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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 the 2023-24. Concerning the DAE office, data was gathered from 64 districts. The mean and percentage were used in the statistical analysis. Overall, the area coverage for BINA-developed rice varieties was 9.97%. The Aman season had the highest coverage at 15.49%, followed by Aus at 11.15% and Boro at 3.12%. The Jashore region (Reg-13) reported the highest rice coverage at 16.46%, while the Rangamati region (Reg-4) had the lowest at 1.09%. For pulse varieties, the overall coverage was 8.85%, with Barishal region (Reg-6) leading at 55.51%. Oilseed varieties had an overall coverage of 22.35%, with Jashore region at 12.53%. Among horticultural crops, Binalebu-1 achieved the highest coverage at 4.58%, with Rangamati region having the most for Binalebu-1 (495 ha) and Binahalud-1 (117 ha). The overall coverage for BINA distributed seeds was 1% for rice, 1.55% for pulses, and 4.29% for oilseeds. The study highlighted constraints such as seed availability and lack of training, demonstrations, field day and collaboration. To support variety expansion, BINA should ensure timely quality seed supply and enhance training and collaboration with organizations like DAE, BADC and NGOs.

Keywords: Area coverage, BINA rice varieties, BINA pulse varieties, BINA oilseed varieties, BINA horticultural Crop Varieties.

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 contributed about 11.37 percent in 2023-24 to the country`s Gross Domestic Product (GDP) and employed around 45.33 percent of total labor force (BBS, 2023). 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. 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 for other uses in Bangladesh is 10 to 35 million ha, with half of this lost land coming from crop land. 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 (Roling, 1988).

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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 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 to country's total production as well as support in achieving food security (Rahman *et. al.*, 2020).

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

Bangladesh has been classified into fourteen agricultural regions (Fig. 1). The 14 agricultural regions were assigned as Reg-1: Cumilla region (Cumilla, B. Baria, Chandpur), Reg-2: Mymensingh region (Mymensingh, Sherpur, Netrokona, Jamalpur), Reg-3: Sylhet region (Sylhet, Moulavibazar, Habiganj, Sunamganj), Reg-4: Rangamati region (Khagrachari, Bandarban, Rangamati) Reg-5: Khulna region (Khulna, Narail, Bagerhat, Satkhira), Reg-6: Barishal (Patuakhali, Jhalokathi, Bhola, Borguna, Pirojpur, Barishal), Reg-7: Rajshahi region (Rajshahi, Naogaon, Natore, Chapainawabganj), Reg-8: Rangpur Region (Gaibandha, Lalmonirhat, Rangpur, Nilphamari, Kurigram), Reg-9: Dinajpur region (Dinajpur, Panchagarh, Thakurgaon), Reg10: Bogura region (Bogura, Pabna, Sirajganj, Joypurhat), Reg-11: Dhaka region (Narsingdi, Narayanganj, Gazipur, Tangail, Manikganj, Munshiganj, Kishoreganj), Reg-12: Chattogram region (Noakhali, Cox's Bazar, Feni, Lakshmipur, Chattagram), Reg-13: Jashore region (Jashore, Magura, Meherpur, Kushtia, Chuadanga, 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. Data were collected through pre-designed structured questionnaire from concerned Deputy Directors of Department of Agricultural Extension (DAE) of 64 districts. A stratified random sampling technique was employed in selecting the data. Data on area under cultivation of different varieties of rice across all these seasons, pulse crops, oilseed crops, horticultural crops like Binalebu-1 and Binahalud-1 were collected by using a pre-tested questionnaire. The questionnaire also included some requests to the respondents to describe

the constraints and relevant suggestions thereof in case of the expansion of the BINA developed crop varieties to the end user farmers. 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 adress the objectives. Besides, secondary data from Bangladesh Bureau of Statistics (BBS) was also used. Tabular and descriptive statistics using mean and percentage were used to analyze the collected data. The period of data collection was 1 April to June 30, 2024.

Varietal adoption (%) and area coverage (%) were calculated by using these formulas-

$$\text{Varietal adoption} = \frac{\text{Area coverage of specific variety}}{\text{Total area coverage by the varieties of similar crops of same institute}} \times 100$$

$$\text{Area coverage (\%)} = \frac{\text{Area coverage of specific variety in a season}}{\text{Total cultivated area of that season}} \times 100$$

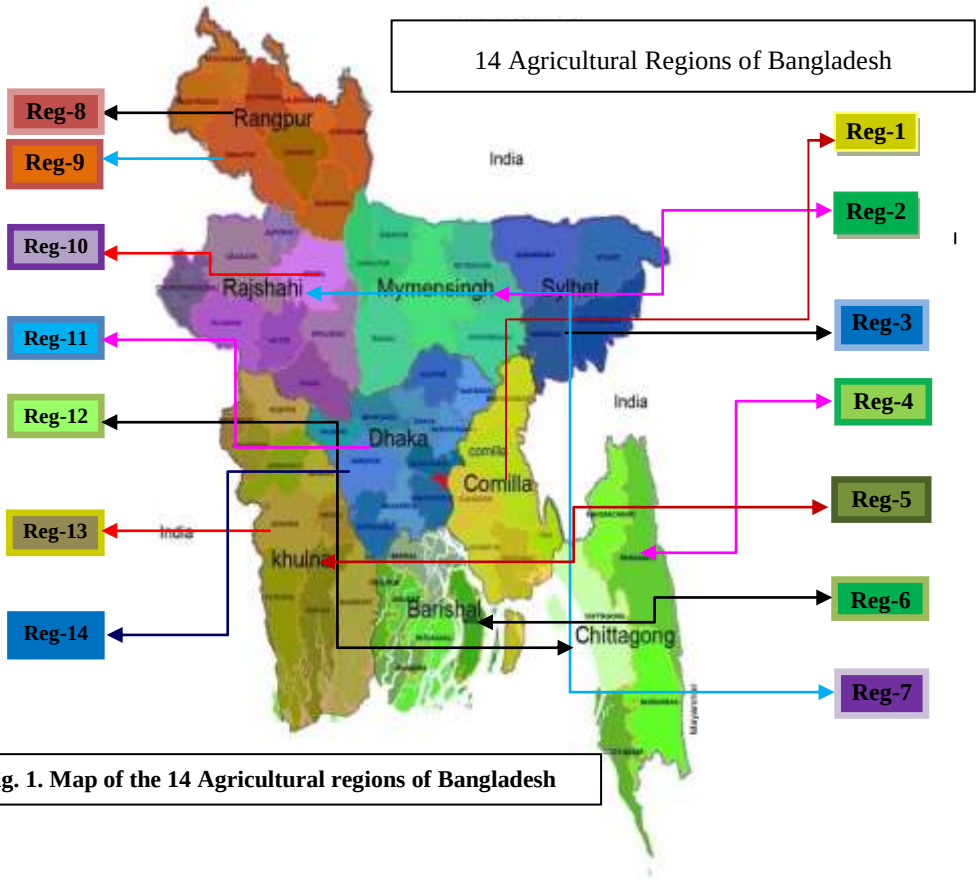

Fig. 1. Map of the 14 Agricultural regions of Bangladesh

Results and Discussion

It was observed that the overall area coverage of BINA developed rice varieties was 9.97% (Table 1). Among the three seasons (*Aus, Aman and Boro*) the highest area coverage was 15.49% found in *Aman* season followed by *Aus* 11.15% and Boro 3.12%, respectively (Table-1). In *Aman* season, the highest coverage was 8.78% for Binadhan-17 and the lowest was 0.0001% for Binadhan-13. In *Boro* season, the highest coverage was 1.27% for Binadhan-10 and the lowest was 0.01% for Binadhan-5. In *Aus* season, the highest coverage was 8.70% for Binadhan-19 and the lowest was 0.01% for Iratom-24 (Table 1).

Table 1. Variety-wise area coverage of BINA developed rice varieties in 2023-24

Rice	Total cultivated area (ha)	Varieties	Cultivated Area (ha)	Varietal Adoption (%)	Area Coverage (%)
Boro	**4951600**	Binadhan-5	354	0.03	0.01
		Binadhan-6	1001	0.08	0.02
		Binadhan-8	6617	0.55	0.13
		Binadhan-10	62951	5.25	1.27
		Binadhan-14	18151	1.51	0.37
		Binadhan-18	1537	0.13	0.03
		Binadhan-24	8367	0.70	0.17
		BINA dhan25	55669	4.64	1.12
		Subtotal	**154647**	**12.90**	**3.12**
Aus	**1163100**	Iratom-24	65	0.01	0.01
		Binadhan-14	3780	0.32	0.32
		Binadhan-19	101189	8.44	8.70
		Binadhan-21	24618	2.05	2.12
		Sub-total	**129651**	**10.82**	**11.15**
Aman	**5903700**	Binashail	553	0.05	0.01
		Binadhan-7	268570	22.40	4.55
		Binadhan-11	34265	2.86	0.58
		Binadhan-12	6178	0.52	0.10
		Binadhan-13	49	0.00	0.00
		Binadhan-15	98	0.01	0.00
		Binadhan-16	13612	1.14	0.23
		Binadhan-17	518246	43.23	8.78
		Binadhan-20	31293	2.61	0.53
		Binadhan-22	40706	3.40	0.69
		Binadhan-23	899	0.07	0.02
		Sub-total	**914468**	**76.28**	**15.49**
Total	**12018400**		**1198767**	**100.00**	**9.97**

Source: DAE, 2023-24 and BBS, 2023.

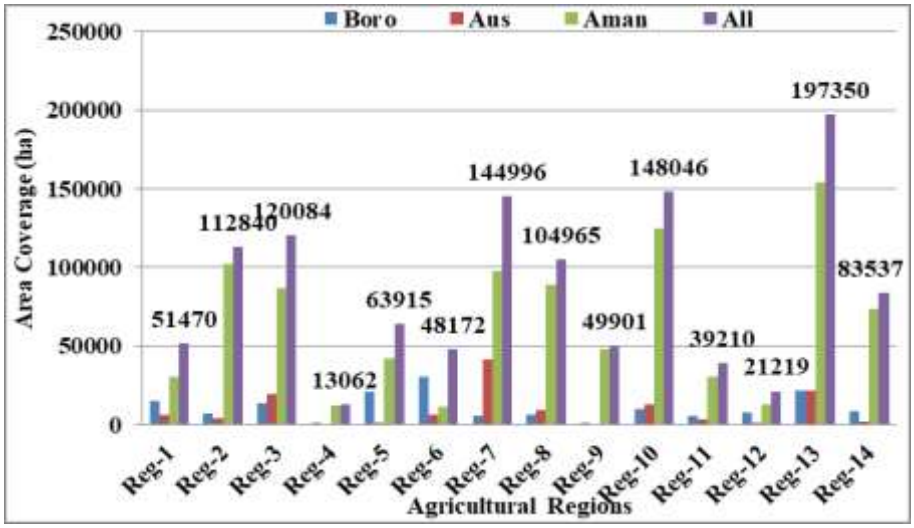

Fig. 2. Regional coverage of BINA developed rice varieties during 2023-24.

The results presented in Table 2 depicted that among three seasons, area coverage was the highest 76.28% for *Aman* followed by *Boro* 12.90% and it was the lowest for *Aus* i.e.10.82%. Among the 14 agricultural regions the highest area coverage was found 16.46% in Jashore region (Reg-13) and the lowest (1.09%) in Rangamati region (Reg-4) (Table 2). In Jashore region, the highest area was found for *Aman* season 154151 ha and the lowest was found for *Boro* season 21879 ha (Fig. 2). In Rangamati region, total *Aman* area was 11816 ha and *Aus* area was 343 ha.

Table 2. Region-wise area coverage of BINA developed rice varieties during 2023-24

Region	Boro		Aus		Aman		Total	
	ha	%	ha	%	ha	%	ha	%
Reg-1	14755	9.54	5977	4.61	30738	3.36	51470	4.29
Reg-2	7170	4.64	3832	2.96	101839	11.14	112840	9.41
Reg-3	13835	8.95	19510	15.05	86739	9.49	120084	10.02
Reg-4	903	0.58	343	0.26	11816	1.29	13062	1.09
Reg-5	20586	13.31	1456	1.12	41874	4.58	63915	5.33
Reg-6	30626	19.80	6243	4.82	11304	1.24	48172	4.02
Reg-7	5626	3.64	41759	32.21	97611	10.67	144996	12.10
Reg-8	6282	4.06	9412	7.26	89271	9.76	104965	8.76
Reg-9	1434	0.93	720	0.56	47747	5.22	49901	4.16
Reg-10	10202	6.60	12865	9.92	124979	13.67	148046	12.35
Reg-11	5345	3.46	3513	2.71	30352	3.32	39210	3.27
Reg-12	7457	4.82	972	0.75	12790	1.40	21219	1.77
Reg-13	21879	14.15	21320	16.44	154151	16.86	197350	16.46
Reg-14	8549	5.53	1729	1.33	73258	8.01	83537	6.97
All	**154647**	**12.90**	**129651**	**10.82**	**914468**	**76.28**	**1198767**	**100**

Source: DAE, 2023-24.

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From Table 3, the overall area coverage of BINA developed pulse varieties was 8.85%. The highest area as well as coverage was found 15.36% for Binamoog-8 and the lowest was 0.001% in case of Binasola-4.

Table 3. Variety-wise area coverage of BINA developed pulse varieties in 2023-24

Pulses	Total cultivated area (ha)	Varieties	Cultivated Area (ha)	Varietal Adoption (%)	Area Coverage (%)
Lentil	**152600**	Binamasur-1	43	0.07	0.03
		Binamasur-5	3778	6.27	2.48
		Binamasur-6	275	0.46	0.18
		Binamasur-7	118	0.19	0.08
		Binamasur-8	6248	10.37	4.09
		Binamasur-9	115	0.19	0.08
		Binamasur-10	15	0.02	0.01
		Sub-total	**10590**	**17.57**	**6.94**
Mungbean	**232200**	Binamoog-3	8	0.01	0.00
		Binamoog-4	210	0.35	0.09
		Binamoog-5	453	0.75	0.19
		Binamoog-6	514	0.85	0.22
		Binamoog-7	1853	3.07	0.80
		Binamoog-8	35669	59.19	15.36
		Binamoog-9	50	0.08	0.02
		Sub-total	**38757**	**64.31**	**16.69**
Chickpea	**37000**	Binasola-4	3	0.00	0.00
		Binasola-6	5	0.01	0.00
		Binasola-7	300	0.50	0.14
		Binasola-8	428	0.71	0.19
		Sub-total	**735**	**1.22**	**1.99**
Grass Pea	**221300**	Binakhesari-1	9553	15.85	25.82
		Binakhesari-2	13	0.02	0.03
		Sub-total	**9565**	**15.87**	**4.32**
Blackgram	**58400**	Binamas-1	380	0.63	0.65
		Binamas-2	235	0.39	0.40
		Sub-total	**615**	**1.02**	**1.05**
Total	**680900**		**60262**	**100.00**	**8.85**

Source: DAE, 2023-24 and BBS, 2023.

Among the 14 regions, the highest area coverage for pulses was found in Barishal region 54.51% (Reg-6) and the lowest was found in Rangamati region 0.001% (Reg-4) (Table 4).

Table 4. Region-wise adoption of BINA developed Pulse varieties during 2023-24

Region	BINA released Lentil varieties		BINA released Mungbean varieties		BINA released Chickpea varieties		BINA released Grasspea varieties		BINA released Blackgram varieties		Total	
	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
Reg-1	0	0	2.5	0.01	0	0	15	0.16	0	0	17.5	0.03
Reg-2	42.5	0.40	22.5	0.06	0	0	5	0.05	0	0	70	0.12
Reg-3	0	0	195	0.50	0	0	25	0.26	0	0	220	0.37
Reg-4	0	0	0	0	0	0	0	0	0	0	0	0
Reg-5	255	2.41	437.5	1.13	0	0	287.5	3.01	0	0	980	1.63
Reg-6	22.5	0.21	32792.5	84.61	0	0	637.5	6.66	0	0	33452.5	55.51
Reg-7	480	4.53	2415	6.23	277.5	37.63	680	7.11	2.5	0.41	3855	6.40
Reg-8	0	0	131.88	0.34	0	0	880	9.2	105	17.07	1116.9	1.85
Reg-9	0	0	781.65	2.02	0	0	0	0	0	0	781.65	1.30
Reg-10	387.5	3.66	300	0.77	450	61.02	142.5	1.49	250	40.65	1530	2.54
Reg-11	0	0	27.5	0.07	0	0	70	0.73	0	0	97.5	0.162
Reg-12	30	0.28	53.75	0.14	0	0	6110	63.88	0	0	6193.75	10.28
Reg-13	6490	61.28	1300	3.35	10	1.36	0	0	232.5	37.80	8032.5	13.33
Reg-14	2882.5	27.22	297.5	0.77	0	0	712.5	7.45	25	4.07	3917.5	6.50
All	**10590**	**17.57**	**38756**	**64.31**	**738**	**1.22**	**9565**	**15.87**	**615**	**1.02**	**60263**	**100**

Source: DAE, 2023-24.

From Table 5, it was found that the overall area coverage of BINA developed oilseed varieties was 22.35%. The highest area coverage 36.25% was found for groundnut followed by sesame (29.83%), mustard (21.78%) and soybean (6.96%) (Fig. 8). The highest area coverage 22.38% was found for Binachinabadam-4 and the lowest 0.0001% was seen in case of Binasarisha-12 as a new variety.

Table 5. Variety-wise area coverage of BINA developed oilseed varieties during 2023-24

Oil seeds	Total cultivated area (ha)	Varieties	Cultivated Area (ha)	Varietal Adoption (%)	Area Coverage (%)
BINA released Mustard varieties	**610600**	Binasarisha-4	32871	17.09	5.38
		Binasarisha-5	225	0.12	0.04
		Binasarisha-7	420	0.22	0.07
		Binasarisha-8	2470	1.28	0.40
		Binasarisha-9	83403	43.35	13.66
		Binasarisha-10	1413	0.73	0.23
		Binasarisha-11	12160	6.32	1.99
		Binasarisha-12	63	0.03	0.01
		Sub-total	**132963**	**69.11**	**21.78**
BINA released Soybean varieties	**79900**	Binasoybean-3	758	0.39	0.95
		Binasoybean-4	625	0.32	0.78
		Binasoybean-5	1780	0.93	2.23
		Binasoybean-6	2400	1.25	3.00
		Sub-total	**5563**	**2.89**	**6.96**
BINA released groundnut varieties	**95000**	Binachinabadam-1	180	0.09	0.19
		Binachinabadam-2	225	0.12	0.24
		Binachinabadam-3	225	0.12	0.35
		Binachinabadam-4	21259	11.05	22.38
		Binachinabadam-5	145	0.08	0.15
		Binachinabadam-6	338	0.18	0.36
		Binachinabadam-7	175	0.09	0.18
		Binachinabadam-8	9072	4.72	9.55
		Binachinabadam-9	2486	1.29	2.62
		Binachinabadam-10	330	0.17	0.35
		Sub-total	**34435**	**17.90**	**36.25**
BINA released Sesame varieties	**65100**	Binatil-1	2333	1.21	3.58
		Binatil-2	6771	3.52	10.40
		Binatil-3	2870	1.49	4.41
		Binatil-4	7449	3.87	11.44
		BINA til5	1325	0.69	2.04
		Sub-total	**19423**	**10.10**	**29.83**
Total	**860900**		**192383**	**100.00**	**22.35**

Source: DAE, 2023-24 and BBS, 2023.

From Table 6, it was found that among the 14 regions, the highest area coverage 12.53% for oilseed was found in Jashore region (Reg-13) and the lowest was found in Rangamati region 0.73% (Reg-4).

Table 6. Region-wise adoption of BINA developed Oilseed varieties during 2023-24

Region	BINA released Mustard varieties		BINA released Soybean varieties		BINA released Groundnut varieties		BINA released Sesame varieties		Total	
	ha	%	ha	%	ha	%	ha	%	ha	%
Reg-1	4775	3.59	0	0	170.75	0.50	620	2.99	5565.75	2.87
Reg-2	20150	15.15	0	0	726	3.51	37.5	0.18	21397.5	11.04
Reg-3	5992.5	4.50	0	0	949.5	4.60	190	0.92	7765	4.01
Reg-4	1040	0.78	0	0	207	1.00	37.5	0.18	1422.5	0.73
Reg-5	7900	5.94	0	0	187.5	0.91	1418.75	6.84	9631.25	4.97
Reg-6	4288.75	3.22	1855	33.35	5602.5	27.12	3975	19.16	19456.25	10.04
Reg-7	16000	12.03	0	0	91.5	0.44	1717.5	8.28	17870	9.22
Reg-8	16760	12.60	187.5	3.37	4015.28	19.43	45	0.22	23684.6	12.22
Reg-9	1685	1.27	0	0	1455	7.04	140	0.67	4250	2.19
Reg-10	13862.5	10.42	0	0	1648.5	7.98	2900	13.98	19510	10.07
Reg-11	11532.5	8.67	0	0	1536	7.43	405	1.95	14497.5	7.48
Reg-12	3042.98	2.29	2875	51.69	2167.4	10.49	36.25	0.17	9566.55	4.94
Reg-13	17913.75	13.47	0	0	774	3.75	5085	24.51	24288.75	12.53
Reg-14	8082.5	6.08	645	11.60	1198.5	5.80	4140	19.95	14865	7.67
Total	**133025.5**	**68.65**	**5562.5**	**2.87**	**34435.2**	**17.77**	**20747.5**	**10.71**	**193770.7**	**100**

Source: DAE, 2023-24.

From Table 7, it was found that, the overall area coverage of BINA developed horticultural crop varieties was 0.17%. The highest area coverage 4.58% was found for Binalebu-1 and the lowest was found 0.06% for Binalebu-2.The highest cultivated area was found 561 ha for Binalebu-1 followed by Binarosun-1 (210 ha), Binaholud-1 (117 ha) and Binatomato-10 (105 ha). The highest area coverage was found 4.64% for lemon and among the lemon varieties the highest area coverage was found 4.58% for Binalebu-1 followed by Binatomato-10 (0.36%), Binahalud-1 (0.31%) and Binarosun-1 (0.24%).

Table 7. Variety-wise area coverage of BINA developed horticultural crop varieties during 2023-24

Horticultural crops	Total cultivated area (ha)	Varieties	Cultivated Area (ha)	Varietal Adoption (%)	Area Coverage (%)
Lemon	**12246**	Binalebu-1	561.00	56.07	4.58
		Binalebu-2	7.50	0.75	0.06
Garlic	**89200**	Binarosun-1	210.00	20.99	0.24
Tomato	**29555**	Binatomato-7	0.00	0.00	0.00
		Binatomato-10	105.00	10.49	0.36
Termeric	**37600**	Binahalud-1	117.00	11.69	0.31
Total	**168601**		**1000.50**	**100.00**	**0.17**

Source: DAE, 2023-24 and BBS, 2023.

From Table 8, it was revealed that among the 14 regions, the highest area coverage for horticultural crop was found 495 ha (49.48%) in Rangamati agricultural region (region-4) and the lowest was found 0.001% in Dhaka region (region-11). It was also observed that among the 14 regions, the highest area coverage was for Binalebu-1 about 495 ha (49.48%) while Binahalud-1 was found 117 ha (11.69%) in Rangamati region (Region-4).

Table 8. Region-wise adoption of BINA developed horticultural crop varieties during 2023-24

Region	BINA released Lemon varieties		BINA released Garlic varieties		BINA released Tomato varieties		BINA released Turmeric varieties		Total	
	ha	%	ha	%	ha	%	ha	%	ha	%
Reg-1	21	3.69	0	0	0	0	0	0	21	2.10
Reg-2	42	7.39	0	0	0	0	0	0	42	4.20
Reg-3	0	0	0	0	0	0	0	0	0	0
Reg-4	495	87.07	0	0	0	0	0	0	495	49.48
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	0	0	0	0	0	0	0	0
Reg-8	0	0	210	100	105	100	117	100	432	43.18
Reg-9	0	0	0	0	0	0	0	0	0	0
Reg-10	0	0	0	0	0	0	0	0	0	0
Reg-11	0	0	0	0	0	0	0	0	0	0
Reg-12	7.5	1.32	0	0	0	0	0	0	7.5	0.75
Reg-13	0	0	0	0	0	0	0	0	0	0
Reg-14	3	0.53	0	0	0	0	0	0	3	0.30
Total	**568.5**	**56.82**	**210**	**20.99**	**105**	**10.49**	**117**	**11.69**	**1000.5**	**100**

Source: DAE, 2023-24.

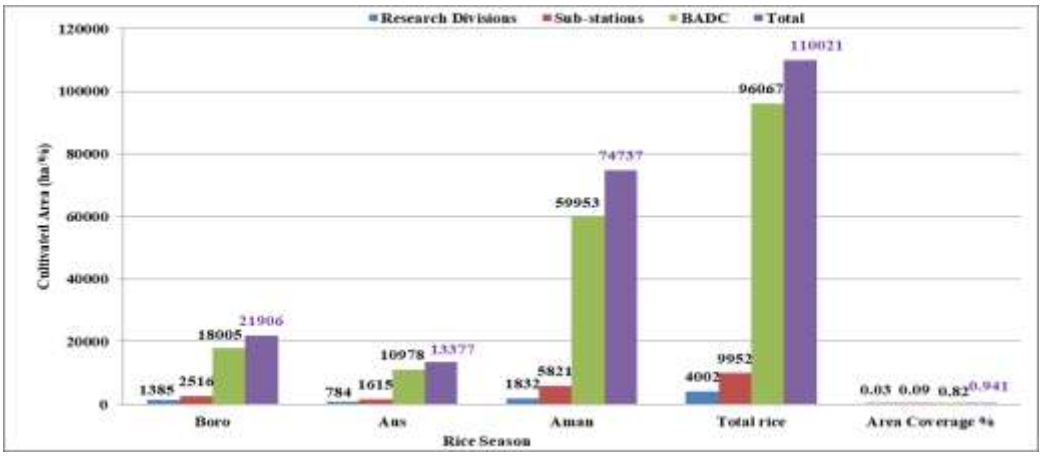

Fig. 3. Cultivated areas of BINA developed rice varieties through own seed distribution, 2023-24.

From Fig 3, it was found that the overall area coverage of BINA developed rice varieties with own seed distribution was 1110021 ha (0.941%). The highest cultivated area was found 96067 ha (0.82%) for BADC followed by BINA sub-stations 9952 ha (0.09%) and research divisions 4002 ha (0.03%). Among the rice seasons, the highest area coverage was found for *Aman* (74737 ha), followed by *Boro* (21906 ha) and *Aus* (13377 ha).

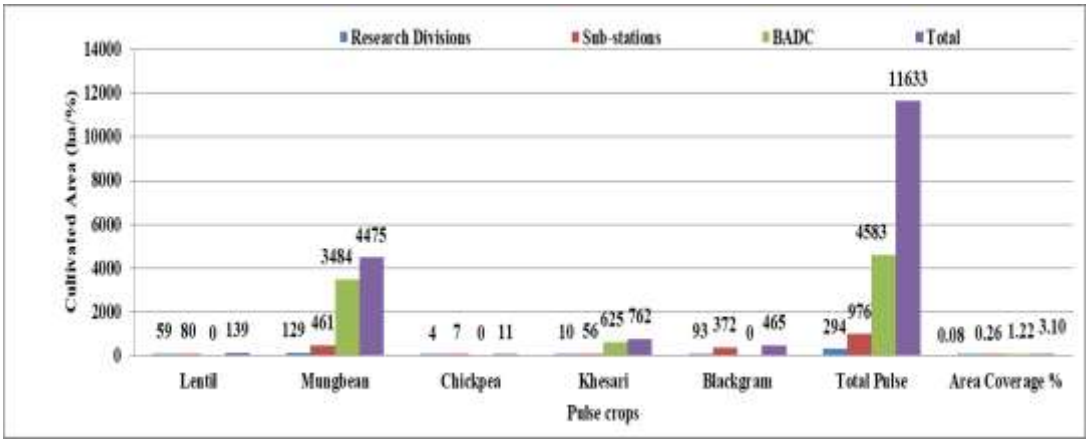

Fig. 4. Cultivated areas of BINA developed pulse crops through seed distribution, 2023-24.

It was observed from the Fig. 4 that the overall area coverage of BINA developed pulse crop varieties with own seed distribution was 11633 ha (3.10%). The highest cultivated area was found 44583 ha (1.22%) for BADC followed by BINA sub-stations 976 ha (0.26%) and research divisions 294 ha (0.08%). Among the pulse crop varieties, the highest area coverage was found for mungbean varieties (4475 ha), followed by khesari varieties (762 ha), lentil varieties (139ha), blackgram varieties (465ha) and chickpea (11 ha).

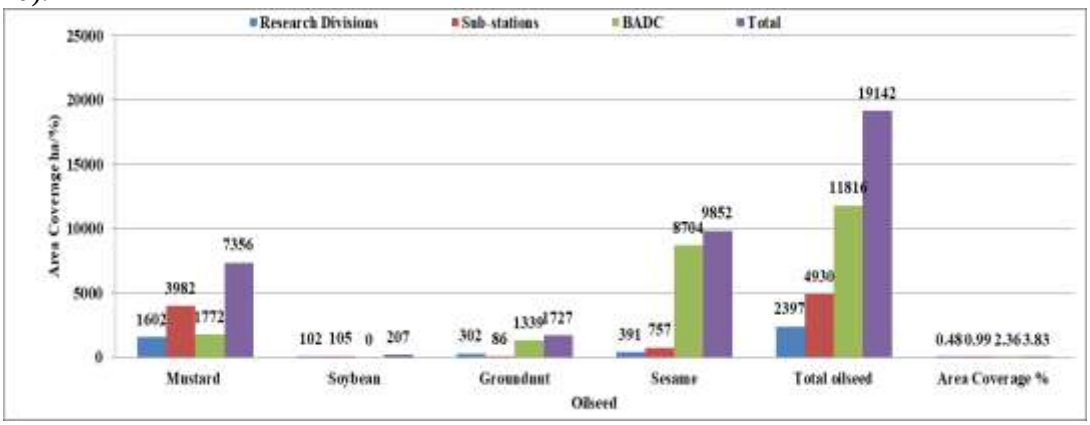

Fig. 5. Cultivated areas of BINA developed oilseed crop varieties through own seed distribution, 2023-24.

From Fig 5, it was seen that the overall area coverage of BINA developed oilseed crop varieties with own seed distribution was 19142 ha (3.83%). The highest cultivated area was found 11816 ha (2.36%) for BADC followed by BINA sub-stations 4930 ha (0.99%) and research divisions 2397 ha (0.48%). Among the oilseed crop varieties, the highest area coverage was found for sesame (9852 ha) followed by mustard (7356 ha) groundnut (1727 ha), and soybean (207 ha). It was also observed that the area coverage for BADC distributed sesame seed was the highest (9852 ha).

The study identified some constraints (Table 9) of increasing area coverage of BINA developed varieties such as-non availability of seed which ranked I; followed by lack of training, workshop and field day for DAE personnel, extension workers and farmers (rank II); lack of publicity of BINA developed varieties (rank III); lack of demonstrations of BINA developed different varieties to the farmers field (rank IV); lack of proper coordination with DAE, BADC and BINA (rank V); lack of proper knowledge about BINA developed varieties of the farmers (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 Demonstrations and its fund should be increased which was ranked I; Ensuring adequate seeds in every seasons at appropriate time and supply seed to the market, seed dealer and selling center (rank II); arranging proper training to build proper conception about BINA developed varieties and technologies for the DAE personnel, extension workers and farmers (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); Ensure proper coordination and strong linkages among DAE, BADC, BINA and farmers (rank VI); BINA developed varieties should be included in different govt. incentive projects (rank VII) and ensuring proper monitoring activities by BINA for the extension of BINA developed varieties (rank VIII).

Table 9. Constraints and suggestions provided by DAE personnel

Item	No. of respondent	Percentage	Rank
Constraints			
Non availability of seeds	64	41	I
Lack of publicity of BINA developed varieties	19	12	III
Lack of proper knowledge about BINA developed varieties of the farmers	13	8	VI
Lack of training, workshop and field day for DAE personnel, extension workers and farmers	21	13	II
Lack of demonstrations of BINA developed varieties to the farmers	16	10	IV
Lack of proper coordination with DAE, BADC and BINA	15	10	V
Lack of monitoring activities of BINA for the extension of BINA developed varieties	3	2	VIII
Weak marketing linkage	6	4	VII
Suggestions			
Ensure adequate seeds in every season at appropriate time and supply seed to the market, seed dealer and selling center	45	25	II
Publicity is needed and distribute leaflets and booklets to popularize BINA developed varieties among the farmers through DAE and BADC	17	9	IV
Arrange proper training to build proper conception about BINA developed varieties and technologies for the DAE personnel, extension workers and farmers	28	16	III
Ensure proper coordination and strong linkage among DAE, BADC, BINA and farmers	12	7	VI
Ensure proper monitoring activities by BINA for the extension of BINA developed varieties	4	2	VIII
Organize demonstrations and its fund should be increased	51	28	I
BINA developed varieties should be included in different govt. incentive projects	6	3	VII
More Field Day, farmers discussion meeting and Uthanbaithak should be arranged	16	9	V

Source: DAE data, 2023-24.

Conclusion

For continuation of variety expansion, the institute should ensure quality seed supply in proper time. Besides, more training, demonstration, collaboration with DAE and BADC as well as research organization and its budget should be increased which will support in food production as well as minimize the future hazard of climate change for ensuring food and nutritional security of Bangladesh.

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