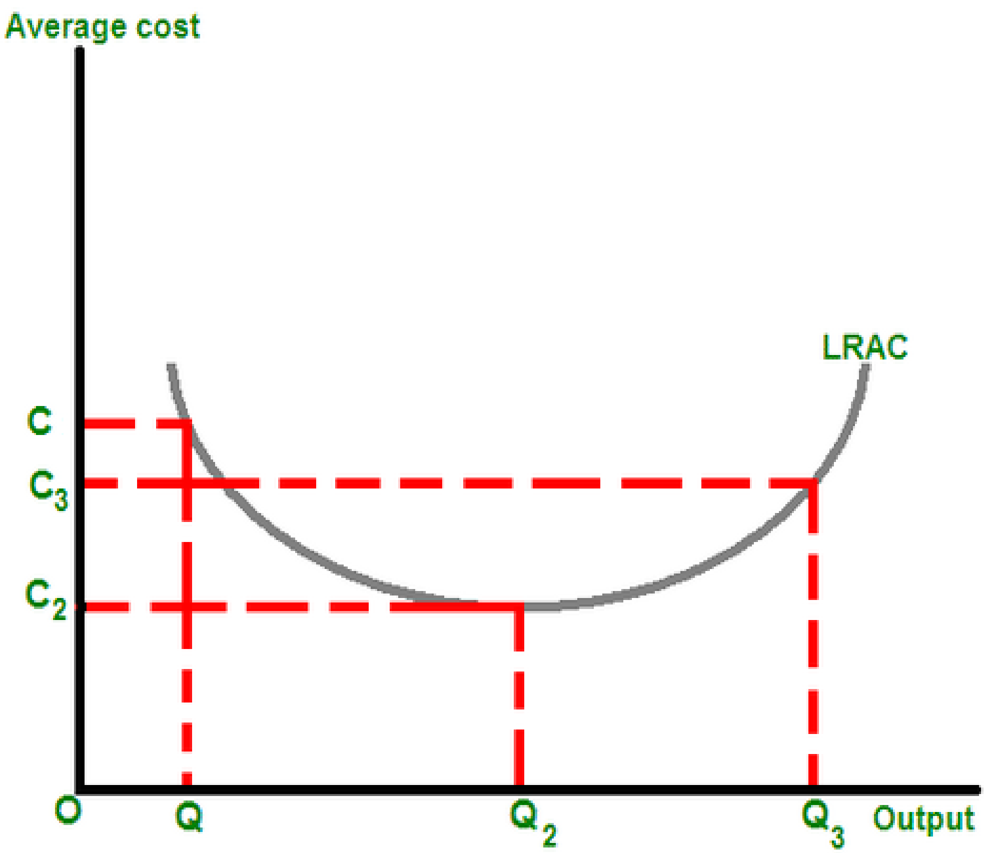
ANNUAL RESEARCH REVIEW WORKSHOP
2024-2025



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SUMMARY

The study assesses socio-economic vulnerability to climate change in saline-prone coastal districts of Bangladesh—Satkhira and Patuakhali—using the Livelihood Vulnerability Index (LVI)-Intergovernmental Panel on Climate Change framework (IPCC). While Satkhira exhibits higher overall exposure and sensitivity to climate-induced hazards, its adaptive capacity benefits from active NGO and government engagement. Patuakhali, though less exposed, suffers from infrastructural deficits and limited livelihood diversification, resulting in higher LVI-IPCC vulnerability. These findings underscore the need for region-specific policy interventions to enhance climate resilience.

The study findings reveal that strategies for reducing rural poverty in Bangladesh through agricultural production must be highly tailored to farm size and are sensitive to temporal shifts in markets, policies, or environmental conditions. Relying on a single crop type or strategy across all farm sizes or time periods is ineffective. The significant volatility, particularly the unique profile of 2015 and the new developments in 2018-19, underscores the need for adaptive policies.

The study findings revealed that it is needed to increase rice yield more than 10% both for T. Aman and Boro rice. Farmers want disease and insect resistance free/less susceptible rice variety, higher market price. Lodging free T. Aman variety is a crying need for all over Bangladesh. While consumers prefer good taste, stays fresh longer time after cooking, require less time for cooking, and good appearance. Millers demand is higher milling outturn, higher head rice recovery as well as higher market price.

Per hectare variable costs were highest for MV Boro rice compared to MV T. Aman and Aus. MV Boro also yielded the highest gross margin (Tk 86,076.5), followed by MV T. Aman (Tk 84,891) and MV Aus (Tk 53,244). However, MV T. Aman achieved the highest full-cost BCR (1.23 vs. Boro's 1.21 and Aus's 1.04). Its significantly higher gross profit ratio (43%) suggests favourable selling prices made T. Aman cultivation the most profitable season.

SOCIO-ECONOMIC VULNERABILITY TO CLIMATE CHANGE IN THE SALINE PRONE COASTAL AREAS OF BANGLADESH

Introduction

The impact of climate change is already being felt by different countries across the world. The socioeconomic vulnerability of households to climate change differs from region to region in Bangladesh. The country frequently experiences extreme climatic hazards, such as floods, droughts, riverbank erosion, salinity intrusion, waterlogging, and cyclonic storm surges in different vulnerable areas. Therefore, this study emphasizes to estimate LVI based on the primary data collected from the vulnerable saline prone coastal areas of Bangladesh.

Objective. The objective of this study is to estimate the households' socio-economic vulnerability in the saline prone coastal areas of the country.

Methodology

A multistage sampling technique was employed for selecting the sample households from the saline and tidal submerge prone Satkhira and Patuakhali districts. A well-structured questionnaire was used to conduct face-to-face interviews among the 200 selected households. The well-known LVI-IPCC approach was used to analyze the collected data for vulnerability assessment.

Results and discussion

The estimated results show that the study areas are highly vulnerable to climate change induced events (LVI: 0.402). Whereas, Satkhira is more vulnerable (LVI: 0.415) than Patuakhali (0.390). Satkhira faced multiple climate related hazards, such as- salinity, water logging, river erosion, cyclone, etc. Availability of drinking water and fresh irrigation water in the dry season are the core socio-economic vulnerable items in Satkhira. The social conflict regarding shrimp culture without considering the living environment is another constraint to multiple crop cultivation and it also causes water logging by restricting the water flow through the canals. On the other hand, Patuakhali is relatively less prone to salinity. The major socio-economic constraints in Patuakhali are under developed infrastructure, low income generating activities, lack of irrigation water in dry season, and cyclone (Fig. 1). Considering the IPCC contributing factors, Satkhira has higher sensitivity and exposure than Patuakhali. The GOs and NGOs are relatively less active in Patuakhali. The vulnerable communities in Satkhira are having multiple adaptation measures against climate change induced hazards. Many NGOs with GOs are working for community development, awareness building, and facility development in Satkhira. Therefore, the adaptive capacity of Patuakhali is less than Satkhira (Fig. 2). The LVI-IPCC index shows that Patuakhali is more vulnerable than Satkhira (Table 1).

Table 1. IPCC contributing factors to the LVI.

IPCC contributing factor	IPCC contributing factor value		
	Patuakhali	Satkhira	Overall
Adaptive capacity	0.333	0.369	0.351
Sensitivity	0.362	0.374	0.368
Exposure	0.587	0.606	0.596
LVI	0.390	0.415	0.402
LVI-IPCC	0.092	0.089	0.090

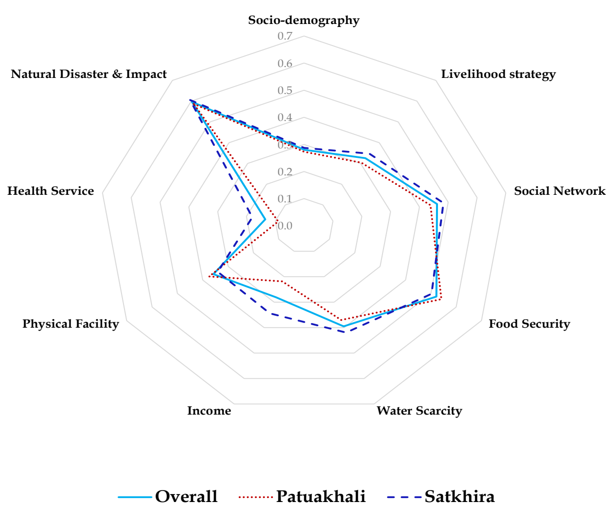

Fig 1. Spider diagram of the major components of the livelihood vulnerability index (LVI) for the households in the selected coastal areas of Bangladesh.

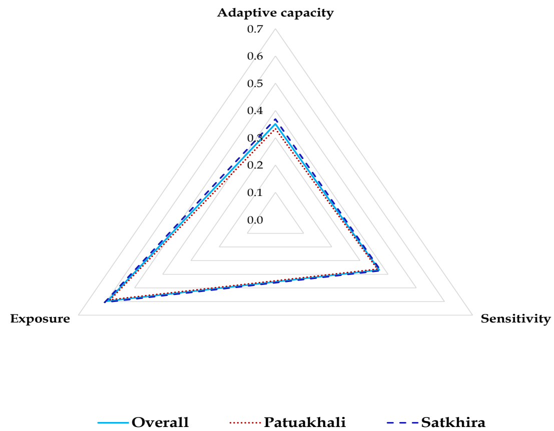

Fig 2. Triangle diagram of the vulnerability of the saline prone coastal areas of Bangladesh based on LVI-IPCC scores.

Conclusion

This study investigated the livelihood vulnerability to flood among the Satkhira and Patuakhali districts of Bangladesh. The LVI values show that Satkhira is more vulnerable than Patuakhali. However, considering the adaptive capacity, LVI-IPCC values show that Patuakhali is more vulnerable than Satkhira. The major vulnerable items in Satkhira are water logging and social conflict. Whereas, Patuakhali is vulnerable to income diversification, infrastructure, and social network. Both the areas are vulnerable to salinity, dry season irrigation facility, and cyclone. The GOs and NGOs involvement in the concerned districts made a difference in the community's adaptation ability. The findings of this study would help to identify the causes of household vulnerability in the study areas and plan for drawing policy options for suitable adaptation to reduce vulnerability.

M C Rahman, M A Islam, M Khanam, M S Islam

IMPACT OF RICE PRODUCTION ON POVERTY REDUCTION IN RURAL BANGLADESH: A PANEL DATA ANALYSIS

Introduction

Rice is the important staple food in Bangladesh. More than three-fourth of the country's total cropped land is devoted to rice production, contributing more than 87.06% to the total cereal supply (Year Book of Agricultural Statistics, 2024). It is estimated that over 48% of the daily calorie intake is derived from rice, with an average per capita consumption of about 120 kg per year (HIES, 2022). In Bangladesh, since independence in 1971, the government has been spending huge amount of money for research and development (R and D) of agricultural technologies (with the management packages) and has also been trying to disseminate those technologies to the farmers for alleviating poverty and raising their incomes. At present, the country has achieved remarkable progress in rice self-sufficiency, but poverty is still a major problem. With this back drop, The present study aims to investigate whether rice production can decrease poverty level in rural farm families like marginal, small, medium and large farmers in Bangladesh.

Methodology

In this study, three-period balanced panel data were used and data were also collected from the International Food Policy Research Institute (IFPRI). IFPRI conducted three periods (2011-12, 2015 and 2018-19) surveys covering 6,500 rural households in each, which were nationally representative sample in Bangladesh. Out of 6,500 rural households, we selected 2,186 rural households in each period to achieve the goal of the study.

Poverty measurement

In the context of measuring poverty in a population the indices in Foster et al. (1984) are commonly used which is expressed as:

1. Head count ratio (HCR), 2. Poverty gap index, 3 Square poverty gap index.

$$P_{\propto} = \frac{1}{N}\sum_{i=1}^{N}\left[\frac{Z-y_i}{Z}\right]^{\propto} (\alpha > 0)\ and\ (y_i < Z)$$

where Z is the agreed-upon poverty line (US$ 2.15/capita/day), N is the total household population, y_i is household income per capita PPP basis for the i^{th} person, and $\propto$ is a poverty aversion (sensitivity) parameter. When $\propto = 1$, it is a measure of the poverty gap. When $\propto = 2$, P equals the squared poverty gap, which is used as a measure of the severity of poverty.

Analytical technique

Panel probit regression model was used.

Results and discussion

The Table 2 presents descriptive statistics across three time periods: 2011-12, 2015, and 2018-19, focusing on household agricultural production, income, and poverty metrics using a $2.15 per capita per day poverty line (PPP adjusted). The significant income growth, especially the surge between 2015 and 2018-19, aligns strongly with the accelerated decline in poverty incidence (HCR) during that period. The mixed trends in agricultural production, particularly the significant and sustained decline in vegetables/fruits, contrast with the robust income growth, suggesting a diversification of income sources beyond crop production (e.g., wages, remittances, non-farm enterprises) and/or favourable price movements. The year 2015 stands out as an anomaly: despite a slight decrease in the poverty headcount (HCR), both the depth (PGI) and severity (SPGI) of poverty worsened significantly, indicating a shock that disproportionately affected the poorest households. The subsequent period (2015 to 2018-19) shows a remarkable recovery, with strong income gains driving improvements across all poverty metrics. The data underscore that focusing solely on the poverty headcount (HCR) can mask important changes in the depth and severity of poverty experienced by those remaining below the line, as evidenced by the 2015 results.

Table 2. Descriptive statistics.

Particulars	2011-12	2015	2018-19
Household rice production (kg)	2062.269	2366.178	2261.469
Household all non-rice crops production (kg)	665.435	722.356	755.516
Household vegetables and fruits production (kg)	394.116	309.063	344.753
Household real annual income (PPP basis $)	3517.138	4082.797	5106.474
Per capita real household income (PPP basis $)	880.651	919.291	1052.587
Poverty category: (Poverty line: 2.15 US $ per capita/day)			
Head count ratio (HCR) (%)	56.8	54.8	46.8
Poverty gap index (PGI) (%)	25.9	27.5	24.3
Square poverty gap index (SPGI) (%)	16.4	18.1	17.0

Source: Own calculation

The Table 3 presents the estimated change in poverty incidence (Head Count Ratio - HCR, measured in percentage points) associated with a unit increase in agricultural production, broken down by farm size (small, medium, large) and crop type (rice, non-Rice crops, vegetables and fruits) for three distinct time periods. Covariates are controlled in all the models.

Table 3. Effect of household food production on poverty of rural Bangladesh.

Particular[a]	2011-12		2015		2018-19	
	HCR	z-value	HCR	z-value	HCR	z- value
Log of household rice production X small farm size dummy	-0.021**	-2.320	-0.005	-0.400	-0.039***	-2.910
Log of household rice production X Medium farm size dummy	-0.064***	-3.740	-0.029	-1.640	-0.054***	-2.760
Log of household rice production X large farm size dummy	-0.158**	-2.440	-0.276***	-2.770	-0.142*	-1.930
Log of household all non-rice crops production X small farm size dummy	-0.005	-0.600	-0.024***	-2.470	-0.009	-0.950
Log of household all non-rice crops production X medium farm size dummy	-0.006	-0.560	-0.051***	-4.260	-0.021*	-1.770
Log of household all non-rice crops production X large farm size dummy	-0.045	-0.710	-0.016	-0.430	-0.009	-0.330
Log of household vegetables and fruits production X small farm size dummy	0.002	0.180	0.011	0.710	-0.016	-1.090
Log of household vegetables and fruits production X medium farm size dummy	-0.002	-0.130	0.001	0.050	-0.033*	-1.750
Log of household vegetables and fruits production X large farm size dummy	0.001	0.010	-0.016	-0.470	-	-
Covariates considered	Yes	-	Yes	-	Yes	-

Source: [a]Base farm size: Marginal farm; Statistical significance is indicated by asterisks (* $p<0.10$, ** $p<0.05$, *** $p<0.01$);

Rice consistently reduces poverty, especially for large farms. Small and medium farms lost significant benefits in 2015 but regained them by 2018-19, with small farms seeing a stronger effect than before. Large farms experienced extreme volatility, with a massive spike in effectiveness in 2015. Non-rice crops emerged as a crucial poverty reduction tool for small and medium farms specifically in 2015. This effect faded by 2018-19, becoming only marginal for medium farms and disappearing for small farms. Large farms never benefited significantly. Vegetables and fruits showed virtually no impact on poverty for any farm size in 2011-12 or 2015. The only significant effect appeared marginally for medium farms in 2018-19, suggesting a potential late shift in their importance for this group.

Conclusion

The findings reveal that strategies for reducing rural poverty in Bangladesh through agricultural production must be highly tailored to farm size and are sensitive to temporal shifts in markets, policies, or environmental conditions. Relying on a single crop type or strategy across all farm sizes or time periods is ineffective. The significant volatility, particularly the unique profile of 2015 and the new developments in 2018-19, underscores the need for adaptive policies. Further research is needed for better understanding.

M A Islam, M C Rahman and M S Islam

PRODUCT PROFILE DEVELOPMENT OF LSTD PROJECT LOCATIONS (TECHNOLOGY VILLAGES)

Introduction

Rice plays a vital role in sustaining food security and generating income for the rural poor in Bangladesh. So far, Bangladesh Rice Research Institute (BRRI) has developed 113 inbred and eight hybrid rice varieties targeting favourable to stress environments (BRRI, 2025). In addition, the Bangladesh Institute of Nuclear Agriculture (BINA) has also developed 24 modern rice varieties (BINA website accessed on 12/06/2025). However, the varietal adoption is slow, a few mega varieties are still covering all three seasons. The popularity of adopting newly released rice varieties is very slow at the farm level. The unavailability of appropriate product concepts and quality traits is the main constraint for the varietal replacement plan, which is not considered in earlier breeding pipelines. An insufficient database of rice consumers, farmers, market preferences and market segments for developing product profiles is also another reason. Therefore, an emergency approach is needed to reformulate BRRI's breeding programmes to generate market and farmer-demanded varieties. The proposed project aims to help BRRI to increase the rate of genetic gain generated and delivered to farmers by 1.5% per year from the current rate, which is likely less than 0.5% annually. Besides, more focused and effective variety development will ensure that breeding pipelines are driven by market demand, targeted towards product development, and properly managed to deliver an increased rate of genetic gain. Market segments and target environments will be precisely characterized to provide the essential information needed to develop various product profiles hat reflect consumers, producers and other value chain actors' preferences, as well as specific stress tolerances and characteristics needed for each breeding pipeline.

Objectives of the study

- To develop product profiles by project locations.

Methodology

Selection of the study location

The study area was selected based on the project objectives. Based on preliminary information, five project locations namely Tangail, district was selected for this study.

Stakeholder types and selection criteria: The sample stakeholders, Rice producer cum Consumers were selected and categorized based on operated land

- Small farmers (50-249 decimals)
- Medium farmers (250-749 decimals)
- Large farmers (750 and above decimals)

The criteria for selecting other respondents are Faria/bepari, Aratdar, Miller, Wholesaler and Retailer in the study locations.

Millers were classified as

- Automatic rice mills
- Semi-automatic rice mills

Wholesaler and retailers

- Wholesaler and wholesaler-cum-retailers in rural and urban areas;
- Retailers who solely purchased rice and retailers who purchased rice with other groceries in rural and urban areas.

Results and Discussion

Product profile development

Table 4 shows that, this profile outlines ambitious targets for developing new rice varieties tailored to each season's specific challenges in Dhanbari upazila under Tangail district. **T. Aman** requires a fundamental shift in grain type and introduction of critical lodging/disease resistance. **Boro** builds on a stronger base but needs significant boosts in tillering, milling quality, and specific disease resistance. Both the seasons demand higher yields, shorter duration, better milling recovery, longer-lasting cooked rice, and new insect resistance, while maintaining preferred cooking quality and grain colour. Current high fertilizer inputs, especially in Boro, are documented but not yet targeted for reduction.

T. Aman Season:

Benchmark variety. Ronjit Pajam

Existing yield. 5,928 kg/ha

Target yield. >10% increase (>6,520 kg/ha)

Key Targets and Challenges:

Grain Quality. Shift from medium bold (MB) to medium slender (MS) grain shape. Maintain non-sticky but soft cooking quality (Amylose) and white colour.

Lodging. Currently no tolerance. Critical target: Develop varieties with lodging tolerance.

Growth duration. Reduce from 150-155 days to 140-145 days (Earlier maturity).

Plant Architecture. Maintain height (90-95 cm), but increase tillering from 10-12/hill to 12-14/hill.

Milling quality. Significantly improve milling outturn (>65% vs 64-65%) and head rice recovery - HRR (>64% vs. 58-60%).

Leftover rice. Improve keeping quality after cooking from 7-8 hours to 9-10 hours.

Disease resistance. Critical Need. Move from susceptibility to resistance against Blast, Sheath Blight, and Sheath Rot.

Insect resistance. Critical Need. Introduce resistance against Stem Borer and Brown Plant Hopper (BPH) where none exists currently.

Game changer traits. Resistance to sheath blight, sheath rot, and BPH is highlighted as transformative.

Current fertilizer use (kg/ha). Urea (226), DAP (58), TSP (58), MoP (83), Gypsum (45), $ZnSO_4$ (8), $MgSO_4$ (6).

Boro Season

Benchmark variety. BRRI dhan29

Existing yield. 6,538 kg/ha

Target yield. >10% increase (>7,191 kg/ha)

Key Targets and Challenges.

Grain quality: Maintain Medium Slender (MS) grain shape, non-sticky but soft cooking quality (Amylose), and white colour.

Lodging. Existing tolerance (Yes) must be maintained.

Growth duration. Reduce from 150-155 days to 140-145 days (Earlier maturity).

Plant architecture. Maintain height (95-100 cm), but significantly increase tillering from 13-14/hill to 15-16/hill.

Milling quality. Improve milling outturn (>66% vs. 65-66%) and Head Rice Recovery - HRR (>65% vs. 61-62%).

Leftover rice. Improve keeping quality after cooking from 8-9 hours to 10-11 hours.

Disease resistance. Critical need. Move from susceptibility to resistance against blast and bacterial leaf blight (BLB).

Insect resistance. Critical need. Introduce resistance against stem borer and brown plant hopper (BPH) where none exists currently.

Game changer traits. Resistance to blast and BLB is highlighted as transformative.

Current fertilizer use (kg/ha). Higher than T. Aman: Urea (268), DAP (92), TSP (83), MoP (108), gypsum (54), $ZnSO_4$ (10), $MgSO_4$ (6).

Table 4. Product profile for project technology village in Dhanbari upazila under Tangail district in T. Aman and Boro seasons.

Target Location: Dhanbari, Tangail		Benchmark variety: Ronjit Pajam		Benchmark variety: BRRI dhan29	
Season		T. Aman		Boro	
Major cropping Pattern:	Boro – Fallow – T. Aman				
Trait	Trait specification	Existing trait	Expected trait	Existing trait	Expected trait
Basic	Average yield (kg/ha)	5928	>10%	6538	>10%
Basic	Grain size and shape	MB	MS	MS	MS
Basic	Amylose	Non-sticky but soft	Non-sticky but soft	Non-sticky but soft	Non-sticky but soft
Basic	Lodging tolerant	None	Yes	Yes	Yes
Basic	Shattering tolerant	Yes	Yes	Yes	Yes
Basic	Grain color	White	White	White	White
Range	Growth duration (day)	150-155	140-145	150-155	140-145
Range	Plant height (cm)	90-95	90-95	95-100	95-100
Range	Tillering (no./hill)	10-12	12-14	13-14	15-16
Range	Milling outrun (%)	64-65	>65	65-66	>66
Range	HRR (%)	58-60	>64	61-62	>65
Range	Leftover rice (hours)	7-8	9-10	8-9	10-11
Future value added	Disease resistance	Susceptible to blast, Sheath	Blast resistance, Sheath Blight and Sheath rot	Susceptible to blast and BLB	Blast resistance and BLB

Target Location: Dhanbari, Tangail		Benchmark variety: Ronjit Pajam		Benchmark variety: BRRI dhan29	
Season		T. Aman		Boro	
Major cropping Pattern:		Boro – Fallow – T. Aman			
Trait	Trait specification	Existing trait	Expected trait	Existing trait	Expected trait
		Blight and Sheath rot			
Future value added	Insect resistance	None	Stem borer and BPH	None	Stem borer and BPH
Game changer	Disease and insect resistance	-	Sheath Blight, Sheath rot, BPH	-	Blast resistance, BLB
Average chemical fertilizers used (kg/ha):					
	Urea	226	-	268	-
	DAP	58	-	92	-
	TSP	58	-	83	-
	MoP	83	-	108	-
	Gypsum	45	-	54	-
	$ZnSO_4$	08		10	
	$MgSO_4$	06		06	

Source: Field survey

Conclusion.

For both rice seasons, it is needing a solid 10% yield jump. But it's not just about quantity. Farmers struggle with diseases and pests wiping out crops, while consumers want rice that cooks perfectly, looks good, and stays fresh longer after cooking. Milling losses also eat into profits. Overcoming disease/insect susceptibility (like blast, sheath rot, BPH) is the biggest game-changer for stable harvests. It also needs T. Aman rice to stand strong against lodging and both seasons' rice to mature 10 days earlier.

Recommendations (Prioritized):

1. **Build tough rice first.** Pour resources into breeding **strong resistance against Stem Borer, BPH, and the major diseases** (sheath blight/rot for Aman; Blast/BLB for Boro). This is foundational – no point in higher yields if pests destroy them.
2. **Speed up and bush out.** Breed varieties that mature 10 days faster (140-145 days) AND produce significantly more tillers per plant **w**ithout getting taller. This means more rice, quicker.
3. **Boost quality and value.** Rigorously select for better grain shape (especially shifting Aman to medium slender), improved milling yields, and rice that stays palatable

for 2+ extra hours after cooking. This meets market demands and reduces waste.

4. **Fortify and fertilize smart.** Ensure Aman rice stands up to weather (lodging tolerance)**.** Review the higher Boro fertilizer use – can we maintain yields smarter, perhaps more efficient, nutrient management alongside these new tough varieties?

M A Islam, M Salman, M S Islam

ESTIMATION OF COSTS AND RETURN OF MV RICE CULTIVATION AT THE FARM LEVEL

Introduction

Economic decisions are primarily concerned with determining the most profitable level of input use in the production process. The viability of a technology is largely dependent on its cost and returns. Therefore, it is essential to understand the cost and return of rice cultivation where farmers use different types of technologies. Through cost and return analysis, researchers and planners can develop technologies that increase farmers' returns while reducing costs. This study has been undertaken to assess the profitability of rice cultivation in Bangladesh with the following specific objectives:

- To determine the level of inputs used in modern rice production in different seasons.
- To estimate the cost of MV rice cultivation at the farm level across different seasons.
- To evaluate the profitability of MV Aus, MV T. Aman, and MV Boro rice cultivation at the farm level.

Methodology

A multistage random sampling technique was adopted to select farmers from all 14 agricultural regions of Bangladesh. Data on input use patterns, prices of inputs and outputs, and yields were collected from 120, 200, and 200 farmers for the Aus, T. Aman, and Boro seasons respectively. This resulted in 520 rice-growing farmers being surveyed. Data were collected through face-to-face interviews using structured questionnaire. Descriptive statistical techniques were primarily used for data analysis, and the results were presented using tabular formats.

Results and Discussion

Input Use Patterns. Farmers primarily hired contractual labor for three major labour-intensive intercultural operations: transplanting, harvesting, and carrying. They also hired labour on a daily wage basis for other operations such as land preparation, weeding, and post-harvest processing. Most farmers used power threshers on a custom-hired basis for threshing rice.

The analysis of input use patterns for MV rice cultivation across different seasons—Aus, T. Aman, and Boro—highlights significant variations in labor use, seed rates, and fertilizer application. The highest use of human labour was recorded in MV Boro rice cultivation, where 110 man-days per hectare were employed, followed by MV Aus (108 man-days/ha) and MV T. Aman (104 man-days/ha). Labour was divided into hired, family, and contractual labor, with MV Aus showing the highest reliance on hired contract labour for transplanting, weeding, and harvesting operations (59 man-days/ha).

Seed use across all seasons exceeded BRRI recommendations, with farmers using 38 kg/ha for Aus, 42 kg/ha for T. Aman, and 35 kg/ha for Boro, against the recommended rate of 25–30 kg/ha. Fertilizer usage was also generally higher than recommended levels. For instance, the use of urea during Aus season was 155 kg/ha compared to the recommended 125 kg/ha. Similarly, the application of TSP, MoP, and DAP fertilizers was notably higher in all seasons except Boro, reflecting the farmers' tendency to over-use of fertilizer (Table 5)**.**

Table 5. Per hectare input used for MV rice cultivation in different seasons of Bangladesh, 2024-25.

Input Item	Season		
	T. Aman	Aus	Boro
Human labour (man-day/ha):	104	108	110
Hired	36	34	40
Family	14	15	15
Hired contract (transplanting, weeding and harvesting)	54	59	55
Seed (kg/ha):	42	38	35
Fertilizer (kg/ha):			
Urea	150	155	219
TSP	70	66	85
MoP	100	88	105
DAP	95	83	67
Gypsum	33	34	41
ZnSo4	4	5	6
MgSo4	2	1	3

Source: Field survey 2024-25

Cultivation Costs

The per-hectare costs for human labour were highest for MV Boro cultivation at Tk 71,500 followed by MV Aus at Tk 64,800 and MV T. Aman at Tk 64,480. Fertilizer costs were also highest for Boro cultivation at Tk 15,509/ha, followed by T. Aman (Tk 14,941/ha) and Aus (Tk 13,025/ha). The increase in fertilizer costs can be attributed to rising fertilizer prices.

Irrigation costs were significantly higher for MV Boro cultivation at Tk 17,114 /ha, primarily due to the heavy reliance on irrigation during the dry season. In contrast, MV T. Aman and MV Aus required much lower irrigation costs (supplementary irrigation), at Tk 6,309 /ha and Tk 6,091 /ha respectively. This increase in irrigation costs, especially during the Boro season was due to a lack of rainfall and higher fuel prices. per hectare were highest for Boro at Tk 1,29,131 followed by T. Aman (Tk 1,10,770) and Aus (Tk 1,09,201) (Table 6).

Table 6: Per hectare cost of MV rice cultivation in different seasons in Bangladesh, 2024-25

Input-wise cost	Season (Tk./ha)		
	T. Aman	Aus	Boro
Seed	3150	2680	3850
Seedling development	3257	3715	4526
Land preparation (ploughing and laddering)	11526	14360	12388

Human labour:	64480	64800	71500
Hired	22320	20400	26000
Family	8680	9000	9750
Hired contract (transplanting, weeding, and harvesting)	33480	35400	35750
Fertilizer cost	14941	13025	15509
Irrigation	6309	6091	17114
Pesticide:	5024	4437	4705
Herbicide	1353	1239	1145
Insecticide and fungicide	3671	3198	3560
Power thresher	5739	4656	4584
Total variable cost	110770	109201	129131
Interest on operating capital	2769.25	2730.025	3228.275
Land rent	35466	35000	36850
Total fixed cost	46915.25	46730.025	49828.275
Total cost	157685.25	155931.025	178959.28

Source: Field survey 2024-25

Profitability

Per hectare yield of Boro paddy was the highest at 6,421 kg, followed by T. Aman season at 5,389 kg and Aus season at 5,188 kg. The favourable climate, low pest and disease infestation, and availability of irrigation contributed to the higher yields during the Boro season.

The gross margin per hectare for T. Aman season rice cultivation was (Tk 89,067) followed by Boro Tk 84,480 and Aus (Tk 59,251). The benefit-cost ratio (BCR) based on full-cost calculation was highest in T. Aman (1.27) followed by Boro (1.19) and Aus (1.08) reflecting the profitability of rice cultivation in all three seasons.

Moreover, gross profit ratios were 45%, 35%, and 40% for, T. Aman, Aus and Boro seasons, respectively, indicating that farmers earned substantial profits, especially during the T. Aman season. The cost of production per kilogram of rice was similar across the seasons at Tk 27.87/kg for Boro, Tk 30.06/kg for Aus, and Tk 29.26/kg for T. Aman, while the selling price of grain was Tk 31/kg for Boro, Tk 33/kg for T. Aman, and Tk 29/kg for Aus (Table 7).

Table 7. Per hectare profitability of MV rice cultivation in different seasons in Bangladesh, 2024-25.

	Item	Season		
		T. Aman	Aus	Boro
1	Total costs (Tk/ha) (2+3)	157685.25	155931.03	178959.28
2	Total variable costs (Tk/ha)	110770	109201	129131
3	Total fixed cost (Tk/ha)	46915.25	46730.025	49828.275
4	Yield (kg/ha)	5389	5188	6421
5	Market value of paddy (Tk/ha) (4*11)	177837	150452	199051
6	Market value of straw (Tk/ha)	22000	18000	14560
7	Gross benefit (GB) (Tk/ha) (5+6)	199837	168452	213611
8	Gross margin (GM) (Tk/ha (7-2)	89067	59251	84480

9	Gross profit ratio ((GM*100)/GB)	44.57	35.17	39.55
10	Net return (Tk/ha) (7-1)	42152	12521	34652
11	Cost of production (Tk/kg)	29.26	30.06	27.87
12	Selling price of grain (Tk/kg)	33	29	31
13	BCR (full cost basis) (7/1)	1.27	1.08	1.19
14	BCR (cash cost basis) (7/2)	1.80	1.54	1.65

Source: Field survey 2024-25

Conclusion

Per hectare total variable costs for MV Boro rice were higher than those for MV T. Aman and MV Aus rice. The gross margin per hectare was highest for MV T. Aman rice (Tk 89,067), followed by MV Boro (Tk 84,480) and MV Aus (Tk 59,251). The BCR on a full-cost basis was highest for MV T. Aman (1.27), followed by MV Boro (1.19) and MV Aus (1.08). The higher gross profit ratio during the T. Aman season (45%) indicates that farmers were able to sell their produce at favourable prices, making rice cultivation more profitable in that season.

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