, line 30, *for* the words "“multi-locational trials", the words "“multi-locational trials conducted in India and" be *substituted*.

CLAUSE 38

4. That at page 14, line 12 after 'be punishable with' the following be *substituted*
 'a fine in proportion to the damage caused, quantity of seed supplied or stocked with malicious/negligent intent and therefore, X-times the real loss or potential loss incurred by farmers'.

CLAUSE 46

5. That at page 16, *after* line 4, the following be *inserted*, namely,-
 "(ja) the composition and experience of the members of the Compensation Committee, the procedure to be followed by it to make adequate, the manner of giving compensation and the time within which the compensation so determined is to be paid to the farmer under sub-section (2) of section 20;
 (jb) the authority to whom appeal may be preferred and time and manner for making appeal under sub-section (4) of section 20;"

Plate I

Researcher conducting interviews with Farmers in Bihar



Researcher conducting interviews with Farmers in Andhra Pradesh

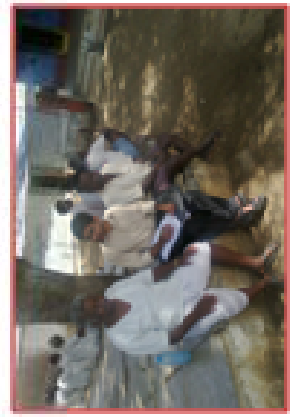


Plate II

Researcher conducting interviews with other stakeholders



Interviewing Dr. Vishnuvardhan Reddy, Director, Seed Research and Technology Centre, ANGRAU, Hyderabad



Interviewing Dr. K. Keshavulu, Head, Division of Seed Science & Technology, ANGRAU, Hyderabad



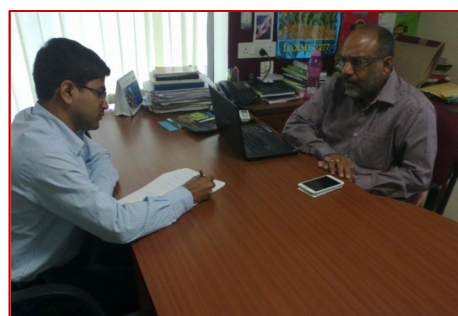
Interviewing Dr. C. B. Pandey, Director Seeds Farms, RAU, Samastipur, Bihar



Interviewing Seed Dealer in Samastipur, Bihar



Interviewing Dr. G. V. Ramanjaneyulu, Director, Centre for Sustainable Agriculture (NGO), Hyderabad



Interviewing Mr. Venkateswarlu Yaaganti, Owner of Yaaganti Seeds Pvt. Ltd., based in Hyderabad