

Note of Information for the National seed Association of India (NSAI) proposal on Capacity Building program Initiatives for Indian Seed Industry as part of AtmaNirbhar Bharat program submitted to NABARD

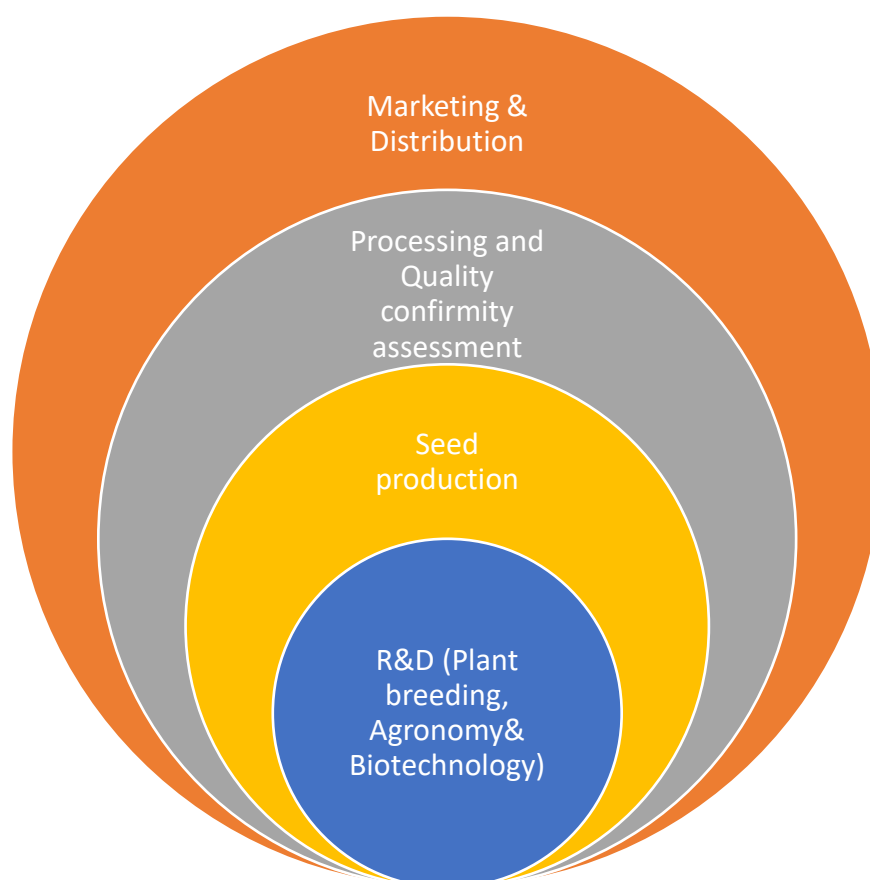


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1. Overview of the seed industry – Structure of the industry, size of the industry, major players of the sector (Organised and Unorganised) and their respective crop-wise share in the total turnover of the industry

Indian Seed industry is a sub-sector within Agri-input sector of Agriculture and allied industry. Seed is the primary input in Agriculture, which encapsulates the genetics of Plant variety. At the core of Indian Seed Industry is Plant variety development through conventional plant breeding in the process of genetic improvement of crops. Plant variety therefore is the key product of seed industry, with each new variety showing incremental advantage over pre-existing varieties. The seeds of such identified best varieties are evaluated for their suitability for specific agro-climatic conditions before commercialization and then multiplied through standard seed production process, tested for genetic purity and seed quality standards, processed and then marketed to farmers across various distribution channels. The seed industry is structured based on different functions of the overall production process.



Another important dimension of seed industry is seeds being self-replicating entities based on their nature of reproduction which is a natural life process. In most of the self-pollinated crops like foodgrains, pulses, oilseeds and certain vegetable crops, forage crops, fruit crops, sugarcane, potatoes, etc., seeds can be directly produced by farmers from the agricultural output produced by them. Such seed is called Farm Saved Seed (FSS), which is widely prevalent in many of the crops mentioned above. However there is an increased trend of farmers replacing the FSS with newly purchased seed once in every 2-3 years.

The increasing trend of Seed Replacement Rate (SRR) by farmers in various crops expands the size of commercial seed industry. Over the period of time the SRR of various crops has been increasing from 10% to more than 50% in many of the crops where Open Pollinated Varieties (OPV) seeds are used. This leads to a large section of farmers using FSS and being out of purview of the commercial seed industry. It should be noted that in case of crops where hybrid seeds are used, the SRR is 100% as the farmers cannot re-use the seed for the next generation as re-use of hybrid seed leads to dilution of genetic purity due to genetic segregation of characters in the next generations.

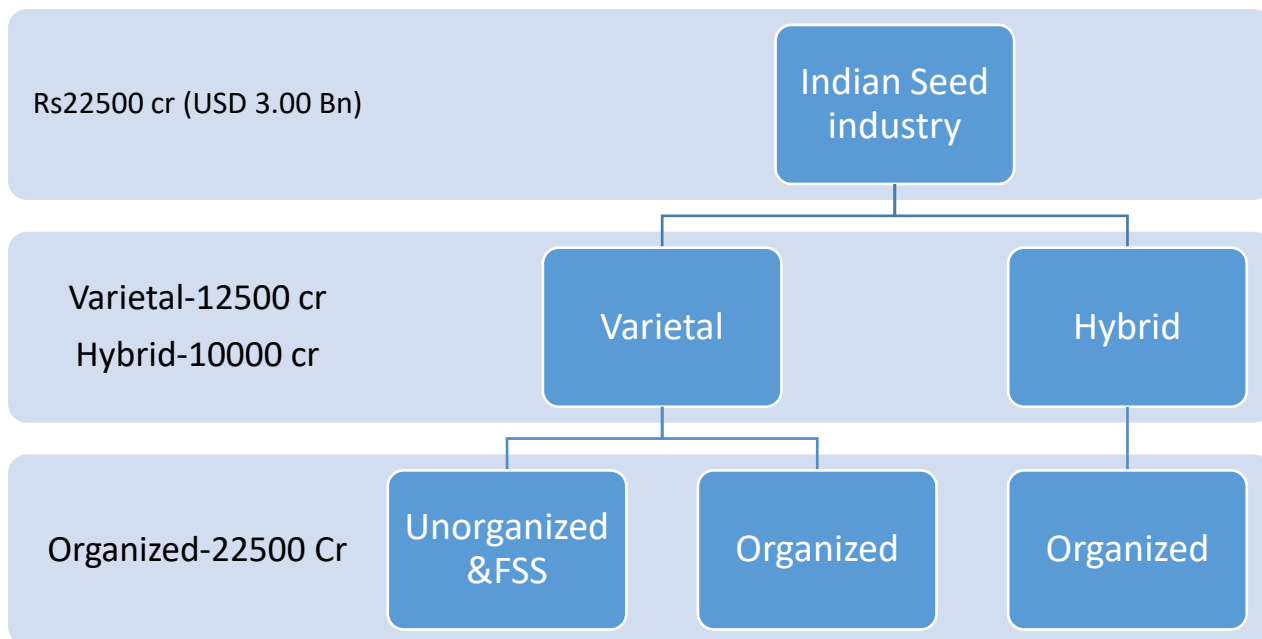
Globally the growth of seed industry and especially private seed sector happened over the harnessing of the concept of Hybrid vigour or Heterosis, where the hybrid seeds express significant improvement in economic attributes over the parent varieties. Hybrid seed initially launched in crops like Maize, Millets, Cotton, Vegetable crops, etc, have also been developed in Rice, Mustard, etc. However in many of the self-pollinated crops, like Wheat, Pulses, groundnut, etc., the concept of heterosis is yet to be harnessed and as there is no significant advantage of hybrid seed over varietal seeds. Therefore still OPV seeds are utilized in crops like Wheat, Rice, Redgram, Greengram, Blackgram, Soybean, Groundnut, etc.

The seed industry in India is a mix of large, medium and small seed companies in public and private sector. While certain large companies have competencies in all the industry functions such as R&D, Production, Processing, marketing and distribution, small companies specialize in one or more functions. It is to be noted that the Indian seed sector developed on the strong foundation laid down by public sector research institutions in 1960s and 1970s since the era of green revolution.

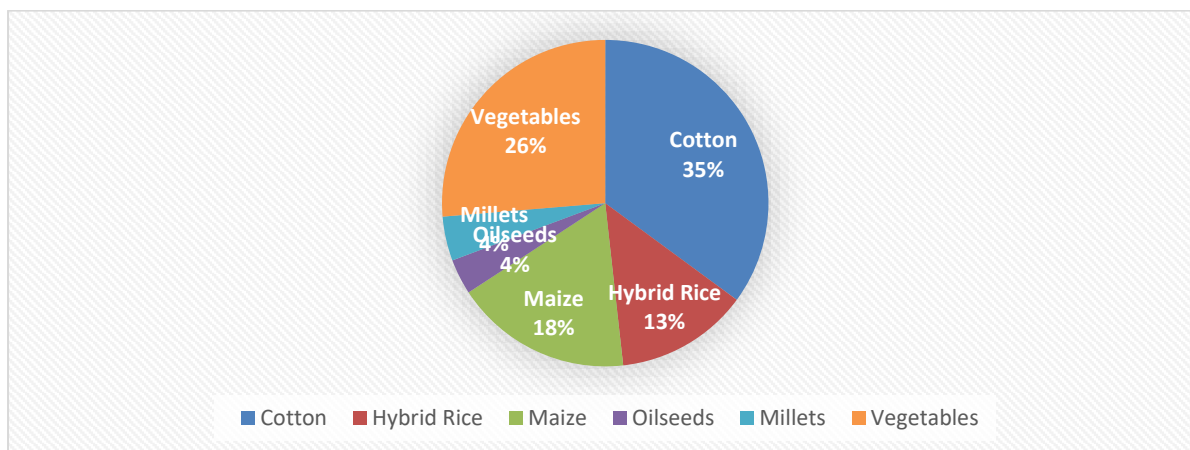
The public sector is represented by the National Seed Corporation (NSC) and the State Seed Corporations (SSCs). Currently there are nearly 700+ seed companies in India both in private and public sector. The public sector research of State Agricultural Universities (SAUs) and Indian Council of Agricultural Research (ICAR) has not only fuelled the development of Indian seed industry, but also continues to drive the industry with continuous delivery of new improved plant varieties of Plant varieties to both Public and private sector.

The Indian seed industry is regulated by Seeds Act, 1966 which regulates the quality of seeds sold to farmers. The Seed Control Order, 1983 oversees the process of licensing for conducting of seed business. In general private sector specializes in high value hybrid seeds and varietal seeds and offers them to farmers as Truthfully Labelled (TL) seeds, public sector specializes in high volume OPV seeds and offers them to farmers Certified Seeds. The Indian seed sector is valued at USD 3.0 Bn dollars and is the 5th largest globally as per NSAI estimates. The Farm saved seed saved and used by farmers and exchanged between farmers is not included in market size. However with respect to exports, India has a miniscule share and has a huge opportunity to become a global seed hub. The seed industry landscape of depicted below. The unorganized sector also includes seed and propagating materials, nurseries.

Globally Genetically Modified (GM) crops came into existence in 1995 and in 2002, the Government of India gave permission of large scale environmental release and therefore commercialization of GM Cotton (also known as Bt Cotton). By 2010, 85% of Indian Cotton was converted into GM Cotton and presently nearly 99% of Cotton grown in India is GM Cotton. Bt Cotton is the only GM crop allowed for cultivation in India. Presently India has the fifth largest GM cropped area in the world and the GM Cotton market in India is nearly 16% of the total commercial seed market in India.

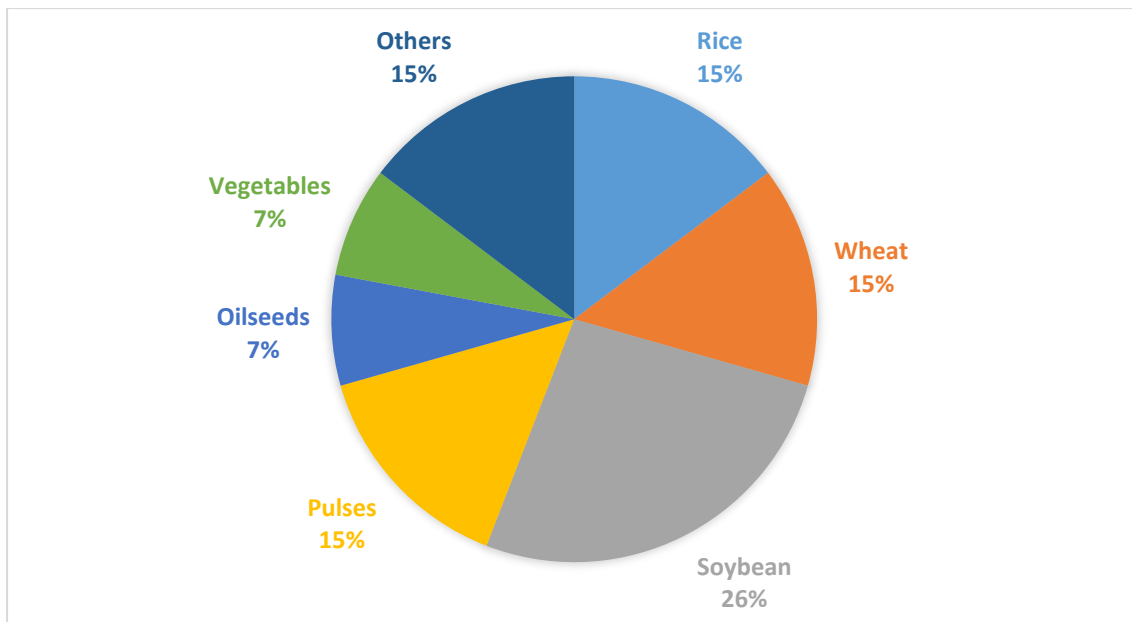


The Indian hybrid seed industry is estimated at Rs 10000 crores or USD 1.33 Bn. The entire hybrid Cotton seed market is GM Cotton seed and therefore GM seed market is nearly 16% of the total seed market and 35% of the hybrid seed market. The crop-wise share of Indian seed industry for hybrid seeds is given below.



SNo	Crop	Mkt size vol (in MT/Pkts in Cotton)	Value in Rs Cr
1	Cotton	5 crore pkts	3650
2	Maize	1.2 lakh tons	1800
3	Rice	60000 tons	1200
4	Millets (Bajra,Jowar,Forages)	30000 tons	500
5	Oilseeds (Sunflower,Mustard)	5000 tons	225
6	Others		25
7	Vegetable seeds		2600
8	Total		10000

The Indian OPV seed industry is estimated at Rs 12500 crores including nurseries and crops where vegetative planting material is utilized as seed or propagating material. The commercial OPV seed industry falls under both organized and unorganized sectors. The estimates for unorganized seed sector and FSS are not available and may be valued at atleast 20-25% more than estimated value of the industry which pegs the market size at USD 3.6 Bn to USD 3.75 Bn. The unorganized sector sells both branded and unbranded seed, however the estimates of revenue of branded seeds are not available as it is sold in informal channels out of seed quality regulation. The FSS comprises farmer's seed is part of farm produce which is used for sowing and also exchanged between farmers in unbranded manner. The crop-wise share of Indian seed industry for hybrid seeds is given below.



SNo	Crop	Value in Rs Cr
1	Rice @ 50% SRR	3000
2	Wheat@ 50% SRR	3000
3	Milletts (Maize, Jowar, Forage crops,etc)	500
4	Pulses (Soybean and Grams)	3000
5	Oilseeds	500
6	Vegetables (Potato, Onion, OPV crops)	1000
7	Planting material (Nurseries, Horti crops,etc)	750
8	Others (Sugarcane,Tobacco, Jute,etc)	500
	Total	12500

With respect to the various players in the seed industry landscape, the industry has domestic seed companies, Multinational companies (MNCs), domestic MNCs, small and medium R&D driven companies, Small and medium companies specializing only in one or more industry functions, NGOs involved in seed production, Public sector companies, FPOs specializing in seed production, etc. Based on the industry structure as mentioned above, key players with end to end industry functions including R&D are presented in the table below.

Category	Key Players (indicative only)
Seed companies with Revenue over Rs500 cr revenue)	MNCs: Corteva, Bayer, Syngenta Domestic: NSC, NSL, Advanta, Rasi, Kaveri
Seed companies with Revenue over Rs 200-Rs 500 cr	MNCs: BASF, Limagrain, East-West, CP Domestic: Seedworks, Ganga Kaveri, Mahyco, Ajeet, VNR seeds, Mahabeej, Tata-Rallis, etc.
Seed companies with revenue less than Rs 200 cr)	MNCs- Sakata, Tokita, KnownYou, Nongwoo, Domestic- Hytech seeds, Ascen-Hyveg, Namdhari, Tulasi, Veda seeds, JK seeds, Nath seeds, Krishidhan seeds, Pan seeds, Pallishree seeds, Kalash Seeds, Doctor seeds, GreenGold seeds, etc.

In addition to the R&D driven above companies with all the industry functions, there are companies which specialize only in Seed production and processing or companies which focus only on marketing of seeds by licensing Plant varieties from other companies.

2. Crop-wise Seed Exports – Existing and potential

The global seed industry market size as per OECD report, 2018, ¹ is estimated at USD 45 bn in 2012 and presently at USD 52 Bn. The market is growing at a CAGR of 5%. India stood at sixth position as per statistics in 2012, however presently India is at 5th position.

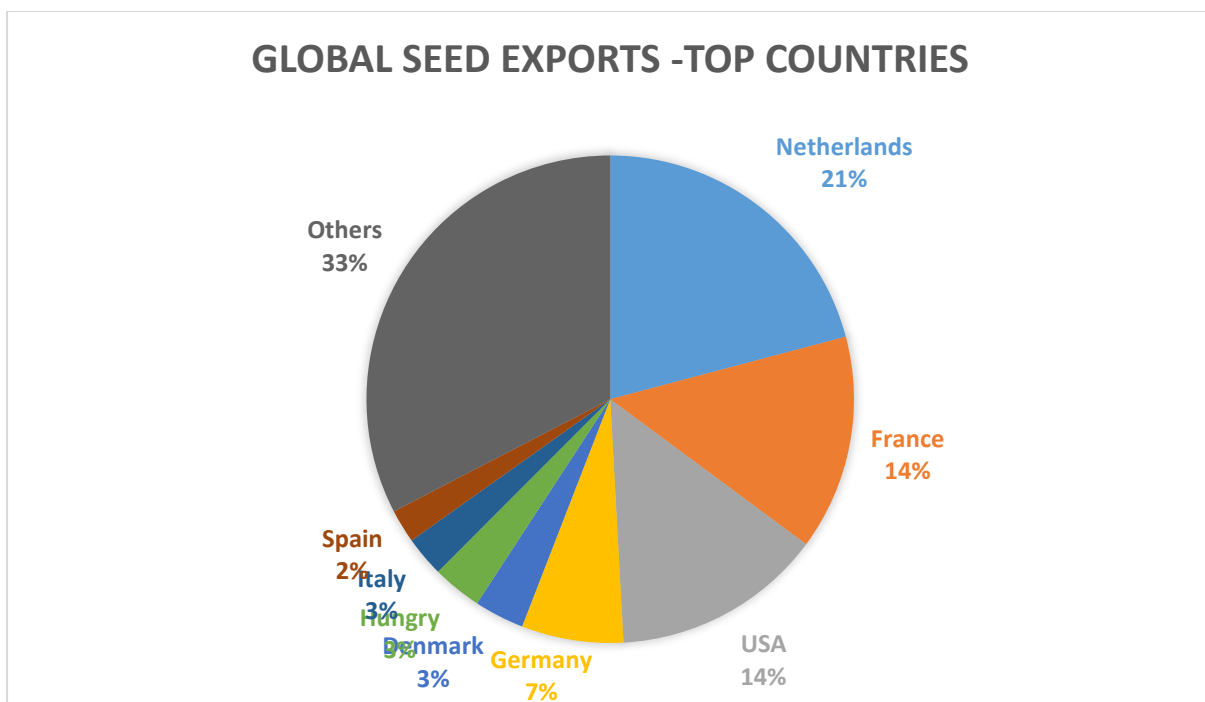
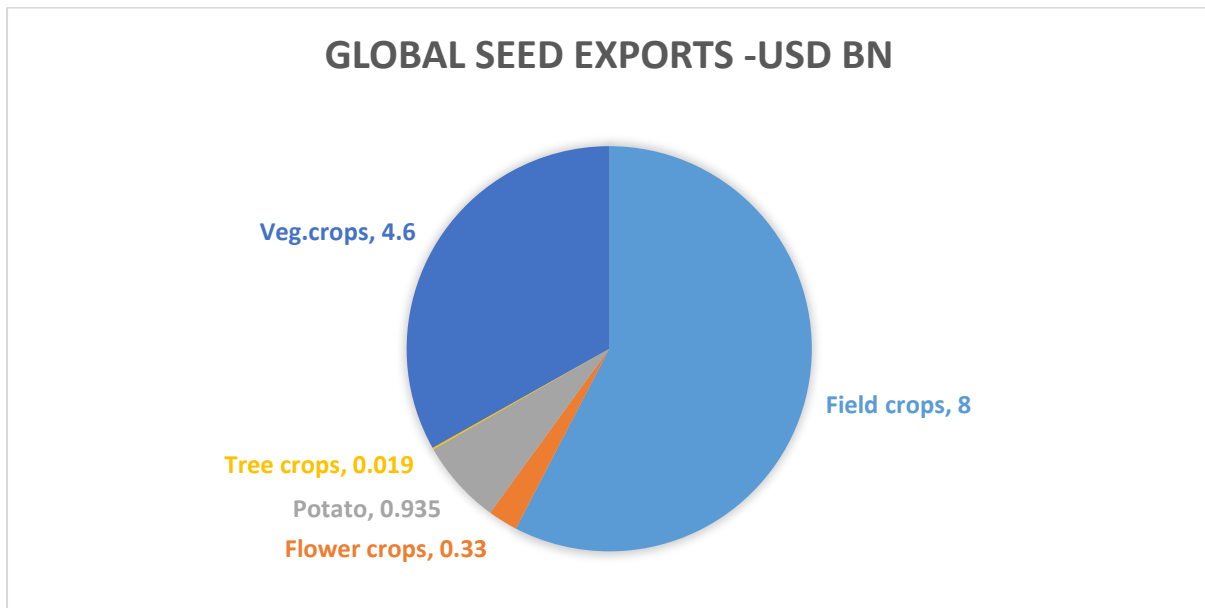
Sno	Country	Mkt size in USD Bn in 2012 as per ISF data	% global share	Mkt size in USD bn in 2019-20	% global share
1	USA	12	27%	13	25%
2	China	10	22%	11	21%
3	France	2.8	6%	3.5	7%
4	Brazil	2.6	6%	3.2	6%
5	Canada	2.1	5%	2.8	5%
6	India	2	4%	3.1	6%
7	Japan	1.4	3%	1.7	3%
8	Germany	1.2	3%	1.4	3%
9	Argentina	1	2%	1.1	2%
10	Italy	0.8	2%	1	2%
11	Turkey	0.8	2%	0.8	2%
12	Spain	0.7	2%	0.85	2%
13	Netherlands	0.6	1%	0.6	1%
14	Russia	0.5	1%	0.6	1%
15	UK	0.4	1%	0.5	1%
16	South Africa	0.4	1%	0.5	1%
17	Australia	0.4	1%	0.5	1%
18	S.Korea	0.4	1%	0.5	1%
19	Mexico	0.4	1%	0.5	1%
20	Czech Republic	0.3	1%	0.4	1%
21	RoW	4.4	10%	4.8	9%
	Total	45.2	100%	52.25	100%

While India is the fifth largest seed industry globally, it has a miniscule share in global seed trade. The total global seed exports are valued at USD 13.8 Bn market size of seeds of Field crops, tree crops, Potato, Flower crops and Vegetables crops as per ISF data 2018². Netherlands leads in global

¹ OECD (2018)- Concentration in Seed markets, Potential effects and Policy responses, OECD publishing Paris. <https://www.oecd-ilibrary.org/sites/9789264308367-5-en/index.html?itemId=/content/component/9789264308367-5-en>

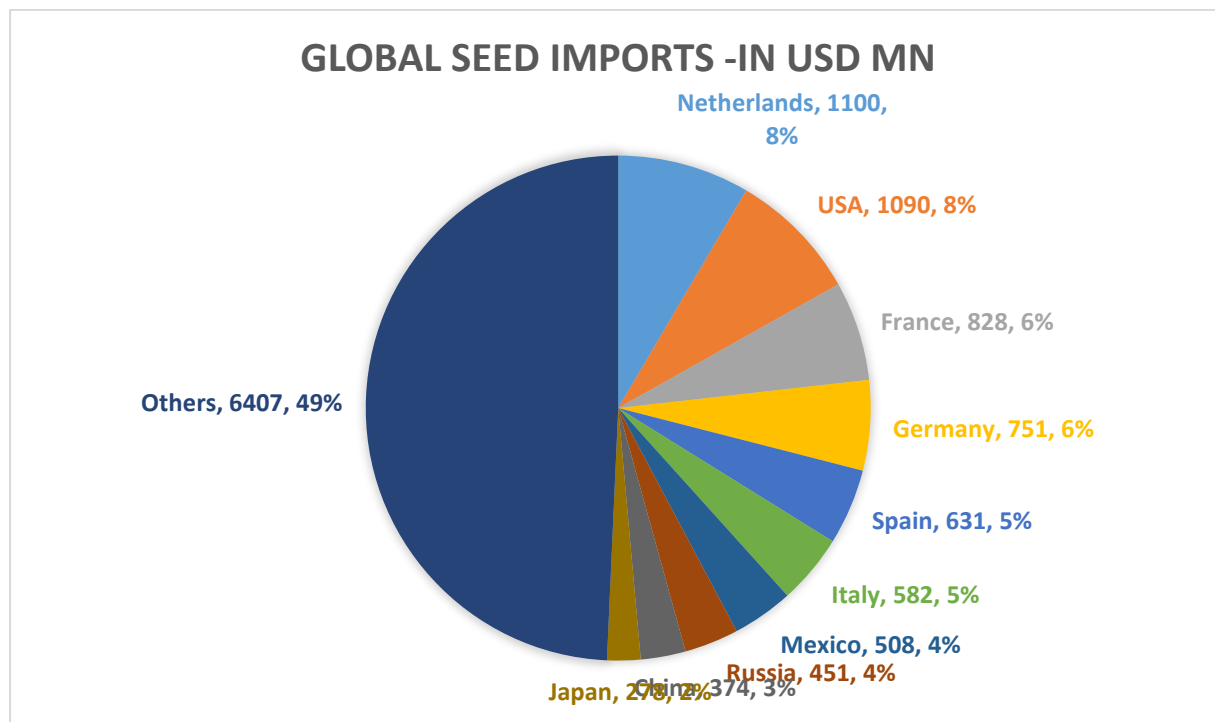
² ISF data-https://www.worldseed.org/wp-content/uploads/2020/10/Export_2018.pdf

seed exports with nearly USD 2.88 bn, followed by France with USD 1.97Bn and USA with USD 1.93 bn. India exports USD 137million worth seeds per year, which accounts to approximately 1% of the total global exports.



India also imports USD 137 million seeds especially cool season vegetables, Forage grasses, etc., from Europe and other countries as per 2018 ISF data. The global imports 2018 data also show that out of the USD 13bn imports, Netherlands is the top importer at USD 1.1 Bn seed imports followed

by USA (USD 1.09Bn) , France (USD 828 mn), Germany (USD 751 mn), Spain (USD 631mn), Italy (USD 582mn), Mexico (USD 508), Russia (USD 451 mn), China (USD 374 mn), and Japan (USD278 mn).



With enormous geographical and agro-climatic diversity, there is an excellent opportunity for India for exporting seeds to both sub-tropical and tropical regions of the world. Further India has skilled manpower for catering needs of R&D in plant breeding, Biotechnology, seed production and seed technologies which create an enabling environment for India to become a global seed hub for breeding varieties for varied global markets and to undertake custom seed production. With similar agro-climatic conditions and edaphic conditions, Indian Plant varieties have an excellent fit in South Asian, South East Asian and African countries.

Future opportunity: With proper capacity building in seed production processes, Digitalization of supply chain and quality infrastructure development, India can ramp up its exports to atleast USD 500 mn in the next five years and further to USD 1Bn within 7-8 years. However this needs big policy reform push from Government for strengthening the capacities of domestic seed sector, ease of doing business, significant investments in R&D, coupled with accreditation based seed quality systems will enabled harnessing the business opportunity particularly in similar agro-climatic regions in Asian and African continents.

3. Region & Crop-wise Seed producing regions of India

India has diverse agro-climatic zones, which describe suitability of agriculture crops in a land or a region in terms of a combination of major climatic patterns, temperature, water availability and soil types. India has 15 major agro-climatic zones and 127 agro-climatic regions and 20 agro-ecological zones based on soils classifications. The cropping patterns in different States of India is also dependent on the agro-climatic suitability of particular crops in India. The total land area in India is 328 mha out of which 156 mha is arable land³. As per 2018-19 data the total cropped area in India for major crops is given below.

S. No.	Crops	Seasons	2017-18**	2018-19*
1	Rice	Kharif	39.35	39.42
		Rabi	4.44	3.96
		Total	43.79	43.38
2	Wheat	Rabi	29.58	29.08
3	Barley	Rabi	0.66	0.72
4	Jowar	Kharif	1.9	1.56
		Rabi	3.07	2.45
		Total	4.97	4.01
5	Bajra	Kharif	7.38	6.7
6	Maize	Kharif	7.62	7.54
		Rabi	1.85	1.59
		Total	9.47	9.13
7	Ragi	Kharif	1.2	0.95
8	Nutri/ Coarse	Kharif	18.63	17.23
		Rabi	5.58	4.77
		Total	24.21	22.00
9	Cereals	Kharif	57.98	56.65
		Rabi	39.59	37.81
		Total	97.57	94.46
10	Tur (Arhar)	Kharif	4.43	4.27
11	Moong	Kharif	3.29	3.31
		Rabi	0.97	0.94
		Total	4.26	4.25
12	Urad	Kharif	4.5	3.92
		Rabi	0.94	0.91
		Total	5.44	4.83
13	Gram	Rabi	10.56	9.67
14	Lentil (Masur)	Rabi	1.55	1.5

³ CACP report- <https://cacp.dacnet.nic.in/ViewReports.aspx?Input=2&PageId=39&KeyId=669>

15	Pulses	Kharif	14.08	13.21
		Rabi	15.91	15.08
		Total	29.99	28.29
16	Foodgrains	Kharif	72.06	69.86
		Rabi	55.5	52.88
		Total	127.56	122.74
17	Groundnut	Kharif	4.1	4.06
		Rabi	0.81	0.79
		Total	4.91	4.85
18	Soybean	Kharif	10.47	11.28
19	Sunflower	Kharif	0.13	0.12
		Rabi	0.15	0.17
		Total	0.28	0.29
16	Sesamum	Kharif	1.56	1.56
17	Nigerseed	Kharif	0.22	0.18
18	Mustard/RM	Rabi	5.96	6.24
19	Safflower	Rabi	0.07	0.04
20	Nine Oilseeds	Kharif	17.32	17.98
		Rabi	7.33	7.55
		Total	24.65	25.53
21	Cotton		12.43	12.35
22	Jute		0.68	0.68
23	Mesta		0.06	0.05
24	Jute & Mesta		0.74	0.73
25	Sugarcane		4.73	5.06

For Gross cultivated area of 167 mha in 2018-19, the total seed requirement in India is met by both Public sector, Private sector and Farmer's own saved seed (FSS). While larger private sector companies specializes in hybrids and certain OPV crops, the public sector corporations such as NSC and SSCs focus on supply of certified seeds to farmers. While elaborate and specialized seed production practices and processes are required for hybrid seeds, OPV seeds are produced using normal off-type screening and roguing standards are practiced for OPVs. Based on seed rate, seed replacement rate (SRR) and seed multiplication rate (SMR), the area and seed requirements are calculated⁴. For Cotton the volume is counted in no.of packets of each packet weighing 450g to 475g as 99% of Cotton in India is Bt Hybrid Cotton. The total seed requirement in MT of major crops per year is given in the table below.

⁴ <https://seednet.gov.in/PDFFILES/National%20Seed%20Plan.pdf>

SNo	Crop	Total Area (Million Acres)	Seed rate per acre (kg/acre) or Pkts/acre in Cotton	Total seed production requirement volume per year (Pkts for cotton MT for all other crop)@ 100%SRR	Total seed requirement for OPV @ 50% SRR for Rice,Wheat and Soybean	Major States where seed production is undertaken
1	Cotton	31	1.75	5,Cr Pkts	5 Cr pkts	Gujarat, AP,Telangana, Tamilnadu,Maharashtra
2	Rice- varietal	98	25	24,50,000 tons	12,25,000 tons	AP, Telangana, UP, MP, Maharastra, Gujarat, Chattisgarh
3	Rice hybrid	11	6	66000 tons	66000 tons	Telangana
4	Wheat	75	40	30,00,000 tons	15,00,000 tons	UP,Uttarakhand,Punjab,Haryana,MP,
5	Soybean	28.2	30	8,46,000 tons	4,23,000 tons	MP,Karnataka,Maharashtra, Telagana
6	Maize @ 80%hybrid	22.82	8	182600 tons	14608 tons	AP, Telangana, MP,Karnataka, Maharashtra
7	Bajra @ 80% hybrid	16.75	1.5	25125 tons	20100 tons	AP, Gujarat, Rajasthan

Almost all the hybrid seed production happens in specialized pockets in States like Karnataka, AP, Telangana, Gujarat, Mahrastra, UP, Uttarakhand, MP, Odisha, etc., where in farmers have acquired specialized skillset over a period of time for performing specialized operations for production of hybrid crops. However commercial OPV seeds production happens in almost every State. The National Seed Corporation (NSC), State Seed Corporations, Cooperative societies, FPOs, NGOs and other organizations in each of the States mostly undertake certified seed production of OPVs seeds.

Some districts have acquired high level competencies in hybrid seed production. For example, Karimnagar and Warangal in Telangana accounts for more than 80% hybrid paddy seed production in India. Similarly West Godavari district in Andhra Pradesh and Khammam in Telangana specialize in Hyrid Maize production. Haveri and Koppal districts in Karnataka

are famous for vegetable seed production and Gadwal district of Telangana, Kurnool district of Andhra Pradesh and Sabarkantha district of Gujarat, specialize in Cotton production. The crop-wise and state-wise seed producing regions are given in the table below.

SNo	Crop	Avg Seed output	No.of Acres	Seed production regions/Districts
1	Hybrid Paddy	650-750 kg/acre	140,000	Karimnagar (TS), Warangal (TS), Khammam (TS), Kurnool (AP), Mahbubnagar (TS), Raichur (KTK),Koppal (KTK), Raipur (Chattisgarh),etc
2	Hybrid Maize	1 ton/acre	150,000	West Godavari (AP),Khammam (TS), E.Godavari (AP), Prakasam (AP),Kadapa (AP), Karimnagar (TS), Warangal (TS), Nizambad (TS) ,etc
3	Hybrid Bajra	500 kg/acre	70000	Kadapa (AP), Nizambad (TS), Ballari (KTK),Anantapur (AP)
4	Hybrid Mustard	400 kg/acre	15000	Nizambad (TS), Sabarkantha (Guj), Jalna (Maha)
5	Hybrid Cotton	350 kg/acre	150000	Mahboobnagar (TS), Kurnool (AP), Koppal (KTK), Sabarkantha (Guj), Attur (TN), Akola (Mah),etc.
6	Hybrid Tomato	60 kg/acre	2000	Haveri, Koppal and Davangere districts of (Karnataka) Buldhana (Maharashtra) Bayad of Aravalli (Gujarat)
7	Hybrid Okra	150 kg/acre	12000	Aravalli District (Gujarat), Haveri, Gadag, Koppal and Davanagere (Karnataka) Buldhana district (Maharashtra)
9	Hybrid Chilli	120 kg/acre	1000	Koppal, Haveri and Davangeri districts of Karnataka, Buldhana district of Maharashtra
10	Hybrid Watermelon	40 kg/acre	3000	Koppal, Tumukur, Chikmangalore and Davangere district of Karnataka, Buldhana district of Maharashtra, Aravalli district of

				Gujarat
11	Wheat	1500 kg	7.5 lakh acres	UP,Uttarakhand, MP,Gujarat,Rajasthan,Haryana, etc.
12	OPV Rice	1800 kg	10 lakh acres	Telangana, AP, Odisha,AP, West Bengal, UP,UK,MP, Punjab, Haryana
13	Soybean	700 kg	2 lakh ha	MP, Maharastra, Telangana
14	Redgram	800 kg	NA	Northern Ktaka
15	Greengram	400 kg	NA	AP,Karnataka,Maharashtra
16	Groundnut	1000 kg	NA	Gujarat,AP
17	Bengalgram	600kg	NA	MP,UP,Gujarat

Hybrid seeds of Cool season vegetables like Cauliflower, Cabbage and other cole crop give higher seed yields of good quality in Mediterranean climates in countries like Italy, Spain, Chile, etc. and such seeds are imported into India by many vegetable seed companies. However within vegetable seeds onion and Potato are the major high volume contributing crops. While Onion seed is majorly produced in Buldhana, Jalgaon, Nasik, Jalna and Aurangabad districts of Maharashtra and Gulbarga district of Karnataka, Potato seed is produced in Punjab,UP and West Bengal. In case of horticultural crops and fruit crops, nurseries supply vegetative planting material in major growing hubs, like Kadapa,Nalgonda,Wardha, Nagpur regions for Citrus fruits, Krishna, West Godavari and East Godavari districts for Mango, Solapur for Pomegranate,etc.

4. Crop wise and Region wise, prominent varieties in demand and their availability

The prominent varieties and hybrids in major States of India in major crops is given below.

The public sector varieties are highlighted in red color. If the State has insignificant area or no cropped area of a particular crop, then no varieties are shown in the table.

State	OPV. Rice	Hybrid Rice	Maize	Bajra	Bt Cotton	Hyb.Mustard	Wheat
AP	MTU 7029, BPT5204, Sampada, Sonam, NLR 34449	MC-13, Arize 6444, NPH-X4, Champion	NMH-8352 Winner, PAC-751, NK 7720, PHI-3396, DKC-9120	NBH-4903 Balwan, Venus	RCH-659, Tulasi- Akira, NCS-929 Navneeth, Goldcot, US-7067		
Telangana	RNR-15048, BPT-5204 MTU-1010, Omkar, Ankur Puja	Bioseed-Tanatan, K-468	NK-30, PHI 3401, DKC-9133, Bond and PAC-751		RCH-659, Sadanand, Goldcot, Moksha, Jangi		Ajeet-102, Mahyco Goal, Ankur-Kedar, NSL-Ruchi, Nirmal-Nirbhay
Karnataka	RNR-15048, Jaya, BP-5204, MTU-1001, Omkar	VNR-2233, dhanya-MC-13	NK-6668, PHI-3550, DKC-9133, Bond, PHI-30 B 07	PHI-36 M 35, Dhanya-778, Super Boss, Balwan	Jaadu, 7383, 7067, Yuva, Supercot		Lok-1, Ankur-Kedar, Ajeet-102, Eagle-Sushika, Nirmal - Nirbhay- JK Pithamber
Tamilnadu	Ponni, ADT-37, Mahindra 606, sonal, aman, Siri, NLR 34449		NK-6668, Dhanya 8255, DKC-9133, NK-30, 30 B 07, PHI-3302, NK-6240,		Rasi 659, ATM, Jaadu, Mahyco Jangi, Bioseed Yuva		
Maharashtra	Jaya, PKV-HMT, MTU-1010, Jaisriram, Karjat-3, YSR, Zordar, D1008	Arize-6444, 6129, US312, Mahyco-5629, Raja	PHI-3401, PAC-751, NK6240, Hitech5101, DKC-9141, NK-6668	Dhanya-7872, 86 M 38, Mahyco-204, Mahodaya-318, 339, Nirmal-9	RCH-659, Dhandev, US-7067, Dhanya-Aathis, Nsl - Raja		Ankur-Kedar, Ajeet-102, Greengold-23, Srirama-111, Rasi-Thunder, Mahyco-Mukut
Gujarat	Nath poha,	US-312,	PHI-3546,	86 M 11,	Kaveri-ATM,	45 S 42, 45 S 35,	GW-496,

	Gujarat-13, Gujarat-17, Gurjari, Ankur Sonam	6444, MC-13, Indo american 022, Advanta 837	Rasi-4558, NK-6668, Kaveri- K-50, PHI-3502, Rasi-4794	86 M 20, Super boss, Dhanya-7883, Bayer-9444, Biostad-Nandi-5	Jaadu, Rasi-659, Raja, Nawab	Bayer- 5222, Baioseed-Sonalika	Lok-1, Sriram-111, Ankur-kedar, Rasi-Thunder, GW-373
Chattisgarh	MTU-1001, MTU-1010, MUT-7029, Mahamaya, Komal, Silky	Kaveri-468, US-312, Bayer 6444 gold, Advanta 837,	NK30, PHI 3401, PAC-751, DKC-9162, NK-6668				Ajeet-102, Mahyco Goal, Ankur-Kedar, NSL-Ruchi, Nirmal-Nirbhay, Shriram-111
Madhya pradesh	IR-64, MTU-1010, Nathpoha, Dhaftari-1008, D-125, YSR	Bayer-6444, Kaveri 468, MC-13, PAC--807, Champion	NK-30, PHI-3401, NK-6240, PAC-751, DKC-9126	86 M 84,	RCH-659, Gold cot, Jaadu, Moksha, Magic,	Kalasona, nathisona, Talia, PHI-45 S 42, Bayer-5222	Sriram-111, Sriram-303, 1544, Lok-1, mahyco-Goal
UP	Pusa 1509, Sharbathi, 1121, Sampurna, Moti, Prasanna, Dhamini, Sarju-51	Kaveri-468, PHI-27 P 37, Bayer 6444, Mahinda 3030, Jk 2082, Taj	DKC-9108, DKC-7174, PHI-1899, simsim	Super Boss, 86 M 90, 86 M 84, bayer-9001, Nandi-75		54 S 42, 45 S 46, bayer 5222, Sriram-1666, Savanna- 2042	HD-2967, Sriram-303, mahyco Goal, Ankur Kedar, Savanna 1734, NSL Veer
Punjab	Pusa 1121, Pusa 1509, 1718, Sugandha, Sharbathi	Savanna 134, Savanna 127, Kaveri 468, Bayer shift gold, Phi-27 P 68	DKC-9108, DKC-9162, PHI-1844, PHI-1899, PHI-3401, DKC-9144		Rasi-776, 773, US-71, Simsim, Bayer 7172,	45 s 46, 45 S 42, Advanta 414, Bayer 5222	Sriram-272, Sriram-252, HD 3086, HD-2967, SW 23
Haryana	Pusa 1121, Pusa 1509, 1718, Sugandha, Sharbathi	Savanna 134, Savanna 127, Kaveri 468, Bayer shift gold, Phi-27 P 68	DKC-9108, DKC-9162, PHI-1844, PHI-1899, PHI-3401, DKC-9144	86 M 90, 86 M 84, Bayer 9001, Bayer 9444	Rasi-776, 773, US-71, Simsim, Bayer 7172,	45 s 46, 45 S 42, Advanta 414, Bayer 5222	Sriram-272, Sriram-252, HD 3086, HD-2967, SW 23
HP	Pusa 1121, Pusa 1509, 1718, Sugandha, Sharbathi		DKC-9108, DKC-9162, PHI-1844, PHI-1899, PHI-3401,			45 s 46, 45 S 42, Advanta 414, Bayer 5222	Sriram-272, Sriram-252, HD 3086, HD-2967, SW 23

			DKC-9144				
Rajasthan			NK-30, Dhanya- 8255, Bioseed- 369, Advanta 751, Phi- 3502, DKC- 9180	86 M 90, 86 M 84, Bayer 9001, Balwan, Dhanya- 7179, Super Boss	Money Maker, Rasi Jet, Bayer- Surpass 7172, Rasi-776, Ankur 3028	45 s 46, 45 S 42, Advanta 414, Bayer 5222, MRR-8030	sriram-231, Sriram 252, Mahyco Goal, Rasi Spark, Raj 3077,
Bihar	Mudhha, Ankur Sonam, Sourabh, Rajendra manshuri, MTU-7029	Bayer 6444 gold, PHI- 27 P 31, MC-13, Pioneer- 27 P 63, Kaveri 468	PHI-3355, NK-7720, DKC-9165, PHI-3388, DKC-9120			PHI-45 S 42, 45 S 46, Bayer 5222	Sriram-303, Mahyco Goal, Ankur kedar, Lok- 1, Sriram- 404
Jharkhand	MTU-1010, IR-64, Sourabh, MTU- 7029, Aman	Kaveri- 468, MC- 13, 27 P 31, 6444 gold, Tej gold	Kanchan- 25, NK-30, Advanta 751, Phi 3377, JK 502				
West Bengal	IET 4786, MTU 1010, GB 1, MTU 7029 & BB 11	KPH 468, PAN 2423, 6444 & MC 13	3355 @ Corteva, 9081 @ Bayer, NK 6607 @ Syngenta, Sultan & Kaveri Bumper @ Kaveri Seeds			45S 42, 45S 46, Sakata 555 & Bayer 5111	Shriram 303 & Ankur Kedar
Odisha	MTU-7029, MTU- 1010, MTU-1001, Sampada, Sadhana	Kaveri- 468, Bayer 6444, US- 312, Bayer Arize bold, Syngenta 5231, Dhayna MC-13	DKC-9126, PHI-3401, PHI-3396, Advanta- 751		Supercot, Shalimar, Rasi-659, Thadaka		
Assam	GB 1, BB 11, MTU 7029 & Ranjit	NK 5231, PAN 2423, VNR 2245 & INDAM 200 017	9081 @ Bayer, 1107 @ TATA & 3355 @Corteva.				

Prominent hybrid seed varieties supplied by private sector in vegetable crops is given below

State	Tomato	Chilly	Okra	Watermelon	Onion
Andhra Pradesh	BASF-US-440	Mahyco-Tejaswini	Advanta-Radika	Namdari-NS-295	East West-Prema
	PHS-448	BASF-Amrour	Advanta-Navya	BASF-Maxx	Jindal-Red Diamond
	Syngenta-Sahoo	BASF-US-341	Namdari-NS-862	Pahuja-Arun	Ellora Seeds-Ellora
Telangana	PHS-448	BASF-Tejaswini	Advanta-Radika	Sagar seeds-Sagar king	East West-Prerana
	Unisem-Kapila	BASF-US-341	PHS-Surabi	Kalash-Melody	Jindal-White marlobe
	BASF-US-440	Hyveg-Sonal	BASF-Singham	Namdari-NS-295	East West-Prerana
Karnataka	Syngenta-6242	Seminis-Sitara	Mahyco-10	BASF-Maxx	East West-Prema
	Seminis-Virang	Syngenta-5531	BASF-Shakti	Kalash-Melody	Indoamerican-Marshal
	Syngenta-Sahoo	Indo American-Indam-5	Hyveg-Sahiba	Namdari-NS-295	Kalash-Flare
Tamilnadu	Hyveg-Shivam	Mahyco-Sierra	Advanta-Jonny	Namdari-NS-295	East West-Prema
	Syngenta-Meghadooth	Nongwoo-Kiran	Advanta-Radhika	PHS-Suman	Ankur-Nasik red
	JK seeds-Akshaya	BASF-Priyanka	BASF-Selvam	Syngenta-Sugar queen	Mallesappa &co
West Bengal	Hyveg-Sakhm	Hyveg-Eagle	Advanta-Radhika	Sakata-Sato	Kalash-Sukh Sagar
	Kaushal	Astha	Namdari-NS-862	BASF-Maxx	
	Syngenta-1507	Mahyco-Tejeswani	BASF-Singam	Syngenta-Red Chief	
Assam	Syngenta-Rocky	Kalash-918	Advanta-Radhika	Shibaji	
	Hard Rock	Tejata	Namdari-NS-862	Known you-Sarasati	
	Namdari-NS-501	BASF-US-803	BASF-Singam	Sagar seeds-Sagar king	
Madhya pradesh	Seminis-Abhilash	Divyshakti-Divyshakti -51	Advanta-Radhika	BASF-Maxx	Prashant
	Hyveg-Chirayu/Shivam	Advanta-AK-47	BASH-Singam	Pahuja-Suman-235	Panchganga
	Namdari-NS-592	BASF-Armour	Advanta-Venus Plus	Syngenta-Augusta	Seminis-Gulmohar/Jindal
Chattisgarh	Namdari-NS-592	Nandari-NS-1701	Advanta-Radhika	Syngenta-Augusta	Panchganga
	Seminis-Abhilash	VNR-305	Namdari-NS-862	Seminis-Sugar Pack	East west-Prema
	BASF-US-440	Hyveg-Eagle	VNR-999	NSL-Sugar baby	Ellora/ Jindal
Odisha	Hyveg-SAKHAM	VNR-305	Advanta-Radhika	Syngenta-Augusta	
	BASF-LAXMI	KRISHNA	SIBANSU	BASF-Maxx	
	BASF-US-440	East west-DAYA-619	Namdari-NS-862	Seminis-Sugar pack	
Haryana	Namdari-NS-5013	VNR-Unnati-60-13	Advanta-Navya	Advance Seed Co-Kalia	Prema
	Syngenta-Heem Shikhar	VNR-78	East west-Kirti	Alibaba	Nasik Red
	BASF-US-2853	VNR-74	Sakata-Poorvi	Master-37	Red Diamond
Punjab	Namdari-NS-5013	VNR-Sahiba	Syngenta-OH-2324	Honey Plus	Black Onion
	Namdari-NS-4266	United Genetics-8307	Advanta-Navya	Sugar-74	Taki-821
	East West-Rani	Heer	Namdari-NS-862	Advance Seed Co-Kalia	XP Red

Himachal Pradesh	Namdari-NS-816				
	BASF-US-2853				
	Lal Shona				
Maharashtra	clause-Rishika	Seminis-Sitara gold	Advanta-Radhika	Kalash-Melody	Panchganga
	Chia tai-Keshar	Hyveg-Sonal	BASF-Singham	Sagar-Sagar king	Yellor
	Chia tai-Anisha	Ankur-ARCH-930	Advanta-Lavanya	BASF-Maxx	Prashant
Rajasthan	Seminis-Abhilash	VNR-Krishna	Advanta-Radhika	Kaliya	Prema
	Syngenta-1057	East West-Daiya	Syngenta-OH-102	Sagar-Sagar king	Ellora
	Damini/Vansh-03	Meenam	Namdari-NS-862	BASF-Maxx	Matahari
Uttar Pradesh	Seminis-Abhilash	VNR-305	Advanta-Radhika	BASF-Maxx	Divya
	Namdari-NS-592	Hyveg-78	Namdari-NS-862	Sagar-Sagar king	Nasik red
	Angle	Hyveg-Eagle	Advanta-Navya	BASF-Astha	Mata Hari
Gujarat	Syngenta-1057	Hyveg-Saniya	Advanta-Radhika	Sagar seeds-Sagar King	East west-Prapti
	Clause-Rishika	Excell 502	NS-862	Pahuja-555	Amber seed-Phursungi
	JK-811	VNR-305	BASF- Sartaj	VNR-Honey	Nasik red
Bihar	NS-585,592	Nangubio-5424	Ns-862	Nunhems-Madubala, Aastha	Jindal Seeds-Sukh sagar
	Sy-3038	Ankur-Sola, NS-1101, Kalash-811	UPL-Radhika	Noble-Krishna , NS-23	Jindal seeds-Nasik-53
	Seminis-Abhilas	Seminis-Ganture, VNR-305	Bio seeds-Abha	Nunhems-Maxx	Bangal-SukhSagar
Jharkhand	Sy-1156	VNR-305	JK-7315	Nunhems-Aesa	East-west-parema
	Chiatai-Kundan, kunal	Rasi-Aastha, Agni	Ns-862	Unicem-Kajal	Seminis- Gulmohar
	Pan seeds-1286	Rasi-Eagale, East west-Daya	Nunhems-Shakti	SY-Redchif	Bangal-SukhSagar

5. State wise and Crop wise SRR and VRR *vis-a-vis* targeted SRR & VRR

The two critical parameters for improvement of productivity in seeds of OPVs especially applicable to food grains (cereals, millets and pulses) and oilseeds are (i) Seed Replacement Rate (SRR) and (ii) Varietal Replacement Rate. Government of India and State Governments are promoting improvement of both the parameters across all the States.

While SRR has significantly improved in the past one decade in many of the States, it is still low compared to global standards where SRR is more than 90%-100%. In Cotton, the SRR is more than 99% as the entire Cotton cultivated in India has been converted into Bt Cotton hybrids. Similarly in hybrid seed crops such as Maize, Bajra, Castor and vegetable crops the hybridization ranges from 70%-95% in different states. However in many OP crops in food grains and oilseeds, the SRR is less than 25%-30% leading to low productivity⁵.

Similarly in many crops, old varieties released and commercialized in the past 3-5 decades in both private and public sector are still under cultivation in many States of India and the productivity of the most of these old varieties has reached a plateau or stagnated. There is a strong need for Varietal Replacement with new varieties being developed by R&D in both public and private sector, however due to various socio-economic factors the Varietal Replacement Rate (VRR) of the highly adopted varieties is low in many States of the country. Data on VRR is also not available in public domain. The state-wise and crop-wise data on SRR for can be accessed from the following link <https://seednet.gov.in/PDFFILES/SRR-13.pdf>

Crop	2015-16		2016-17		2017-18		2018-19		2019-20	
	Req.	Av.	Req.	Av.	Req.	Av.	Req.	Av.	Req.	Av.
Rice	82.9	95.1	87.7	100.5	89.5	104.1	82.6	95.8	82.4	92.3
Maize	10.7	12.7	12.5	13.5	14.5	15.7	13.2	14.2	12.7	15.1
Tur	2.5	2.7	2.7	3.0	3.3	3.8	2.8	3.2	2.7	3.2
Soybean	31.0	23.5	29.0	29.6	35.7	40.3	29.1	28.2	30.5	33.9
Cotton	2.0	2.1	2.2	2.4	3.2	3.5	2.2	2.5	2.2	2.4

Note: Req:Requirement, Av:Availability

Source: Department of Agriculture, Cooperation and Farmers Welfare, Ministry of Agriculture and Farmers Welfare

⁵ <https://cacp.dacnet.nic.in/ViewQuestionare.aspx?Input=2&DocId=1&PageId=39&KeyId=702>

SRR can be enhanced by ensuring timely availability of quality seed to the farmers. The availability of quality seeds at affordable cost breaks the farmer's practice of saving seeds. Regular use of FSS not only deteriorates genetic purity but also overall seed quality. As per CACP data presented in the above table the requirement and availability of certified/quality seed for Rice, Maize, Tur, Soybean and Cotton for the last five years, it can be noticed that in recent years there has been sufficient availability of certified/quality seed. Rice, Maize, Tur and Cotton seed availability has remained higher than requirement of certified/quality seed for all the years, while for Soybean, requirement was higher than availability in 2015-16 and 2018-19 but in 2019-20, availability improved to outstrip the requirement⁶. By improving SRR and VRR the productivity potential of various Plant varieties in different crops can be realized successfully on par with global averages in line with improvement in irrigation potential and improved agronomic practices to optimally utilize natural resources.

(kg/ha)

Crop	World Average	World Highest	All-India Average	State Highest
Rice	4679	7027 (China)	2638	4132 (Pun)
Maize	5924	11864 (USA)	3070	7258 (TN)
Total Pulses	964	1950 (Canada)	757	916 (MP)
Tur	852	1743 (Malawi)	729	1209 (Guj)
Soybean	2791	3468 (USA)	1192	1254 (Raj)
Groundnut	1611	4473 (USA)	1422	2718 (TN)

Sources: 1. FAOSTAT for World Average and World Highest

2. Directorate of Economics and Statistics, Ministry of Agriculture and Farmers Welfare for All-India Average and State Highest

As per Seednet portal of Government of India, SRR projection for pulses with future projections is given below.

Crop	Seed produced during 2014-15		SRR (%)					Quality seed (' 000 q)					
								2020-21			2025-26		
								Breeder seed (q)	Quality seed (lakh q)	2014-15	2020-21	2025-26	SMR*
Chickpea	7,703	14.73	25.4	35.0	40.0	15	80	11.40	170.8	2562.0	13.51	202.7	3040.0
Pigeonpea	670	1.69	41.0	45.0	50.0	40	20	0.23	9.2	368.0	0.26	10.5	420.0
Mungbean	1,038	2.00	23.6	35.0	40.0	30	20	0.30	9.0	270.0	0.38	11.4	342.0
Urdbean	402	1.84	30.3	35.0	40.0	30	20	0.26	7.9	237.0	0.31	9.3	279.0
Lentil	312	1.19	31.5	35.0	40.0	15	40	1.07	16.1	241.5	1.47	22.1	331.5
Fieldpea	637	2.03	34.1	40.0	40.0	15	80	1.15	17.3	259.5	1.22	18.3	274.5
Total	10,152	23.48						14.41	230.3	3938.0	17.152	274.3	4687.0

*Seed Multiplication Ratio

⁶ <https://cacp.dacnet.nic.in/ViewQuestionare.aspx?Input=2&DocId=1&PageId=39&KeyId=702>

The State-wise aggregate SRR of various crops is presented in the table below. Each cell in the table depicts two numbers, the first number shows SRR of OPVs and the second number shows SRR of hybrid Plant varieties in major Agricultural States of India as per data published by GoI.

State	2001	2005	2006	2007	2008	2009	2010	2011
Andhra Pradesh	48/100	84/100	87/100	0/100	0/100	0/100	0/100	0/100
Bihar	21/0	40/0	60	75	57	64	81	100
Chhattisgarh	-/-	9/-	11	11	12	16/-	18/-	21/-
Karnataka	-/100	-/ 100	0/100	-/100	-/100	-/100	-/100	-/100
Tamil Nadu	8/-	2/-	2/-	1/-	70	98/-	83/-	-/98
Maharashtra	53/-	60/-	75/100	60/-	89	91/-	91/-	94/-
Rajasthan	2/-	18/-	20/-	25/-	43	44	50	53
Madhya Pradesh	8/-	17/-	13/-	11/-	19/-	21/-	35/-	48/-
Uttar Pradesh	7/-	12/-	20/-	20/-	21/-	22/-	38/-	31/-
Punjab	42/-	69/-	-/95	-/95	-/91	-/98	-/99	-/99
All India	21.0	35.4	43.8	44.2	48.5	46.9	54.1	56.6

Source: www.seednet.gov.in/Material/SRR-13.pdf

Note: The first number shows SRR for OPVs, while the second number shows SRR for hybrids.

In case of single number, it is overall.

'-' indicate that the information are not available.

6. Demand and Supply Position of seeds of major crops and future projections of seed requirement *vis-a-vis* projected crop projections (2030)

The timely availability of quality seed of improved plant varieties on a periodical basis, suitable for specific agro-climatic conditions is the key requirement for sustainable agricultural growth. The genetic improvement of new varieties over the existing varieties in line with customer and market requirements, changing climatic conditions and tolerance to various biotic and abiotic stress conditions, reflect in the genetic gains developed through conventional plant breeding supported by other R&D approaches including biotechnologies.

The demand and supply of quality seeds of major crops including future projections is given below.

- 1) Cotton: Cotton is grown in an area of nearly 12 million ha in India. At average 1.75 packets per acre nearly 5.25 Crore packets of Bt Cotton hybrid seed is required in India. The Indian seed industry has enough capacities to supply 5.25 Cr to 7.0 cr pkts per year. However in future if the agronomy shifts towards mechanization at high density planting for improvement of productivity, the requirement of Bt Cotton seeds may triple or quadruple, but the area under Cotton may also come down to 60% to 75% of the current area with a net demand of 20 Crore pkts of Bt Cotton varieties and hybrids.
- 2) Hybrid Rice: In the past few years hybrid paddy has grown from nearly 5%-6% of total Rice cultivated area to nearly 8% to 9% of total area under Rice in India. The market size at a seed rate of 6 kg/acre rose from nearly 45000 tons to 75000 tons currently. With launch of new hybrids with excellent quality grain and cooking suiting Indian cultural requirements, in future the hybrid Rice is set to grow at least 20% of the Rice cultivated area amounting to 1.3 lakh tons.
- 3) Varietal Rice/paddy: If 9% of area is considered under Hybrid paddy, nearly varietal paddy is grown in 39-40 million ha. At 50% SRR, nearly 10 lakh tons of Varietal Rice seed is required in India at an average seed rate of 20 kg/acre. Further there is an urgent need for varietal replacement to break the productivity barrier. Mega varieties such as BPT 5204, MTU 7029, MTU 1010, MTU 1001, IR-8, IR-64, etc. need to be replaced with better varieties which are suitable for specific agroclimatic

requirements and market requirements in addition to tolerance to biotic and abiotic stresses and climate resilience. Significant investments in R&D are essential, especially in domestic companies which deal with Varietal Rice.

- 4) Maize: In India Maize is grown in 8mha-10 mha of area. However still 20%-25% area is yet to come under hybrids completely, as low value seed including fodder Maize is grown in such area. The conversion of Indian Maize area into Hybrids will certainly boost the productivity. Presently at 8kg per acre seed rate, the Indian Maize market is estimated at 125000 tons at a hybridization of 70%. However in the next 5-7 years if atleast 90% of the area is converted to hybrid Maize, then the market size can go upto 180000 tons.
- 5) Wheat: Wheat is cultivated in 32 million ha of area. At seed rate of 40 kg per acre, the seed requirement in wheat is 32 lakh tonnes. At 50% SRR, the seed requirement is 16 lakh tonnes. Local capacities of seed companies including involvement of FPOs is essential for meeting demand of quality wheat seed.
- 6) Soybean: An important oilseed crop, soybean is cultivated in 10mha to 11mha in India. At 30kg per acre seed rate the present requirement of Soybean is 7.5 lakh tons. At 70% of SRR, the requirements of quality seed is 5 lakh tons. India needs to develop decentralized supply chain and local capabilities for supply of improved seed in future. The current and future projections of seed demand in important crops is given below.

SNo	Crop	Avg Seed rate kg per acre/04.75 kg pkt in Cotton	Present area in million acres	Present Seed demand in MTs/Cr pkts in cotton @ 50% SRR for OPV crops	Future area in million Acres	Future seed rate kg/acre & 0.475 kg pkts/acre for cotton	Seed demand in MTs@ 75% SRR in OPV
1	Rice- varietal	20	100.0	10 lakh tons	90.0	15.0	11 lakh tons
2	Rice- Hybrid	6	7.5	45000	15.0	6	90000 tons
3	Wheat	40	75.0	15 lakh tons	75.0	40	20 lakh

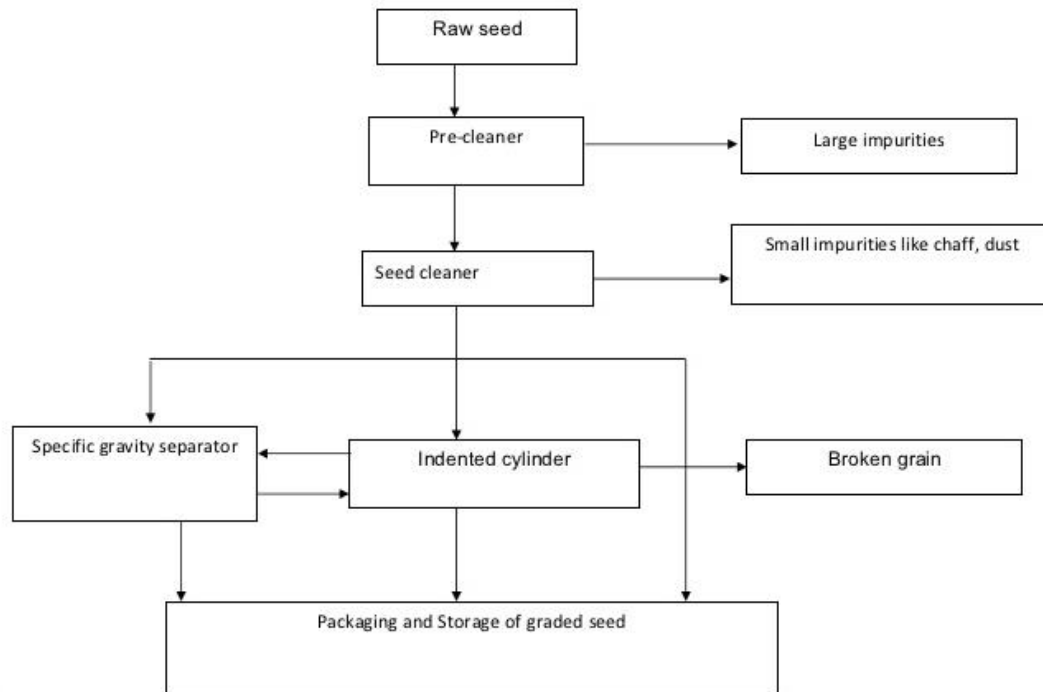
							tons
4	Maize@ 70% hybrids	8	22.50	1.26 lakh tons	22.50	8	1.8 lakh tons
5	Bajra @ 80% hybrids	1.5	17.5	21000 tons	18.0	1.5	25000 tons
6	Cotton	1.75	30.0	5.25 Cr pkts	20.0	5.0	10.0 Cr pkts
7	Soybean	30	28.0	4.2 lakh tons	30.0	30	6 lakh tons
8	Redgram	5.0	11.0	27500 tons	12.0	5.0	40000 tons
9	Groundnut	40.0	12.0	2.4 lakh tons	12.0	40.0	3 lakh tons
10	Chickpea	25.0	23.0	3.13 lakh tons	25.0	25.0	4lakh tons

The future seed requirements in various crops is dependent on the following.

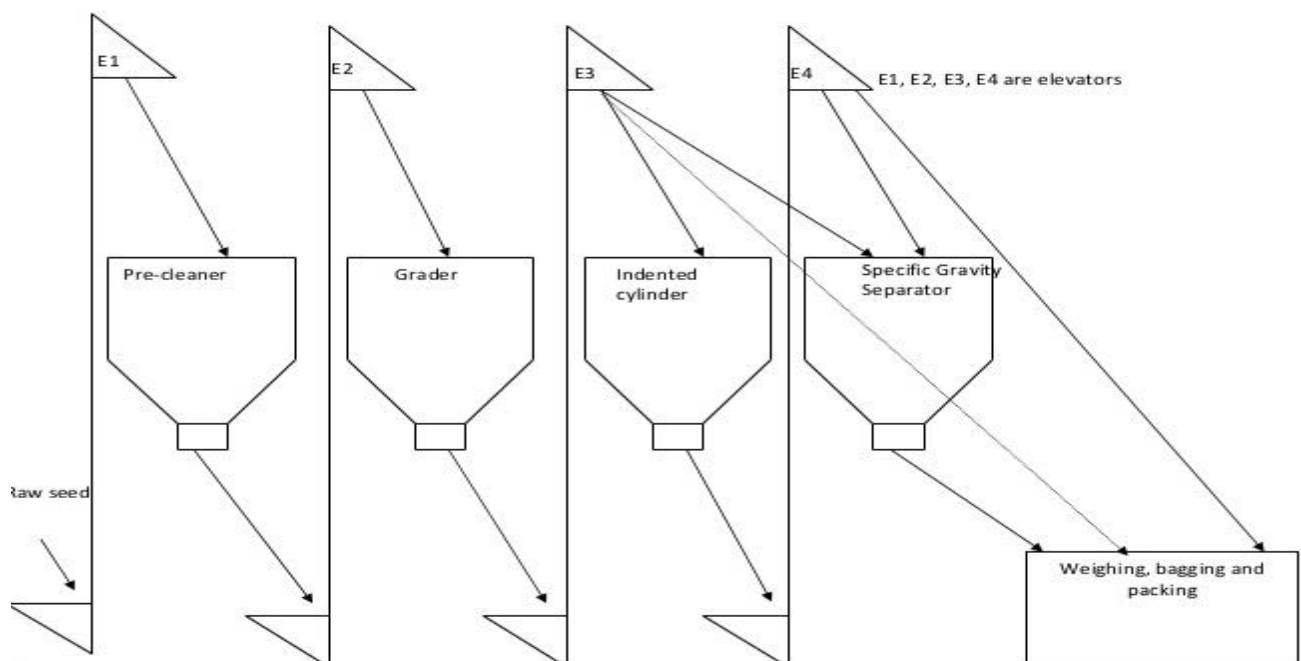
- 1) Change in agronomy including mechanization in several crops leading to optimization of plant population and seed rate per acre.
- 2) R&D investments for development of improved Plant varieties in all crops including use of biotechnologies for development of transgenic traits, gene edited traits, etc.
- 3) Development of decentralized supply chains for timely supply of seeds without deterioration of quality.
- 4) Development of local level cold storage and conditioned warehouses and local level processing infrastructure in support of domestic seed companies
- 5) PPVFR act based IPR regime aligned to the seed quality regulations and plant variety evaluation/ VCU testing for timely release and commercialization of new Plant varieties.
- 6) Development of capabilities for supply chain traceability utilizing digital technologies, block chain and ICTs.

7. Current Seed Processing Infrastructure - Areas of upgradation (Machinery requirements and its indicative cost).

The raw seed from the production fields is sent to seed processing plants. At seed processing plants the seed is received and is subject to the processing including seed treatment with requisite chemicals. The basic process flow of a seed processing plant for paddy and wheat is shown below.



The sequence of processing machinery units in a seed processing plant are shown below. The seed treatment components are not shown below.



Typically the seed processing plant consists of the following machinery, 1) Pre-cleaner to separate larger impurities and 2) cleaners which can be further classified as a) Graders , b) Gravity separators and 3) indented cylinders for length grading, to separate smaller impurities to arrive at uniform quality seed. After cleaning, the seed is treated with seed treatment chemicals, mostly fungicides or sometimes insecticides for providing protection against seed borne pests and diseases.

The processing plant design and layout is dependent on the crop species. While for majority of cereals and pulses the above basic process is sufficient, for crops like Cotton, Maize and certain high value vegetable crops, the process flow has additional components. For example in Cotton the delinting setup is present before the cleaning process. Similarly in Maize, shelling of Maize cobs need to be done before initiation of seed processing. The specialized components have additional cost implications.

Costs of basic seed machinery used for Wheat and Rice

Name of Machinery	Cost in Rs. Capacity of Machinery (Eg:Wheat crop)		
	4 TPH	10 TPH	20 TPH
Main V B Elevator 1	150,000	250,000	425,000
Dump Hopper with Vibrator	75,000	125,000	225,000
Pre-cleaner	550,000	650,000	850,000
Pre-cleaner Screens	125,000	150,000	175,000
V B Elevator 2	150,000	250,000	425,000
Fine Cleaner	675,000	850,000	1,050,000
Screens for Fine cleaner	125,000	150,000	175,000
V B Elevator 3	150,000	250,000	425,000
Main Gravity	375,000	500,000	750,000
Gravity deck and Hopper	125,000	175,000	250,000
V B Elevator 4	150,000	250,000	425,000
Return Seed Gravity	300,000	375,000	500,000
V B Elevator 5	150,000	250,000	425,000
De-stoner	325,000	450,000	550,000
V B Elevator 6	150,000	250,000	425,000
Seed treator	450,000	625,000	875,000

V B Elevator 7	150,000	250,000	425,000
Packing Bin	200,000	325,000	450,000
Packing Machine	2,100,000	2,100,000	4,200,000
Remnant Conveyors & Bin	350,000	475,000	650,000
Cyclo fans	350,000	475,000	650,000
Printer machine with bar code	350,000	350,000	700,000
Compressors	475,000	550,000	1,250,000
Stitching machines	150,000	225,000	450,000
Weighing machines	250,000	250,000	250,000
Seed storage Pallets	500,000	500,000	1,250,000
Hand pallets fork lift	100,000	150,000	250,000
Total Cost	8,400,000	9,175,000	16,725,000

Some of the modern automation systems with indicative costs are shown below as a reference.

Sr No	Name of Machinery	4 TPH	10 TPH	20 TPH
1	Fork Lifts for Internal handling	750,000	750,000	1,500,000
2	SCADA system for energy saving with sensors	1,200,000	1,200,000	2,000,000
3	Seed Dryers	3,500,000	3,500,000	7,500,000
4	Seed conveying system	1,500,000	1,500,000	2,500,000
5	Packing Automation	2,500,000	2,500,000	5,000,000
a	Pick and fill machine			
b	Primary Pouch Take up Conveyor			
c	Check Weigher			
d	Pouch counting			
e	Secondary bag filling			
f	Auto stitchery			
g	Primary Bar code Scanner			
h	Secondary bag Weighment			
i	Secondary bag bar coder			
j	Color sorter			
6	Truck Loader	350,000	450,000	700,000
7	Camera for surveillance	500,000	1,200,000	2,500,000
	Total Cost	10,300,000	11,100,000	21,700,000
	Cold storage set up for maintenance of RH/Temperature balance including automated controls			

8. Existing credit arrangements for seed industry - quantum of credit disbursed to seed processing industries

As per RBI norms agricultural credit was categorized under two broad heads, viz., Direct and Indirect⁷. The production and processing of hybrid seed crops also was considered as direct agriculture credit by RBI. However providing working capital facility for seed production and processing as a separate credit requirement at concessionary rates which is delinked from commercial credit will give a fillip to the seed industry not only in terms of strengthening quality throughout the supply chain, but also making seed industry globally competitive. The present credit arrangements to seed industry are provided both for loans for Capital expenditure and also working capital for all the functions viz., R&D, Production, Processing, distribution and marketing as commercial loans. NABARD also provides long term loans for investment credit for seed production and seed industry.

The Government of India under various initiatives have provided the following credit support subsidies as a part over a period of time⁸ to strengthen the seed industry⁹.

- 1) Credit for schemes for certified seed distribution
- 2) ISOPOM-Subsidies for purchase of breeder seeds
- 3) Subsidies for purchase of breeder seeds and foundation seeds under technology mission for Cotton and Technology mission for oilseeds
- 4) Subsidy for hybrid Rice seed production, full subsidy for minikits, under NFSM
- 5) Subsidies under seed village program
- 6) Transport subsidies for seeds
- 7) Subsidies and credit support for hybrid seed production
- 8) Support to seed infrastructure under Rastriya Krishi Vikas Yojana.
- 9) Credit linked back-ended capital subsidy at the rate of 25% of the project cost subject to a maximum limit of Rs.25.00 lakh per unit on seed infrastructure development.

However there is a need for focus to particularly develop domestic seed industry through strong credit arrangements to make it globally competitive. Typically what differentiates the domestic company and an MNC operating in 25 or more countries is the germplasm base, global R&D investments, standardized production, processing and quality assurance infrastructure, human resources, warehousing and logistics and

⁷Report of the Internal Working Group to Review Agricultural Credit,2019
<https://www.rbi.org.in/Scripts/PublicationReportDetails.aspx?UrlPage=&ID=942>

⁸ [https://seednet.gov.in/material/prog-schemes.htm#\(i\)%20Assistance%20for%20Boosting%20Seed%20Production%20in%20the%20Private%20Sector:](https://seednet.gov.in/material/prog-schemes.htm#(i)%20Assistance%20for%20Boosting%20Seed%20Production%20in%20the%20Private%20Sector:)

⁹<https://seednet.gov.in/PDFFILES/Guidelines%20on%20Boosting%20Seed%20Production%20in%20Private%20Sector.pdf>

distribution system. For improving the standards of domestic companies and also small enterprises in unorganized sector, there is a strong need for investment in various differentiators mentioned above. Therefore NABARD as the apex bank for rural development need to consider Seed industry as a top-priority sector to transform the entire agriculture industry in India.

9. Issues related to the credit flow to the seed production and processing - both Organised and Unorganised sectors

Seed is unique among agricultural inputs. Unlike other inputs such as seed is not manufactured in an industrial plant, but is a product of agriculture, grown out of natural biological processes in a standard environment to ensure quality and purity. Being a product of agriculture, seed production faces all the vagaries and uncertainties of climate and the reliability of supply of quality seed is dependent on multiple variables. Further production planning for seeds is done at least 1-2 years prior to the sale of seeds, as seeds need to be produced at least one year or one season prior to the sales process. This makes demand estimation for a particular variety of seed very difficult with respect to the accuracy of estimation of quantity of production.

Further due to vagaries of monsoon and climate change, the estimated yield of seed production crop also varies leading to lower output and revenues. As seed production is different from agriculture crop production in terms of yield/seed output and also monitoring and compliance to standard operating processes for hybrid seeds or OPV seeds, there is a further need to consider it as a specialized form of agriculture process with higher risks and uncertainty. Therefore there is a need for a policy reform for consideration of Working capital loan requirements for seed industry especially for production and processing. All loans for seed industry and also insurance should be considered as part of priority sector lending, to cover the risks of seed industry for both organized and unorganized sector.

Further seeds which encapsulate plant varieties, which are products of R&D should be given a special status in terms of insurance protection of seed farmers and companies against any unforeseen losses. Also Government should establish seed traceability systems to enable tracing of seed to its production plot in case of any deviation to the quality standards.

10. Scope for FPOs in seed production

The policies and action plans for promoting Farmer Producer Organizations (FPOs) were started by Government of India in 2012-13, with an aim to empower farmers to enable them harness the power of collectivization and thereby develop profitable agribusiness enterprises at grass root level. While FPOs work on economies of scale and scope both for input procurement and sales of output, seed production has also become an important competency that some of the FPOs have developed over time¹⁰.

The FPOs have been developed by NABARD, SFAC, Central and State Governments and various other institutions in the past 8 years and Government of India plans to develop 10000 FPOs in the next 3-4 years from the current 4000 FPOs. Presently FPOs have developed competencies for production of OPV seeds such as Spices, Soybean, Wheat, Rice, Pulses, Oilseeds, OPV vegetable seeds, nurseries of fruit crop and plantation crops, etc.

Given below are an indicative list of FPOs involved in Seed production.

SNo	FPO	State	Crops
1	Kirtinagar Valley Association	Uttarakhand	Organic spice seeds
2	Bijawar FPC	MP	Cereals,Pulses
3	Karnvati FPC	MP	Cereals,Pulses
4	DharmarajuPalli Society	Telangana	Cereals
5	Yeotmal FPO	Maharastra	Tur,Soybean
6	MadhyaBharatFPO	MP	Soybean,Wheat
7	Satwaji Baba FPO	Maharashtra	Potato
8	Rishiwat FPC	Maharashtra	Turmeric,Soybean
9	Krishijeewan Agro	Maharashtra	Onion
10	Avirat Seed foundation	Gujarat	Cotton,Castor,Cumin, Groundnut
11	Kalmeshwara FPO, Dharwad	Karnataka	Pulses
12	MVK-FPOs	AP	Groundnut
13	Rowmari FPO	Assam	Mustard

¹⁰ FPOs in Seed production [http://sfacindia.com/PDFs/Krishi-Sutra\(Version2\).pdf](http://sfacindia.com/PDFs/Krishi-Sutra(Version2).pdf)

Government of India has released operational guidelines for promotion of FPOs in 2020 in which seed production has been considered among the higher revenue generating activities for FPOs¹¹. The scheme envisages the following objectives.

- 1) To provide holistic and broad based supportive ecosystem to form new 10,000 FPOs to facilitate development of vibrant and sustainable income oriented farming and for overall socio-economic development and wellbeing of agrarian communities.
- 2) To enhance productivity through efficient, cost-effective and sustainable resource use and realize higher returns through better liquidity and market linkages for their produce and become sustainable through collective action.
- 3) To provide handholding and support to new FPOs up to 5 years from the year of creation in all aspects of management of FPO, inputs, production, processing and value addition, market linkages, credit linkages and use of technology etc.
- 4) To provide effective capacity building to FPOs to develop agriculture entrepreneurship skills to become economically viable and self-sustaining beyond the period of support from government.

The scope for FPOs as Seed production partners of seed companies is very promising. Both public and private sector can engage FPOs in foundation seed production, seed production of both hybrids and OPVs and developing nurseries for planting material. The FPO partnership shall also enable building decentralized supply chains in seed industry.

In the coming future, more and more seed companies shall engage in seed production with FPOs given the advantages of collectivization for ensuring a reliable supply of quality seeds. The seed industry is among the few in agriculture sector which has already standardized Contract farming type of arrangements with respect to seed production and partnership with FPOs with right skill development and capacity building will become a natural progression in Indian seed sector. NSAI, as the apex industrial association of Indian seed industry shall promote FPOs and also work with them as partners in the vision to achieve AtmaNirbhar Bharat.

¹¹ http://agricoop.nic.in/sites/default/files/English%20FPO%20Scheme%20Guidelines%20FINAL_0.pdf