**Study the Adoption and Adoption gap of BRRI-released Boro rice varieties and the factors that influenced the adoption decision**

**Abstract**

The adoption gap is one of the main concerns of rice scientists, extension officials and policymakers of Bangladesh. A field-level study was conducted in 2018, 2019 and 2020 boro seasons, and data was collected from 371 rice farmers belonging to four boro dominant districts like Cumilla, Mymensing, Tangail and Bogura. By analyzing farm-level survey data this paper attempts to find out the adoption and adoption gap of BRRI-released 10 (ten) prominent Boro rice varieties and factors that affects the adoption and adoption gap of those boro rice varieties. BRRI has developed a few replacements for previous boro varieties, this study revealed that in terms of adoption still, BRRI dhan29 is the dominant boro rice variety followed by BRRI dhan28 and their adoption quotient is about 48.31 and 38.36 percent respectively. On the other hand, a lower adoption quotient or higher adoption gap was found for the variety BRRI dhan67 and BRRI dhan63. Econometric analysis shows that farm-level adoption decision is influenced by a wide range of socioeconomic factors such as Farming experience, profitability, extension contact, farmer’s satisfaction, and knowledge about BRRI-released boro rice varieties. The findings argue for some specific policy interventions and emphasized the importance of redesigning strategies for new variety dissemination considering farm-level factors.

**Keywords:** Adoption, Adoption Gap, BRRI Boro Varieties, Bangladesh

**Introduction**

Among all crops, rice is the driving force of Bangladesh agriculture (Alam, 2012). Rice is the staple food of Bangladesh eaten and grown throughout the year across the country. Rice is grown on about 10.5 million hectares which have remained almost stable over the past three decades. About 75% of the total cropped area and over 82% of the total irrigated area is planted to rice (BRKB, 2021). It accounts for 92% of the total food grain production in the country and provides more than 50% of the agricultural value addition employing about 44% of the total labor force (Rice Vision-2050). The total cultivable area in Bangladesh is about 8.5 Mha and net cultivated area is 7.45 Mha. The present status of the production of rice is 38.70 lakh MT. The total rice production increased from 11.4 million metric tons to 38.70 lakh MT, which is more than tripled (DAE, 2022).

Bangladesh Rice Research Institute (BRRI) is the center of excellence in terms of research and development of high-yielding rice varieties and their production technologies. So far, BRRI has developed and released 108 modern rice varieties (MVs) including 7 hybrids suitable for growing in three distinct seasons such as *Aus, Aman* and *Boro.* Among the 108 MVs 48 are released for Boro season*.* Boro is a major rice growing season alone contributed to **55 percent of total food grain** and was also highest (3.44 MT per hectare) compared to aus rice (1.66 MT per hectare) and aman rice (1.99 MT per hectare) per unit production. (Parvin, 2009). Every year a number of high-yielding varieties are released but very few are cultivated in the farmer’s field. Notably, BRRI Dhan28, and BRRI Dhan29 are still popular among rice growers and traders across the country. The area coverage of other BRRI-released Boro varieties is negligible and many varieties distinct from the farmer’s field.

BRRI is designated to develop modern rice varieties (MVs). After every HYV being released for cultivation, the promotion and dissemination of those HYVs are designated to other departments or agencies of government. The impact pathway of rice HYVs is yet under development even though policy of varietal extension is continuously executed and strengthened. In most cases, the fullest benefits of new BRRI varieties and matured technologies could not be harvested by the end-users. Moreover, all those varieties having the high potentials, inadequate motivation and slow of diffusion are major reasons for lower adoption than traditional or the aged HYVs. Farmers always face the risk for adoption of new varieties in their field for “technical-know-how” such as proper knowledge, scientific guidance as well as market uncertainty. Usually, new varieties are released to replace older varieties which are gradually susceptible to insects and diseases over the years. As but the farmers were familiar with older varieties, they show much reluctant to understand the facts.

A conventional debate sounds that the weaker research-extension-private linkage leads to the low uptake of MV in Bangladesh. The traditional public extension system, and lack a high grid seed market are also major reasons in Bangladesh. The evidence revealed that in 2000, only 12% of farmers got information regarding MVs from public sector extension officials, and a remaining 90% of the seeds planted were used from farmers’ own harvests or exchanged with neighbors. However, a major reason for low adoption of BRRI HYVs is lack of traits superiority over the existing varieties. In more recent, farmers always gives emphasis on traits of new high yield varieties, quality, and field duration to choose among alternatives options of HYVs. .

The overall adoption of modern rice varieties remained relatively slow during the seventies and eighties; the coverage of modern varieties speeded up and increased to about 34%. In the later period (2000 onward), farmers enormously increased the area under MVs cultivation and that was triggered up to 66% in 2005. According to the available statistics, the average coverage of modern rice varieties has reached to 79% during 2010 (Alam 2012).

To implement national food policies, researchers, extension agents, as well as planners need to know the status of area cultivation and yield of existing modern rice varieties. Identifying the most popular rice varieties is particularly important for rice breeders who are trying to develop new varieties with higher yield under unfavorable conditions. It is also important to know the diffusion process of modern varieties, identify the traits for the popularity of some varieties and investigating the reasons for the discontinuation of growing some popular varieties for enhancing rice production for food security.

From above discussion, it is clear that more specific drivers or determinants of adoption as well as area cultivation under BRRI released rice varieties will be strategic pathway to develop suitable varieties and widely disseminate at farmers’ field. For further research and development of high yielding modern rice variety, it is imperative to inquiry which HYVs is most popular and which HYVs is not . What is the seasonal and area based coverage of BRRI released modern rice varieties in Bangladesh? What are the stumbling blocks in disseminating promising rice varieties and their production technologies? This study will, therefore, help to find out the adoption rate of BRRI released varieties in Bangladesh and finding out the reasons of non-adoption, as well as low adoption newly BRRI developed HYVs. Finally suggest ways of advancing adoption and promotional activities of existing and upcoming rice varieties and production technologies.

**Objectives**

1. To determine the adoption gaps of BRRI released Boro rice varieties and to know the way-out of minimizing adoption gap.
2. To determine the profitability of adopting BRRI released Boro rice varieties
3. To determine factors affecting adoption of BRRI released HYV Boro rice varieties.

**Methodology**

The study considered several economic and social variables as well as natural-physical contexts, within which farmers operate, that may influence their adoption decisions and extent of adoption. These include membership of Common Interest Group (CIG), Age, Access to extension services, own cultivable land, rice farming area, extension contact, rice farming income, education level of the farmer, rice farming knowledge, adoption associated attributes of *Boro* rice cultivation and constraints, finally, the agro-ecological contexts about which we will have some more details.

The adoption quotient is a measure of multi-practice adoption behavior. It was developed by Pareck and Chattopadhyay (Dasgupta,1989. Ray 1998). It includes several dimensions such as potential lands for using particular innovations (L), and actual land allotted for those innovations (I). Length of time being used for the innovations, number of practices etc. The measurement contains several methods.

**Calculation Adoption Quotient, Time Score and Area Proportion Score**

Adoption Quotient is a measure of multi-practice adoption behavior (Dasgupta, 1989). It includes area coverage by the adoption innovation, a potential area of adoption of innovation, time, adoption, and awareness period. Calculation of the measurement of the adoption quotient of time score and area score involves the following steps:

**Step 1:** Time proportion score: Time score of adoption is measured by calculating the proportion of time required for awareness since the introduction of the technology and the time required for the adoption of the technology since the introduction. The following formula can be applied:

T =

Where, T= Time Score

T1 = Year of the introduction of technology

T2=Year of awareness of technology

T3=Year of adoption of technology

Step 2: Area proportion score

Where,

I = Land allotted for a particular variety

L= Potential land for a particular variety

Step 3: Calculation of Calculation Adoption Quotient/Adoption percentage

In 3rd step time score of adoption is multiplied by the area score of adoption and expressed in percentage as in the following way:

Adoption Quotient = x x100

Finally, Adoption Gap is calculated excluding Adoption Quotient from 100.

Adoption Gap = {100- ( ) x ( ) x 100}

Result & Discussion

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name of the Variety | Adoption Area (ha)  N=371 | Percent Adoption (%) | Adoption Ranking | Adoption Gap  Ranking Order | Ad. Gap  Category |
| BRRI dhan28 | 90.94 | 38.36 | 2 | 8 | Low |
| BRRI dhan29 | 114.54 | 48.31 | 1 | 9 | Low |
| BRRI dhan50 | 02.16 | 0.91 | 5 | 5 | Moderate |
| BRRI dhan58 | 12.42 | 5.24 | 3 | 7 | Moderate |
| BRRI dhan63 | 0.52 | 0.22 | 9 | 1 | High |
| BRRI dhan67 | 0.00 | 0.00 | 0 | 0 | High |
| BRRI dhan74 | 1.12 | 0.47 | 7 | 3 | High |
| BRRI dhan81 | 1.05 | 0.44 | 8 | 2 | High |
| BRRI dhan88 | 2.00 | 0.84 | 6 | 4 | Moderate |
| BRRI dhan89 | 4.07 | 1.72 | 4 | 6 | Moderate |
| Adoption Area | 228.82 | 96.51 | - | - | - |
| Potential Area | 237.09 | 100 | - | - | - |

|  |  |  |  |
| --- | --- | --- | --- |
|  | Minimum | Mean (SD) | Maximum |
| Age | 24.00 | 50.52 (11.58) | 80.00 |
| Education | 0.0000000 | 6.51 (4.37) | 16.0000000 |
| Area | 0.10526316 | 1.22 (0.72) | 5.61133603 |
| Income | 16.1318182 | 193.14 (120.64) | 903.6000000 |
| Experience | 2.0000000 | 26.59 (13.80) | 199.0000000 |
| Innovativeness | 0.10000000 | 2.16 (1.41) | 6.60000000 |
| Profitability | 1.07303371 | 1.74 (0.23) | 3.17177914 |
| Extension contacts | 0.0000000 | 20.06 (6.58) | 40.0000000 |
| Value chain contacts | 8.0000000 | 18.24 (5.59) | 39.0000000 |
| Training | 0.0000000 | 0.52 (2.46) | 28.0000000 |
| Decision making | 13.0000000 | 29.81 (3.61) | 40.0000000 |
| Farmers satisfaction | 19.0000000 | 33.10 (4.98) | 45.0000000 |
| Farmers knowledge | 14.0000000 | 30.04 (5.67) | 40.0000000 |
| Problem faced farmers | 0.0000000 | 49.46 (22.84) | 89.0000000 |
| Adaptation gap | 0.0000000 | 22.95 (22.10) | 92.8045515 |

The highest mean in variables is recorded in farmers income (193.14), with a standard deviation of 120.64, followed by age (50.52) with a standard deviation of 11.58. In contrast, the lowest mean is evident in the training at 0.52 (SD = 2.46).

|  |  |  |  |
| --- | --- | --- | --- |
|  | Estimate | 95% Confidence interval | P-value |
| Age | 0.23 | -0.06 to 0.53 | 0.121 |
| Education | 0.03 | -0.63 to 0.70 | 0.923 |
| Area | 3.12 | -12.28 to 18.53 | 0.691 |
| Income | -0.04 | -0.13 to 0.06 | 0.447 |
| Experience | -0.02 | -0.25 to 0.21 | 0.841 |
| Innovativeness | 4.37 | 2.11 to 6.64 | <0.001 |
| Profitability | 12.57 | -1.87 to 27.01 | 0.088 |
| Extension contacts | -0.08 | -0.54 to 0.38 | 0.735 |
| Value chain contacts | 0.34 | -0.15 to 0.83 | 0.177 |
| Training | -1.02 | -2.20 to 0.16 | 0.090 |
| Decision making | 2.32 | 1.53 to 3.11 | <0.001 |
| Farmers satisfaction | -0.52 | -1.17 to 0.12 | 0.112 |
| Farmers knowledge | -0.15 | -0.71 to 0.41 | 0.602 |
| Problem faced farmers | 0.12 | -0.02 to 0.27 | 0.098 |

The innovativeness and decision making are significantly positive correlation to adaptation gap of farmers. The coefficient of innovativeness (Estimate: 4.37, 95 percent CI: 2.11-6.64) and decision making (Estimate: 2.32, 95 percent CI: 1.53-3.11).

The Pearson correlation coefficients among adaptation gap with innovations (r = 0.168, p<0.05) and decision making (r = 0.238, p<0.05) suggested a significant but weak positive correlation.

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Adoption and Adoption Gap

Social Characteristics

Regression

Conclusion

References:

Parvin, Lovely & Rahman, Wakilur. (2009). Impact of Irrigation on Food Security in Bangladesh for the Past Three Decades. Journal of Water Resource and Protection. 01. 10.4236/jwarp.2009.13027.