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Analysis of production and marketing status of Gobindabhog rice in Nadia district of West Bengal

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ABSTRACT

The area and production of Gobindabhog, a popular indigenous aromatic rice of West Bengal, India is going down during last 30-40 years due to rapid adoption of high-yielding varieties in the state. A base-line survey was conducted on 261 randomly selected Gobindabhog farmers of 6 blocks in Nadia district through personal interview using structured and pre-tested schedule during 2010 to assess the production status; while on 46 growers for post-production parameters like use of paddy, processing, marketing, etc. during 2010-11. Most (90.8%) of the respondent farmers, being small and marginal ones, cultivated Gobindabhog rice upto 0.3 ha land, with district average of 0.2 ha. Mean seed rate of the district was 30.0 kg ha^{-1} and major (83.1%) transplanting operations were done during the period between 2nd fortnight of July and 1st fortnight of August. Most of the farmers adopted nutrient, weed and water management practices in their fields planted with Gobindbhog as they expected higher returns compared to other rice varieties. With mixed responses in use of paddy, milling and marketing, about 58.7% farmers sold their paddy at district average selling price of ₹1116.00 per 60 kg bag. Analysis of grain samples across the blocks showed that mean hulling, milling and head rice recovery were 78.9, 69.0 and 59.6%, respectively.

Key words: *aromatic rice, Gobindabhog, cultivation, grain quality, marketing, West Bengal*

Gobindabhog is a popular aromatic rice (landrace) of West Bengal, whose native area is the gangetic-alluvial belt of the state covering the districts of Nadia, Burdwan, Bankura, Murshidabad, Hoogly, North 24 Parganas, etc. Major characteristic features of the cultivar are golden-yellow coloured grain, kernel length 3.9 mm, L/B ratio 2.5, short bold kernel, elongation ratio >1.8, alkali spreading value 2.7, amylose content 15.4%, protein content 6.8% and strong aroma (Ghosh and Ghose, 2007). With rapid adoption of high yielding rice varieties during last 30-40 years, the cultivation of traditional rice varieties is being marginalized. However, the farmers of Naida and adjoining districts still cultivate Gobindabhog during wet season mainly for domestic consumption like preparation of 'dessert' (*payas*), mixed rice (*bhog*), biriyani, etc. in social functions and religious festivals. Therefore, an attempt was made to assess the present status of Gobindabhog rice in Nadia district and to examine the crop environment, cultivation practices, grain yield, milling recovery, marketing network etc. along with socio-economic impact in the farming community.

MATERIALS AND METHODS

A base-line survey was conducted in six blocks (*viz*. Chakdah, Haringhata, Ranaghat I, Ranaghat II, Santipur and Krishnagar I) of Nadia district, West Bengal in two phases (production and post-production periods) during 2010. Two hundred sixty one farmers were randomly selected during production phase (wet season, 2010) and data were collected through personal interview using structured and pre-tested schedule. Later, the post-production parameters like use of paddy, processing, marketing, etc. were collected from 48 farmers during 2010-11. Descriptive statistics and Kruskal-Wallis chi-square test following SPSS (version 7.5) were done to compare the block means in respect of different variables of the study.

After harvesting of Gobindabhog paddy, grain samples were collected from 3 farmers of each six blocks in the study, grain quality parameters were estimated. Moisture content of the grain was determined by digital moisture meter (Indosaw make, India) and milling quality parameters by rice sheller, rice miller and rice grader (Indosaw make, India). Alkali spreading value was determined following Little *et. al.* (1958) and aroma was scored by sensory method (Nagraju *et. al*., 1991).

RESULTS AND DISCUSSION

The survey-based study revealed that most of the farmers (90.8%) in Nadia district cultivated Gobindabhog upto 0.3 ha land (Table 1) and mean area under Gobindabhog cultivation per farmer was about 0.2 ha with a range between 0.12 ha (Krishanagar I) and 0.27 ha (Santipur) (Table 2). The findings could explain the fact that small and marginal farmers under the study allocated a small portion of their land for Gobindabhog during wet season, while rest of the portion was used for other common rice varieties for their year-round consumption.

Farmers used seeds from their own harvest or received from Agricultural University or State Department of Agriculture rather than purchasing, which was similar to the findings of a study on rice farmers in Myanmer (Naing *et. al*., 2008). The recommended seed rate of Gobindabhog was very low because of its small seed size (short-bold type, mean test weight 10g). About 75.7, 6.9 and 17.3% farmers used the seed rate of < 25, >25-35 and >35 kg ha^{-1}, respectively. Mean seed rate in the district was 30.0 kg ha^{-1} with significant variation among blocks from 24.0 (Chakdah, Krishanagar I) to 39.0 kg ha^{-1} (Ranaghat II). Although seed treatment was advocated as a prophylactic measure of disease management, 95.1% farmers did not follow seed treatment before sowing in their nursery (Table 1). Sowing time is an important non-monetary input, which influences the production of crop as well as the economic benefit of the farming community. Farmers generally started their sowing operations with the onset of south-west monsoon. In Nadia district, the sowing time was found to vary from 1st fortnight of June to 2nd fortnight of July, but most of the farmers sowed their seeds during 2nd fortnight of June (63.2%) and 1st fortnight of July (24.9%). Likewise, major (83.1%) transplanting operations were done during the period between 2nd fortnight of July and 1st fortnight of August. The planting of Gobindabhog during the month of August indicated that there was jute as pre-wet season crop in the land, which would be harvested during 1st week of August.

Random planting was the general practice in all the 6 blocks of study, with the exception of some farmers in Santipur and Chakdah blocks (*i.e.* 17.6% of the district), who planted their seedlings in rows. Mean spacing across the blocks was about 19.4 cm. between the rows. Most of the Gobindabhog growers planted either 22-28 days (44.1%) or 29-35 days (49.0%) old seedlings in the field, with a district average of about 27.7 days. Significant block variation in respect of number of seedlings $hill^{-1}$ was observed from 4.9 (Haringhata) to 6.4 (Santipur), wherein about 64.8% farmers in the district planted >5 seedlings $hill^{-1}$, while 29.5% growers used 3-5 seedlings in each hill.

A small portion of the farmers in the study did not go for any kind of nutrient (9.2%) management practices in their fields. However, 63.2% farmers used chemical fertilizers, 11.5% gave organic manures and 16.1% followed integrated nutrient management. Among organic sources, farm yard manure, vermi-compost, mustard cake, etc. were generally used, while common fertilizers were urea, di-ammonium phosphate, single super phosphate, muriate of potash etc. Most of the farmers applied plant nutrients in split doses either as basal + 1 top dressing (25.7%) or basal + 2 top dressings (24.5%). Based on a survey-based study on rice in Nigeria, Odoemena *et. al.* (2008) reported that about 23.4% farmers followed row planting, 77.6% used fertilizers, 62.2% applied insecticides and 79.3% used herbicides.

About 93.5% farmers in Nadia district weeded their plots manually and rest of the farmers kept their fields unweeded. It was also noted that none of the farmers included in the study, in the district adopted mechanical or chemical methods of weed control. First weeding was done between 21.5 days (Chakdah) and 24.8 days after transplanting (Krishnagar I), with the district average of 22.6 days. The second weeding was done between 42.2 days and 45.7 days after transplanting (Table 2).

All the farmers in the study irrigated the fields mainly through shallow tube-well depending on

Table 1. Evaluation of Gobindabhog rice cultivation status in different blocks of Nadia district during wet season, 2010

Production variable	Class	Block						Total (N=261)
		Chakdaha (n_1=93)	Haringhata (n_2=17)	Ranaghat I (n_3=25)	Ranaghat II (n_4=81)	Santipur (n_5=39)	Krishnagar I (n_6=6)	
Area under Gobinda bhog cultivation	=0. 2 ha	46 (48.4)	7 (41.2)	16 (64.0)	54 (66.7)	16 (41.1)	5 (83.3)	144 (55.2)
	>0.2 - 0.3 ha	37 (39.8)	9 (52.9)	8 (32.0)	27 (33.3)	11 (28.2)	1 (61.7)	93 (35.6)
	>0.3 - 0.4 ha	10 (10.8)	1 (5.9)	–	–	7 (17.9)	–	18 (6.9)
	> 0.4 ha	–	–	1 (4.0)	–	5 (12.8)	–	6 (2.3)
Seed rate	=25 kg ha^{-1}	86 (92.4)	15 (88.2)	19 (76.0)	51 (62.9)	22 (56.3)	5 (83.3)	198 (75.7)
	>25 - 35 kg ha^{-1}	4 (4.3)	1 (5.9)	3 (12.0)	–	9 (23.3)	1 (16.7)	18 (6.9)
	>35 kg ha^{-1}	3 (3.3)	1 (5.9)	3 (12.0)	30 (37.1)	8 (20.6)	–	45 (17.3)
Seed treatment	No	88 (94.6)	17 (100.0)	24 (96.0)	81(100.0)	35 (89.7)	3 (50.0)	248 (95.1)
	Yes	5 (5.4)	–	1 (4.0)	–	4 (10.3)	3 (50.0)	13 (4.9)
Sowing time	1st fortnight of June	–	–	–	10 (12.3)	15 (38.5)	–	25 (9.6)
	2nd fortnight of June	60 (64.5)	17 (100.0)	–	62 (76.6)	22 (56.4)	4 (66.7)	165 (63.2)
	1st fortnight of July	33 (35.5)	–	19 (76.0)	9 (11.1)	2 (5.1)	2 (33.3)	65 (24.9)
	2nd fortnight of July	–	–	6 (24.0)	–	–	–	6 (2.3)
Transplanting time	1st fortnight of July	5 (5.4)	–	–	15 (18.5)	22 (56.4)	–	42 (16.1)
	2nd fortnight of July	54 (58.0)	17 (100.0)	4 (16.0)	65 (80.3)	13 (33.3)	6 (100.0)	159 (60.9)
	1st fortnight of August	34 (36.6)	–	20 (80.0)	–	4 (10.3)	–	58 (22.2)
	2nd fortnight of August	–	–	1 (4.0)	1 (1.2)	–	–	2 (0.8)
Method of transplanting	Random	82 (88.2)	17 (100.0)	24 (96.0)	81 (100.0)	5 (12.8)	6 (100.0)	215 (82.4)
	Row to row	11 (11.8)	–	1 (4.0)	–	34 (87.2)	–	46 (17.6)
Spacing (hill to hill distance)	=15 cm	10 (10.8)	1 (5.9)	8 (32.0)	22 (27.2)	7 (17.9)	–	48 (18.4)
	16 - 20 cm	82 (88.1)	14 (82.4)	13 (52.0)	58 (71.6)	15 (38.5)	5 (83.3)	187 (71.6)
	21 - 25 cm	1 (1.1)	2 (11.8)	4 (16.0)	1 (1.2)	17 (43.6)	1 (16.7)	26 (10.0)
Age of seedling	=21days	–	–	5 (20.0)	5 (6.1)	6 (15.5)	–	16 (6.1)
	22 - 28 days	32 (34.5)	2 (11.8)	16 (64.0)	40 (49.4)	20 (51.2)	5 (83.3)	115 (44.1)
	29 - 35 days	60 (64.4)	14 (82.3)	4 (16.0)	36 (44.5)	13 (33.3)	1 (16.7)	128 (49.0)
	>35 days	1 (1.1)	1 (5.9)	–	–	–	–	2 (0.8)
No. of seedlings $hill^{-1}$	<3	5 (5.4)	2 (11.8)	2 (8.0)	–	6 (15.4)	–	15 (5.7)
	3 - 5	21 (22.6)	8 (47.1)	11 (44.0)	30 (37.0)	5 (12.8)	2 (33.3)	77 (29.5)
	>5	67 (72.0)	7 (41.2)	12 (48.0)	51 (63.0)	28 (71.8)	4 (66.7)	169 (64.8)
Nutrient management	No	18 (19.4)	2 (11.8)	–	–	4 (10.3)	–	24 (9.2)
	Organic	21 (22.6)	6 (35.3)	1 (4.0)	–	2 (5.1)	–	30 (11.5)
	Inorganic	43 (46.2)	9 (52.9)	17 (68.0)	69 (85.2)	24 (61.5)	3 (50.0)	165 (63.2)
	Integrated	11 (11.8)	–	7 (28.0)	12 (14.8)	9 (23.1)	3 (50.0)	42 (16.1)

Contd.... Table 1

Production variable	Class	Block						Total (N=261)
		Chakdaha (n_1=93)	Haringhata (n_2=17)	Ranaghat I (n_3=25)	Ranaghat II (n_4=81)	Santipur (n_5=39)	Krishnagar I (n_6=6)	
Application of organic manure & fertilizer (timing)	Nil	18 (19.4)	2 (11.8)	–	–	4 (10.3)	–	24 (9.2)
	Basal	21 (22.6)	6 (35.8)	1 (4.0)	–	4 (10.3)	–	32 (12.3)
	1 topdressing	20 (21.5)	2 (11.8)	1 (4.0)	–	4 (10.3)	–	27 (10.3)
	Basal + 1 top dressing	10 (10.8)	1 (5.9)	4 (16.0)	47 (58.0)	3 (7.7)	2 (33.3)	67 (25.7)
	Basal + 2 top dressing	4 (4.3)	–	14 (56.0)	34 (42.0)	8 (20.5)	4 (66.7)	64 (24.5)
Pest-disease management	Nil	91 (97.8)	17 (100.0)	22 (88.0)	67 (82.7)	35 (89.7)	5 (83.3)	237 (91.9)
	Organic	–	–	–	–	–	–	–
	Chemical	2 (2.2)	–	3 (12.0)	14 (17.3)	4 (10.3)	1 (16.7)	24 (9.1)
	Integrated	–	–	–	–	–	–	–
Harvesting time	1st fortnight of November	–	–	–	7 (8.6)	–	–	7 (2.7)
	2nd fortnight of November	93(100.0)	17 (100.0)	25 (100.0)	74 (91.4)	39 (100.0)	6 (100.0)	254 (97.3)
Grain yield	=2.25 t ha^{-1}	48 (51.6)	4 (23.5)	19 (76.0)	48 (59.2)	30 (76.9)	4 (66.7)	153 (58.6)
	>2.25-3.00 t ha^{-1}	45 (48.4)	13 (76.5)	6 (24.0)	33 (40.8)	9 (23.1)	2 (33.3)	108 (41.4)

Values in parentheses are given in %.

distribution pattern and amount of rainfall during the cropping season. Thus, it indicated that the growers did not want to raise Gobindabhog paddy as a pure rainfed crop in their areas because of their expectations of high returns compared to other common rice varieties cultivated for domestic consumption. Most (90.9%) of the farmers did not adopt any kind of insect or diseases control measures, while spraying of insecticides and fungicide was done by only 9.1% farmers. Gobindabhog, being a long duration rice, was generally harvested during 2nd fortnight of November (97.3%).

About 58.6% farmers obtained the grain yield of <2.25 t ha^{-1}, while rest of the cultivators got slightly higher yield in the range of 2.25-3.00 t ha^{-1}. Mean grain yield in Nadia district was 2.21 t ha^{-1}, with significant variation between 2.00 t ha^{-1} (Santipur) and 2.35 t ha^{-1} (Haringhata).

Table 2. Analysis of production system of Gobindabhog rice in Nadia district during wet season, 2010-11

Production parameter	Block						Total (N=261)	F value
	Chakdah (n_1=93)	Haringhata (n_2=17)	Ranaghat I (n_3=25)	Ranaghat II (n_4=81)	Santipur (n_5=39)	Krishnagar I (n_6=6)		
Area under Gobindabhog cultivation (ha)	0.20	0.21	0.15	0.17	0.27	0.12	0.20	6.57**
Seed rate (kg ha^{-1})	24.0	25.5	27.0	39.0	31.5	24.0	30.0	7.05**
No. of seedlings hill^{-1}	5.5	4.9	5.2	5.6	6.4	6.0	5.6	5.53**
Age of seedling (days)	28.9	30.6	23.6	27.8	26.2	28.0	27.7	12.71**
Spacing (cm)	20.9	20.3	18.1	17.5	20.6	19.1	19.4	3.16**
1st weeding (DAT)	21.5	22.9	24.4	22.8	23.1	24.8	22.6	3.52**
2nd weeding (DAT)	42.7	42.6	45.7	45.5	42.2	45.7	44.3	2.68*
Yield (t ha^{-1})	2.26	2.35	2.09	2.24	2.00	2.20	2.21	6.71**

DAT - Days after transplanting

Table 3. Evaluation of post-production status of Gobindabhog rice in different blocks of Nadia district during 2010-11

Post-production variable	Class	Block						Total
		Chakdah (n_1=18)	Haringhata (n_2=4)	Ranaghat I (n_3=12)	Ranaghat II (n_4=6)	Santipur (n_5=2)	Krishanagar I (n_6=6)	(N=48)
Seed preservation	No	14 (77.8)	2 (50.0)	11 (91.7)	1 (16.7)	–	2 (50.0)	30 (65.2)
	Yes	4 (22.2)	2 (50.0)	1 (8.3)	5 (83.3)	2 (100.0)	2 (50.0)	16 (34.8)
Use of paddy	Domestic	–	–	–	–	1 (50.0)	–	1 (2.2)
	Sale	15 (83.3)	4 (100.0)	–	6 (100.0)	–	2 (50.0)	27 (58.7)
	Domestic+sale	1 (5.6)	–	–	–	–	–	–
Paddy marketing place	Local	10 (55.6)	4 (100.0)	–	6 (100.0)	–	2 (50.0)	22 (47.8)
	Other places	5 (27.8)	–	–	–	–	–	5 (10.9)
Milling place	Local	5 (27.8)	1 (25.0)	11 (91.7)	–	2 (100.0)	2 (50.0)	21 (45.7)
	Modern rice mill	2 (11.1)	1 (25.0)	1 (8.3)	–	–	–	4 (8.7)
Use of rice	Domestic	1 (5.6)	1 (25.0)	10 (83.3)	–	2 (100.0)	2 (50.0)	16 (34.8)
	Sale	3 (16.7)	–	2 (16.7)	–	–	–	5 (10.9)
	Domestic+sale	3 (16.7)	1 (25.0)	–	–	–	–	4 (8.7)
Rice marketing place	Local	4 (22.2)	1 (25.0)	1 (8.3)	–	–	–	6 (13.0)
	Other places	2 (11.1)	–	1 (8.3)	–	–	–	3 (6.5)

† There are some missing data due to lack of appropriate information in some post-production variables.

Analysis of data regarding post-production parameters collected from 46 farmers of Nadia district revealed that about 34.8% farmers preserved their seeds for the next season (Table 3). Gobindabhog paddy after harvesting was dried under sun for a period from 2.5 to 4.0 days (Table 4). There were mixed responses among respondents regarding use of paddy, milling and marketing of rice. About 58.7% growers in the district sold their paddy and the selling rate of paddy varied significantly among blocks, with district average of ₹ 1860 qtl^{-1} bag. Milling of paddy was done at local indigenous or semi-modern or modern rice mills and the milling charge varied accordingly from 0.50 to 1.08 kg^{-1} of paddy. Gobindabhog, being popular for special uses in festivals, social functions etc., was used by the farming families either for domestic consumption or for sale or for both. Farmers sold their Gobindabhog rice to the retailers at an average rate of ₹ 40.90 per kg. With average production cost of ₹12,938.3 ha^{-1} along with income of ₹ 31,374.8 ha^{-1}, the benefit was estimated about ₹ 15,017.3 ha^{-1}. Similar findings on economics and marketing of aromatic rice in Chhattisgarh were reported by Marothia *et. al.* (2007).

There was a little variation in moisture content of grain between 13.2% (Haringhata) and 14.0% (Ranaghat II), with the district average of 13.6% (Table 5). Mean hulling, milling and head rice recovery were 78.9, 69.0 and 59.6%, respectively; which were similar to the findings of Banerjee (2011) for

Table 4. Analysis of post-production status of Gobindabhog rice in Nadia district during 2010-11

Post-production parameter	Block						Total (N=48)	Fvalue
	Chakdah (n_1=18)	Haringhata (n_2=4)	Ranaghat I (n_3=12)	Ranaghat II (n_4=6)	Santipur (n_5=2)	Krishanagar I (n_6=6)		
Period of sun drying (days)	3.7	3.5	3.2	2.5	4.0	3.0	3.3	6.25**
Rate of paddy (₹ 60 kg bag^{-1})	1173.3	1175.0	–	1008.8	–	900.0	1116.7	14.86**
Milling charge (₹ kg^{-1})	0.61	0.65	1.08	–	0.50	0.75	0.84	0.52(NS)
Rate of rice (₹ kg^{-1})	40.5	40.0	42.5	–	–	–	40.9	0.02(NS)
Cost of production (₹ ha^{-1})	13000.5	14250.0	–	–	10001.3	–	12938.3	0.26(NS)
Income (₹ ha^{-1})	32824.5	27750.0	–	–	–	–	31374.8	0.34(NS)
Benefit (₹ ha^{-1})	15396.0	13312.5	–	–	–	–	15017.3	0.05(NS)

Table 5. Grain quality of Gobindabhog rice grown in different blocks of Nadia district during wet season, 2010

Block	No. of Samples	Moisture content (%)	Hulling (%)	Milling (%)	Head rice recovery (%)	Alkali spreading value (score)	Aroma (score)
Chakdah	3	13.7	79.2	67.7	58.4	4.0	3
Haringhata	3	13.2	79.6	69.8	60.3	4.0	3
Ranaghat I	3	13.7	78.0	69.1	59.5	4.3	3
Ranaghat II	3	14.0	78.5	68.8	60.0	4.3	3
Santipur	3	13.5	77.7	68.7	58.78	4.0	3
Krishnagar I	3	13.7	80.2	69.7	60.4	4.0	3
	Mean	13.6	78.9	68.69	59.6	4.1	3

Scoring of aroma: 0 = no, 1 = mild, 2 = medium and 3 = strong

Gobindabhog rice. Alkali spreading value was found to vary between 4.0 and 4.3, which indicated intermediate gelatinization temperature of Gobindabhog rice. The grains of the variety possessed strong aroma across the blocks in Nadia district of West Bengal.

It is concluded that most of the farmers under study in Nadia district cultivated Gobindabhog rice with an average of 0.2 ha. The crop transplanted during mid July to mid August and the farmers adopted nutrient, weed and water management practices in their fields. Mean grain yield in Nadia district was 2.21 t ha^{-1}.

REFERENCES

Banerjee S 2011. Development of organic production system for indigenous aromatic rice of West Bengal. Ph. D. Thesis, Department of Agronomy, Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal, India.

Ghosh M and Ghose TK 2007. Research Report on "Nutritional quality characterization and DNA-fingerprinting based genetic diversity analysis of aromatic rice (*Oryza sativa* L.) landraces of West Bengal" under INSA Visiting Fellowship Programme at Bose Institute, Kolkata, West Bengal, India.

Little RR, Hidder GB and Dawson EH 1958. Differential effect of dilute alkali on 25 varieties of milled white rice. Cereal Chemistry, 35: 111-126.

Marothia DK, Singh RK, Chandrakar MR and Jain BC 2007. Economics and marketing of aromatic rice – A case study of Chhattisgarh, Agricultural Economics Research Review, 20, pp. 29-46.

Nagaraju M, Mohanty KK, Chaudhury D and Gangadharan C 1991. A sample screening technique to detect scent in rice. Oryza, 28: 109-110.

Naing T AA, Kingsbury AJ, Buekert A and Finch MR 2008. A survey of Myanmar rice production and constraints. Journal of Agricultural and Rural Development in the Tropics and Subtropics, 109 (2): 151-168.

Odoemena Benjamin, Ihedioha Damian, Ibana Simon and Okoli Paul 2008. Making rice agrobusiness model in sub-humid tropics of Nigeria: The commodity value-chain development approach. African Journal of Agricultural Research, 3 (11): 779-786.

Thanh NC and Singh B 2006. Constraints faced by the farmers in rice production and export. Omonrice, 14: 97-110.