daily sun

Date:04/07/2023 (P- 07)

JIBAN KRISHNA BISWAS PHD

No Rice Variety Perform Equally for Ever

Scientists of the International Rice Research Institute (IRRI) knew that the supremacy of miracle rice IR8 would not last long. Hence, they were in the process of discovering better breeding lines and extended their assistance to the scientists of the other rice worlds. The scientists of Bangladesh (East Pakistan up to 1971) were no exception and they were in close contact with IRRI. Thus, they were able to recommend their first variety (both for Boro and Aus seasons) of their own, EPRRI 1 (later called BR1 and popularly called Chandina) in 1970. The performance of that variety was satisfactory. But they expected more to satisfy the farmers' demand. Since then they developed ten more varieties by 1980. Out of those varieties, BR2, BR6, BR7, BR8, and BR9 were recommended both for Boro and Aus seasons. The other varieties like BR4, BR5, BR10 and BR11 were recommended only for the transplanted Aman (T. Aman) season. However, scientists recommended the variety BR3 (Biplob) for Aus, Aman and Boro seasons for its better yielding ability almost throughout the year.As the most popular rice variety, BR3 played a significant role in the green revolution just after independence. Early on, it was tolerant to Rice Tungro Virus (RTV), a disease harmful to rice. But within a few years of its cultivation, the variety became quite susceptible to RTV and lost its popularity. BR4, the first T. Aman variety lasted only a few years due to its poor adaptation ability as late-planted Aman rice. Transplanting Aman late is still a reality due to the late receding of flood water in some T. Aman areas. The Aman variety able to adapt to late-planted required a physiological mechanism (photoperiod-sensitive) to flower within the first to the second week of November to avoid the cold shock at its reproductive phase. So, scientists were trying to develop photoperiod-sensitive varieties able to flower by 1st week of November to avoid cold stress. Accordingly, in 1980 they recommended two weakly photoperiod-sensitive (strongly photoperiod-sensitive breeding lines were still then in the pipeline) varieties BR10 and BR11, which were comparatively superior to BR4. The field performance of BR10 was better than that of BR11. But the farmers were reluctant to accept BR10 as the panicles of this variety remain hidden under the erect flag leaves during maturity. In contrast, the flag leaf of BR11 was not erect so the farmers could get happy watching their golden crop before harvest. The shape, size and taste of boiled rice were very much farmers' friendly. That is why BR11 is still popular as a T. Aman crop throughout the country. However, despite its poor acceptability, BR10 was not rejected completely as it showed some tolerance to salinity. So, many of the farmers in the south-western coastal belt still prefer BR10. So, before developing, agro-technology, scientists consider whether the technology would be farmers' friendly or not.

In 1983, BRRI recommended, BR14 (Gazi) both for Boro and Aus season. The rice variety was quite high and got popular in some haor areas. But it could not maintain its popularity due to its large and coarse grain. Even the adaptability of this variety to March-low night temperatures was not satisfactory. BRRI-Habiganj regional station recommended BR17 (Hashi), BR18 (Mangal) and BR19 (Sahajalal) exclusively for the haor area in 1985. The haor-farmers accepted these varieties due to their tall and sturdy plant stature. The growth duration of the latter two varieties was too long (170 days) good for the upper belt of the haor compared to that of BRRI dhan17 (155 days). But the grains of those varieties were coarse. The grain quality and growth duration were the main matter of consideration to the haor farmer. The Mega varieties BRRI dhan28 and BRRI dhan29 were released in 1994. The grain quality and growth duration of these varieties were quite reasonable. Farmers all over the country liked these two varieties very much. They started to replace their existing varieties with these two varieties. So, the haor-farmers did the same too. BRRI recommended some upland Aus varieties for upland ecology. But with few exceptions, they could not perform well. Another context is the farmers were in the progress to transform their upland culture (upland culture) to irrigated rice culture (Boro). In 1988, BRRI developed two strongly photoperiod-sensitive varieties BR22 and BR23. They were the offspring of DA25 (Nizershail) and DA29 (Badsha Bhoge: stock#518), respectively and a perfect fit for the late T. Aman. The farmers of some pocket areas in Cumilla still cultivate BR22 where three rice crops are in practice throughout the year. BR23 is tolerant to salt and waterlogging conditions some farmers in the Satkhira region still prefer BR23 in some pocket areas. There was another T. Aman variety BR25 (Naya Pajam), an offspring of popular Pajam released in 1992. Unfortunately, the variety could not get popularity. Despite the grain shape and size, more or less like Pajam, Naya Pajam could not sustain due to some pests and diseases. As transplanted Aus, BR26 and BRRI dhan27 (a new style of naming a variety after BR26) was released in 1993 and 1994, respectively. BRRI dhan27 was quite popular in some parts of Barishal because of its bold grain (many farmers in the Barishal region still prefer bold grain). But farmers did not accept BR26 due to its stickiness after cooking.

The farmers' trend of accepting BRRI dhan28 and BRRI dhan29 was in the upward trend up to 12 to 14 years and then reached a plateau. These varieties are still popular and occupy most of the Boro land in Bangladesh. But they are now very much susceptible to blast disease. This is quite natural for some particular varieties to become susceptible to certain pests and diseases if they are repeatedly cultivated for several years in the same field. Scientists were aware of that phenomenon. That is why they were in the process to replace the existing poor-performing varieties. Accordingly, they developed BRRI dhan58 in 2012. The grain quality and yield of BRRIdhan58 were the same as BRRI dhan29 but the growth duration is a little less. The variety was quite good but not enough to satisfy the farmers' demand. They were expecting a rice variety with a yield equivalent to BRRIdhan29 and growth duration the same as that of BRRI dhan28. BRRI scientists' present effort is to develop varieties with more yield (More than BRRI dahn29), less growth duration (less than BRRI dhan28) and tolerance to biotic and abiotic stresses.

It is better to say scientists are trying to develop SMART varieties and agronomic management for SMART agriculture. They have already developed some varieties with reasonable growth duration for favorable environments. Similarly, they were trying to replace BR11 to get space for a reasonable rabi crop to increase the cropping intensity. BRRI dhan31 and BRRI dha32 are some varieties developed in that context. Their growth durations are 140 and 130 days, respectively. But farmers' preference was BRRI dhan32 because of its shorter growth duration. But the variety failed to sustain itself. Because the plant cannot hold erect before maturity. The growth duration of the subsequent varieties was far less than BR11 even less than BRRI dhan32. The growth duration of the BRRI dhan33 recommended in 1997 was only 118 days. As a result, the variety was used to mitigate the monga crisis in North Bengal. The other short-duration T. Aman varieties used for the same reason are BU dhan1 (115 days), and BINA dhan7 (115 days). The farmers have increased the cropping intensity by introducing BRRI dhan33 as a relay crop in some jute-growing areas. The growth duration of BRRI dhan62 (the first zinc-enriched variety) is only 100 days for the T. Aman season. The seeding time and seedling age are important for a very short-duration rice variety like this. Otherwise, it might encounter a high-temperature shock during September around its reproductive phase. That is why, despite being a very short-duration rice variety, BRRI dhan62 could not get popularity.

Several varieties like Boro rice BRRI dhan47 and BRRI dhan67 have been developed for saline environments over time. The plant-architecture of BRRI dhan47 is excellent, and scientists are trying to transfer this trait to other varieties, also. The yield, grain size, and growth duration of BRRI dhan67 were more or less similar to those of BRRI dhan28. In addition to those traits, the variety is tolerant to cold. So, appears quite prospective to the haor-farmers. For drought-prone areas, T. Aman varieties like BRRI dhan56, BRRI dhan57, BRRI dhan66, and BRRI dhan71 were developed.Swarna, a widely cultivated Indian rice is quite popular in western Bangladesh. The Farmers started cultivating this variety a few decades ago. This variety is still widespread due to its dark green leaves and grain quality. But its vulnerability to stem-rot disease was a matter of worry to the scientists. Since their popularity, scientists develop two better versions of Swarna and BR11 called Swarna Sub-1 (BRRI dhan51) and BR11 Sub-1 (BRRI dhan52), respectively through a biotechnological approach. They can tolerate submergence for two weeks at the early vegetative stages after transplanting. The tall seedling is a prerequisite to establishing T. Aman rice in the tidal-prone area that may be non-saline or saline. BRRI scientists developed BRRI dhan77 and BRRI dhan78 good for non-saline and saline tidal-prone areas, respectively.

No rice variety can perform equally forever. Every variety is developed to satisfy the demand of the time. So, no matter how popular a variety is, should not stay with the farmer for more than five years. The biotic and abiotic environment is always in change. Even varieties grown from breeder seeds one day lose their power to adapt to changing environments. As I mentioned earlier scientists are ready with their new varieties and relevant agronomic practices. These older technologies should be replaced with the newer ones at regular intervals

We have several varieties in the name of Swarna in the field such as Swarna, Ranajit Swarna, Guti Swarna etc. Even a drought-tolerant variety BRRI dhan56 was available in the market as Ranajit Swarna. So, the scientists had the effort to legalize a few of them through an intensive pure-line selection procedure. The resultant varieties are BRRI dhan93 (pure line from Swarna) and BRRI dhan94 (pure line of Ranajit Swarna). Even, there is Swarna offspring called BRRI dhan95. Now, it is time to select another pure line from a variety of Subal lata (unknown origin) also popular to the farmer.

For rainfed upland culture (an eco-friendly traditional direct seeded Aus rice culture), scientists developed some varieties such as BR20, BR21, BRRI dhan42, BRRI dhan43, BRRI dhan65 and BRRI dhan83. But most of the upland rice land was transformed into lowland (irrigated) rice land those varieties could not show their performance in the field. Anyway, as upland rice, their yield is still not comparable to that of lowland rice. Therefore, scientists had to develop lowland Aus rice (Transplanted Aus rice) like BRRI dhan48, BRRI dhan82, and BRRI dhan85. BRRI dahn82 and BRRI dhan85 mature a little earlier than BRRI dhan48.Considering the community health issue, scientists developed some zinc-enriched varieties. They were BRRI dhan72, BRRI dhan74, BRRI dhan84, and Bangabandhu dhan100 (BRRI dhan100 for Boro season. The zinc-enriched T. Aman varieties are BRRI dhan62, BRRI dhan72 etc. BRRI dhan69, another T. Aman variety is fertilizer-efficient and diabetic patient-friendly (low GI variety). There are some more low GI varieties like BR16, BR25, and BRRI dhan46 developed earlier. BR5 is a pure line selection of Badhshabhog(traditional aromatic rice variety) rich anti-oxidants.

The demand for premium-quality (aromatic/slender Kalijira-type ceremonial rice) rice varieties is increasing day by day. Most of the traditional and BRRI-developed premium-quality rice belongs to the T. Aman season. They premium quality varieties are BRRI dhan5, BRRI dhan34, BRRI dhan37, BRRI dhan38, BRRI dhan70, BRRI dhan80, BRRI dhan90 etc. BRRI dhan34 was a pure line selection from the traditional aromatic variety Khaskani. Except for this variety, the others could not sustain in the field most probably due to their lacking of traditional flavor. But this variety is now very much susceptible to neck blast disease. The premium quality Boro varieties are BRRI dhan50 (Banglamati), BRRI dhan63 (Balam type), BRRI dhan80 (Jasmine type) and BRRI dhan81 (Jira type). A recent addition to this list is BRRI dhan104 (approached to Basmati type). BINA has a recent variety BINA dhan25 (grains look exactly like Basmati type) developed through nuclear technique on BRRI dhan29.

We have already an indication from the recent achievement from rice research and development that the yield ceiling is already broken. Notwithstanding the growth duration like BRRI dahn28, most of the recently innovated rice varieties achieved a yield level of more than BRRI dahn29. For example, the yield of BRRI dhan96, BRRI dhan100, BRRI dhan101, BRRI dhan104, BRRI dah74, and BRRI dhan101 ranged from 7.0 to 7.5 tons per hectare. BRRI dhan101 is resistant to Blast disease. These varieties can easily be substitutes for BRRI dhan28. In contrast, BRRI dhan89, BRRI dhan92 and BRRI dhan102 are potential alternatives to BRRI dhan29 having a yield of more than 8.0 tons per hectare. BRRI dhan89 is in progress towards admiration. Some of the inbred lines having growth duration not more than 135 days with a yielding ability of 9.5 tons per hectare are already in pipeline. Recently BRRI-developed hybrid rice varieties have a potential of more than 10 tons per hectare. BRRI hybrid8, a 133-day-Boro variety can yield around 11 tons per hectare. A 104-day Aus variety can yield up to 7 tons per hectare. BRRI has some inbred breeding lines with a growth duration of 135 days and a yield approaching 10 tons per hectare. So, all these varieties are ready to replace the existing varieties in the field.

No matter how good a variety is, it will not yield enough if not provided with proper agronomic management specific to the rice variety and location. In addition to that, farmers should not cultivate the same rice variety repeatedly on the same land. Even the same variety of paddy should not be planted side by side. The different rice varieties with similar growth duration are a better option for a synchronized system of cultivation for the convenience of mechanization. Farmers should adopt diversification following the appropriate cropping pattern to maintain the soil and crop health. If necessary, they could use environment-friendly pesticides under proper guidance. They should be acquainted with IntegratedPest Management and Integrated Crop Management practices to harvest the maximum potential of any crop. Even after that, any crop can be damaged at any time due to some causes which are yet to be known.

In conclusion, I have to say that no rice variety can perform equally forever. Every variety is developed to satisfy the demand of the time. So, no matter how popular a variety is, should not stay with the farmer for more than five years. The biotic and abiotic environment is always in change. Even varieties grown from breeder seeds one day lose their power to adapt to changing environments. As I mentioned earlier scientists are ready with their new varieties and relevant agronomic practices. These older technologies should be replaced with the newer ones at regular intervals. It is better to have a regulatory body (getting personalities from relevant institutions of like MoA BARC, NARS, DAE etc.) to ascribe this. We should be with science not with passion. Otherwise, it will not be good not only for rice but also for any other crop.

The writer is Director General (Former), Bangladesh Rice Research Institute; Executive Director, Krishi Gobeshona Institute, BARC campus, Dhaka