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Study on Production and Supply of Quality Seed in Eastern Uttar Pradesh

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ABSTRACT

India has made significant advancements in agriculture in the last five-six decades, in which the role of the seed sector has been substantial. A superior quality seed increases productivity per unit area and helps produce uniform crops without any admixtures, which is important for obtaining high prices on the market. The majority of the population in Eastern Uttar Pradesh is engaged in agriculture, and it employs a significant share in the workforce and income of the population. The present study was taken with the objectives to study the country's seed scenario with special emphasis on Eastern Uttar Pradesh. The study is based on secondary data and information collected from various sources. Three generation system of seed multiplication is followed in India. Total quality seed availability in India during 2018-19 was 398.88 lakh quintals. The share of the public and private sector in total seed quantity was 43:57. The data reveals that the increase in quality seed availability has a huge bearing on food grain production. Analysis of Seed replacement rate reflects the incremental trend in nationwide SRR in major crops and is due to combined efforts of varied seed stakeholders and adept policy backing. Eastern Uttar Pradesh has an area of about 8.88 million ha, which is around 35.5 percent of the total geographical area of Uttar Pradesh. The total population of Eastern Uttar Pradesh is around 8.25 crores which is 41.67 percent of the state population. The top five crops *i.e.,* wheat, paddy, maize, lentil, and pigeon pea, occupied around 86 percent of the gross cropped area in Eastern Uttar Pradesh. The cropping intensity and irrigation intensity of Eastern Uttar Pradesh are 157.99 and 150.74, respectively.

The total certified, foundation, and breeder seed requirement of Eastern Uttar Pradesh is around 5747155 quintals, 162369 quintals, and 5296 quintals, respectively. In total, breeder seed requirement around 97 percent of requirement comes from four crops, namely wheat, paddy, gram and pea. The average annual breeder seed production of major crops under NARES was 1599.15 quintals against indent of 664.22 quintals. The average annual production of all classes of seed by NARES Institute was 17310.71 quintal in Eastern Uttar Pradesh. The Eastern Uttar Pradesh produces sufficient quantity of breeder seed as per total requirement on the basis of acreage under paddy, Pigeon pea, and Rapeseed & Mustard. The seed production, availability, and supply scenario in Eastern Uttar Pradesh can be improved by strengthening participatory seed production technology, seed village scheme, and seed production under the Public-Private-Farmers partnership. There is also a need to follow the general system of seed multiplication from breeder seed to certified seed. Reduction in cost of seed production and availability of trained manpower in seed production, storage, and processing will further improve seed scenario in the area.

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HIGHLIGHTS

- The share of the public and private sector in the availability of total seed quantity was 43:57 in India.
- The top five crops *i.e.* wheat, paddy, maize, lentil, and pigeon pea occupied around 86 percent of the gross cropped area in Eastern Uttar Pradesh.
- The cropping intensity and irrigation intensity of Eastern Uttar Pradesh are 157.99 and 150.74, respectively.
- The total certified, foundation, and breeder seed requirement of Eastern Uttar Pradesh is around 5747155 quintal, 162369 quintals, and 5296 quintals, respectively.

Keywords: Seed production, Supply, Eastern Uttar Pradesh

Seed is a vehicle for the delivery of improved technologies and is a mirror for portraying inherent genetic potential. About significant advances registered in Indian Agriculture, the progression of the seed sector is of having pivotal importance. The importance of quality seed in agriculture has been recognized since time immemorial, dating back to Vedic period (Yajur Veda, 1500 to 1100 BC) (Roy, 2009). In one of the oldest pieces of literature on Agriculture, Parashara (400 BC) states 'Origin of plentiful yield is seed' (Nene, 2012). Kautilya (321 BC to 296 BC) was the first to record the importance of seed treatment to ensure good germination. Manu (200 BC) in *Manu Smriti* states *'Subeejam Sukshetre Jayate Sampadyathe'* means 'Good seed in good soil yields abundantly' (Komala *et al*. 2017).

Nearly sixty percent of India's population of over 137 crores is still dependent on Agriculture. Country has made significant advancements in agriculture in the last five-six decades, in which the role of the seed sector has been substantial. Nearly sixty percent of the India's population of over 137 crores is still dependent on Agriculture. The expansion of the seed industry has occurred in parallel with growth in agricultural productivity. In 2018, the Indian seeds market reached a value of US$ 4.1 Billion, registering a CAGR of 15.7% during 2011-2018. It is further expected to grow at a CAGR of 13.6% during 2019-2024, reaching a value of US$ 9.1 Billion by 2024 (Anonymous, 2019). Around 500 organized seed companies are existing in India. Several companies have developed a large number of varieties and hybrids through their own Research and Development Units. Big public sector seed industry include the National Seeds Corporation and the Fifteen State Seed Corporations. National Seeds Corporation was the first public sector seed organization established in 1963 in India. The Central Government is playing a major role by providing support to State Government in seed sectors through quality control, capacity building, Seed Village scheme, and extension activities in seeds to create infrastructure and strengthen seed production and marketing of varieties and hybrids of various kinds of seeds.

Agriculture is the mainstay of the majority of the population in Eastern Uttar Pradesh, and it employs a significant share in workforce and income of the population. Seed is the *numero uno* input for agriculture, which determines the response of all other inputs seeds in agriculture. It is estimated that the direct contribution of quality seed alone to the total production is about 15-20 percent depending upon the crop. It can be further raised up to 40 percent with effective management of other inputs (Anonymous, 2007). A superior quality seed increases productivity per unit area and helps produce uniform crops without any admixtures, which is essential for obtaining high prices on the market. No systematic study has been conducted on the production and supply of quality seed in Eastern Uttar Pradesh. Considering these facts, the present study was taken to study the Indian seed scenario with details of quality seed production, demand, and seed gap analysis in Eastern Uttar Pradesh for major crops.

METHODOLOGY

The present study is based on secondary data and information collected from various sources. The market share of public and private sectors based on seed availability in the country, quality / certified seed availability, and food grains production in the country have been obtained from various issues of Agricultural statistics at a glance, published by the Directorate of Economics and Statistics, Ministry of Agriculture

and Farmers Welfare, GoI, New Delhi (Agricultural Statistics at a Glance, 2015, 2016, 2017, 2018, 2019). Data on seed replacement rate for critical agricultural crops during the last five years have been obtaining from the seed section of ICAR, New Delhi. Data and Varietal replacement rates for varieties less than five years old and varieties less than ten years old have been computed from the data and information available from Seed division, Department of Agriculture, Co-operation and Farmers Welfare, Ministry of Agriculture and Farmers Welfare, Government of India and Breeder Seed Production Unit of AICRP NSP (Crops). Crop-wise breeder seed production and total quality seed production in Eastern Uttar Pradesh under the National Agricultural Research and Education System (NARES) have been obtained from two National network projects *i.e.*, All India Co-ordinated Research Project- National Seed Project (Crops) and ICAR Seed Project operated from ICAR- Indian Institute of Seed Science, Mau, Uttar Pradesh. Data and information on various aspects (Divisions, districts, population, area under different crops, land use pattern etc) of Eastern Uttar Pradesh have been obtained from the Directorate of Economics and Statistics, Lucknow, Uttar Pradesh.

Seed supply system in India

In order to produce seeds of the highest quality, solid linkage exists between various stakeholders of seed production and the supply chain in India. ICAR, along with various SAUs under NARES system, shoulders the responsibility of breeder seed production. At the same time, National Seed Corporation, State Seed Corporations (SSCs), and other stakeholders of the seed industry are involved in the production and distribution of foundation and certified seed.

Three generation system of seed multiplication is followed in India. Breeder seed is exclusively produced by originating breeder or crop breeding Institute or a sponsored Institute. While foundation and certified seed are produced by breeding Institutes, sponsored Institutes, state seed corporations, national seeds corporations, various seed cooperatives, NGOs, private seed companies, farmers produce organizations etc. Details of the generation system of seed multiplication have been presented in Fig. 1.

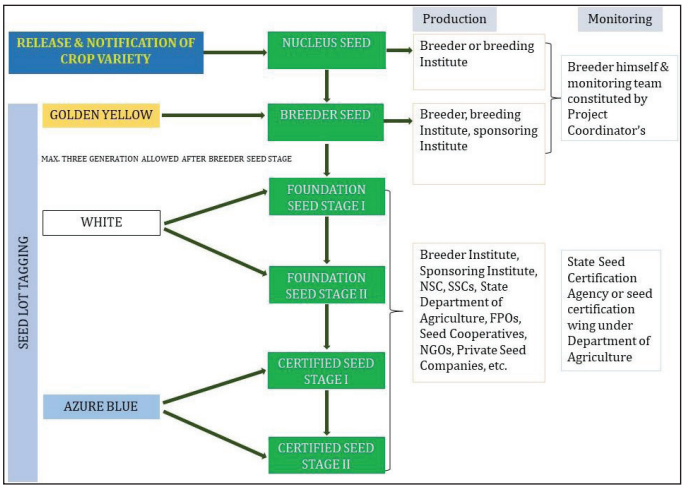

Fig. 1: Flow chart of generation system of seed multiplication in India

Indian seed scenario

Indian seed sector is one of the mature and vibrant domains in the world seed scenario. Enhanced Seed Replacement Rates in high volume and low-value crops like Paddy and Wheat is the driving impetus resulting from pro-active policy support and adept execution by diverse seed stakeholders. Total quality seed availability in India during 2018-19 was 398.88 lakh quintals against the requirement of 353.54 lakh quintals. Table 1 indicates the market share of public and private sectors based on seed availability. The public and private sector share in total seed quantity was 43:57 during the year 2018-19.

Table 1: Market share of public and private sectors based on seed availability

Year	Quantity (million tons)		Quantity of seed produced (million tons)	
	Availability	Requirement	Public sector	Private Sector
2008-09	2.50	2.07	1.51 (60.2%)	1.00 (39.8%)
2009-10	2.80	2.49	1.71 (61.1%)	1.09 (38.9%)
2010-11	3.22	2.90	1.66 (51.6%)	1.56 (48.4%)
2011-12	3.54	3.30	1.81 (51.1%)	1.73 (48.9%)
2012-13	3.29	3.15	1.61 (49.1%)	1.67 (50.9%)
2013-14	3.47	3.35	1.68 (48.4%)	1.79 (51.6%)

Table 2: Quality seed / certified seed availability and food grains production in the country

Period	Quality/Certified seed availability (lakh quintal)	Food grains production (million t)	Oilseeds Production (million t)	Pulses Production (million t)
1980-81	35.00	129.59	9.37	10.63
1990-91	57.00	176.39	18.61	14.26
2000-01	85.00	196.81	18.44	11.08
2009-10	279.72	218.10	24.90	14.70
2010-11	321.36	244.49	32.48	18.24
2011-12	353.62	259.29	29.80	17.09
2012-13	328.52	257.13	30.94	18.34
2013-14	332.84	265.05	32.75	19.25
2014-15	351.77	252.03	27.51	17.15
2015-16	343.52	251.54	25.25	16.32
2016-17	380.34	275.11	31.28	23.13
2017-18	419.41	285.01	31.46	25.42
2018-19	398.88	284.95*	32.23*	23.40*

**4th advance estimates.*

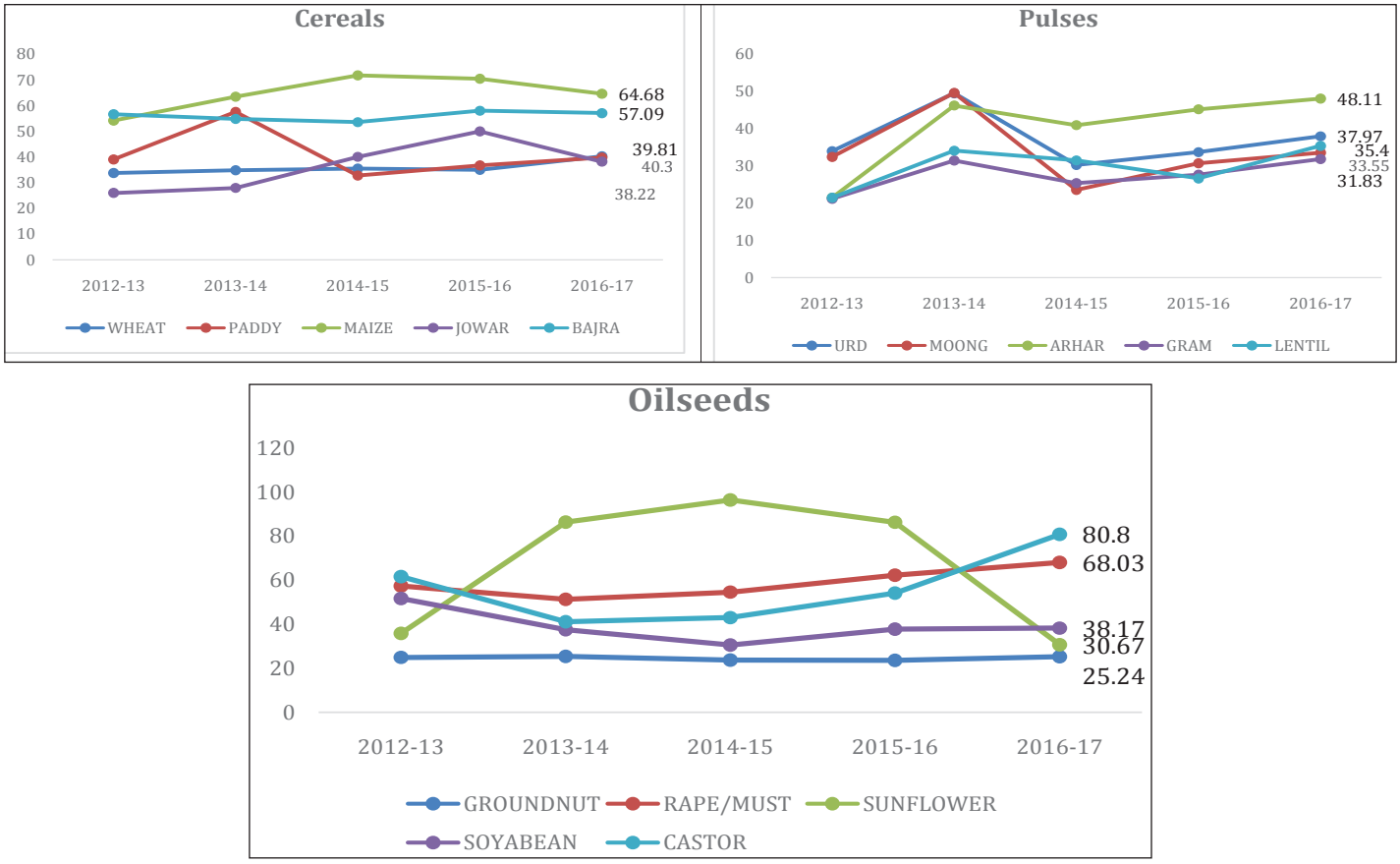

Fig. 2: Seed replacement rate in essential cereals, pulses, and oilseeds

2014-15	3.52	3.44	1.51 (41.2%)	2.06 (58.8%)
2015-16	3.43	3.37	1.47 (42.8%)	1.96 (57.2%)
2016-17	3.80	3.53	1.84 (48.5 %)	1.96 (51.5%)
2017-18	4.19	3.71	1.79 (42.72%)	2.40 (57.28%)
2018-19	3.99	3.54	1.71 (42.86%)	2.28 (57.14%)

Seed Security *vis-a-vis* Food Security

Seed security is a prerequisite for food security, and in the past few decades, we made significant strides in this aspect. The figure mentioned in Table 2 clearly reveals that the increase in quality seed availability has a significant bearing on food grain production. During the year 2018-19, the quality seed availability was 398.88 lakh quintal, and the food grains, oilseeds, and pulses production were 284.95, 32.36, and 23.40 million tons, respectively.

Seed Replacement Rate (SRR)

SRR is a measure of the cropped area covered with quality seed. Hence SRR has a direct bearing on productivity augmentation and enhancement in farmers' income and is one of the means for achieving doubling the farmers' income. Fig. 2 illustration reflects the incremental trend in nationwide SRR in significant crops. The increment in SRR in crops *viz.* wheat, paddy, and maize is of greater significance and is due to combined efforts of varied seed stakeholders and adept policy backing. Farmers were also contemplating the fact about replacement of contemplating the fact that replacing seed in high volume and low value crops reflects a sea change in perception and is viewing agriculture as a remunerative enterprise. Increment in SRR of pulses and oilseeds is also mainly due to renewed emphasis and due to policy initiatives (seed hubs) in the Indian seed domain.

Varietal Replacement Rate (VRR)

In addition to SRR, Varietal Replacement Rate (VRR) is one of the critical factors in realizing higher crop productivity. The pace of progress in food production largely depends upon the progress of seed programmes that could supply good quality seeds of wide yielding varieties with superior genetics. A perusal of statistics mentioned in Table 3 suggests that, across the crops, the pace of VRR was highest in wheat followed by mungbean, chickpea, soybean, rapeseed & mustard, rice, and pigeon pea. In wheat, the average share of varieties notified during the last five years and ten years in total breeder seed indent were 45.3 percent and 74.0 percent, respectively. Among pulses, mungbean has the share of 16.9 percent and 64.4 percent w.r.t. varieties, notified during last five years and ten years to total breeder seed indent, respectively. While in chickpea, the share of varieties notified during the last five years is 28.4 percent, indicating better VRR. In general, the pace of VRR among the wheat, chickpea, and soybean was being found satisfactory.

Eastern Uttar Pradesh description

Eastern Uttar Pradesh geographically lies between $23^0$51′N to $28^0$30′N and $81^0$31′E to $84^0$39′E, covering

Table 3: Varietal Replacement Rate (VRR) among major field crops in the country

Crops	No. of varieties in seed chain	Total indent (q)	Varieties < 5 years old			Varieties < 10 years old		
			Numbers	Indent (q)	Per cent share in total indent	Numbers	Indent (q)	Per cent share in total indent
Rice	293	4720.0	68	705.3	14.8	129	2264.1	47.7
Wheat	158	21873.3	45	9977.0	45.3	86	16190.3	74.0
Pigeonpea	55	312.7	8	15.1	4.9	18	120.9	39.0
Chickpea	73	10045.3	15	2845.9	28.4	34	6028.0	60.1
Mungbean	53	846.4	5	143.7	16.9	20	546.7	64.4
Soybean	35	18189.7	12	7486.4	41.5	20	10084.6	55.6
Groundnut	46	10571.2	8	1235.9	11.5	26	4095.1	38.5
R & M	43	63.6	9	7.8	12.4	23	32.7	51.6

an area of about 8.88 million ha, which is around 35.5 percent of the total geographical area of Uttar Pradesh. This region stretched eight divisions and 28 districts out of 18 divisions and 75 districts of Uttar Pradesh. This region borders Nepal in the north, Bihar, and Jharkhand in the east, Chhattisgarh and Madhya Pradesh in the south, and many districts of Uttar Pradesh in the west. The total population of Eastern Uttar Pradesh is around 8.25 crores which are 41.67 percent of the state population (according to the 2011 census report). The details of divisions, districts, and population in Eastern Utter Pradesh have been presented in Table 4.

Table 4: Divisions, districts and population in Eastern Uttar Pradesh

Sl. No.		Divisions	Districts	Total Population
I	1	Varanasi	Varanasi	3676841
	2		Chandauli	1952756
	3		Ghazipur	3620268
	4		Jaunpur	4494204
II	5	Gorakhpur	Gorakhpur	4440895
	6		Kushinagar	3564544
	7		Deoria	3100946
	8		Maharajganj	2684703
III	9	Prayagraj	Prayagraj	5954391
	10		Pratapgarh	3209141
	11		Kaushambi	1599596
	12		Fatehpur	2632733
IV	13	Mirzapur	Mirzapur	2496970
	14		Bhadohi	1578213
	15		Sonbhadra	1862559
V	16	Azamgarh	Azamgarh	4613913
	17		Mau	2205968
	18		Ballia	3239774
VI	19	Basti	Basti	2464464
	20		Sant Kabir Nagar	1715183
	21		Siddharth Nagar	2559297
VII	22	Devipatan Mandal	Gonda	3433919
	23		Bahraich	3487731
	24		Sravasti	1117361
	25		Balrampur	2148665
VIII	26	Ayodhya	Ayodhya	2470996
	27		Ambedkar Nagar	2397888
	28		Sultanpur	3797117
Total				**82521036**

Area under different crops in Eastern Uttar Pradesh

The details of the area under different crops in Eastern Uttar Pradesh have been presented in the Table 5. The top five crops occupied around 86 percent of the gross cropped area in Eastern Uttar Pradesh. Wheat occupied the highest share of 43.74 percent, followed by Paddy (35.58 percent), Maize (2.81 percent), Lentil (1.96 percent), and Pigeon pea (1.70 percent). Around 25 crops occupy the remaining fourteen per cent gross cropped area.

Table 5: Area under different crops in Eastern Uttar Pradesh (2017-18)

Sl. No.	Crops	Total Area (ha)	Share in gross cropped area (%)
1	Wheat	3954189	43.74
2	Paddy	3216435	35.58
3	Maize	253614	2.81
4	Lentil	177568	1.96
5	Pigeon pea	153563	1.70
6	Gram	110435	1.22
7	Rape seed & Mustard	108724	1.20
8	Pearl millet	107906	1.20
9	Fodder	88355	0.98
10	Pea	67940	0.75
11	Urd	54483	0.60
12	Jowar	46638	0.52
13	Barley	34517	0.38
14	Sesame	23905	0.26
15	Moong	17677	0.2
16	Linseed	10338	0.11
17	Groundnut	10431	0.12
18	Barnyard millet	4534	0.05
19	Kodo	3005	0.03
20	Tobacco	2209	0.02
21	Jute	927	0.01
22	Other crops	432473	6.56
Total		**8447896**	**100.00**

Land use pattern of Eastern Uttar Pradesh

Land use pattern of Eastern Uttar Pradesh has been provided in Table 6.

Table 6: Land use pattern of Eastern Uttar Pradesh (2015-16)

Sl.	Particulars	Area (ha.)
1	Reported Area	8879866
2	Forest Area	791588
3	Agricultural waste land	123926
4	Follow land	667594
5	Net sown area	5722064
6	Area sown more than area	3318233
7	Gross cropped area	9040297
8	Net-irrigated area	4620954
9	Gross irrigated area	6965575
10	Cropping intensity	157.99
11	Irrigation intensity	150.74

The total reported area is 8.88 m ha in Eastern Uttar Pradesh. The forest cover is 8.91 percent of the total reported area. The agricultural wasteland is 0.123 m ha which is 1.40 percent of the total reported area. Follow land in Eastern Uttar Pradesh is 0.66 m ha. The net sown area in Eastern Uttar Pradesh is 5.72 m ha, and area sown more than once is 3.32 m ha. The Gross cropped area in Eastern Uttar Pradesh is 9.04 m ha, and the cropping intensity is 157.99. The net irrigated area in Eastern Uttar Pradesh is 4.62 m ha which is 80.75 percent of the net sown area. The Gross irrigated area is 6.96 m ha which is 77.05 percent of the gross cropped area. The irrigation intensity of the Eastern Uttar Pradesh is 150.74.

Requirement of different classes of seed in major crops in Eastern Uttar Pradesh

The requirement of different classes of seed (Breeder seed, foundation seed and certified seed) has been presented in Table 7. It is evident from the table that the total certified, foundation, and breeder seed requirement of Eastern Uttar Pradesh is around 5747155 quintals, 162369 quintals, and 5296 quintals, respectively. In total, certified seed requirement around 98 percent of requirements come from six crops, namely wheat (73 percent), paddy (21 percent), gram, lentil, and pea (around 1 percent each). Similarly, in the case of foundation seed requirement, around 98 percent of requirements come from five crops, namely wheat (86

Table 7: Requirement of different classes of seed in major crops in Eastern Uttar Pradesh

Sl. No.	Crops	Total Area (ha)	Seed rate (kg/ha)	SMR (Enumerated)	Total CS requirement (q)	Total FS requirement (q)	Total BS requirement (q)
1	Wheat	3954189	106.23	30	4200534.97	140017.83	4667.26
2	Paddy	3216435	36.68	117	1179788.35	10083.66	86.18
3	Maize	253614	23.98	153	60816.63	397.49	2.59
4	Lentil	177568	33.28	38	59094.63	1555.12	40.92
5	Pigeon Pea	153563	12.5	105	19195.37	182.81	1.74
6	Gram	110435	66.7	20	73660.14	3683.00	184.15
7	Rape seed & Mustard	108724	5.42	250	5892.84	23.57	0.09
8	Pearl Millet	107906	5.4	242	5826.92	24.07	0.09
9	Fodder	88355	20	20	17671.00	883.55	44.17
10	Pea	67940	90	18	61146.00	3397.00	188.72
11	Urd	54483	20.48	42	11158.11	265.66	6.32
12	Jowar	46638	10	138	4663.80	33.79	0.24
13	Barley	34517	94.05	27	32463.23	1202.34	44.53
14	Sesame	23905	4.31	296	1030.30	3.48	0.01
15	Moong	17677	17.26	53	3051.05	57.56	1.08
16	Groundnut	10431	107	20	11161.17	558.05	27.90
Total					**5747155.00**	**162369.00**	**5295.99**

Table 8: Crop-wise Breeder Seed Production in significant crops in Eastern Uttar Pradesh under NARES (in quintals)

Sl. No.	Centre	Crop	2015-16	2016-17	2017-18	2018-19	2019-20	Total		Average	
								Indent	Production	Indent	Production
1	NDUAT, Ayodhya	Paddy	781.82	1205.40	542.15	480.89	428.35	808.02	3438.61	161.60	687.72
		Wheat	652.77	742.60	195.75	380.20	12.24	1064.93	1983.56	212.98	396.71
		Lentil	37.30	100.13	64.15	38.60	9.00	115.00	249.18	23.00	49.83
		Gram	21.82	95.75	8.90	7.50	0	20.00	133.97	4.00	26.79
		Pigeon Pea	54.10	89.50	27.00	00	55.00	140.54	225.60	28.10	45.12
		Rai/Sarson	17.09	0	10.74	2.60	5.20	9.50	35.63	1.90	7.12
		Oats	0	0	00	00	0.75	4.75	0.75	0.95	0.15
		Total	1564.90	2233.38	848.69	909.79	510.54	2162.74	6067.30	432.54	1213.46
2	BHU, Varanasi	Paddy	177.90	118.25	145.90	167.50	53.90	322.00	663.45	64.40	132.69
		Wheat	128.54	218.20	103.50	140.40	180.00	404.59	770.64	80.91	154.12
		Lentil	22.53	22.20	30.00	40.00	20.00	73.10	134.73	14.62	26.94
		Pigeon Pea	9.58	20.00	17.80	0.00	13.25	70.62	60.63	14.12	12.12
		Total	338.55	378.65	297.20	347.90	267.15	871.31	1629.45	174.26	325.89
3	IISS, Mau	Paddy	40.00	40.00	0	0	0	51.70	80.00	10.34	16.00
		Wheat	22.00	25.00	20.00	152.00	0	235.40	219.00	47.08	43.80
		Total	62.00	65.00	20.00	152.00	0.00	287.10	299.00	57.42	59.80
Grand Total			**1965.45**	**2677.03**	**1165.89**	**1409.69**	**777.69**	**3321.15**	**7995.75**	**664.22**	**1599.15**

percent), paddy (6 per cent), pea, and gram (2 percent each), and lentil (1 percent). In the case of breeder seed requirement, around 97 percent of requirements come from four crops, namely wheat (88 percent), paddy (2 percent), gram, and pea (3.5 percent each).

Crop-wise Breeder Seed Production in Eastern Uttar Pradesh

Crop-wise breeder seed production in significant crops in Eastern Uttar Pradesh under NARES has been presented in Table 8. There are three Institutions *i.e.* Acharya Narendra Deva University of Agriculture and Technology, Ayodhya; Banaras Hindu University, Varanasi and ICAR- Indian Institute of Seed Science, Mau working under NARES in Eastern Uttar Pradesh, engaged in breeder seed production of important crops. All three institutions have produced 7995.75 quintal breeder seed of major crops during the last five years (2015-16 to 2019-20) with an average annual production of 1599.15 quintals. On average NDUA&T, Ayodhya produces 75.88 percent share of total breeder seed production in Eastern Uttar Pradesh, followed by BHU, Varanasi (20.38 percent) and ICAR- IISS, Mau (3.74 percent). On average, breeder seed production of Eastern Uttar Pradesh under NARES paddy constitute a high share of 52.30 percent followed by wheat (37.19 percent), Lentil (4.80 percent), Pigeon pea (3.58 percent), Gram (1.68 percent), Rai/ Sarson and oats (0.45 percent).

Quality Seed Production in Eastern Uttar Pradesh

Quality seed production in Eastern Uttar Pradesh under NARES has been presented in Table 9. It is evident from the Table that during the last five years (2015-16 to 2019-20) average annual production of all classes of seed (foundation seed, certified seed, and Truthfully labeled seed) by three NARES institutes were 17310.71 quintals. On average NDUA&T, Ayodhya produces 76.23 percent share of total quality seed production in Eastern Uttar Pradesh, followed by BHU, Varanasi (18.45 percent) and ICAR- IISS, Mau (5.32 percent). In average quality seed production of Eastern Uttar Pradesh under NARES foundation seed constitutes a high share of 50.69 percent followed by Truthfully labeled seed (37.19 percent) and certified seed (10.64 percent).

Table 9: Quality Seed Production in Eastern Uttar Pradesh under NARES

Particulars	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	Average
NDUA & T, Ayodhya						
Foundation Seed	5269.26	6756.50	5124.94	9816.51	10359.51	7465.34
Certified Seed	15.00	0.00	970.00	3033.00	4455.00	1694.60
Truthfully labeled seed	5767.09	6283.58	6248.50	0.00	1878.00	4035.43
Total	11051.35	13040.08	12343.44	12849.51	16692.51	13195.37
BHU, Varanasi						
Foundation Seed	1009.55	617.90	688.20	529.90	529.90	675.09
Certified Seed	0.00	0.00	0.00	0.00	0.00	0.00
Truthfully labeled seed	4324.10	3009.50	2675.30	0.00	2588.50	2519.48
Total	5333.65	3627.40	3363.50	529.90	3118.4	3194.57
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Foundation Seed	307.15	613.63	1589.90	330.20	330.20	634.22
Certified Seed	538.73	18.00	45.00	66.00	66.00	146.75
Truthfully labeled seed	70.75	305.97	262.30	30.00	30.00	139.80
Total	916.63	937.60	1897.20	426.20	426.20	920.77
Grand Total	**17301.63**	**17605.08**	**17604.14**	**13805.61**	**20237.11**	**17310.71**

Table 10: Gap analysis for breeder seed in major crops under Eastern Uttar Pradesh

Sl. No.	Crops	Total BS requirement (q)	Total BS produced under NARES (q)	Deficit (-) /Surplus (+)
1	Paddy	86.18	836.41	+750.23
2	Wheat	4667.26	597.91	-4069.35
3	Barley	44.53	—	-44.53
4	Jowar	0.24	—	-0.24
5	Pearl Millet	0.09	—	-0.09
6	Maize	2.59	—	-2.59
7	Urd	6.32	—	-6.32
8	Moong	1.08	—	-1.08
9	Lentil	40.92	76.77	+35.85
10	Gram	184.15	83.06	-101.09
11	Pea	188.72	—	-188.72
12	Pigeon Pea	1.74	57.24	+55.50
13	Rape seed & Mustard	0.09	7.12	+7.03
14	Sesame	0.01	—	-0.01
15	Groundnut	27.90	—	-27.90
16	Fodder	44.17	—	-44.17

Gap analysis in breeder seed

The gap between the requirement and production of breeder seed in significant crops has been presented in Table 10. It is evident from the table that Eastern Uttar Pradesh produces a sufficient quantity of breeder seed as per total requirement on the basis of acreage under paddy, Pigeon pea, and Rapeseed & Mustard. There is a huge shortage in the case of wheat breeder seed availability to cover 100 per cent area with quality seed. The breeder seed demand may be met from other breeder seed producing centres within NARES. Breeder

seed of wheat is available only 597.91 quintals against the requirement of 4667.26 quintals in Eastern Uttar Pradesh. Small quantities of breeder seed of crops like Barley, Jowar, Pearl Millet, Maize, Urd, Moong, Pea, Sesame, Groundnut, and fodder is required in Eastern Uttar Pradesh, but there is no breeder seed production in Eastern Uttar Pradesh. The gap can be minimized by making a strategy towards strengthening the centers taking breeder seed production program. The agreement / MoU with SAU and ICAR Institutes, which are involved in developing crop varieties popular in this region, can be a good initiative. They can provide a nucleus seed for further seed multiplication. Under AICRP NSP (Crops), facilitation of these institutions can be done to boost up the production of breeder seed which lead to the production of a sufficient quantity of foundation, certified, and TL Seed to fulfill the quality seed.

CONCLUSION

Three generation system (breeder seed- foundation seed- certified seed) of seed multiplication is followed in India. Seed security is a prerequisite for food security, and in the past few decades, we made significant strides in this aspect. Analysis of Seed replacement rate reflects the incremental trend in nation-wide SRR in significant crops. Pace of Varietal replacement rate among important crops was being found satisfactory. Eastern Uttar Pradesh has an area of about 8.88 million ha, which is around 35.5 percent of the total geographical area of Uttar Pradesh. Top five crops occupied around 86 percent of the gross cropped area in Eastern Uttar Pradesh. The cropping intensity and irrigation intensity of Eastern Uttar Pradesh are 157.99 and 150.74, respectively. The total certified, foundation, and breeder seed requirement of Eastern Uttar Pradesh is around 5747155 quintal, 162369 quintal, and 5296 quintals, respectively. The total breeder seed production of major crops under NARES was 7995.75 quintals during the last five years (2015-16 to 2019-20), with an average annual production of 1599.15 quintals. The average annual production of all classes of seed by NARES Institute was 17310.71 quintals in Eastern Uttar Pradesh. Eastern Uttar Pradesh produces a sufficient quantity of breeder seed as per total requirement based on acreage under paddy, Pigeon pea, and Rapeseed & Mustard. There is a huge shortage in the case of wheat breeder seed availability. The seed production, availability, and supply scenario in Eastern Uttar Pradesh can be improved by strengthening participatory seed production technology, seed village scheme, seed production under Public-Private-Farmers partnership, contract seed production program, and commercialization of informal seed sale. Identifying potential seed production area and preparation of 5-10 years road map for seed sector will further improve the seed scenario in Eastern Uttar Pradesh.

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