

Performance of 22 Cultivars of FAG rice in Srimangal and Sadar Upazilas of Moulvibazar district

2002 T. Aman Season



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Background

Bangladesh is a small country. It is one of the most densely populated countries in the world. The population density is 896 per sq. km (BBS 1993). Assuming the cropped area to be constant since 1991-2, the per capita net-cropped area and total cropped area stands approximately at 0.07 and 0.12 ha respectively. Such small per capita areas of cropped land are insufficient to provide food, clothing, shelter and other necessities of life for the population.

Within the food grain sub-sector, the rice crop is the dominant crop in respect of both the cropped area output. Rice is the nation's most strategic commodity. It contributes nearly 20% of GDP and occupies 75% of cropped land. Rice production provides nearly 50% of employment and 75% of calories consumed in the country. Furthermore, the rural and urban poor spend up to 60% of their income on it. By far the largest component of our agricultural produce is rice, which is the staple food of over 130 million Bangladeshis.

The present food production is about 27million m. tons (2001-2002). The country seems to have attained a sustainable level self-sufficiency in food production. In general farmers sell their paddy below its production cost. In particular, the price of coarse rice falls tremendously during and after harvesting the crop. On the other hand, the price of fine rice is comparatively stable, being higher yielding greater profit than do the coarse rice varieties. Thus, the Indian fine rice (Miniket, Sorna etc) is very popular in Southwest and Northern border districts of the country. Similarly, BRRI dhan 28 has already gained popularity all over the country. Bangladesh is an abundant source of genetic variations of fine, fine & aromatic and glutinous rice. The production of these popular fine, fine & aromatic and glutinous rice varieties are location specific; their production being confined to certain traditional production pockets of Bangladesh (e.g. Dinajpur, Rajshahi, Mymensingh, Sylhet etc).

The loss in gross production due to lower yields of fine varieties of rice is more than offset by their substantially higher prices.

The demand of fine, fine & aromatic rice is much higher than production in the Sylhet region. Cultivation of fine, fine & aromatic rice has tremendous potential in Sylhet region due to high market demand and to the desire among RPFs in the area to increase their net incomes from the production of these fine, fine & aromatic and glutinous rice cultivars within the traditional rain fed T. Aman cropping pattern. This tendency is bringing about a "sea-change" in the past slow growth in rice production in Sylhet region. There is considerable scope for export of surplus Fine, fine & aromatic and glutinous rice to markets outside of Bangladesh, i.e., Middle East, Europe and North America.

The sub-project on Fine, Fine & Aromatic and Glutinous rice (FAG) variety has been undertaken in the North-East region of Bangladesh. It aimed to promote opportunities to build upon the lessons and experience learned from local resource poor farmers with technical inputs from BASC, APEX, BRRI, AAS and facilitated by HEED Bangladesh.

Purpose

The purpose of the seasonal report of “2002 T. Aman” of the sub-project on production and marketing of FAG rice through farmer’s participation in North-East region in Bangladesh has been to compile the findings and lessons learned from the sub-project activities in Sadar and Srimongal upazilas of Moulvibazar district and to share the conclusions of these findings and lessons among the network partners, relevant scientists, exporters and other relevant stakeholders in the country.

Methodology

Location/Research site

The FAG rice sub-project has been implemented in 5 upazilas of Moulvibazar district since 1 April 2002. Out of 5 upazilas, sub-project has been implementing in sadar and Srimongal upazilas by AAS and HEED-Bangladesh in Kamalgonj, Kulaura and Rajnagar upazilas. The sub-project activities were implemented by AAS at nine villages, of which 5 villages in Srimongal upazila (Uttar Varaura, Esobpur, Sirajnagor, Majdehee and Nischintapur) and 4 villages in sadar upazila (Mohammadpur, Gias Nagor, Akbarpur and Kodupur) of Moulvibazar district during 2002 T. Aman season. These villages were selected by the assigned agronomist using the AAS developed village selection strategy and process.

Group formation and farmers selection

Resource poor farmer groups for FAG rice were formed at nine selected project villages in sadar and Srimongal upazilas of Moulvibazar district during May-June 2003. Each resource poor farmer group (RPF) was formed with 10 resource poor farmers (RPFs) with a coordinator at each project village. Farmers for trial and demonstration on FAG rice were selected with cooperation of group coordinators of the RPFs and using pre-determined selection criteria at each project village.

Farmers training

Farmer’s participatory training was conducted at the beginning of the sub-project and after group formation. At the beginning of the training, farmer’s knowledge on FAG rice cultivars and their production practices were collected. Later improved production practices of FAG rice were matched with farmer knowledge in a participatory process. Through this participatory presentation and discussion farmer’s learning on FAG rice technology were clarified among the participating farmers. The training process and its output documented for sharing among the participating farmers and other stakeholders.

Varietal trial

At the beginning of FAG rice varietal trial for 2002 T. Aman a pre-tested resource poor farmer (Mr. Nimesh Ghop) was selected for varietal trial using AAS developed farmers selection strategy and criteria at Uttar Varaura village in Srimongal upazila of Moulvibazar district. Similarly Mr. Frahim Miah a resource poor farmer (RPF) was selected for fertilizer trial at Uttar Varaura village in Srimongal upazila (Annex.3).

A total of 22 FAG rice cultivars were selected for varietal trial to assess their performance in Northeast region of Bangladesh. Accordingly seed of 22 cultivars were collected from different sources (Annex.1). Seed of 22 cultivars were sown (250 gm each cultivars) with special care on 15 July 2003 in seedbed for raising quality seedlings. Post sowing seedbed management practices were provided by the farmers under the direct supervision of the assigned Agronomist of the sub-project.

Each plot was 1 decimal and was used to trial one only of the 22 FAG rice cultivars. Thus, there were 22 plots of 1 decimal each for the trial of the 22 FAG cultivars. Four modern cultivars of BRRI (fine and aromatic rices) separated by making strong bunds for better fertilizer management practices. Similarly, nine Beruin cultivars separated by making the strong bunds in the same trial plot.

The seedlings were transplanted on 7 August 2003 with 23 days old seedlings of 22 cultivars.

2-3 seedlings per hill for the four modern varieties of BRRI and 3-5 seedlings per hill for local cultivars were transplanted in the prepared trial and demonstration plots at 9 villages in the two upazilas of the district. The spacing between rows was 20cm and 15 cm between the hills.

The varietal trial plots and demonstration plots were fertilized with urea, TSP, MP, and gypsum at the rate of 90 kg, 70 kg, 50 kg and 40 kg for local cultivars of FAG rice respectively. On the other hand Urea, TSP, MP, and gypsum were used at the rate of 150kg, 100kg, 70kg, and 60kg per hectare for the four modern BRRI varieties. Varietal trial plots (22 cultivars) fertilized with cowdung at of 7MT/ha during land preparation. Farmers provided the post transplanting management such as weed control, irrigation, and top-dressing with urea as per guidelines.

Yield component data and plant height (cm) were collected from 16 hills at 4 spots (4 hills/spot) for each variety of varietal trial plot. Three representative (average) hills were harvested for 22 cultivars for the yield component from the varietal trial plots. Later, panicles were detached from three representative hills for each cultivar separately. After drying the detached panicles both filled and unfilled grains were threshed and counted manually at the Zonal Office of AAS, Srimongal. Thereafter, 1000-grain weight was taken and adjusted at 14% moisture content for 22 FAG rice cultivars.

The crop was harvested by keeping two hills at the boarder of the four sides to avoid the boarder effect for appraising the 22 cultivars. After harvesting the crop, threshing, drying and cleaning were done for each cultivar separately. The grain-yield, yield contributing characters,, growth duration and plant height of the 22 FAG rice cultivars are provided in table 1.

Assigned Agronomist of the sub-project collected primary data of cost and return of 22 cultivars of FAG rice from trial plots and demonstration plots at nine project villages. Later, the collected data on cost and return of 22 cultivars calculated and presented in Table 3.

Fertilizer trial

Three cultivars of fine and aromatic rice (Tushimala, Kachra & Chinisagor) and two types of fertilizer (Cowdung and chemical fertilizers) along with a control (no fertilizer) were selected to assess the influence of both the organic and inorganic fertilizers on aromatic characters of fine and aromatic rice production.

Seed of three fine and aromatic cultivars were sown (500gm of each cultivar) in the seedbed on 15 July 2003 for production of seedlings. Post-sowing management was provided by the respective farmer in the seedbed.

Infield-layout was done for the observational fertilizer trial with nine treatments before transplanting the seedling and application of fertilizer. The "fertilizer trial" seedlings of 3 cultivars were transplanted on 9 August 2003; using 25 days old seedlings.

Cow-dung was applied at the rate of 10 Mt/ha in organic fertilizer treatment plots. Similarly chemical treatment plots fertilized with Urea, TSP, MP and Gypsum at the rate 90 kg/ha, 70 kg/ha, 50kg/ha and 40kg/ha respectively. Post transplanting management such as weed control, irrigation and top-dressing with Urea was provided by the farmers as per pre-determined guidelines. The plant height, yield component and grain yield of nine plots of the fertilizer trial was collected using the same procedures applied during the varietal trial. The grain yield, yield-contributing characters, growth duration and plant height of the fertilizer trial are provided in table 4.

After measuring the grain yield of nine plots of fertilizer trial, 3kg rice (Un-husked) was collected from each plot for rice aroma test. Three kg rice for each treatment (plot) was used for making un-parboiled polish rice (Atop chal) through milling for aroma test.

Farmers Field Demonstration

Seed of 14 FAG rice cultivars was distributed (1 kg of each cultivars) among the 40 farmers. Each farmer received seed of at least one cultivar and maximum three cultivars of FAG rice. The seed of 14 FAG rice cultivars sown in seedbed during 15 July 2003 to 30 July 2002 by the 40 farmers in project areas.

The seedling age ranged at 23-40 days old was transplanted during 7 August to 10 September 2003 by the trained 40 farmers in the project areas.

The respective demo farmers provided post transplanting cultural management practices as per guidelines developed during the farmer's training sessions.

The grain yield data collected and adjusted at 14% moisture content for each demo farmer and variety-wise average grain yield is provided in table 2.

Field day

A total of 143 resource poor farmers (RPFs) participated at 4 field days at trial and demonstration villages in Srimongal upazila during ripening stage of the 2002 T. Aman season. At each field day, after field visit farmers participated in open discussion about the varietal assessment based on their knowledge and learning during field visit. Total 22 FAG rice cultivars were divided into three categories, such as fine, fine & aromatic and glutinous. During the field day, project staffs acted as facilitators. Moreover, field days were informal, highly participatory and very cost effective ways to disseminate the accumulated knowledge and lessons. Farmer's assessment on the 22 FAG rice cultivars is summarized and presented in table 6.

Physico-chemical analysis for Beruin rice

The laboratory analysis was conducted at Grain Quality and Nutrition Division of Bangladesh Rice Research Institute (BRRI). Milled rice outturn was determined by dehulling 200 gm rough rice in a Satake rice mill, followed by 45 second polishing in a Satake Grain Testing Mill TM-05. Head rice outturn was expressed of rough and milled rice, respectively. Grain length and breadth were measured by slide calipers. In determining the size and shape, milled rice was first classified into three classes based on length, long (>6 mm in length), medium (5-6 mm in length), and short (< 5 mm in length). Then again classified into three classes according to the ratio of length to breadth: slender (ratio more than 3); bold (ratio 2-3); round (ratio less than 2). Amylose content was determined by the procedure of Juliano, (1971) and gelatinization temperature was determined according to the procedure of Little *et al*, (1958). Protein content was calculated from nitrogen and was determined by Micro Kjeldahl method. Volume of cooked and milled rice measured by water displacement method. Five gram of milled rice was placed in a graduated cylinder containing 50 ml of water and change in volume was noted. For cooked rice volume 5 gm of milled rice was cooked and the cooked rice was placed in the same cylinder and the change in volume was measured. Cooking time was measured when 90 % of cooked rice was totally gelatinized. Data presented in the table 8 are calculations based on the mean of three replications.

Farmer's participatory workshop

Three, daylong, participatory farmers workshops were carried out to validate the earlier assessments and conclusions reached during the field days. A total of 60 RPFs participated in the participatory workshops at AAS's Zonal Office in Srimongal. The participants hailed from 9 project villages in Srimongal and sadar upazilas of Moulvibazar district. A total of 22 FAG rice cultivars were divided into three categories (fine, fine & aromatic and glutinous). Farmers in the workshop assessed the FAG rice cultivars based on the pre-determined indicators such as grain yield, growth duration, rice quality, market demand (local) and price, using scoring scale 1-5. But for disease and insect infestation scoring scale was 5-1. Farmers participatory 22 FAG rice cultivars assessment is given in Tables 7(a), 7(b), & 7(C).

Rice Aroma testing

Total of 13 Farmers (RPFs & RPFs) from 5 project villages participated in the "aroma testing" phase of cooked and uncooked aromatic rice at AAS's Srimongal Zonal Office in January 2003. Nine un-parboiled, milled-polished rice samples from nine plots were aroma tested. These samples were taken from the sub-project's fertilizer trials. The aroma test involved two types of fertilizer (organic and inorganic) and included a non-fertilizer control. The aroma-tested varieties included three fine and aromatic rice cultivars (Tulshimala, Kachra and Chinisagor).

Each sample of un-cooked (chal) and cooked rice was given a code number. Each participant was asked to scent test the aroma of each cooked and un-cooked sample. The nine rice samples were rated (one by one) on a 1 to 3 (Strong, modest and weak) scale. Thus each sample received total evaluation marks based on the sum of all participants ratings. The cooked rice samples were rated using the same scale as the uncooked (chal) samples. The overall ranking was compiled based on the marks obtained and their position declared in the farmer's participatory workshop.

Findings

The performance of 22 FAG rice varieties was evaluated through varietal trial, varietal demonstration, fertilizer trial, cost and return analysis and farmers participatory assessment (e.g field day, workshop, aroma testing etc) during 2002 T. Aman season at 9 villages in sadar and Srimongal Upazilas of Moulvibazar district. The findings of FAG rice study during 2002 T. Aman season is given below:

Fine and Aromatic rice

Among the 11 fine and aromatic rice cultivars, the grain yield from trial plots was highest with 3.30 t/ha in BRRI dhan 34 followed in order by 2.75 t/ha in Chinisagar, 2.67 t/ha in katarivough and BRRI dhan 38. Similarly, the grain yield in demonstration plots was highest with 3.20 t/ha in BRRI dhan 34 in sadar and Srimongal upazilas of Moulvibazar district (Table 1&2).

The average panicles per hill of eleven fine and aromatic rice cultivars was low ranging from 5.00 to 8.31 and highest with BRRI dhan 34 (Table 1).

The average number of filled grains per panicle was highest with 101 in BRRI dhan 34 followed by 99 in Chinisagor and 95 in Katarivough. The proportion of filled grains was lowest in Begun Bechi (69.76%). However, the proportion of filled grains fluctuates between about 70 – 87 per cent in eleven cultivars under the varietal trial (Table 1).

1000-grain weight is the lowest with BRRI dhan 34 and Tulsimala followed by Chinisagor. However, 1000-grain weight fluctuates between 10-19 gm of the eleven tested cultivars (Table1).

The growth duration was lowest (105 days) in Begun Bechi and highest with Khachra (145 days). The growth duration of BRRI dhan 37 and BRRI dhan 38 were 141 and 140 days respectively. The growth duration of the rest seven cultivars ranged from 128 to 131 days (Table 1).

The plant height was highest in Tulshimala (151 cm) and it ranged between 120-145 cms in remaining cultivars.

Fine rice

The grain yield from trial plot of BRRI dhan 39 was 1.39 t/ha and that was 2.49 t/ha in demonstration plots. The grain yield of Parbatjira was 1.00 t/ha (Table 1&2).

The average panicle per hill was higher with BRRI dhan 39 (6.25) than parbatjira (5.72) in trial plot. The average number of filled grains per panicle was higher with parbatjira than BRRI dhan 39. But the average proportion of unfilled grains was higher with BRRI dhan 39 (67%) than parbatjira (43%). Both parbatjira and BRRI dhan 39 need to re-examine the filled and unfilled grains per panicle due to grain loss during maturity stage. 1000-grain weight is lower with parbatjira (9 gm) than BRRI dhan 39 (23gm). 1000-grain weight of parbatjira is the lowest among the tested 22 FAG rice cultivars during 2002 T. Aman season (Table 1).

The growth duration of parbatjira was lower (103 days) than BRR dhan 39 (120 days). But the plant height was higher with parbatjira (126 cm) than BRR dhan 39 (107 cm) in the trial plot (Table.1).

Glutinous rice

More or less similar grain yield was achieved with the 9 tested Beruin cultivars from demonstration plots during 2002 T. Aman season. The grain yield in varietal trial plots ranged from 2.31 t/ha to 3.70 t/ha. The grain yield from demonstration plots varied from 2.80 t/ha to 3.61 t/ha. The highest grain yield of Aikka Beruin was 3.7 t/ha from a varietal trial plot. The same variety yielded 3.61 t/ha in demonstration plots (Table 1 &2).

The average panicle per hill was highest with Mou Beruin (10.56) followed by Lal Beruin (10.21) and the remaining 7 cultivars ranged from 4.35 to 9.03 panicles per hill (Table1).

The average number of filled grains per panicle was highest with 82 in Kathali Beruin followed in order by 74 in Modho Beruin and 72 in Lal Beruin. The average filled grains per panicle ranged from 58–63 of the remaining six cultivars. The proportion of filled grains fluctuated between 72.28–86.23 percent in nine cultivars under varietal trial. 1000-grain weight is the highest with Mou Beruin (31 gm) and lowest with Lal Beruin (18 gm). 1000grain weight ranged from 20–27 gm of the remaining seven cultivars (Table 1).

Growth duration of the nine Beruin rice cultivars was more or less same; ranging from 128 – 133 days. The plant height was highest with Aikka Beruin (142.65 cm) followed by Kathali Beruin (142.25 cm). The plant height of the remaining seven cultivars ranged from 121.40 cm to 134.35 cm (Table 1).

Cost and return of FAG rice

Cost and return of the main product and by-product of 22 cultivars of FAG rice is provided in Table 3.

The net-return on cash cost basis of the most tested cultivars of FAG rice was found economically encouraging. The net-return on full cost basis of the most tested cultivars of FAG rice was found economically discouraging. Moreover, the net-return on full cost basis of Begun Bechi and parbatjira cultivars were found negative values.

Similar trend of findings was observed for benefit cost ratio and net return in terms of gross value of the product (%) with the cash cost basis and full cost basis of 22 tested cultivars of FAG rice.

Thus, most of the tested cultivars of FAG rice were found economically viable with farmers on cash cost basis with better farm-gate price for FAG rice.

However, the per hectare net-return on cash cost basis was highest with BRR dhan 34 (Tk. 39,123), followed in order to BRR dhan 37 (Tk. 29,183), BRR dhan 38 (Tk. 28,942), Chinisagor (Tk. 27,912), KatariVough (Tk. 27,383) and Tulshimala (Tk. 26,840) among the eleven fine & aromatic rice cultivars tested during 2002 T. Aman season. The benefit cost ratio on cash cost basis was highest with BRR dhan 34 (6.67), followed in order by Kalijira (5.74), Tulshimala (5.48), BRR dhan 37 (5.46), BRR dhan 38 (5.35) and Chinigura 2 (5.30) among eleven fine & aromatic rice cultivars tested during 2002 T. Aman season.

Similarly, the net return on cash cost basis was highest with Khara Beruin (Tk. 35,416), followed in order by Lal Beruin (Tk. 32,703), Aikka Beruin (Tk. 31,677), Modho Beruin (Tk. 30,849), Mou Beruin (Tk. 30,555) and Kalo Beruin (Tk. 27,887) among nine glutinous rice cultivars tested during 2002 T. Aman season. The benefit cost ratio on cash cost basis was highest with Khara Beruin (6.91) followed in order by Aikka Beruin (6.80), Lal Beruin (6.76), Modho Beruin (6.12), Mou Beruin (5.81) and Kalo Beruin (5.68) among the nine glutinous rice cultivars tested during 2002 T. Aman season.

Fertilizer trial on fine and aromatic rice

Both organic and inorganic fertilizers produced significantly higher grain yield over control (no fertilizer application). On the other hand inorganic fertilizer produced slightly higher grain yield than organic fertilizer.

The organic and inorganic fertilizers produced higher panicles per hill, filled grain per panicle and proportion of filled grain over the control treatment with Tulshimala, Kachra and Chinisagor cultivars. Influence of both organic and inorganic fertilizers on yield contributing characters of three tested cultivars was found more or less similar with few exceptions.

Application of inorganic fertilizers produced slightly higher grain yield and filled grain per panicle than cow-dung application with Tulshimala, Kachra and Chinisagor cultivars. But growth duration, percent filled grain and plant height was slightly increased due to application of organic fertilizer compared to inorganic fertilizers in the three tested cultivars. The panicles production per hill increased due to application of inorganic fertilizers over cow-dung with chinisagor cultivar. But panicles production per hill was more or less same for the both Tulshimala and Kachra cultivars with organic and inorganic fertilizers application.

Use of organic or inorganic fertilizers had little effect on 1000-grain weight with Tulshimala, Kachra and Chinisagor cultivars over the control treatment.

A total of 13 farmers (male & female) participated in the aroma testing process of uncooked (Chal) and cooked rice of fertilizers trial plots (nine plots). Thus nine rice samples of three cultivars with three fertilizers treatments (two types of fertilizers and a control) were used for aroma testing. Before testing each cooked and uncooked sample was given a coded identifier.

The comparison of rice aroma of three cultivars with organic and inorganic fertilizers is given in table 5. The aromatic test findings of three cultivars are presented below:

Tulshimala

Overall higher aroma of Tulshimala rice observed with organic fertilizer followed by inorganic fertilizer/control treatment.

Tulshimala registered the highest aroma of cooked rice. It was followed in order by inorganic fertilizer and control treatment of cooked rice tested by eating with chicken curry.

The highest aroma observed with control treatment of Tulshimala rice (chal) followed in order by organic fertilizer and inorganic fertilizer for rice tested by nose.

Chinisagor

Overall the highest aroma of Chinisagor rice was observed with inorganic fertilizer followed in order by organic fertilizer and control treatment.

The highest aroma of Chinisagor cultivar was observed with organic fertilizer followed in order by inorganic fertilizer and control treatment of cooked rice tested by eating with chicken meat.

The result of uncooked Chinisagor rice (chal) test by nose was similar to Tulshimala cultivar.

Kachra

Overall the highest aroma of Kachra rice observed with control treatment followed in order by organic and inorganic fertilizer.

The highest aroma of Kachra observed with control followed in order by cowdung and in organic fertilizers of cooked rice tested by eating with chicken curry.

More or less similar aroma of Kachra rice (chal) observed with organic and inorganic fertilizers and also with control of rice testing by scent.

Farmer assessment on FAG rice cultivars

Farmers assessed 22 FAG rice cultivars. This was done during four field days and three participatory workshops. At these times they shared their practical experience and accumulated observations during demonstrations and trials. The field days and workshops were organized primarily for this purpose. Participating farmers ranked and discussed their specific experiences and conclusions regarding the 22 trialed / demonstrated FAG rice cultivars. Accordingly, their conclusions and rankings are given in tables 6, 7(a), 7(b), and 7(c).

Varietal assessment during field days

At the end of each field day at trial and demonstration sites participating farmers ranked the FAG rice cultivars and provided their specific comments according to the following three categories (fine, fine & aromatic and glutinous rice).

Among the eleven fine and aromatic rice cultivars, farmers ranked BRR1 dhan34 as the best followed in order by chinisagor, Tulshimala, BRR1 dhan37, Chinigura2, Chinigura1, Katarivogh, BRR1 dhan38, Kalijira, Begun Bechi and Kachra.

Among, the two fine rice cultivars, farmer ranked parbetjira as being better than BRR1 dhan39.

Among the nine Beruin (glutinous) rice cultivars farmers ranked Modho Beruin as the best followed in order by Khara Beruin, Lal Beruin, Mou Beruin, Aikka Beruin, Kalo Beruin, Pakh Beruin, Push Beruin and Kathali Beruin in the last.

Varietal assessment during workshop

During three participatory workshops at AAS's Zonal Office at Srimangal, farmers ranked the FAG rice cultivars under the following three categories, such as fine, fine & aromatic and glutinous rice.

Fine and aromatic rice

Farmers ranked BRR I dhan 34 as the best followed in order by Chinisagor/Chinigura 1(2nd) and Tulshimala/Kalijira(3rd) among the eleven tested fine and aromatic cultivars during the first workshop held on 4 February 2003.

Farmers ranked BRR I dhan 34/chinisagor as the best followed in order by Tulshimala and Chinigura 2/ Kalijira among the eleven fine and aromatic cultivars during the second workshop held on 5 February 2003.

Farmers ranked BRR I dhan 34 as the best followed in order by Kalijira (2nd) and Chinisagor/Tulshimala/Katarivough (3rd) among the tested eleven fine and aromatic cultivars during the third workshop held on 6 February 2003.

Fine rice

Farmers ranked parbatjira as the better fine rice cultivar when compared with BRR I dhan 39 during the three workshops held on 4-6 February 2003 at AAS's Srimongal office.

Glutinous

Farmers ranked Modhu Beruin as the best followed in order by Mou Beruin (2nd) and Aikka Beruin(3rd) among the nine glutinous rice cultivars during the first workshop held on 4 February 2003.

Farmers ranked Aikka Beruin as the best followed in order by Khara Beruin/Mou Beruin and Lal Beruin among the nine glutinous rice cultivars during the second workshop held on 5 February 2003.

Farmers ranked Aikka Beruin as the best followed in order by Modhu Beruin and Khara Beruin/Mou Beruin among the nine glutinous rice cultivars during the third workshop held on 6 February 2003.

Physico-Chemical properties of Beruin Cultivars

The physico-chemical properties such as milling out-turn (%), Head rice (%), chalkiness, appearance, length, breath, L/B ratio, size & shape, alkali spreading value, amylose (%), Protein (%), ER, IR etc. of nine Beruine rice are provided in table 8.

Amylose content is lowest with 7.9% in Mou Beruin increased followed in order by Lal Beruin (8.5%), Khara Beruin, Kathali Beruin (8.7%), Aikka Beruin/ Pakh Beruin/ Push Beruin (9.0%), Kalo Beruin(9.5%) and Sada Beruin (10%). However, the tested nine Beruin cultivars were found as sticky rice and close to glutinous rice (Table 8).

Similarly protein content is highest with 8.4% in Khara Beruin followed in order by Push Beruin, Pakh Beruin/ Kathali Beruin, Lal Beruin/lekka Beruin, kalo Beruin, Sada Beruin and Mou Beruin (Table 8)

Conclusion

Among the tested 11 fine and aromatic rice cultivars, the performance of BRR1 dhan 34 was found to be best followed in order by Chinisagar, Tulshimala and Katarivough during the 2002 T. Aman season in the project area. Thus, the Sub-project (AAS component) identified BRR1 dhan 34 as having a tremendous potential for producing such rice during the T. Aman season in Sylhet region. BRR1 dhan 34 is a modern, fine-grain rice variety and it has pleasant aroma as well. Moreover, it is highly adaptable for production in T. Aman season. Its overall yield acceptability was found to be very high among farmers in Sadar and Srimangal upazilas of Moulvibazar district. This high level of acceptability was consistently assessed and documented during farmer's participatory field days/visits at trial sites and participatory varietal assessment workshops after harvesting the crop of 2002 T. Aman season. Yield and profitability of BRR1 dhan 34 is also very high when compared with the other ten fine and aromatic cultivars tested. Moreover, profitability of BRR1 dhan 34 was found to be far better on a cash cost basis than a full cost basis when compared to the other FAG rice cultivars being tested. The implication of this is that resource poor farmers fare better with FAG rice than with non-FAG rice alternatives. They and their families are benefiting in important economic ways from the introduction of high value FAG rice cultivation in the project areas.

Average panicles production per hill with tested fine and aromatic rice cultivars was low with satisfactory grains per panicle and the proportion of filled grains production. 1000 grains weight is the lowest with BRR1 dhan 34 and Tulshimala followed by Chinisagar. The growth duration of BRR1 dhan 34, Tulshimala and Chinisagar was found acceptable (in the intermediate range) during the T Aman season.

Both the tested BRR1 dhan 39 and parbatjira were rejected by the farmers during 2002 T. Aman season in the project areas. But the grain size of Parbatjira is the lowest among the tested FAG rice cultivars. Moreover, Parbatjira (fine) is short duration in T.Aman season and it has photoperiod-insensitive characters alike Begun Bechi, a fine and aromatic rice cultivar.

More or less similar performance on grain yield of nine tested Beruin cultivars observed during 2002 T. Aman season with few exceptions in the project areas. The average panicle per hill, filled grains per panicles, proportion of filled grains and growth duration of nine tested Beruin cultivars were found acceptable among the farmers in the project areas. Moreover, profitability of nine Beruin cultivars was found to be far better on a cash cost basis than a full cost basis.

Both organic and inorganic fertilizers performed better than no fertilizers treatment in-terms of yield and yield contributing characters of Tulshimala, Kachra and Chinisagar, fine and aromatic cultivars during 2002 T. Aman season. Performance variations between organic and inorganic fertilizers were found to be narrow. The effect of organic fertilizers (Cowdung) and inorganic fertilizers over control (no fertilizer) on rice aroma of three tested fine & aromatic rice cultivars (Tulshimala, Kachra and Chinisagar) was found mixed through farmer's participatory testing of cooked and uncooked (chal) rice.

Recommendation

The sub-project will take initiative to disseminate BRRRI dhan 34, Tulshimala and chinisagor fine and aromatic rice cultivars in Moulvibazar district (Sadar & Srimangal Upazilas) through cost effective approach using AAS developed RPFs of FARMSEED network.

The variety selection process will continue through farmers field trial and demonstration followed by varietal assessment using farmers participatory field days/workshops and rice quality test.

Both Begun Bechi (fine&aromatic) and Parbatjira (fine) will be demonstrated during 2002/03 Boro season.

Trial on organic and inorganic fertilizers will conduct with BRRRI dhan 34 to find-out their influence on aromatic characteristics of the cultivar during 2003 T. Aman.

The sub-project needs to develop a clean seed supply system for traditional FAG rice cultivars in the project areas. This will be done with the help of BRRRI. The FARMSEED strategy and network should also be used for this purpose.

FAG rice is high value as compared with coarse rice and should be introduced among properly trained and motivated resource poor farmers (RPFs) both within and outside the project areas.

FAG rice production system should be developed for acceptable cultivars using AAS established RPFs, its FARMSEED and FAG rice sub-projects in the project areas. A Farmer driven FAG rice seed procurement linkage should be developed with private sector outlets and HEED Bangladesh.

Modern, privately owned milling systems suitable for FAG rice processing should be introduced in the project areas. Both IRRI and BRRRI can play a key role in developing improved milling systems for FAG rice processing and packaging in the project areas.

The project tested Beruin rice cultivars are not glutinous rice varieties in the scientific sense. Rather these are highly sticky rice and some of them have a milled aromatic character. However, Beruin cultivars can easily enter into the export market though systematic promotional approach. At this stage the sub-project may take initiative testing its acceptability in the Japanese, Chinese and Korean in communities in Dhaka.

The sub-project should take initiative for linkage development among FAG rice producers,, millers (using improved FAG rice processing systems) and wholesale/retail market outlets (both domestic & international).

Table 1: Comparison of different Characteristics of 22 FAG rice cultivars tested in 2002 T. Aman season

Sl No	Variety	Panicle per hill (Nr)	Filled grain per panicle (Nr)	% Filled grain	1000 grain weight (gm) at 14% moisture	Growth duration (days)	Plant Height (cm)	Yield (t/ha)
A: Fine and Aromatic rice								
1	Chinisagor	6.23	99	81.50	11	128	137.65	2.75
2	Chinisagor-1	5.00	88	82.24	12	130	142.10	1.93
3	Chinisagor-2	6.21	82	80.39	12	130	138.25	2.35
4	Kalijira	5.19	77	83.25	12	129	145.35	2.19
5	Begun Bechi	5.08	60	69.76	12	105	136.10	1.00
6	Khachra	6.10	78	78.78	12	145	127.55	1.68
7	Tulshimala	6.52	75	86.56	10	130	151.00	2.34
8	Katarivogh	6.41	95	81.19	14	130	142.15	2.67
9	BRRRI dhan34	8.31	101	79.69	10	131	119.75	3.30
10	BRRRI dhan37	7.21	91	78.64	15	141	122.35	2.59
11	BRRRI dhan38	7.13	86	81.70	19	140	128.45	2.67
B: Fine rice								
1	Parbatjira	5.72	44	43.36	9	103	125.65	1.00
2	BRRRI dhan39	6.25	34	66.66	23	120	107.35	1.39
C: Glutinous rice								
1	Kara Beruin	7.21	60	72.28	23	130	122.35	3.19
2	Lal Beruin	10.21	72	75.78	18	132	134.10	3.00
3	Mou Beruin	10.56	62	84.60	31	133	131.75	3.50
4	Aikka Beruin	9.03	63	79.32	24	132	142.65	3.70
5	Kalo Beruin	5.61	61	83.20	25	128	128.20	3.00
6	Pakh Beruin	6.14	58	85.35	26	128	121.40	2.81
7	Push Beruin	5.22	61	78.20	20	133	134.35	2.31
8	Kathali Beruin	4.35	82	79.10	27	128	142.25	2.51
9	Modho Beruin	8.25	74	86.23	22	132	123.35	3.43

Table 2: Average yield of 14 cultivars of FAG rice demonstrations at farmer's field:

SI No	Variety	Plot (Nr)	Average Yield (t/ha)
A: Fine and Aromatic rice			
1	Tulshimala	5	2.56
2	Chinisagor	3	2.70
3	Katarivogh	4	2.70
4	BRRRI dhan34	8	3.20
5	BRRRI dhan37	12	2.69
6	BRRRI dhan38	9	2.68
B: Fine rice			
7	BRRRI dhan39	5	2.49
C: Glutinous rice			
8	Khara Beruin	6	3.24
9	Lal Beruin	5	2.89
10	Mou Beruin	5	3.20
11	Aikka Beruin	2	3.61
12	Modho Beruin	3	3.42
13	Kalo Beruin	5	3.00
14	Pakh Beruin	6	2.80

Table 3: Cost and return of 22 FAG rice cultivars for 2002 T. Aman season

Items	Variety							
	Fine and Aromatic							
	Chinisagor	Chinigura-1	Chinigura-2	Kalijira	Begun Bechi	Khachra	Tulshimala	Katarivogh
Paddy Yield (Kg/ha)	2700	1900	2300	2210	1000	1698	2340	2650
Price of paddy (Tk/kg)	13	12.50	12.50	14	11.25	13.75	13.75	12.50
Straw Yield (Kg/ha)	1890	1330	1610	1547	700	1146	1638	1855
Price of straw (Tk/kg)	.40	.40	.40	.40	.40	.40	.40	.40
Gross return (Tk/ha)	35856	24282	29394	31559	11530	23806	32830	33867
Total cost (Tk/ha)								
(i) Full cost basis ^a	24553	22041	22471	22291	21342	21347	23240	22845
(ii) Cash cost basis ^b	7944	5582	5542	5491	5342	5162	5990	6484
Net return (Tk/ha)								
(i) Full cost basis	11303	2241	6923	9268	- 9812	2459	9590	11022
(ii) Cash-cost basis	27912	18728	23852	26068	6188	18644	26840	27383
Benefit-cost ratio								
(i) Full-cost basis	1.46	1.10	1.30	1.41	- 0.54	1.16	1.41	1.48
(ii) Cash-cost basis	4.51	4.35	5.30	5.74	2.19	4.61	5.48	5.22
Net return in terms of gross value of the product (%)								
(i) Full cost basis	31.52	9.22	23.55	29.36	- 85.09	10.32	29.21	32.54
(ii) Cash cost basis	77.84	77.12	81.14	82.60	53.66	78.31	81.75	80.85

Full cost includes human labours, bullock power, seed, fertilizers, insecticides, interest on working capital and land rent

Cash cost includes seeds, fertilizers, insecticides, irrigation and interest of the out flow cash.

** Grain and straw is considered at 1:0.7 for this cost analysis.

* Average paddy yield estimated from both trial and demo. plots.

Table 3: Cost and return of 22 FAG rice cultivars for 2002 T. Aman season (Contd.)

Items	Variety							
	Fine and Aromatic			Fine		Glutinous		
	BRRIdhan34	BRRIdhan37	BRRIdhan38	BRRIdhan39	Parbat jira	Khara Beruin	Lal Beruin	Mou Beruin
Paddy yield (Kg/ha)	328.0	26.90	2680	2590	980	3240	2890	3200
Price of paddy (Tk/kg)	13.75	13.00	13.00	8.75	12.50	12.50	13	11.25
Straw yield (Kg/ha)	2296	1883	1876	1813	686	2268	2023	2240
Price of straw (Tk/kg)	.40	.40	.40	.40	.40	.40	.40	.40
Gross return (Tk/ha)	46018	35723	35590	23388	12524	41407	38379	36896
Total cost (Tk/ha)								
(i) Full cost basis	24740	23355	24307	22590	20940	22814	23309	23645
(ii) Cash cost basis	6895	6540	6648	6239	5392	5991	5676	6341
Net return (Tk/ha)								
(i) Full cost basis	21278	12368	11283	798	- 8416	18593	15070	13251
(ii) Cash cost basis	39123	29183	28942	17149	7132	35416	32703	30555
Benefit cost ratio								
(i) Full cost basis	1.86	1.52	1.46	1.03	- 0.59	1.81	1.64	1.56
(ii) Cash cost basis	6.67	5.46	5.35	3.74	2.32	6.91	6.76	5.81
Net return in terms of gross value of the product (%)								
(i) Full cost basis	46.23	34.62	31.70	3.41	- 67.19	44.90	39.26	35.91
(ii) Cash cost basis	85.02	81.69	81.32	73.32	56.94	85.53	85.21	82.81

Table 3: Cost and return of 22 FAG rice cultivars for 2002 T. Aman season (Contd.)

Items	Variety					
	Glutinous					
	Aikka Beruin	Kalo Beruin	Pakh Beruin	Push Beruin	Kathali Beruin	Modho Beruin
Paddy yield (Kg/ha)	3610	3000	2800	2300	2530	3420
Price of paddy (Tk/kg)	10	11	11	11.25	10.25	10.50
Straw yield (Kg/ha)	2527	2100	1960	1610	1771	2394
Price of straw (Tk/kg)	.40	.40	.40	.40	.40	.40
Gross return (Tk/ha)	37136	33840	31584	26519	26641	36868
Total cost (Tk/ha)						
(i) Full cost basis	21997	23920	22144	22871	22345	23142
(ii) Cash cost basis	5459	5953	6891	5542	5948	6019
Net return (Tk/ha)						
(i) Full cost basis	15139	9920	9440	3648	4296	13726
(ii) Cash cost basis	31677	27887	24693	20977	20693	30849
Benefit cost ratio						
(i) Full cost basis	1.68	1.41	1.42	1.15	1.19	1.59
(ii) Cash cost basis	6.80	5.68	4.58	4.78	4.47	6.12
Net return in terms of gross value of the product (%)						
(i) Full cost basis	40.76	29.31	29.88	13.75	16.12	37.23
(ii) Cash cost basis	84.49	82.40	78.18	79.10	77.67	83.67

Table 4: Comparative effect of cow-dung and chemical fertilizer application on yield and yield components of Tulshimala, Kachra and Chinisagor, fine & aromatic rice cultivars.

Fertilizer	Panicle per hill (Nr)	Filled grain per panicle (Nr)	% Filled grain	1000 grain weight (gm) at 14 % moisture	Growth duration (days)	Plant Height (cm)	Yield (t/ha)
Variety: Tulshimala							
Cowdung	7.35	83	91.21	11	136	152.30	2.64
Inorganic Fertilizer	7.12	89	92.46	11	132	148.10	2.72
Control	5.68	71	81.97	10	134	140.15	1.93
Variety: Khachra							
Cowdung	6.79	84	91.00	12	143	139.20	1.84
Inorganic Fertilizer	6.92	92	82.80	12	141	138.45	1.98
Control	5.15	76	78.00	12	138	125.25	1.42
Variety: Chnisagor							
Cow-dung	7.23	98	89.26	11	134	145.25	2.68
Inorganic Fertilizer	8.24	109	86.50	12	131	142.35	2.97
Control	5.79	79	82.29	11	131	134.10	1.89

Table 5: Assessment of rice aroma of three cultivars (Fine & aromatic) grown with cow-dung, chemical fertilizers and without fertilizer (control) during 2002 T. Aman season.

Variety	Type of Fertilizer (Treatment)	Score: 1-3			Place
		un-cooked Rice (chal)	Cooked rice	Total	
Tulshimala	Cow-dung	27	31	58	1 st
	Inorganic Fertilizer	25	28	53	2 nd
	Control	29	24	53	2 nd
Chinisagor	Cow-dung	26	32	58	2 nd
	Inorganic Fertilizer	28	31	61	1 st
	Control	31	26	57	3 rd
Khachra	Cow-dung	24	30	54	2 nd
	Inorganic Fertilizer	23	29	52	3 rd
	Control	24	33	57	1 st

Information:

Total participants = 13

Score: 1-3, Aroma level: Weak-1, Modest-2 & Strong-3

Table 6: Assessment of 22 FAG rice cultivars during farmer's field days

SI Nr	Variety	Ranking	Farmers Comments
Variety: Fine and Aromatic			
1	BRRRI dhan34	1	It is suitable for Moulvibazar area. Rice grain smaller than local Kalijira. It has drought tolerant capacity.
2	Chinisagor	2	It is comparable with Chinigura-2. But yield will be comparatively higher than Chinigura-2.
3	Tulshimala	3	It is comparable with local Kalijira. But yield is higher than local Kalijira.
4	BRRRI dhan37	4	Rice colour, grain shape & size and aroma alike Katarivough. At the end of the un-husked paddy slightly curve with small awn. It is not drought tolerant. It is difficult for threshing.
5	Chinigura-2	5	It is slightly coarse than Chinigura-1.
6	Chinigura-1	6	Yield will be slightly lower than Chinigura-2
7	Katarivough	7	It is susceptible to diseases. It is not strong and stout. It's lodging occurs easily.
8	BRRRI dhan38	8	The awn of the grain is longer than BRRRI dhan37. Rice and awn colour is golden white. It is very difficult for threshing.
9	Kalijira (Dinajpur)	9	Price of rice is high. It has strong aroma. But yield is low. It is used for polao rice.
10	Begun Bechi	10	It is suitable for Boro season.
11	Khachra	11	Long duration variety. It has strong aroma. Plant is hard and lodging does not occur. It is not suitable for Moulvibazar district.
Variety: Fine			
1	Parbatjira	1	It is suitable for Boro season. Higher yield can achieve in the Boro season.
2	BRRRI dhan 39	2	Acceptability is low among the farmers in the project areas. It is short duration crop. Disease infection and pest infestation are higher than other varieties. Crop damaged by the birds during ripening stage.
Variety: Glutinous			
1	Modho Beruin	1	It has modest aroma. It is very delicious to eat with milk. At the end of the rice there is a black spot.
2	Khara Beruin	2	Stem is strong and stout. Leaf is long and green. Rice is medium coarse and long.
3	Lal Beruin	3	Rice colour is red. Plant lodges easily. Rice grain is small bold.
4	Mou Beruin	4	Stem is soft. Leaf is thick, long and black green. Rice is medium coarse and long.
5	Aikka Beruin	5	It is sown at Aus season and harvest at Aman season. When plant growth is excessive then leaves is cut and used as cattle feed without any yield loss.
6	Kalo Beruin	6	Stem is medium stout. Rice colour is black. Rice is coarse and medium long
7	Pakh Beruin	7	There are two wings like bards at the side of the paddy. So it is called Pakh Beruin. Rice coarse, flat and short.
8	Push Beruin	8	It is close to Lal Beruin. Rice grain is small bold.
9	Kathali Beruin	9	Rice is coarse and long

Table 7 (a): Farmer's assessment on FAG rice cultivars at participatory workshop
(Date: 4 February 2003)

SI Nr	Variety	Scale					Total	Place
		Grain Yield (1-5) *	Growth Duration (1-5)*	Insect/ Disease infestation (1-5)*	Quality of rice (1-5)**	Price and market demand (1-5)*		
Variety: Fine and Aromatic								
1	Chinisagor	4	3	3	5	5	20	2 nd
2	Chinigura 1	3	3	4	5	5	20	2 nd
3	Chinigura 2	2	3	3	4	4	16	5 th
4	Kalijara	2	3	4	5	5	19	3 rd
5	Begun Bechi	1	4	2	2	2	11	9 th
6	Khachra	2	1	3	3	3	12	8 th
7	Tulshimala	3	3	3	5	5	19	3 rd
8	Katarivough	3	3	3	4	4	17	4 th
9	BRRI dhan 34	5	3	4	5	5	22	1 st
10	BRRI dhan 37	3	2	3	3	4	15	6 th
11	BRRI dhan 38	3	3	4	3	4	15	4 th
Variety: Fine								
1	Parbat jira	2	4	2	4	5	17	1 st
2	BRRI dhan 39	3	4	1	2	3	13	2 nd
Variety: Glutinous								
1	Khara Beruin	4	3	4	4	3	18	4 th
2	Lal Beruin	3	3	3	4	4	17	5 th
3	Mou Beruin	4	3	4	4	5	20	2 nd
4	Aikka Beruin	5	2	5	4	3	19	3 rd
5	Kalo Beruin	4	5	3	3	3	18	4 th
6	Pakh Beruin	3	3	4	3	4	17	5 th
7	Push Beruin	3	3	3	3	3	15	6 th
8	Kathali Beruin	3	4	3	2	3	15	6 th
9	Modho Beruin	4	3	4	5	5	21	1 st

* 1-5 = Bad-excellent

** 5-1 = Very minimum-severe

Table 7 (b): Farmer's assessment on FAG rice cultivars at participatory workshop
(Date: 5 February 2003)

SI Nr	Variety	Scale					Total	Place (Overall)
		Grain Yield (1-5) *	Growth Duration (1-5)*	Insect/ Disease infestation (1-5)**	Quality of rice (1-5)*	Price and market demand (1-5)*		
Variety: Fine and Aromatic								
1	Chinisagor	4	4	4	4	5	21	1 st
2	Chinigura 1	2	3	3	5	5	18	4 th
3	Chinigura 2	3	3	3	5	5	19	3 rd
4	Kalijira	2	3	4	5	5	19	3 rd
5	Begun Bechi	1	5	2	2	3	13	8 th
6	Khachra	3	1	3	4	4	15	7 th
7	Tulshimala	4	3	4	5	5	21	2 nd
8	Katarivough	4	3	3	4	4	18	4 th
9	BRRI dhan 34	5	3	5	5	4	22	1 st
10	BRRI dhan 37	3	3	4	3	4	17	5 th
11	BRRI dhan 38	3	3	3	3	4	16	6 th
Variety: Fine								
1	Parbatjira	1	5	2	5	5	18	1 st
2	BRRI dhan 39	2	4	1	3	3	13	2 nd
Variety: Glutinous								
1	Khara Beruin	3	4	4	4	4	19	2 nd
2	Lal Beruin	3	3	4	4	4	18	3 rd
3	Mou Beruin	4	4	3	4	4	19	2 nd
4	Aikka Beruin	5	3	4	4	4	20	1 st
5	Kalo Beruin	3	5	3	3	3	17	4 th
6	Pakh Beruin	3	3	3	4	4	17	4 th
7	Push Beruin	3	3	3	3	3	15	6 th
8	Kathali Beruin	3	3	4	3	3	16	5 th
9	Modho Beruin	4	4	3	4	5	20	1 st

* 1-5 = Bad-excellent

** 5-1 = Very minimum-severe

Table 7 (c): Farmer's assessment on FAG rice cultivars at participatory workshop
(Date: 6 February 2003)

SI Nr	Variety	Scale					Total	Place (Overall)
		Grain Yield (1-5) *	Growth Duration (1-5)*	Insect/ Disease infestation (1-5)**	Quality of rice (1-5)*	Price and market demand (1-5)*		
Variety: Fine and Aromatic								
1	Chinisagor	4	3	3	5	4	19	3 rd
2	Chinigura 1	2	3	3	5	4	17	5 th
3	Chinigura 2	3	3	3	4	5	18	4 th
4	Kalijira	3	3	4	5	5	20	2 nd
5	Begun Bechi	1	5	2	3	3	14	8 th
6	Khachra	3	1	3	4	4	15	7 th
7	Tulshimala	3	3	3	5	5	19	3 rd
8	Katarivough	4	3	3	5	4	19	3 rd
9	BRRI dhan 34	5	3	4	4	5	21	1 st
10	BRRI dhan 37	3	2	4	4	5	18	4 th
11	BRRI dhan 38	3	2	4	4	3	16	6 th
Variety: Fine								
1	Parbatjira	1	4	3	4	5	17	1 st
2	BRRI dhan 39	2	4	2	3	3	14	2 nd
Variety: Glutinous								
1	Khara Beruin	4	4	4	4	4	20	3 rd
2	Lal Beruin	4	3	4	4	4	19	4 th
3	Mou Beruin	4	4	4	4	4	20	3 rd
4	Aikka Beruin	5	3	5	5	5	23	1 st
5	Kalo Beruin	3	5	3	3	4	18	5 th
6	Pakh Beruin	3	4	4	3	3	17	6 th
7	Push Beruin	3	2	3	3	3	14	7 th
8	Kathali Beruin	3	5	3	4	4	19	4 th
9	Modho Beruin	4	3	5	5	5	22	2 nd

*1-5 = Bad-excellent

** 5-1 = Very minimum-severe

Table. 8: Comparison of physicochemical properties of the 10 cultivars of Beruin rice

AC #	Variety	Milling outturn	Head rice (%)	Chalkiness	Appearance	Thousand grain weight (gm)	Moisture content	Length (L) mm	Breadth (B) mm	L/B ratio	Size & shape	Alkali spreading value	Amylose (%)	Protein (%)	Cooking time (min)	ER	IR
1	Lal Beruin	68.00	91.0	Opaque	Good	10.3	13.0	5.3	1.9	2.8	MB	7.0	8.5	7.0	14.0	1.3	3.0
2	Sada Beruin	68.00	73.0	Opaque	Good	14.2	12.2	5.2	2.0	2.6	MB	6.9	10.0	6.5	15.0	1.4	3.7
3	Khara Beruin	68.00	48.0	Opaque	Fair	14.4	12.1	5.5	2.0	2.8	MB	6.9	8.7	8.4	15.5	1.3	4.0
4	Mow Beruin	69.00	49.0	Opaque	Fair	17.8	12.3	5.7	2.1	2.7	MB	7.0	7.9	6.2	15.0	1.3	3.0
5	Aikka Beruin	69.00	70.0	Opaque	Good	17.9	12.7	5.4	2.3	2.3	MB	7.0	9.0	7.0	17.5	1.3	3.7
6	Kalo Beruin	68.00	33.0	Opaque	Good	17.3	12.3	5.3	2.4	2.2	MB	6.4	9.5	6.7	16.5	1.4	3.4
7	Pakh Beruin	68.00	35.0	Opaque	Good	16.3	12.3	5.3	2.2	2.4	MB	6.8	9.0	7.3	16.0	1.4	3.3
8	Push Beruin	69.00	87.0	Opaque	Good	14.3	12.4	4.5	2.2	2.0	MB	7.0	9.0	8.1	15.0	1.6	3.0
9	Kathali Beruin	71.00	90.0	Opaque	Fair	15.6	12.2	5.3	2.0	2.7	MB	7.0	8.7	7.3	15.5	1.4	4.2
10	Hatidat Beruin	69.00	83.0	Opaque	Good	14.1	12.3	5.3	2.1	2.5	MB	6.3	9.3	6.9	14.5	1.4	4.3

L = Long

S = Slender

Tr = Translucent

ER = Elongation Ratio

M = Medium

B = Bold

Wb = White belly

IR = Imbibition Ratio

R = Round

R = Round

Wc = White centre

Annex-I: FAG rice varieties and their seed sources

SI Nr	Variety	Quality of rice	Source
1	Chinisagor	Fine & Aromatic	Jamalpur district
2	Chinigura 1	Fine & Aromatic	Dinajpur district
3	Chinigura 2	Fine & Aromatic	Dinajpur district
4	Kalijira	Fine & Aromatic	Dinajpur district
5	Begun Bechi	Fine & Aromatic	Dinajpur district
6	Khachra	Fine & Aromatic	Borguna district
7	Tulshimala	Fine & Aromatic	Jamalpur district
8	Katarivough	Fine & Aromatic	Dinajpur district
9	BRRI dhan 34	Fine & Aromatic	BRRI, Gazipur district
10	BRRI dhan 37	Fine & Aromatic	BRRI, Gazipur district
11	BRRI dhan 38	Fine & Aromatic	BRRI, Gazipur district
12	Parbatjira	Fine	Nilphamari district
13	BRRI dhan 39	Fine	BRRI, Gazipur district
14	Khara Beruin	Glutinous, Aromatic	Srimangal, Moulvibazar
15	Lal Beruin	Glutinous, medium & short	Srimangal, Moulvibazar
16	Mou Beruin	Glutinous, coarse	Kamalganj, Moulvibazar
17	Aikka Beruin	Glutinous, coarse	Srimangal, Moulvibazar
18	Kalo Beruin	Glutinous, coarse	Srimangal, Moulvibazar
19	Pakh Beruin	Glutinous, short & Flat	Srimangal, Moulvibazar
20	Push Beruin	Glutinous, medium & short	Kamalganj, Moulvibazar
21	Kathali Beruin	Glutinous, coarse	Kamalganj, Moulvibazar
22	Modho Beruin	Glutinous, long, Aromatic.	Srimangal, Moulvibazar

Annex-II: List of demo. farmers in Sadar and Srimangal upazila of Moulvibazar district during 2002 T. Aman season

SI Nr	Farmer's Name	Varieties Name	Village	Union	Upazila
1	Ratan Dev	Lal Beruin, Pak Beruin	Uttar Varaura	Srimangal	Srimangal
2	Mintu Dev	BRRi dhan37, BRRi dhan38	Uttar Varaura	Srimangal	Srimangal
3	Mozam mia	BRRi dhan34, Khara Beruin, Katarivough	Uttar Varaura	Srimangal	Srimangal
4	Gopash Goup	BRRi dhan39, Modhu Beruin	Uttar Varaura	Srimangal	Srimangal
5	Dabendra Dev	Kalo Beruin, Lal Beruin, BRRi dhan34	Esobpur	Srimangal	Srimangal
6	Jodugopal Devnath	Pak Beruin, BRRi dhan37, BRRi dhan38	Esobpur	Srimangal	Srimangal
7	Miladur Rahman Khan	Kalo Beruin, Lal Beruin,	Esobpur	Srimangal	Srimangal
8	Suvash Chandra Dev	BRRi dhan37, BRRi dhan38	Esobpur	Srimangal	Srimangal
9	Napal Dev	Kalo Beruin, Khara Beruin	Esobpur	Srimangal	Srimangal
10	Md. Abdur Rahim	BRRi dhan37, Kalo Beruin, Modhu Beruin	Sirajnagor	Kalapur	Srimangal
11	Md. Arzan mia	BRRi dhan37, BRRi dhan38, Mou Beruin	Sirajnagor	Kalapur	Srimangal
12	Md. Abdul Hannan	BRRi dhan38, BRRi dhan37, Pakh Beruin	Sirajnagor	Kalapur	Srimangal
13	Md. Abu Tahar	BRRi dhan37, BRRi dhan39	Sirajnagor	Kalapur	Srimangal
14	Md. Abdul Kadir	BRRi dhan38, BRRi dhan39	Sirajnagor	Kalapur	Srimangal
15	Md. Joynal mia	BRRi dhan37, BRRi dhan38	Sirajnagor	Kalapur	Srimangal
16	Md. Abdul Hamid	Tulshimala, Chinisagor	Mazdihee	Giasnagor	Srimangal
17	Sazal Kanti Dev	Khara Beruin	Nischintapur	Mirzapur	Srimangal
18	Arabindu Dev	Aikka Beruin	Nischintapur	Mirzapur	Srimangal
19	Ronodhir Dutta	Khara Beruin, Lal Beruin, BRRi dhan34	Nischintapur	Mirzapur	Srimangal
20	Sazal Dhar	Pakh Biroin	Nischintapur	Mirzapur	Srimangal
21	Hemendra Dev	Khara Biroin	Nischintapur	Mirzapur	Srimangal
22	Jotirmoy Dutta	Chinisagor, Tulshimala	Nischintapur	Mirzapur	Srimangal
23	Md. Akkas mia	Mou Beruin, Khara Beruin	Mohammadpur	Giasnagor	Srimangal
24	Md. Sanor mia	BRRi dhan37, BRRi dhan38	Giasnagor	Giasnagor	Moulvibazar Sadar
25	Md. Akhlak mia	Katarivough, Pakh Beruin	Giasnagor	Giasnagor	Moulvibazar Sadar
26	Md. Ishak mia	BRRi dhan34, BRRi dhan37	Giasnagor	Giasnagor	Moulvibazar Sadar
27	Md. Ahad mia	BRRi dhan34, BRRi dhan38	Akbarpur	Giasnagor	Moulvibazar Sadar
28	Md. Imran mia	BRRi dhan37, Modhu Beruin	Akbarpur	Giasnagor	Moulvibazar Sadar
29	Md. Amir mia	Tulshimala, Chinisagor	Akbarpur	Giasnagor	Moulvibazar Sadar
30	Md. Abdul mannaf	Tulshimala	Akbarpur	Giasnagor	Moulvibazar Sadar
31	Md. Shahadur Rahaman	BRRi dhan34	Akbarpur	Giasnagor	Moulvibazar Sadar
32	Md. Mohid mia	Tulshimala	Akbarpur	Giasnagor	Moulvibazar Sadar
33	Rakash Debnath	BRRi dhan37, Lal Beruin, Pakh Beruin	Kadupur	Giasnagor	Moulvibazar Sadar
34	Md. Seddque mia	BRRi dhan38, Katarivough	Kadupur	Giasnagor	Moulvibazar Sadar
35	Md. Rakib mia	Kalo Beruin	Kadupur	Giusnagor	Moulvibazar Sadar
36	Mohonlal Debnath	Mou Beruin	Kadupur	Gisnagor	Moulvibazar Sadar
37	Md. Rashid mia	Katarivough, Mou Beruin	Kadupur	Giasnagor	Moulvibazar Sadar
38	Md. Abdul Hamid	Aikka Beruin	Kadupur	Giasnagor	Moulvibazar Sadar
39	Md. Noshib mia	BRRi dhan34	Kadupur	Giasnagor	Moulvibazar Sadar
40	Md. Shahazahan mia	Mou Beruin	Kadupur	Giasnagor	Moulvibazar Sadar

Annex-III: List of trial farmers in Srimangal upazila of Moulvibazar district during 2002 T. Aman season

SI Nr	Farmer's Name	Varieties name	Village	Union	Upazila
1	Nikash Goup	Chinisagor, Chinigura 1, Chinigura 2, Kalizira, Begun Bechi, Khachra, Tulshimala, Katarivough, BRRI dhan34, BRRI dhan37, BRRI dhan38, Parbatzira, BRRI dhan39, Khara Beruin, Lal Beruin, Mou, Beruin, Aikka Beruin, Kalo Beruin, Pakh Beruin, Push Beruin, Kathali Beruin, Modho Beruin	Uttar Varaura	3, Srimangal	Srimangal
2	Frahim Mia	Chinisagor, Tulshimala, Khachra	Uttar Varaura	3, Srimangal	Srimangal