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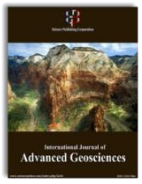

Comparative analysis of the profitability of the tossa and kenaf seed cultivation at contact growers' level in selected areas of Bangladesh

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Abstract

This study compared the profitability of tossa and kenaf seed cultivation based on the 2021 seed-growing season in two locations: Rangpur and Jashore using the tossa variety BJRI Tossa Pat 8 and Rangpur and Kishoreganj using the kenaf variety HC-95. Data analysis methods included descriptive statistics, break-even analysis and cost-benefit analysis. The expensive factors in growing tossa and kenaf seeds were labor costs, followed by land use, machinery, fertilizers, and seed. While the cost of labor (58.38%) and fertilizers (8.74%) were higher for tossa seed, the cost of seed (4.85%) for kenaf seed cultivation was higher as a percentage of the total cost. The highest tossa and kenaf seed yields were 722 $kgha^{-1}$ and 798 $kgha^{-1}$, respectively, in Jashore and Kishoreganj. Average break-even price for kenaf seed was Tk. 130 kg^{-1}, which was less expensive than tossa seed (Tk. 181 kg^{-1}). When compared to kenaf (341 $kgha^{-1}$), average break-even quantity of tossa seed was higher (679 $kgha^{-1}$). The average benefit cost ratio was found higher in the kenaf seed crop, as compared to the tossa seed crop in respect of total cost, variable cost, and cash cost. According to this finding, growing kenaf as seed crop can be profitable for farmers.

Keywords: *Benefit Cost Ratio; Break-Even Point; Kenaf Seed; Profitability; Tossa Seed.*

1. Introduction

Jute and Allied Fiber (JAF) crops belong to the bast (phloem) fiber category (fiber collected from the bark of the stem or skin of the plant) like tossa jute (Corchorus olitorius L.), white jute (C. capsularis L.), kenaf (Hibiscus cannabinus L.) and mesta (H. sabdariffa L.) in the Malvaceae family (Ahmed & Nizam 2008, Islam et al. 2017) and is cultivated mainly in India, Bangladesh, Nepal and some South East Asian countries (Islam et al. 2013). JAF crops are the industrial field crops in Bangladesh. Bangladesh produces the highest-quality fiber in the world because of its favorable agricultural climate. During the fiscal year 2021–22, it contributes about 2.17% total export earnings of Bangladesh (EPB 2022). In last year (2021–2022), JAF crops are cultivated in 7.44 lac hectares of land and produces 15.02 lac MT of raw fiber (DAE 2022a). Kenaf cultivation has been increasing gradually due to easy cultivation, low production cost, wide adaptability, less fertilizer requirement and their industrial demand. The demand for kenaf leaves as fodder is increasing day by day. As a result, the cultivation of JAF crops with huge potential will play an important role in the agricultural economy of Bangladesh.

As the area under tossa jute and kenaf cultivation is increasing day by day, the demand of JAF crops seed is also increasing. Farmers require high-quality seeds at the right time. On the other hand, the growing period of (robi season) jute and kenaf seed is facing challenges against high value crops competition. As a result, supply of quality seed will ensure the fiber quality as well as quantity to a great extent. Under the present jute production acreage, Bangladesh has a requirement of approximately 5000 to 5500 MT of JAF crops seed per year (DAE 2022a). Bangladesh Agricultural Development Corporation (BADC), Jute Directorate (JD), Department of Agricultural Extension (DAE), Bangladesh Jute Research Institute (BJRI) provides only 10-15% of the total seed requirement for which government of Bangladesh allows importing 85-90% of tossa jute and kenaf seed (AIS 2022, Islam & Uddin 2019). In the years 2021–2022, approximately 3469 MT of tossa and 697 MT of kenaf seed were imported from India (DAE 2022b). In the fiscal year 2020–2021, total cultivable land of jute seed was 09 lac hectares; seed production target was 1000 MT (DAE 2022a).

Now-a-days, in Bangladesh, BJRI developed seed production technologies that have not yet been widely disseminated at farmers' level. So, profitable seed production technologies will help the farmers to make them self-sufficient in quality seed. The government has given more thrust to promote the seed industry by strengthening public sectors and also by sensitizing private sectors to reduce the dependence on imported tossa jute and kenaf seed. Encouraging farmers and private sectors to scheme into tossa and kenaf seed production requires relevant information to support their farming decisions. There are some business tools like cost and return, break-even point and benefit-cost ratio analysis those provides this information. Those tools can help different stakeholder with decision making regarding solving risks associated with agricultural production (Netayarak 2007, Puttikorn et al. 2006, Thongpan 2013) as for example tossa and kenaf seed production. With this end in view, the present study was undertaken to know the cost-return, break-even point and benefit-cost ratio analysis between tossa and kenaf seed production at the level of contact growers' in selected areas of Bangladesh.

2. Materials and methods

2.1. Location and sample size

A structured questionnaire was used to survey at Rangpur, Jashore and Kishoreganj based on 2021 seed-growing season for collecting the associated data on production cost and return where tossa (BJRI Tossa Pat 8) and kenaf (HC-95) seed is grown extensively in Bangladesh. A total sample of 100 farmers (25 from each location and crop) was selected randomly for conducting survey through a purposive sampling technique. The farmers were selected from the demonstrations of DAE and JD, the multi-location trials of BJRI, and the contact growers of BADC. In order to collect data for the study, coordination from concerned BADC, BJRI, JD and DAE employees were involved.

2.2. Data analysis

Data analysis consisted of cost and return analysis of tossa and kenaf seed cultivation, which was divided into 3 parts as follows:

2.2.1. Cost and return analysis

Cost and return analysis is a type of economic analysis that considers costs (both implicit and explicit) incurred by farmers (Ciaian et al. 2013, Netayarak 2007). The concepts of Ciaian et al. (2013) and Preedasak (2004) were followed in this study and are presented as follows:

2.2.1.1. Cost

Total Cost (TC) represents the final value of all inputs (cash and non-cash) a farm uses in a given period and is the sum of variable and fixed costs. Fixed Costs (FCs) are independent of the production level, and Variable Costs (VCs) change with the production level. Both FC and VC can be classified into the explicit costs (cash) and implicit costs (non-cash). Explicit costs are the actual expenses incurred, while implicit costs (imputed costs, implied costs) are not associated with the actual expenditure payments.

2.2.1.2. Gross return (GR)

GR represents the total income that farmers receive from selling agricultural products per season.

2.2.1.3. Profit or gross margin (GM)

GM is the difference between the GR and cost.
Thus, the analysis of costs and returns from where jute and kenaf seed production will be analyzed using the following formulas:

Total Variable Cost (TVC) = Total Cash Cost (TCC) + Total Non-cash Cost (TNC)

GR = Value of main product yield (seed) + Value of by product yield (stick)

GM on TC= GR–TC

GM on TVC= GR–TVC

GM on TCC= GR–TCC

2.2.2. Break-even analysis

Break-even analysis is “a technique used to analyze cost information” (Brinckerhoff 2009). It involves the investigation of the level of sales at which a company or producer would make zero profit (Tsorakidis et al. 2008), and it is one of the many techniques that have been developed to aid in management activities such as planning, coordinating, and controlling business operations toward desired success (Dubas et al. 2011). For this study, break-even analyses of yield and price were adopted from Dillon (1992), presented as follows:

2.2.2.1. Price

Given a known yield and cost, at what market price would the farm “break-even” (costs equal income)

$$\text{Output price (Pi)} = \frac{\text{VCi}+\text{FCi}+\pi\text{i}}{\text{Yi}}$$

2.2.2.2. Yield

Given a known price and cost, at what level of production (yield) would the farm “break-even” (costs equal income)

$$\text{Yield (Yi)} = \frac{\text{VCi}+\text{FCi}+\pi\text{i}}{\text{Pi}}$$

Where: Pi is the output prices of commodity i; Yi is the yield of output i; VCi represents the variable costs incurred in the production of commodity i; FCi represents the fixed costs for the production of commodity i. Break-even considerations in just covering costs can be investigated by setting profits (πi) equal to zero. In this case, the profit was not reflected.

2.2.3. Benefit-cost ratio (BCR) analysis

BCR is the proportion of net return (benefit) and total cost of production (Dubas et al. 2011). The BCR was calculated by dividing the GR by the production cost.

$$\text{BCR on TC} = \frac{\text{GR}}{\text{TC}}$$

$$\text{BCR on TVC} = \frac{\text{GR}}{\text{TVC}}$$

$$\text{BCR on TCC} = \frac{\text{GR}}{\text{TCC}}$$

3. Result and discussions

All of the variable costs including labors, machineries, seeds, manures, fertilizers, insecticides, and irrigation were calculated based on survey study to determine the cost of cultivating tossa and kenaf seeds. Land use cost of tossa and kenaf seed cultivation was calculated based on their annual agronomic lifespan. According to Table 1, the cost of cultivation per hectare for tossa seed between Rangpur and Jashore and for kenaf seed between Rangpur and Kishoreganj was almost the same for both locations. From the survey results, the average TC for all locations per hectare for tossa and kenaf seed crops, respectively, were Tk. 128938 and Tk. 102399. Human labor costs comprised the largest portion of the total cost of growing both tossa and kenaf seeds, followed by land use, machineries, fertilizers, and seed. While the average cost of seed (4.85%) for kenaf seed cultivation was higher as a percentage of the total cost, the cost of human labor (58.38%) and fertilizers (8.74%) were higher for tossa seed cultivation. When it comes to tossa and kenaf seed cultivation, contact growers have incurred costs ranging from 61.72 to 68.89% in cash and from 31.11 to 38.28% in non-cash. According to Sujan et al. (2017), the cost of human labor input (26.52%) accounted for the largest portion of the total cost of boro rice farming in the Bogura district of Bangladesh, followed by the costs of irrigation (17.43%), fertilizers (17.36%), and land use (16.58%). As a fiber crop, seed was a considerable cost factor, contributing for 6.77% of the total cost in kenaf while tossa jute only contributed 1.15% (Kundu and Hossain, 2022).

Table 1: Production Cost for Tossa and Kenaf Seed Crop in Various Regions of Bangladesh

Fiber seed crop		Tossa			Kenaf	
Cost item	Rangpur	Jashore	Average	Rangpur	Kishoreganj	Average
Variable Cost (VCs)						
1. Human labor:						
a) Self (Non-cash cost)	16857 (13.59)	20250 (15.13)	18554 (14.39)	11234 (11.35)	13245 (12.51)	12240 (11.95)
b) Hired	55214 (44.52)	58214 (43.49)	56714 (43.99)	38966 (39.38)	42653 (40.30)	40810 (39.85)
Total	72071 (58.12)	78464 (58.62)	75268 (58.38)	50200 (50.73)	55898 (52.81)	53049 (51.81)
2. Mechanical cost (Land preparation, Transport and others)						
a) Self (Non-cash cost)	3234 (2.61)	4132 (3.09)	3683 (2.86)	4326 (4.37)	3287 (3.11)	3807 (3.72)
b) Hired	9764 (7.87)	7893 (5.90)	8829 (6.85)	8954 (9.05)	7985 (7.54)	8470 (8.27)
Total:	12998 (10.48)	12025 (8.98)	12512 (9.70)	13280 (13.42)	11272 (10.65)	12276 (11.99)
3. Seed:						
a) Self (Non-cash cost)	155	268	212	245	432	339
b) Purchased	1360 (1.10)	1280 (0.96)	1320 (1.02)	4156 (4.20)	5096 (4.81)	4626 (1.52)
Total:	1515 (1.22)	1548 (1.16)	1532 (1.19)	4401 (4.45)	5528 (5.22)	4965 (4.85)
4. Chemical fertilizer						
a) Urea	3169 (2.56)	3087 (2.31)	3128 (2.43)	1564 (1.58)	2176 (2.06)	1870 (1.83)
b) TSP/DAP	5350 (4.31)	6140 (4.59)	5745 (4.46)	3275 (3.31)	2654 (2.51)	2965 (2.90)
c) MoP	1675 (1.35)	1600 (1.20)	1638 (1.27)	765 (0.77)	876 (0.83)	821 (0.80)
d) Gypsum	244	351	298	122	106	114
e) Zinc	300	250	275	125	157	141
f) Boron	245	124	185	76	82	79
Total	10983 (8.86)	11552 (8.63)	11268 (8.74)	5927 (5.99)	6051 (5.72)	5989 (5.85)
5. Manure						
a) Self (Non-cash cost)	650 (0.52)	550 (0.41)	600 (0.47)	543 (0.55)	654 (0.62)	599 (0.58)
b) Purchased	87	155	121	67	55	61
Total	737 (0.59)	705 (0.53)	721 (0.56)	610 (0.62)	709 (0.67)	660 (0.64)
6. Pesticide	970 (0.78)	1150 (0.86)	1060 (0.82)	167 (0.17)	342 (0.32)	255 (0.25)
7. Irrigation	1571 (1.27)	1650 (1.23)	1611 (1.25)	1287 (1.30)	956 (0.90)	1122 (1.10)
Total Variable Cost (TVC)	100845 (81.32)	107094 (80.00)	103970 (80.64)	75872 (76.67)	80756 (76.30)	78314 (76.48)
Fixed Cost (FCs)						
Land rent (self) (Non-cash cost)	17680 (14.26)	23920 (17.87)	20800 (16.13)	17543 (17.73)	22896 (21.63)	20220 (19.75)
Land rent (others) (Cash cost)	5487 (4.42)	2849 (2.13)	4168 (3.23)	5543 (5.60)	2187 (2.07)	3865 (3.77)
Total Fixed Cost (TFC)	23167 (18.68)	26769 (20.00)	24968 (19.36)	23086 (23.33)	25083 (23.70)	24085 (23.52)
Total cash cost	85436 (68.89)	84743 (63.31)	85090 (65.99)	65067 (65.75)	65325 (61.72)	65196 (63.67)
Total non-cash cost	38576 (31.11)	49120 (36.69)	43848 (34.01)	33891 (34.25)	40514 (38.28)	37203 (36.33)
Total cost (TVC+TFC)	124012	133863	128938	98958	105839	102399

Figure within the parentheses indicate percentage of total cost.

According to Table 2, the maximum yield for tossa seed was 722 $kgha^{-1}$ in Jashore, the highest yield for kenaf seed was 798 $kgha^{-1}$ in Kishoreganj, and the lowest yield was in Rangpur. Tossa seed had an average yield of 700 $kgha^{-1}$, while kenaf seed produced 780 $kgha^{-1}$. For tossa and kenaf in 2021, the seed collection rate from contact growers was Tk. 190 kg^{-1} and Tk. 300 kg^{-1}, respectively. The cost of collecting seeds varied depending on the organizations in Bangladesh. While DAE and JD paid Tk. 200 kg^{-1} from contact growers, BADC paid Tk. 180 kg^{-1} for tossa seed. The cost of kenaf seed that BJRI approved was Tk. 300 kg^{-1}. As per Table 2, due to the yield and price rate being 11.43% and 57.89% higher in kenaf seed crop than in tossa, respectively. The GR per hectare was Tk. 135642 for tossa

seed and Tk. 234836 for kenaf seed throughout the locations. The highest GR for kenaf seed was 240282 Tk.ha^{-1} in Kishoreganj, while the maximum GR for tossa was 139819 Tk.ha^{-1} in Jashore. For both tossa and kenaf seed crops, it was 5.97% and 4.60% less yield in Rangpur than in Jashore and Kishoreganj, respectively.

For tossa seed crop on TVC basis, the higher GM (Tk. 32725 ha^{-1}) was recorded in Jashore compare to Rangpur (Tk. 30620 ha^{-1}). In contrast, Rangpur had the lowest GM (Tk. 153517 ha^{-1}) and Kishoreganj had the highest (Tk. 159526 ha^{-1}) for kenaf seed crops. On the basis of TCC over the areas, the average GM in the kenaf seed crop was higher (235.57%) than in the tossa (Table 2). For tossa and kenaf seed crops, the benefit-cost ratios were nearly the same in Rangpur and Jashore, and Rangpur and Kishoreganj, respectively. On total, variable, and cash cost basis, the average BCRs for tossa seed crop were 1.05, 1.30, and 1.59, while they were 2.29, 3.00, and 3.60 for kenaf seed crop. BCR (1.25) for the production of white jute seed was reported by Islam & Uddin (2019) and Uddin et al. (2021). According to Mollah et al. (2015), in terms of economic return, the HC-95 of the kenaf seed crop in Kishoreganj produced the highest GR (Tk. 99000 ha^{-1}), GM (Tk. 49670 ha^{-1}), and BCR (2.01).

Table 2: Cost-Return Analysis of Tossa and Kenaf Seed Production in Various Regions of Bangladesh

Fiber seed crop		Tossa			Kenaf	
Return item	Rangpur	Jashore	Average	Rangpur	Kishoreganj	Average
Production						
Seed (F) (kgha^{-1})	677	722	700	762	798	780
Stick (kgha^{-1})	1620	1759	1690	1578	1764	1671
Seed equivalent stick yield (E) (kgha^{-1})	15	14	14	5	6	6
Total yield (F+E) (kgha^{-1}) (Yi)	692	736	714	767	804	786
Price rate						
Price rate of seed (Tk.kg^{-1}) (Pi)	190	190	190	300	300	300
Price rate of stick (Tk.kg^{-1})	1.75	1.50	1.63	0.50	0.50	0.50
Gross return						
Total value of seed (Tk.ha^{-1})	128630	137180	132905	228600	239400	234000
Total value of stick (Tk.ha^{-1})	2835	2639	2737	789	882	836
Total gross return (Tk.ha^{-1})	131465	139819	135642	229389	240282	234836
Gross margin						
Total cost basis (Tk.ha^{-1})	7453	5956	6704	130431	134443	132437
TVC basis (Tk.ha^{-1})	30620	32725	31672	153517	159526	156522
TCC basis (Tk.ha^{-1})	46029	55076	50552	164322	174957	169640
Break-even point						
Break-even quantity [seed equivalent yield (kgha^{-1})]	653	705	679	330	353	341
Break-even price [Tk.kg^{-1} (seed)]	179	182	181	129	132	130
Benefit cost ratio						
Total cost basis	1.06	1.04	1.05	2.32	2.27	2.29
TVC basis	1.30	1.31	1.30	3.02	2.98	3.00
TCC basis	1.54	1.65	1.59	3.53	3.68	3.60

The break-even quantity for the tossa seed crop in Jashore was 705 kg seed ha^{-1}, whereas the break-even quantity for the kenaf seed crop in Kishoreganj was only 353 kg seed ha^{-1}. The results for the break-even price showed that in Rangpur, the minimum price (Tk. 179 kg^{-1}) needed to recover the unit cost of producing tossa seeds was higher than the minimum price (Tk. 129 kg^{-1}) needed to do so for producing kenaf seeds. During the 2021 growing season, the average break-even price and quantity were Tk. 181 kg^{-1} and 679 kgha^{-1} (seed) for the tossa seed crop, compared to Tk. 130 kg^{-1} and 341 kgha^{-1} (seed) for the kenaf seed crop.

4. Conclusion

For both tossa and kenaf seed crops, labor costs represent the largest percentage of variable costs across all locations. The production of tossa seeds in Bangladesh provided a small amount of profit to contact growers. On the other hand, kenaf seed production, particularly that of the HC-95 variety, is more profitable because to its cheaper cost of production, higher market price, and increased demand among farmers. In both the pre- and post-harvest periods, the farmers in the study areas demand mechanized facilities. The farmers have difficulties storing tossa and kenaf seed for a long time. Mechanization-based farming and advanced seed technologies should be promoted to make seed production of fiber crops profitable in Bangladesh.

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