Bangladesh J. Environ. Sci., Vol. 46, 128-133, 2024 @ BAED ISSN 1561-9206

AN ECONOMIC INVESTIGATION OF RICE SEED PRODUCTION STATUS AT MADHUPUR UPAZILA OF TANGAIL DISTRICT IN BANGLADESH

S. M. M. H. Noman[1, 2]*, I. J. Nishu[3], M. I. Omar[1], L. Deb[1,4] and M. S. Islam[1]
[1]Agricultural Economics Division, Bangladesh Rice Research Institute, Bangladesh
[2]School of Agriculture and Environment, The University of Western Australia, Perth, Australia
[3]Department of Agricultural Economics, Bangladesh Agricultural University, Bangladesh
[4]School of Economics and Public Policy, The University of Adelaide, Australia

ABSTRACT

This study investigates the economics of transplanted Aman rice seed production by comparing contract (30 farmers) and non-contract growers (30 farmers) in Madhupur upazila of Tangail district. The study reveals that contract growers incur higher total costs (BDT 143,687/ha) due to greater spending on labor (BDT 82,057/ha), fertilizer (BDT 10,648/ha), and irrigation (BDT 6,206/ha) than the non-contract growers (BDT 137,623). However, they benefit from higher yields (5,121 kg/ha), better market prices (207,408 Tk/ha for paddy), and greater profitability, achieving a higher Benefit-Cost Ratio (BCR) of 2.15 compared to 1.64 for non-contract growers. Rice seed producers face constraints, including labor shortages (cited by 48% of respondents), high wage rates (35%), pest infestations (41%), and post-harvest challenges (10%). The findings highlight the economic advantages of contract farming while emphasizing the need to address production challenges to improve profitability for all farmers.

Key words: Seed, profitability, contract grower, rice, Bangladesh

Introduction

Bangladesh's agriculture is heavily reliant on rice, which accounts for 4.5% of GDP (BBS, 2020)and occupies about 79.4% of the country's cultivable land. Rice-based cropping patterns are widespread, and nearly 90% of the population relies on rice as a staple food Rice farming contributes half of the agricultural GDP, one-sixth of rural household income, and half of rural employment. It also provides two-thirds of the daily caloric and protein intake for the population, with 75% of agricultural land and 80% of irrigated areas dedicated to rice (BBS, 2022). Boosting food security in Bangladesh depends on improving rice yields, which can be achieved using high-quality seeds. Utilizing high-quality seeds can significantly enhance the productivity of nearly all crops. This approach is essential for boosting overall agricultural efficiency and supporting food security on a broader scale (Hoque and Haque, 2014).Superior seeds can increase crop yields by 15-25%, and with optimized management of inputs like fertilizers and irrigation, yields can rise by up to 45% (Thomson, 1979). High-quality seeds reduce the need for planting material, resist diseases better, and enhance the efficiency of other agricultural inputs, contributing to more sustainable farming (Gauchan *et al*., 2016). Rice seed production is a key factor in improving agricultural productivity, particularly in Bangladesh's three cropping seasons-Boro, Aus, and Aman-which account for 77% of the total cropped area (Huq *et al*., 2019). The rice production from these seasons is distributed as follows: Aus contributes around 8 percent, Aman 39 percent, and Boro 53 percent of the total rice production (BBS, 2020).Although both Boro and Aman rice play crucial roles in the value chain, Aman rice holds particular significance (Rahaman *et al*., 2020). Aman rice is especially important, as its straw serves as fuel and cattle feed for rural households (M. J. Kabir *et al*., 2019).However, with Bangladesh’s population projected to reach 215 million by 2050, an additional 10.8 million tons of rice will be needed to meet demand (Hussain, 2011). Meeting this rising need with shrinking land and limited resources presents a significant challenge (Rahaman *et al*., 2018).This challenge can be addressed by increasing rice's genetic potential, developing location-specific technologies, and closing yield gaps (Kabir *et al*., 2015). The seed industry in Bangladesh is pivotal in ensuring the availability of quality seeds, which are essential for maintaining high productivity. Key public sector entities such as BADC, BRRI, DAE, and BINA collaborate to produce, distribute, and

promote the use of high-quality seeds. However, many farmers, burdened by the high cost of purchased seeds, rely on lower-quality self-retained seeds. To ensure sustained agricultural growth, a strategic focus on making high-quality seeds more accessible is essential (Mula *et al*., 2019). Contract growers play a vital role in supplying seeds to farmers through BADC, while non-contract growers distribute seeds locally through dealers and private companies. Understanding the seed production system, particularly the economic and agronomic differences between rice production and seed production, is crucial for improving seed availability and addressing the challenges faced by growers. This study aimed to assess the economics of Truthfully Labelled Seed (TLS) production for Aman rice by both contract and non-contract farmers and to document the constraints faced in this process.

Materials and Methods

The study was conducted in Madhupur Upazila of Tangail district. This Upazila was purposively selected for study as it is one of the largest contracts seed growing zones of Bangladesh Agricultural Development Corporation (BADC). Sixty (60) seed producing farmers were randomly interviewed of which 30 were contract growers and the rest 30 were independent seed producing farmers. T. Aman seasons was considered as it was the prime rice growing seasons of the country.

Cost and return analysis: The following profit equation was employed to assess the profitability of aromatic rice production.

Net margin/return of producer.

$\Pi = TR - TC$

Where,

$\prod$= Net return (Tk/ha)

TR= Total return (Tk/ha)

TC= Total costs (Tk/ha)

$$\Pi = \sum Q_y \cdot P_y + \sum Q_b \cdot P_b - \sum_{i=1}^{n} (X_i \cdot P_{xi}) - TFC$$

Where, $\prod$= Net returns (Tk/ha);

Q_y = Total quantity of (paddy) output (kg/ha);

P_y = Per unit price of (paddy) output (Tk/kg);

Q_b = Total quantity of the concerned byproduct (kg/ha);

P_b = Per unit price of the relevant byproduct (Tk/kg);

X_i = Quantity of the concerned i^{th} input;

P_{xi} = Per unit price of the relevant i^{th} input;

TFC = Total fixed cost involved in production process;

$i = 1,2,3,...,n$ (Number of inputs)

Data collection and analysis: The farmers were interviewed personally using a structured questionnaire to gather the necessary information. The study utilized both qualitative and quantitative analyses. After data collection, the information from the interview schedules was thoroughly edited, checked, and cross-checked. The data were then compiled, coded, and entered a computer for analysis using Microsoft Excel and the Statistical Package for the Social Sciences (SPSS). Qualitative data were converted into quantitative form where needed. Statistical methods such as means, percentages, standard deviations, and frequencies were used to describe the selected characteristics of the respondents. Economic analyses, including the calculation of the Benefit-Cost Ratio (BCR), gross margin, and marginal benefit-cost ratio, were performed to assess the profitability of rice seed production. Additionally, descriptive analysis was used to analyze the demographic profile of the respondents in the study area.

Results and Discussion

Input-wise per hectare cost in Aman season

Table 1 provides a comparison of input-wise costs for Aman rice cultivation between contract growers and non-contract growers, measured in BDT (Bangladeshi Taka) per hectare. Contract growers spend slightly less on seeds (BDT 1,669/ha) compared to non-contract growers (BDT 1,761/ha). Contract growers also spend less on seedling development (BDT 477/ha) compared to non-contract growers (BDT 543/ha). The cost of land preparation is nearly the same for both groups, with contract growers spending BDT 10,660/ha and non-contract growers spending BDT 10,456/ha. Contract growers have a higher total labor cost (BDT 82,057/ha) compared to non-contract growers (BDT 78,441/ha). Specifically, contract growers spend more on hired labor (BDT 40,109/ha) than non-contract growers (BDT 34,805/ha). Non-contract growers, however, have a slightly higher family labor contribution (BDT 14,820/ha) compared to contract growers (BDT 12,607/ha).Contract growers spend more on fertilizer (BDT 10,648/ha) compared to non-contract growers (BDT 9,473/ha). Contract growers have higher irrigation costs (BDT 6,206/ha) compared to non-contract growers (BDT 5,269/ha). Contract growers also spend more on pesticides (BDT 5,142/ha) than non-contract growers (BDT 4,652/ha), with specific differences in herbicide and insecticide/fungicide costs. Non-contract growers spend more on power thresher services (BDT 5,599/ha) compared to contract growers (BDT 5,331/ha)**.** Contract growers face a higher total variable cost (BDT 109,583/ha) than non-contract growers (BDT 101,375/ha)**.** Non-contract growers have slightly higher fixed costs (BDT 36,248/ha) compared to contract growers (BDT 34,104/ha). Land rent remains constant for both groups (BDT 20,583/ha)**.** Overall, contract growers incur a higher total cost of cultivation (BDT 143,687/ha) than non-contract growers (BDT 137,623/ha), primarily due to higher labor, fertilizer, irrigation, and pesticide costs. Contract growers face higher total cultivation costs but spend more on key inputs such as labor, fertilizer, and irrigation, while non-contract growers save marginally on these expenses.

Table 1. Input-wise per hectare cost in Aman season

Input-wise cost (BDT/ha)	Aman Season	
	Contract growers	Non-contract growers
Seed	1669	1761
Seedling development	477	543
Land preparation	10660	10456
Human labor:	82057	78441
Hired	29341	28817
Family	12607	14820
Hired contract	40109	34805
Fertilizer cost	10648	9473
Irrigation	6206	5269
Pesticide:	5142	4652
Herbicide	871	689
Insecticide and fungicide	4271	3963
Power thresher	5331	5599
Total variable cost	109583	101375
Interest on operating capital	913	845
Land rent	20583	20583
Total fixed cost	34104	36248
Total cost	143687	137623

Source: Field Survey, 2021

Per-hectare Profitability of Aman rice seed production

Table 2 compares the economic performance of Aman rice cultivation between contract and non-contract growers in terms of costs, yields, market value, and profitability. Contract growers face a higher total cost per hectare (BDT 143,687) compared to non-contract growers (BDT 137,623).The total cost includes both variable costs (like labor, fertilizer, and irrigation) and fixed costs (like land rent and interest on operating capital).Contract growers produce slightly more rice per hectare (5,121 kg/ha) compared to non-contract growers (5,072 kg/ha).Contract growers receive a significantly higher market value for their paddy (BDT 207,408/ha) compared to non-contract growers (BDT 142,009/ha). This may be due to better pricing or quality of the paddy grown by contract growers. Contract growers also receive a higher market value for straw (BDT 28,416/ha) compared to non-contract growers (BDT 24,700/ha).

Table 2. Profitability analysis of rice seed production

Items	Aman Season	
	Contract growers	Non-contract growers
Total costs (BDT/ha)	143687	137623
Total variable costs (BDT/ha)	109583	101375
Total fixed cost (BDT/ha)	34104	36248
Yield (kg/ha)	5121	5072
Market value of paddy (BDT/ha)	207408	142009
Market value of straw (BDT/ha)	28416	24700
Gross benefit (GB) (BDT/ha)	235824	166709
Gross margin (GM) (BDT/ha)	126241	65334
Gross profit ratio(GM*100)/GB	53.53	39.19
Net return (BDT/ha)	92137	29086
Unit price of grain (BDT/kg)	40.5	28
Cost of production(BDT/kg)	28.05	27.13
BCR (cash cost basis)	2.15	1.64
BCR (full cost basis)	1.64	1.21

Source: Field Survey, 2021

Contract growers earn a higher gross benefit (BDT 235,824/ha) compared to non-contract growers (BDT 166,709/ha). Gross benefit includes the total revenue from both paddy and straw sales. Contract growers have a significantly higher gross margin (BDT 126,241/ha) compared to non-contract growers (BDT 65,334/ha). Gross margin is the difference between total revenue and total variable costs, showing that contract growers benefit more from their paddy. The gross profit ratio is higher for contract growers (53.53%) compared to non-contract growers (39.19%), indicating that a larger proportion of contract growers' revenue is converted into profit. Contract growers achieve a much higher net return (BDT 92,137/ha) compared to non-contract growers (BDT 29,086/ha), demonstrating significantly better profitability after accounting for all costs. Contract growers receive a higher price per kg of grain (BDT 40.5/kg) compared to non-contract growers (BDT 28/kg), possibly due to better quality or market access. Contract growers have a slightly higher production cost per kg of rice (BDT 28.05/kg) compared to non-contract growers (BDT 27.13/kg). Contract growers have a higher BCR on a cash cost basis (2.15) compared to non-contract growers (1.64), meaning contract growers earn BDT 2.15 for every 1 BDT spent on cash costs, while non-contract growers earn BDT 1.64.On a full cost basis (which includes fixed costs), contract growers still have a higher BCR (1.64) compared to non-contract growers (1.21), indicating that contract farming is more cost-effective overall. Contract growers enjoy higher yields, better market prices, and significantly higher profitability across all metrics. Despite slightly higher costs of production, they are compensated by receiving better prices and achieving higher gross margins, net returns, and benefit-cost

ratios. Non-contract growers, while having lower total costs, earn significantly less profit due to lower market prices and gross benefits. Their profitability is notably lower, as reflected in their lower gross margin, net return, and BCR values.

Constraints of rice seed production

Table 3 illustrates the key challenges faced by rice seed producers, with labor-related issues emerging as the most pressing concern. Nearly half (48%) of respondents reported difficulties in sourcing labor, while 35% cited high wage rates as a significant burden. Additionally, 41% of farmers grappled with severe disease and insect infestations, and 18% were affected by adverse weather events such as hailstorms and heavy rainfall. Post-harvest expenses, including drying and grading, troubled 10% of farmers, while 8% struggled with elevated irrigation costs. Furthermore, 5% identified the high price of insecticides as a notable obstacle. These findings highlight the multifaceted challenges confronting rice seed production.

Table 3. Constraints of rice seed production

Constraints	% of respondents
Unavailability of labor	48
High disease and insect infestation	41
High wage rate of labor	35
Hailstorm and heavy rainfall	18
Drying and grading cost high	10
High irrigation cost	8
High price of insecticides	5

Source: Field Survey, 2021

Conclusion

This study analyzes the profitability and challenges of contract vs. non-contract farmers in Aman rice production in Madhupur Upazila, Tangail. Contract growers achieve higher yields, better market prices for paddy and straw, and greater profitability, despite higher input costs for labor, fertilizer, and irrigation. Their access to improved practices and inputs through BADC leads to better economic returns. In contrast, non-contract farmers face lower prices and reduced profits. Both groups, however, share common challenges, such as labor shortages and high costs for disease control and irrigation. Addressing these issues is crucial for enhancing rice production efficiency and profitability, with contract farming showing clear financial advantages.

References

BBS (Bangladesh Bureau of Statistics). (2020). *Yearbook of Agricultural Statistics*. Bangladesh Bureau of statistics. (2020). *Yearbook of Agricultural Statistics-2019*.

BBS (Bangladesh Bureau of Statistics). (2022). *Statistical yearbook Bangladesh 2021*. Gauchan, D., Babu, D., Magar, T. and Gautam, S. 2016. Rice seed production and marketing practices in Nepal. In *The Journal of Agriculture and Environment* (Vol. 17).

Hoque, M. and Haque, M. (2014). Socio-economic Factors Influencing Profitability of Rice Seed Production in Selected Areas of Bangladesh. *The Agriculturists*, *12*(1), 33–40. https://doi.org/10.3329/agric.v12i1.19578

Huq, S., Taub, J., Wright, H., Fenton, A., Stott, C., & Chow, J. (2019). Confronting climate change in Bangladesh. *Policy Strateg Adapt Resil*.

Hussain, S. G. (2011). Assessing impacts of climate change on cereal production and food security in Bangladesh. *Climate Change and Food Security in South Asia*, 459–476.

Kabir, M. J., Islam, M. A., Rahman, M. C., Rahaman, M. S., Kabir, M. S., & Siddique, M. A. B. (2019). Diffusion of wet season (T. Aman) rice cultivars under changed environment in northwest Bangladesh. *Bangladesh Rice J*, *23*(1), 81–106.

Kabir, M. S., Salam, M. U., Chowdhury, A., Rahman, N. M. F., Iftekharuddaula, K. M., Rahman, M. S., Rashid, M. H., Dipti, S. S., Islam, A., & Latif, M. A. (2015). Rice vision for Bangladesh: 2050 and beyond. *Bangladesh Rice Journal*, *19*(2), 1-18.

Mula, G., Layek, N., & Roy, B. (2019). Economics of Rice Seed Production and Marketing – A Study in Terai Zone of West Bengal, India. *International Journal of Current Microbiology and Applied Sciences*, *8*(12), 439–453. https://doi.org/10.20546/ijcmas.2019.812.059

Nishu, I. J., Rahman, M. S., Mehedy, S. M., & Noman, H. (2022). Transformation of Rice Farming to Commercial Farming in Mymensingh: An Empirical Evidence Based on Farmer's Livelihood Patterns. *Bangladesh Economic Association*, *38*(2), 25–52. https://doi.org/10.56138/bjpe.dec2202

Panya, M., & Tippawan, L. (2016). Factors Affecting Rice Seed Production of Farmers. *Journal of Agricultural Technology*, *12*(1), 1499-1508.

Rahaman, M. S., Kabir, M. J., Rahman, M. C., Sarkar, M. A. R., Islam, M. A., Salam, M. A., Omar, M. I., Islam, M. S., & Siddique, M. A. B. (2020). Adoption determinants and constraint of BRRI released Aman rice varieties: Evidence from Mymensingh District. *Journal of Bioscience and Agriculture Research*, *25*(1), 2085–2097. https://doi.org/10.18801/jbar.250120.255

Rahaman, M. S., Sarkar, M. A. R., Deb, L., Kabir, M. J., Sarker, M. R., & Siddique, M. A. B. (2018). Economic investigation of BRRI dhan29 and hybrid rice production in Bangladesh: The case of Haor area. *International Journal of Natural and Social Sciences*, *5*(1), 35–43.

Thomson, J. R. (1979). *An introduction to seed technology*. Leonard Hill.