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AREA COVERAGE OF BINA DEVELOPED RICE, PULSE, OILSEED AND HORTICULTURAL CROP VARIETIES IN BANGLADESH

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Abstract

The study was conducted to assess the area coverage of BINA developed rice, pulse, oilseed and horticultural crop varieties during 2022-23. Field survey data were collected from 64 districts through concern DD, DAE office. Both tabular and descriptive statistical analysis was used. It was observed that the overall area coverage of BINA developed rice varieties were 8.91%. Among the three seasons; Aus, Aman and Boro the highest area coverage was found in Aman season that was 14.54% followed by Aus 5.95% and Boro 2.93%, respectively. Among the 14 agricultural regions the highest area coverage of rice was found 15.41% in Rajshahi region (Reg-7) and the lowest was found 1.01% in Dhaka region (Reg-11). The overall area coverage of BINA developed pulse varieties were 16.32% and among the 14 regions the highest area coverage for pulses was found in Barishal region 58.51% (Reg-6). The overall area coverage of BINA developed oilseed varieties were 23.46% and among the 14 regions the highest area coverage for oilseed was found in Jashore region 16.32% (Reg-13). Among the BINA developed horticultural varieties the highest area coverage was found 4.46% for Binalebu-1 followed by Binahalud-1 (0.93%) and Binatomato-10 (0.36%). It was also observed that, among the 14 regions the highest area coverage for Binalebu-1 and Binahalud-1 were found in Rangamati agricultural region (region-4) about 483 ha (87.26%) and 45 ha (18.19%), respectively. The study identified that the overall area coverage of BINA developed rice, pulse and oilseed crops for distributed seed were 0.93%, 1.41% and 3.45%, respectively. The study also observed some constraints such as-non availability of seed, lack of training, demonstrations, field day, collaboration etc. For continuation of variety expansion, the institute should ensure quality seed supply in proper time and training, demonstration as well as collaboration among other research institutes, DAE, BADC and NGOs should be emphasized.

Keywords: Area coverage, BINA crop variety.

Introduction

Bangladesh is predominantly an agrarian country. Due to its very fertile land and favorable weather, varieties of crop grow abundantly in this country. Agriculture sector contributes about 11.38 percent in 2022-23 to the country`s Gross Domestic Product (GDP) and employs around 45.33 percent of total labor force (Yearbook of Agricultural Statistics, 2022). Due to natural calamities like flood, cyclone, drought, loss of production in both food and cash crops are almost a regular phenomenon. Agricultural holding in Bangladesh is generally small but use of modern machinery and equipment is gradually increasing.

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Rice, jute, sugarcane, potato, vegetables, wheat, tea and maize are the principal crops of Bangladesh. The country is now on the threshold of attaining self-sufficiency in food grain production (BBS, 2022). The current world population is over 6 billion and will reach 8 billion in 2030. Meanwhile, the annual loss of land to other use is 10 to 35 million ha, with half of this lost land coming from crop land.

The problem, however, is that the per capita land area is one of the lowest in the world, estimated at 0.12 ha. In addition, the mostly unplanned economic growth in the past has led to environmental degradation and adversely affected the resilience of society. The arable land in Bangladesh is 15.92 million hectares about 60 percent of the total land area which is contributing to feed 160 million people in Bangladesh. The country has a favorable natural environment for crop production. Of the arable land, 13.39 percent is under single cropping, 25.57 percent double cropping, 11.50 percent triple cropping, 0.10 quadruple cropping and 2.86 percent currently fallow land. Here, Cropping intensity increases up to 198% (BBS 2022). Among various issues such as agriculture, water, energy, climate change, disaster risk reduction and disaster management, food security considered as the key priority for sustainable development in Bangladesh. As population is increasing, cultivable land is decreasing day by day. Facing such severe situation of population growth pressure plus cropland reduction, it is obvious that the only way to solve food shortage problem is to greatly enhance the yield level of food crops per unit land area through advance of science and technology. Keeping this in mind to feed the growing population the scientists of Bangladesh Institute of Nuclear Agriculture (BINA) have developed 128 high yielding varieties (HYV), those are cultivating in all over Bangladesh.

Getting a new idea adopted, even when it has obvious advantages, is difficult (Rogers, 2003). It is a common experience that the adoption of an apparently useful agricultural technology is slower than predicted or desired by extension agents (Röling, 1988). Masangano and Miles (2004) pointed out “when an agricultural program introduces a new agricultural technology, the program must be able to evaluate whether the technology has been adopted. Of equal importance is the need to identify the factors that influence adoption”. The success of any variety depends on its dissemination among the potential users, which ultimately is measured by the level of adoption of the variety. A farmer who has access to agricultural extension service is approximately 39 times more likely to adopt the variety, and if yield increases by 100%, adoption of the varieties increases by 0.08% (Rahman et. al., 2022). Farmers level adoption study results suggested that increasing trend of farmers level adoption of BINA varieties will contribute country’s total production as well as will support in achieving food security (Rahman et. al., 2020). Although some research on the adoption of BINA varieties has been conducted in Bangladesh, no study has dealt with post adoption factors, i.e. continuing adopters or de-adopters (those who discontinue after having previously adopted).

After the release of varieties, due to the lack of information flow and experience with the new varieties, adoption was limited and slow. In order to prepare programs and

courses of action for wider adoption of varieties, it is important to know the current status of BINA varieties in Bangladesh in terms of area they brought under cultivation. The following specific objectives were set to guide the study: i) to examine the area coverage of BINA developed rice, pulse, oilseed and horticultural crop varieties; ii) to identify major constraints of cultivating BINA developed rice, pulse, oilseed and horticultural crop varieties; and iii) to suggest some policy guidelines.

Materials and Methods

Considering the variations of all these factors the total land area of Bangladesh, Department of Agricultural Extension (DAE) classified fourteen agricultural regions of Bangladesh (Fig.1).

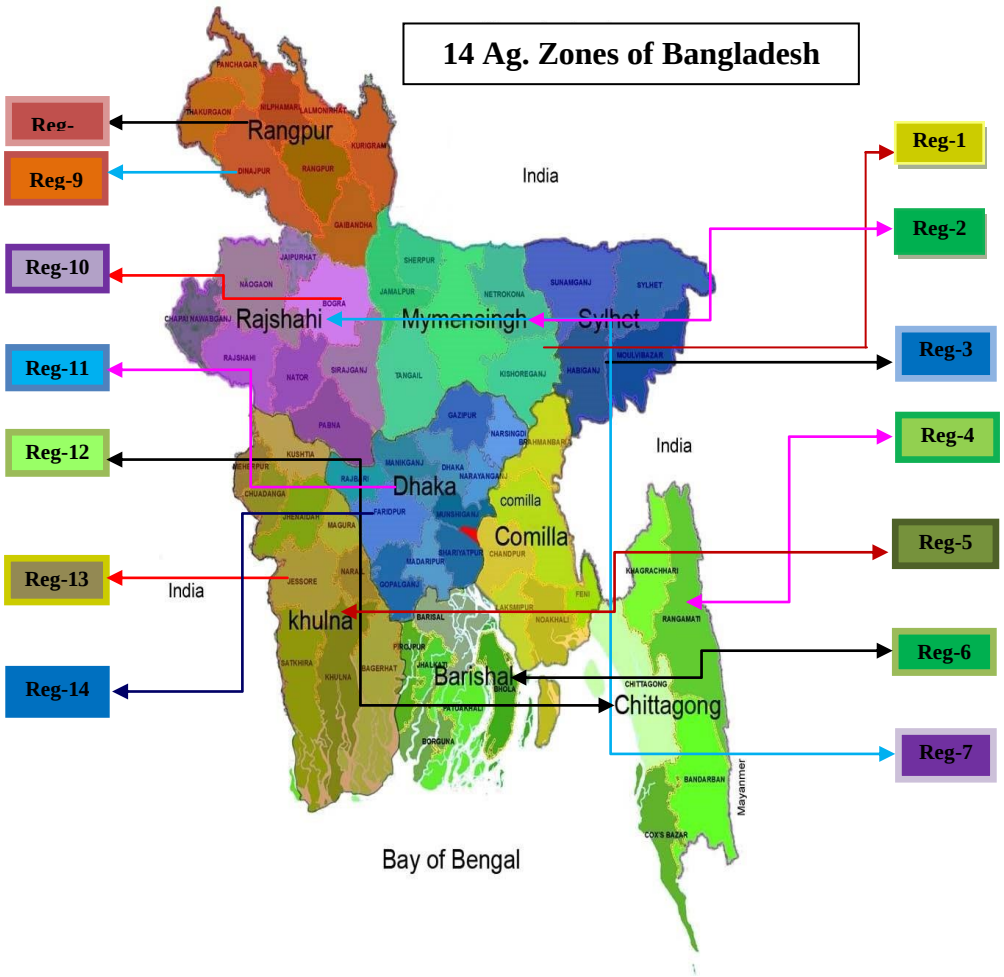

Fig. 1. Map of the 14 Agricultural regions of Bangladesh**.** Source: Department of Agricultural Extension (DAE).

The 14 agricultural regions were assigned such as Reg-1: Cumilla region (Cumilla, B. Baria, Chandpur), Reg-2: Mymensingh region (Mymensingh, Sherpur, Kishoregonj, Netrokona, Jamalpur), Reg-3: Sylhet region (Sylhet, Moulvibazar, Habiganj, Sunamganj), Reg-4: Rangamati region (Khagrachari, Bandarban, Rangamati) Reg-5: Khulna region (Khulna, Bagerhat, Meherpur, Kushtia, Chuadanga, Satkhira), Reg-6: Barishal (Potuakhali, Jhalokathi, Bhola, Borguna, Pirojpur, Barishal), Reg-7: Rajshahi region (Rajshahi, Pabna, Naogaon, Sirajganj, Natore, Chapainawabganj), Reg-8: Rangpur Region (Gaibandha, Lalmonirhat, Rangpur, Kurigram), Reg-9: Dinajpur region (Dinajpur, Panchagarh, Thakurgaon, Nilphamary), Reg10: Bogura region (Bogura, Joypurhat), Reg-11: Dhaka region (Narsingdi, Narayanganj, Gazipur, Tangail, Manikganj, Munshiganj), Reg-12: Chattagram region (Noakhali, Cox's Bazar, Feni, Lakshmipur, Chattagram), Reg-13: Jashore region (Jashore, Narail, Magura, Jhenaidah), Reg-14: Faridpur region (Rajbari, Madaripur, Faridpur, Sariatpur, Gopalganj). The study was conducted in 64 districts under fourteen agricultural regions of Bangladesh in collaboration with concerned sub-stations and regional station of BINA. In total sixty four data were collected through pre-designed interview schedule using structural questionnaire from concern Deputy Director, Department of Agricultural Extension (DD, DAE) of 64 districts. A stratified random sampling technique was employed in selecting the data. Data were collected using a pre-tested questionnaire. Through prior consultation, a six-page questionnaire was designed formatted with open and closed question items to obtain both quantitative and qualitative data. In the questionnaire per hectare area of BINA developed rice (Aus, Aman and Boro), pulses, oilseed and horticultural crop varieties were included to fulfil the objectives. Besides, secondary data from Bangladesh Bureau of Statistics (BBS) was also used. Tabular and descriptive statistics using mean, average and percentage were used to analyze the collected data. The period of data collection was 1 April to June 30, 2023.

Results and Discussion

It was observed that the overall area coverage of BINA developed rice varieties were 8.91% considering the whole Bangladesh (Table 1). Among the three seasons (Aus, Aman and Boro) the highest area coverage was found in Aman season that was 14.54% followed by Aus 5.95% and Boro 2.93%, respectively (Fig 2). In Aman season, the highest coverage was 6.24% for Binadhan-17 and the lowest was 0.002% for Binadhan-23 as a newly developed variety. In Boro season, the highest coverage was 1.89% for Binadhan-10 and the lowest was 0.06% for Binadhan-24 as a newly developed variety. In Aus season, the highest coverage was 5.25% for Binadhan-19 and the lowest was 0.02% for Iratom-24 (Fig 3).

Table 1. Variety wise area coverage of BINA developed rice varieties in 2022-23

(In ha)

Rice	Varieties	Cultivated Area	Varietal Adoption (%)	Area Coverage (%)
Boro	Binadhan-5	440	0.04	0.01
	Binadhan-6	2020	0.19	0.04
	Binadhan-8	15236	1.46	0.32
	Binadhan-10	90789	8.72	1.89
	Binadhan-14	25445	2.44	0.53
	Binadhan-18	3508	0.34	0.07
	Binadhan-24	2740	0.34	0.07
	Subtotal	**141006**	**13.54**	**2.93**
Aus	Iratom-24	200	0.02	0.02
	Binadhan-14	2840	0.27	0.25
	Binadhan-19	60848	5.84	5.25
	Binadhan-21	5042	0.48	0.43
	Subtotal	**68930**	**6.62**	**5.95**
Aman	Binashail	5144	0.49	0.09
	Binadhan-7	347352	33.35	6.07
	Binadhan-11	52642	5.05	0.92
	Binadhan-12	7980	0.77	0.14
	Binadhan-13	238	0.02	0.00
	Binadhan-15	120	0.01	0.00
	Binadhan-16	17417	1.67	0.30
	Binadhan-17	357177	34.29	6.24
	Binadhan-20	23496	2.26	0.41
	Binadhan-22	18688	1.79	0.33
	Binadhan-23	1394	0.13	0.02
	Subtotal	**831649**	**79.84**	**14.54**
	Total	**1041585**	**100.00**	**8.91**

Source: DAE data, 2022-23 and BBS, 2022

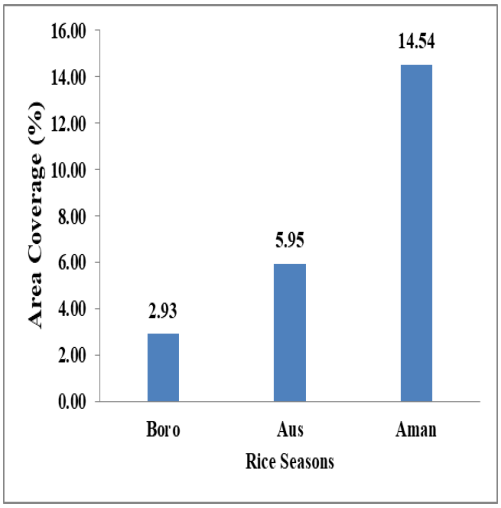

Fig 2. Cultivated areas of BINA developed rice varieties (%)

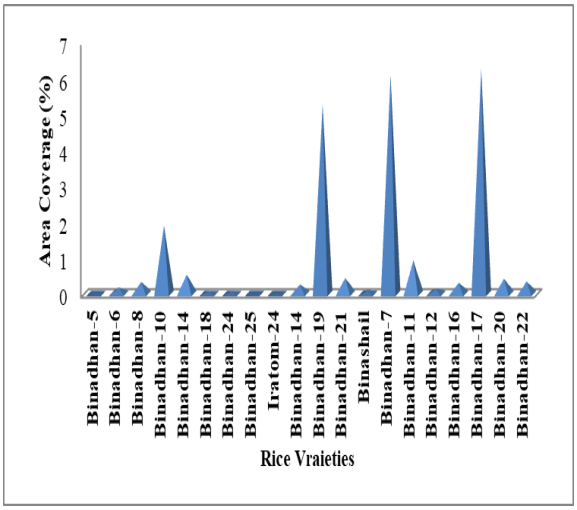

Fig 3. Area coverage of BINA developed rice varieties (%)

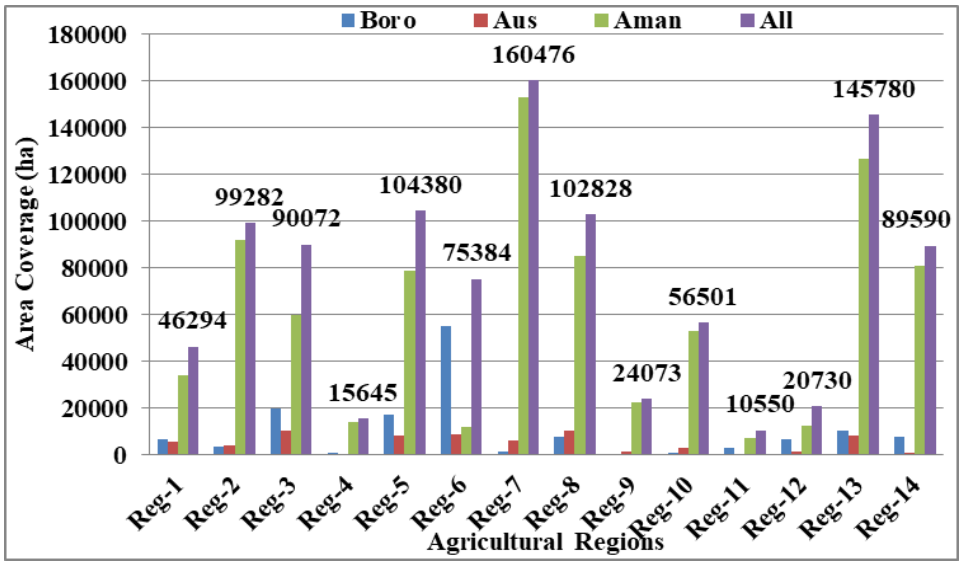

Fig 4. Regional coverage of BINA developed rice varieties during 2022-23

The results presented in Table 2 depicted that among three seasons, area coverage was the highest for Aman that was 79.84% followed by Boro 13.54% and it was the lowest for Aus i.e. 6.62%. Among the 14 agricultural regions the highest area coverage was found 15.41% in Rajshahi region (Reg-7) and the lowest found 1.01% in Dhaka region (Reg-11) (Fig 4.). In Rajshahi region, the highest area was found for Aman season 153128 ha and the lowest was found for Boro season 1320 ha. In Dhaka region, total Aman area was 7242 ha and Aus area was 300 ha.

Table 2. Region-wise area coverage of BINA developed rice varieties during 2022-23

Region	Boro		Aus		Aman		Total	
	Area (ha)	(%)	area (ha)	(%)	area (ha)	(%)	area (ha)	(%)
Reg-1	6670	4.73	5488	7.96	34136	4.10	46294	4.44
Reg-2	3524	2.50	4000	5.80	91758	11.03	99282	9.53
Reg-3	19900	14.11	10524	15.27	59648	7.17	90072	8.65
Reg-4	846	0.60	587	0.85	14212	1.71	15645	1.50
Reg-5	17380	12.33	8274	12.00	78726	9.47	104380	10.02
Reg-6	55044	39.04	8664	12.57	11676	1.40	75384	7.24
Reg-7	1320	0.94	6028	8.75	153128	18.41	160476	15.41
Reg-8	7456	5.29	10492	15.22	84880	10.21	102828	9.87
Reg-9	388	0.28	1176	1.71	22509	2.71	24073	2.31
Reg-10	609	0.43	2796	4.06	53096	6.38	56501	5.42
Reg-11	3008	2.13	300	0.44	7242	0.87	10550	1.01
Reg-12	6626	4.70	1492	2.16	12612	1.52	20730	1.99
Reg-13	10552	7.48	8276	12.01	126952	15.27	145780	14.00
Reg-14	7683	5.45	833	1.21	81074	9.75	89590	8.60
All	141006	13.54	68930	6.62	831649	79.84	1041585	100

Source: DAE data, 2022-23

Note: **Reg-1:** Cumilla region, **Reg-2:** Mymensingh region, **Reg-3:** Sylhet region, **Reg-4:** Rangamati region, **Reg-5:** Khulna region, **Reg-6:** Barishal region, **Reg-7:** Rajshahi region, **Reg-8:** Rangpur region, **Reg-9:** Dinajpur region, **Reg10:** Bogura region, **Reg-11:** Dhaka region, **Reg-12:** Chattogram region, **Reg-13**: Jashore region, and **Reg-14:** Faridpur region.

The results presented in Table 3 showed that the overall area coverage of BINA developed pulse varieties were 16.32%. The highest area coverage was found 16.54% for Mungbean and lowest was seen 1.07% in case of Chikpea (Fig 5). Among the pulses the highest area coverage was found in Binamoog-8 that was 11.03% followed by Binamasur-8 (4.13%) and Binamoog-6 (2.76%), respectively (Fig 6).

Table 3. Variety-wise area coverage of BINA developed pulse varieties in 2022-23

	Varieties	Cultivated Area	Varietal Adoption (%)	Area Coverage (%)
Lentil	Binamasur-1	50	0.08	0.03
	Binamasur-2	8	0.01	0.01
	Binamasur-3	63	0.10	0.04
	Binamasur-4	270	0.44	0.19
	Binamasur-5	2844	4.65	1.97
	Binamasur-6	240	0.39	0.17
	Binamasur-7	460	0.75	0.32
	Binamasur-8	5969	9.76	4.13
	Binamasur-9	164	0.27	0.11
	Binamasur-10	19	0.03	0.01
	Binamasur-12	48	0.08	0.03
	Sub-total	**10133**	**16.56**	**7.01**
Mungbean	Binamoog-2	25	0.04	0.01
	Binamoog-3	25	0.04	0.01
	Binamoog-4	625	1.02	0.25
	Binamoog-5	2178	3.56	0.88
	Binamoog-6	6795	11.11	2.76
	Binamoog-7	3758	6.14	1.53
	Binamoog-8	27153	44.38	11.03
	Binamoog-9	163	0.27	0.07
	Sub-total	**40720**	**66.55**	**16.54**
Chickpea	Binasola-4	65	0.11	0.09
	Binasola-6	11	0.02	0.01
	Binasola-7	300	0.49	0.41
	Binasola-8	428	0.70	0.58
	Binasola-9	8	0.01	0.01
	Sub-total	**793**	**1.32**	**1.07**
Grass pea	Binakhesari-1	8871	14.50	7.53
	Sub-total	**8871**	**14.50**	**7.53**
Black gram	Binamas-1	608	0.99	1.47
	Binamas-2	43	0.07	0.10
	Sub-total	**651**	**1.06**	**1.57**
	Total	**61185**	**100.00**	**16.32**

Source: DAE data, 2022-23 and BBS, 2022

It was observed from Table 4 and Fig 7, among the 14 regions the highest area coverage for pulses was found in the Barishal region 58.51% (Reg-6) and the lowest was found in the Rangamati region 0.001% (Reg-4), respectively.

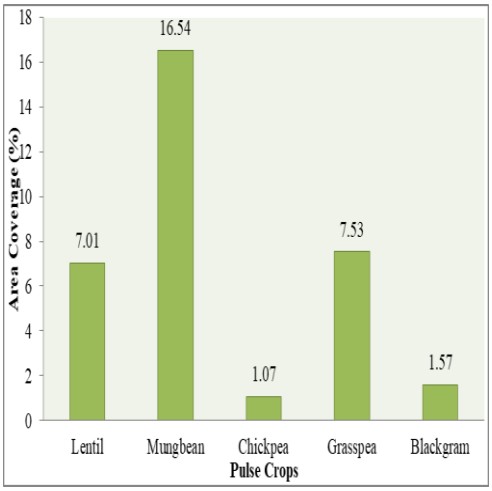

Fig 5. Cultivated areas of BINA developed pulse (%)

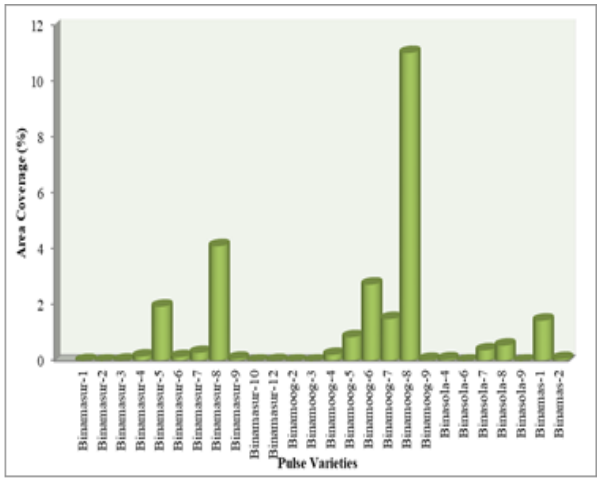

Fig 6. Area coverage of BINA developed pulse (%)

Table 4. Region-wise adoption of BINA developed Pulse varieties during 2022-23

(In ha)

Pulse	Lentil varieties		Mungbean varieties		Chickpea varieties		Grasspea varieties		Blackgram varieties		Total	
	area	%	area	%	area	%	area	%	area	%	area	%
Reg-1	5	0.05	0	0	0	0	105	1.18	0	0	110	0.18
Reg-2	53	0.52	65	0.16	0	0	80	0.9	0	0	198	0.32
Reg-3	0	0	148	0.36	0	0	10	0.11	0	0	158	0.26
Reg-4	0	0	0	0	0	0	0	0	0	0	0	0
Reg-5	748	7.38	786	1.93	0	0	13	0.14	0	0	1546	2.53
Reg-6	90	0.89	34253	84.12	0	0	1455	16.4	0	0	35798	58.51
Reg-7	950	9.38	2108	5.18	790	97.38	133	1.49	250	38.46	4230	6.91
Reg-8	220	2.17	288	0.71	8	0.92	285	3.21	210	32.31	1010	1.65
Reg-9	0	0	777	1.91	0	0	0	0	0	0	777	1.27
Reg-10	0	0	35	0.09	0	0	0	0	0	0	35	0.06
Reg-11	0	0	0	0	0	0	23	0.25	0	0	23	0.04
Reg-12	25	0.25	49	0.12	0	0	5991	67.53	0	0	6065	9.91
Reg-13	3728	36.79	1595	3.92	14	1.69	25	0.28	0	0	5361	8.76
Reg-14	4316	42.59	618	1.52	0	0	753	8.49	190	29.23	5876	9.6
All	10133	16.56	40720	66.55	811	1.33	8871	14.5	650	1.06	61185	100

Source: DAE data, 2022-23

Note: **Reg-1:** Cumilla region, **Reg-2:** Mymensingh region, **Reg-3:** Sylhet region, **Reg-4:** Rangamati region, **Reg-5:** Khulna region, **Reg-6:** Barishal region, **Reg-7:** Rajshahi region, **Reg-8:** Rangpur region, **Reg-9:** Dinajpur region, **Reg10:** Bogura region, **Reg-11:** Dhaka region, **Reg-12:** Chattogram region, **Reg-13**: Jashore region, and **Reg-14:** Faridpur region.

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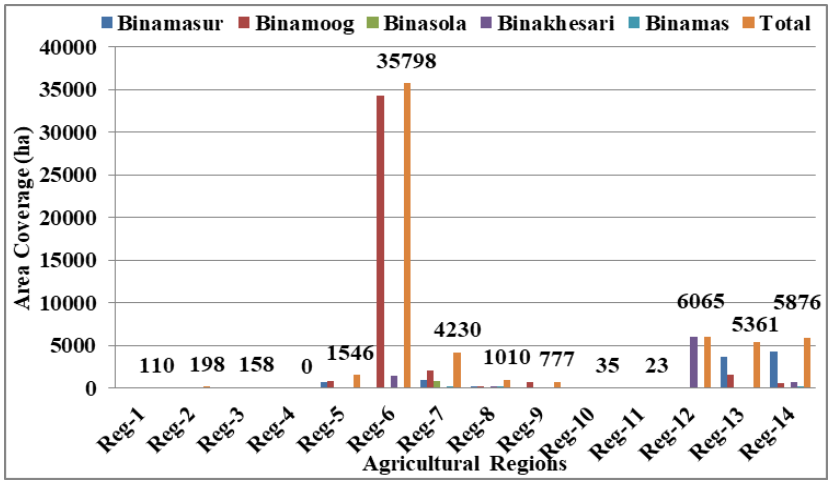

Fig 7: Region-wise adoption of BINA developed Pulse varieties during 2022-23

From Table 5, it was found that, the overall area coverage of BINA developed oilseed varieties were 23.46%. The highest area coverage was found 60.60% for sesame followed by groundnut (55.33%), mustard (21.92%) and soybean (4.22%) (Fig 8). The highest area coverage was found 35.97% for Binachinabadam-4 and the lowest 0.002% was seen in case of Binasoyabean-3 (Fig 9).

Table 5. Variety-wise area coverage of BINA developed oilseed varieties during 2022-23

(In ha)

	Varieties	**Cultivated Area**	**Varietal Adoption (%)**	**Area Coverage (%)**
Mustard varieties	Binasarisha-5	1835	1.56	0.55
	Binasarisha-6	1510	1.29	0.46
	Binasarisha-7	865	0.74	0.26
	Binasarisha-8	798	0.68	0.24
	Binasarisha-9	39201	33.41	11.85
	Binasarisha-10	1815	1.55	0.55
	Binasarisha-11	384	0.33	0.12
	Sub-total	**72545**	**61.82**	**21.92**
Soybean varieties	Binasoybean-2	13	0.01	0.02
	Binasoybean-3	11	0.01	0.02
	Binasoybean-4	48	0.04	0.08
	Binasoybean-5	116	0.10	0.20
	Binasoybean-6	2285	1.95	3.90
	Sub-total	**2472**	**2.11**	**4.22**
Groundnut varieties	Binachinabadam-1	75	0.06	0.19
	Binachinabadam-2	230	0.20	0.57
	Binachinabadam-3	150	0.13	0.37
	Binachinabadam-4	14490	12.35	35.97
	Binachinabadam-5	163	0.14	0.40
	Binachinabadam-6	445	0.38	1.10
	Binachinabadam-7	130	0.11	0.32
	Binachinabadam-8	4293	3.66	10.66
	Binachinabadam-9	796	0.68	1.98
	Binachinabadam-10	1518	1.29	3.77
	Sub-total	**22289**	**18.99**	**55.33**
Sesame varieties	Binatil-1	7747	6.60	23.43
	Binatil-2	2288	1.95	6.92
	Binatil-3	2145	1.83	6.49
	Binatil-4	7855	6.69	23.76
	Sub-total	**20035**	**17.07**	**60.60**
	Total	**117341**	**100.00**	**23.46**

Source: DAE data, 2022-23 and BBS, 2022.

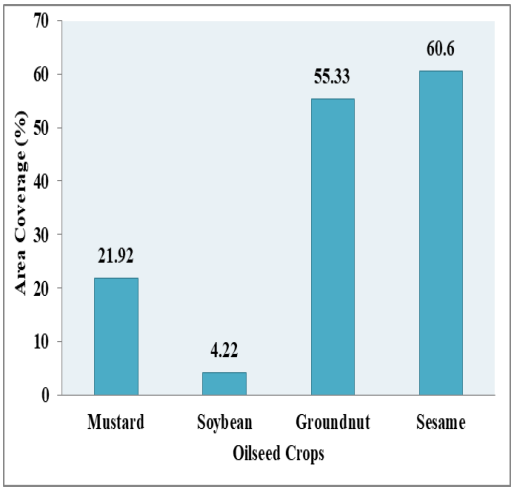

Fig 8. Cultivated areas of BINA developed oilseed varieties (%).

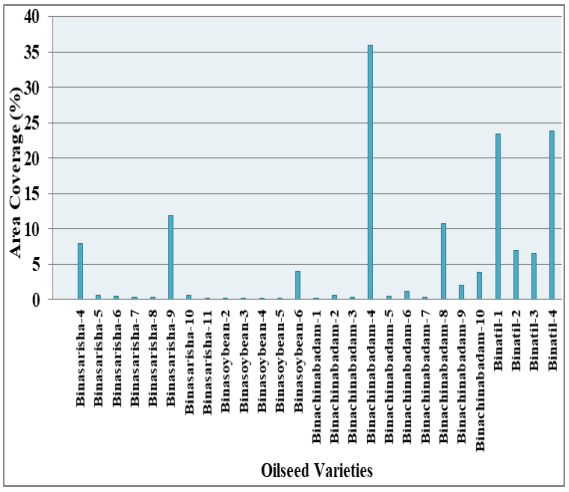

Fig 9. Area coverage of BINA developed oilseed varieties (%).

From Table 6, it was found that among the 14 regions the highest area coverage for oilseed was found in Jashore region 16.32% (Reg-13) and the lowest was found in Rangamati region 1.21% (Reg-10) (Fig 10).

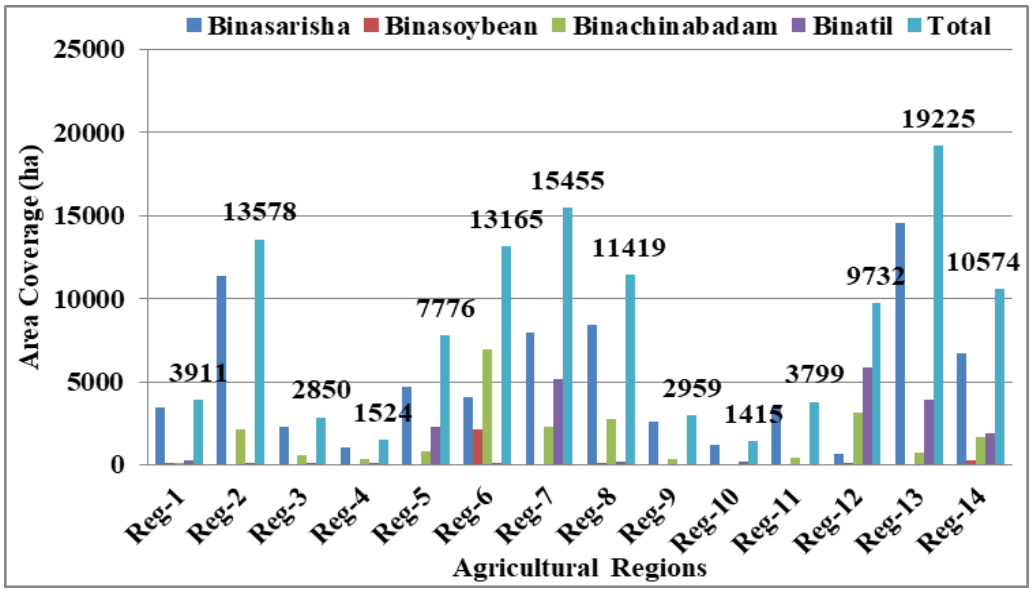

Fig 10. Cultivated areas of BINA developed oilseed varieties in 14 Ag. regions of Bangladesh.

Table-6. Region-wise adoption of BINA developed Oilseed varieties during 2022-23

(In ha)

Region	Mustard varieties		Soybean varieties		Groundnut varieties		Sesame varieties		Total	
	Area	%	Area	%	Area	%	Area	%	Area	%
Reg-1	3458	4.77	53	2.12	108	0.49	293	1.46	3911	3.33
Reg-2	11383	15.69	0	0	2148	9.63	48	0.24	13578	11.57
Reg-3	2253	3.1	0	0	575	2.58	23	0.11	2850	2.43
Reg-4	1070	1.47	0	0	378	1.69	76	0.38	1524	1.3
Reg-5	4718	6.5	0	0	783	3.51	2275	11.35	7776	6.63
Reg-6	4093	5.64	2130	86.17	6925	31.07	18	0.09	13165	11.22
Reg-7	7998	11.02	0	0	2303	10.33	5155	25.73	15455	13.17
Reg-8	8450	11.65	13	0.51	2756	12.37	200	1	11419	9.73
Reg-9	2609	3.6	0	0	350	1.57	0	0	2959	2.52
Reg-10	1240	1.71	0	0	0	0	175	0.87	1415	1.21
Reg-11	3343	4.61	0	0	418	1.87	0	0	3799	3.2
Reg-12	695	0.96	39	1.59	3114	13.97	5883	29.36	9732	8.29
Reg-13	14530	20.03	0	0	743	3.33	3953	19.73	19225	16.38
Reg-14	6707	9.25	238	9.61	1690	7.58	1938	9.67	10574	9.01
Total	72545	61.82	2472	2.11	22289	18.99	20035	17.07	117341	100

Source: DAE data, 2022-23

Note: **Reg-1:** Cumilla region, **Reg-2:** Mymensingh region, **Reg-3:** Sylhet region, **Reg-4:** Rangamati region, **Reg-5:** Khulna region, **Reg-6:** Barishal region, **Reg-7:** Rajshahi region, **Reg-8:** Rangpur region, **Reg-9:** Dinajpur region, **Reg10:** Bogura region, **Reg-11:** Dhaka region, **Reg-12:** Chattogram region, **Reg-13**: Jashore region, and **Reg-14:** Faridpur region.

From Table 7, it was found that, the overall area coverage of BINA developed horticultural crop varieties were 0.26%. The highest cultivated area was found 546 ha for Binalebu-1 followed by Binaholud-1 (246 ha), Binarosun-1 (228 ha) and Binatomato-10 (105 ha) (Fig 11). The highest area coverage was found 4.52% for lemon and among the lemon varieties the highest area coverage was found 4.46% for Binalebu-1 followed by Binahalud-1 (0.93%), Binatomato-10 (0.36%) and Binarosun-1 (0.32%) (Fig 12).

Table 7. Variety-wise area coverage of BINA developed horticultural crop varieties during 2022-23

(In ha)

Varieties	Cultivated Area	Varietal Adoption (%)	Area Coverage (%)
Binalebu-1	546.00	46.73	4.46
Binalebu-2	7.50	0.64	0.06
Binarosun-1	228.00	19.51	0.32
Binatomato-7	36.00	3.08	0.12
Binatomato-10	105.00	8.99	0.36
Binahalud-1	246.00	21.05	0.93
Total	**1168.50**	**100.00**	**0.26**

Source: DAE data, 2022-23 and BBS, 2022

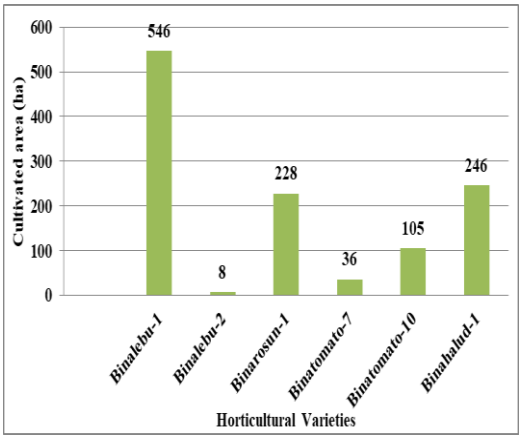

Fig 11. Cultivated areas of BINA developed horticultural crop varieties (%)

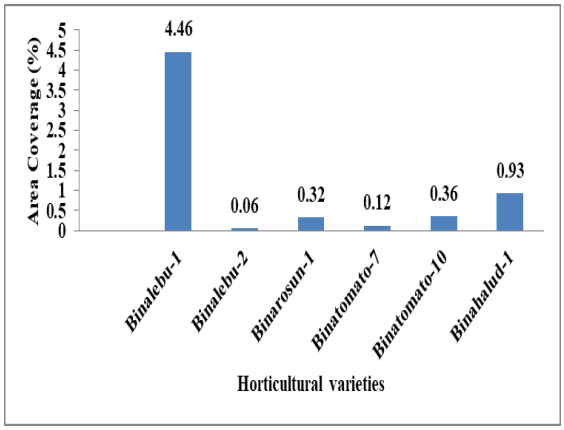

Fig 12. Area coverage of BINA developed horticultural crop varieties (%)

From Table 8, it was revealed that, among the 14 regions the highest area coverage for horticultural crop varieties was found 528 ha (45.19%) in Rangamati region (region-4). It was also observed that, among the 14 agricultural regions the highest area coverage for Binalebu-1 and Binahalud-1 were found in Rangamati region (region-4) about 483 ha (87.26%) and 45 ha (18.29%), respectively. But the highest area coverage for Binarosun-1 was found 195 ha (85.53%) in Rajshahi region (region-7).

Table 8. Region-wise adoption of BINA developed horticultural crop varieties during 2022-23

(In ha)

Region	Lemon varieties		Garlic varieties		Tomato varieties		Turmeric varieties		Total	
	Area	%	Area	%	Area	%	Area	%	Area	%
Reg-1	15	2.71	0	0	0	0	0	0	15	1.28
Reg-2	39	7.05	0	0	36	25.53	93	37.8	168	14.38
Reg-3	0	0	12	5.26	0	0	0	0	12	1.03
Reg-4	483	87.26	0	0	0	0	45	18.29	528	45.19
Reg-5	0	0	0	0	0	0	0	0	0	0
Reg-6	0	0	0	0	0	0	0	0	0	0
Reg-7	0	0	21	9.21	0	0	0	0	21	1.8
Reg-8	0	0	195	85.53	105	74.47	131.71	43.9	408	34.92
Reg-9	4.5	0.81	0	0	0	0	0	0	4.5	0.39
Reg-10	0	0	0	0	0	0	0	0	0	0
Reg-11	6	1.08	0	0	0	0	0	0	6	0.51
Reg-12	1.5	0.27	0	0	0	0	0	0	1.5	0.13
Reg-13	4.5	0.81	0	0	0	0	0	0	4.5	0.39
Reg-14	0	0	0	0	0	0	0	0	0	0
Total	**553.5**	**60**	**228**	**24.72**	**141**	**15.28**	**246**	**26.67**	**1168.5**	**100**

Source: DAE data, 2022-23

Note: **Reg-1:** Cumilla region, **Reg-2:** Mymensingh region, **Reg-3:** Sylhet region, **Reg-4:** Rangamati region, **Reg-5:** Khulna region, **Reg-6:** Barishal region, **Reg-7:** Rajshahi region, **Reg-8:** Rangpur region, **Reg-9:** Dinajpur region, **Reg10:** Bogura region, **Reg-11:** Dhaka region, **Reg-12:** Chattogram region, **Reg-13**: Jashore region, and **Reg-14:** Faridpur region.

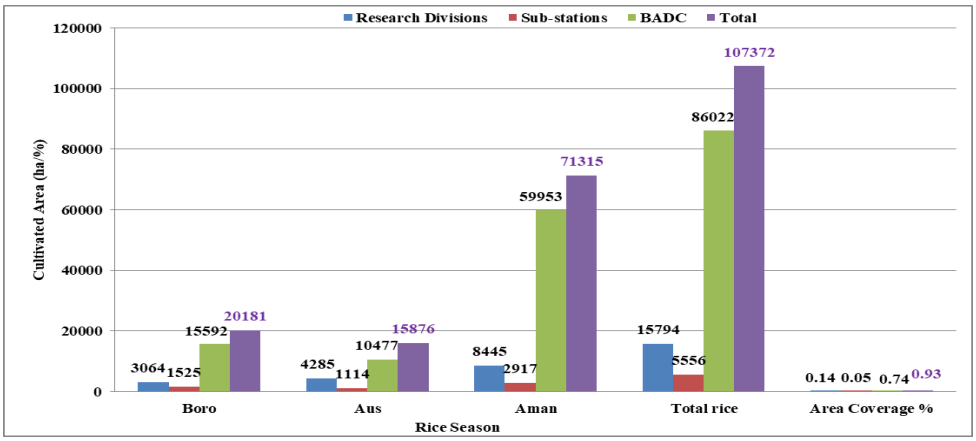

Fig 13. Cultivated areas of BINA developed rice varieties through own seed distribution, 2023.

From Fig 13, it was found that, the overall area coverage of BINA developed rice varieties with own seed distribution were 107372 ha (0.93%). The highest cultivated area was found 86022 ha (0.74%) for BADC followed by research divisions 15794 ha (0.14%)), and BINA sub-stations 5556 ha (0.05%). Among the rice seasons the highest area coverage was found for Aman (71315 ha), followed by Boro (20181 ha) and Aus (15876 ha).

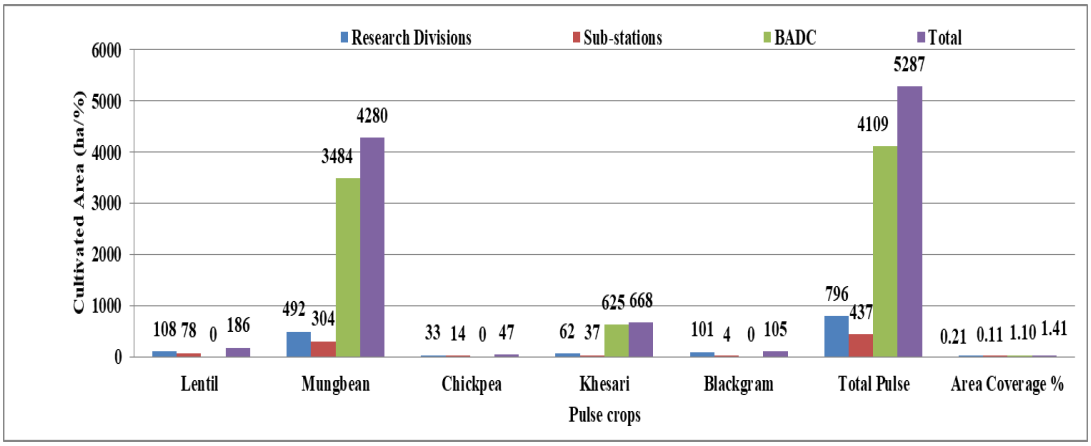

Fig 14. Cultivated areas of BINA developed pulse crops through seed distribution, 2023

It was observed from the Fig 14 that, the overall area coverage of BINA developed pulse crop varieties with own seed distribution were 5278 ha (1.41%). The highest cultivated area was found 4109 ha (1.10%) for BADC followed by research divisions 796 ha (0.21%)), and BINA sub-stations 437 ha (0.11%). Among the pulse crop varieties the highest area coverage was found for mungbean varieties (4280 ha), followed by khesari varieties (668 ha), lentil varieties (186 ha), blackgram varieties (105 ha) and chickpea (47 ha).

From Fig-15, it was seen that the overall area coverage of BINA developed oilseed crop varieties with own seed distribution were 17250 ha (3.45%). The highest cultivated area was found 9619 ha (1.92%) for BADC followed by research divisions 5666 ha (1.13%)), and BINA sub-stations 1965 ha (0.39%). Among the oilseed crop varieties the highest area coverage was found for sesame (8525 ha) followed by mustard (7205 ha) groundnut (1441 ha), and soybean (79 ha). It was also observed that the area coverage for research divisions distributed mustard seed was the highest (4583 ha).

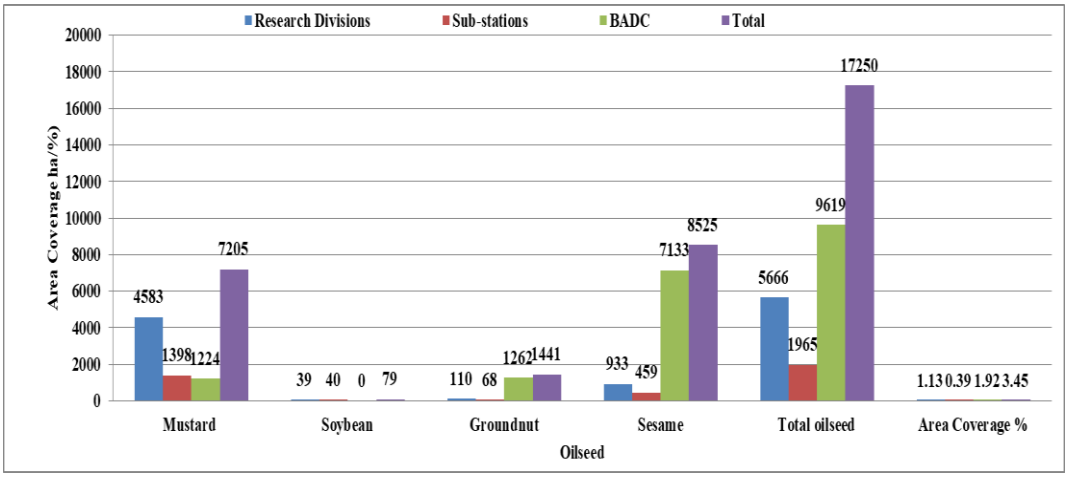

Fig 15. Cultivated areas of BINA developed oilseed crop varieties through own seed distribution, 2023

The study identifies some constraints of increasing area coverage of BINA developed varieties such as-Non availability of seeds which was ranked I; followed by lack of training, workshop and Field Day for DAE personnel, extension workers and farmers (rank II); lack of demonstrations of BINA developed different varieties to the farmers (rank III); lack of proper coordination with DAE, BADC and BINA (rank IV); lack of proper knowledge about BINA developed varieties of the farmers (rank V); lack of publicity of BINA developed varieties (rank VI); weak marketing linkage (rank VII); and lack of monitoring activities of BINA for the extension of BINA developed varieties (rank VIII). For increasing BINA variety cultivation, the highest suggestion was ensuring adequate seeds in every season at appropriate time which was ranked I; Arranging proper training to build proper conception about BINA developed varieties and technologies for the DAE personnel, extension workers and farmers (rank II); demonstrations and its fund should be increased (rank III); publicity is needed and distribute leaflets and booklets to popularize BINA developed varieties among the farmers through DAE and BADC (rank IV); more Field Day, farmers discussion meeting and Uthanbaithak should be arranged (rank V); BINA developed varieties should be included in different govt. incentive projects (rank VI); ensure proper coordination and strong linkage among DAE, BADC, BINA and farmers (rank VII) and ensuring proper monitoring activities by BINA for the extension of BINA developed varieties (rank VIII).

Table 9. Constraints and suggestions by DAE personnel

Item	No. of respondent	Percentage	Rank
Constraints			
Non availability of seeds	35	30	I
Lack of publicity of BINA developed varieties	11	9	VI
Lack of proper knowledge about BINA developed varieties of the farmers	13	11	V
Lack of training, workshop and Field Day for DAE personnel, extension workers and farmers	18	15	II
Lack of demonstrations of BINA developed different varieties to the farmers	17	14	III
Lack of proper coordination with DAE, BADC and BINA	15	13	IV
Lack of monitoring activities of BINA for the extension of BINA developed varieties	3	3	VIII
Weak marketing linkage	6	5	VII
Item	No. of respondent	Percentage	Rank
Suggestions			
Ensure adequate seeds in every season at appropriate time and supply seed to the market, seed dealer and selling center	36	21	I
Publicity is needed and distribute leaflets and booklets to popularize BINA developed varieties among the farmers through DAE & BADC	25	15	IV
Arrange proper training to build proper conception about BINA developed varieties and technologies for the DAE personnel, extension workers and farmers	35	21	II
Ensure proper coordination and strong linkage among DAE, BADC, BINA and farmers	12	7	VII
Ensure proper monitoring activities by BINA for the extension of BINA developed varieties	4	2	VIII
Demonstrations and its fund should be increased	31	18	III
BINA developed varieties should be included in different govt. incentive projects	11	6	VI
More Field Day, farmers discussion meeting and Uthanbaithak should be arranged	16	9	V

Source: DAE data, 2022-23

Conclusion

Area coverage BINA developed variety is increasing day by day and replacing traditional varieties. For continuation of variety expansion, the institute should ensure quality seed supply in proper time through strengthening strong collaboration among other research institutes, BADC, DAE and NGO's. Finally, sufficient number of training for extension workers and farmers, workshop/seminar, demonstration, field day and its budget should be increased which will support in extension/dissemination as well as minimize the future hazard of climate change for ensuring food and nutritional security.

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