Production and Profitability Study of White Jute Seed at Farmer’s Level in Different Areas of Bangladesh

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Abstract

The objective of this study was to investigate the cost and return structures of white jute seed cultivation in Bangladesh. This study was conducted in two locations in three consecutive years 2013-15). The sample included 120 farmers selected using a purposive sampling method, consisting of 60 from each district. Sample size was same for three years. Survey questionnaires were used as the main instrument for data collection. Descriptive statistics and cost and return analysis were used for data analysis. The results indicate that the cost of production (99175 tkha⁻¹) and output (123502 tkha⁻¹) was higher in Tangail than Manikganj. Lowest cost of production (80252 tkha⁻¹) was recorded in 2013 in Manikganj and maximum (102470 tkha⁻¹) in 2014 in Tangail. Average BCR of white jute seed production of two locations was 1.25. Cost of production varies year to year and place to place due to variation in land rent value, labour wages, land preparation cost etc. This result indicates that profitability of jute seed production is almost same in two zones and by product yield is also important in case of white jute seed production.

Keywords: White jute, Seed yield, Fibre yield, Stick yield, BCR, Profitability.

INTRODUCTION

Jute (Corchorus spp) is the most important natural fibre crop next to cotton grown in the humid tropical climate mainly under rain fed condition predominantly by marginal and small farmers of Indo-Bangladesh subcontinent [1]. Jute alone contributes about 1.58% to GDP without involving any foreign investment [2]. The genus Corchorus belongs to the family Malvaceae, which is composed of approximately 100 species [3]. Of these, two species (Corchorus olitorius L. and Corchorus capsularis L.) are widely cultivated for natural fiber in areas distributed throughout the tropical and sub-tropical regions of the world, particularly in Asia, Africa and Latin America [4]. In Bangladesh Corchorus capsularis L. is known as white jute. About 9% of total jute cultivable areas are covered by white jute [5].

Quality seed is the prerequisite for increasing the yield and sustainable production of any crop [6]. Seed is an input could increase crop production by 10-15% [7]. Jute cultivation area was 10% of agricultural land area. Jute production was 26% as of all agricultural crops [23]. Bangladesh requires about 5500-6000 tons jute seeds in every year, of which only 10-15% is produced and distributed by the BADC [8]. In every year Bangladesh require about 800 metric tons white jute which is totally produced in our country [9]. Farmers show less interest to produce jute seed due to jute seed growing season maximum land were occupied by T. Aman rice and high value vegetables. Encouraging farmers to venture into jute seed production requires relevant information to support their farming decisions. One business tool that provides this information is “cost and return analysis.” This crucial tool is used to analyze alternative farming enterprises that can be employed, thereby helping farmers solve practical problems [10]. The cost of production is an important economic indicator that determines farm production performance [11]. This indicator can help farmers with decision making because it considers methods of solving risks associated with agricultural production [12-14]. With the above circumstances, the present study has been undertaken to assess the cost and return of white jute seed production at farm level.

MATERIAL AND METHODS

Study area

The survey was made in 4 upazilla of two districts where white jute seed grown intensively.
Sample size
The sample consisted of 120 farmers (30 from each location) selected through a purposive sampling technique.

DATA COLLECTION
Data collection involved personal interviews with the sampled farmers using structured questionnaires. The survey instrument consisted of cost and return data associated with jute seed production during the 2013-15 cropping years.

DATA ANALYSIS
Data analysis consisted of cost and return analysis of white jute seed production, which was divided into 3 parts as follows:

Cost and return analysis
Cost and return analysis (CRA) is a type of economic analysis that considers costs (both implicit and explicit) incurred by farmers [11, 12]. The concepts of Ciaian et al. [11] and Preedasak [15] were followed in this study and are presented as follows:

Cost (i) Total cost (TC) represents the final value of all inputs (cash and noncash) a farm uses in a given period and is the sum of variable and fixed costs.

(ii) Fixed costs (FCs) are independent of the production level.

(iii) Variable costs (VCs) change with the production level.

Both FC and VC can be classified into the explicit costs (cash) and implicit costs (noncash). Explicit costs are the actual expenses incurred, while implicit costs are not associated with the actual expenditure payments.

Return Total revenue (TR) represents the total income that farmers receive from selling agricultural products and by-products per season.

Profit (gross margin): Net profit is the difference between the TR and TC.

In terms of implicit costs, this study adopted the estimation guidelines from Ciaian et al. [11] and Khunthongjan [16]:

(i) Household labor. This represents the cost of hired labor, which was determined using the prevailing market wage rate in the study area, which was varying from 300-350 taka per day.

(ii) Land rent. Farmers’ land was assessed on the basis of a local rental rate.

(iii) Depreciation of agricultural machinery. This represents costs accounting for the declining value of farm assets computed using the straight-line method.

Break-even analysis: Break-even analysis is “a technique used to analyze cost information” [17]. It involves the investigation of the level of sales at which a company would make zero profit [18], 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 [19]. For this study, break-even analyses of yield and price were adopted from Dillon [20], presented as follows:

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

Output price (Pi) = \( \frac{V_{Ci} + F_{Ci} + \pi_{i}}{Y_{i}} \)

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

Yield (Yi) = \( \frac{V_{Ci} + F_{Ci} + \pi_{i}}{P_{i}} \)

Where:

Pi is the output prices of commodity i;

Yi is the yield of output i;

V_{Ci} represents the variable costs incurred in the production of commodity i;

F_{Ci} represents the fixed costs for the production of commodity i.

Benefit–cost ratio
Benefit cost ratio is the proportion of net return (benefit) and total cost of production [20]. The B-C ratio was calculated by dividing the gross margin by the total variable production cost.

RESULT AND DISCUSSION
Cost of white jute seed production
Cost items for jute seed production were divided into variable and fixed costs (Table 1 and 2). The average total cost of jute seed production in Manikganj was 86024 tkha-1, where in total variable and fixed cost accounted for 80.2 and 19.8% of the overall cost, respectively. Labor cost associated 66% of total variable cost and land rent cover 19.4% of total cost. Noncash labor cost was also estimated from the prevailing labor wage as a shadow price for family labor. Findings showed that land rent responsible for maximum amount of fixed cost and 19.4% of total cost. Pesticide, seed, irrigation and depreciation cost account for negligible amount considering the total cost. Fertilizer and land preparation were two important facts those cover 5.6% and 7.2% of total cost respectively.
For white jute seed production irrigation cost is very low in Manikganj it is less than 1%. Most of the jute seed production farmers in the Manikganj used their own land in farming and land rent was low because for white jute seed production farmers mainly use their marginal land. Result showed that depreciation cost was very marginal because farmer used very small amount of machinery for white jute seed production.

The average output of the jute seed was 608 kg/ha, with a prevailing market price of 100 tk/kg, allowing farmers to have a revenue of 60800 tk/ha. In white jute seed production fibre and stick are two important by-products. By-product yield in the study presented as seed equivalent yield. Total yield containing seed equivalent yield of fibre and stick was 1008 kg/ha, allowing farmers to have return of 100800 tk/ha. Average benefit cost ratio for white jute production was found 1.17 in Manikganj. BCR was below the expectation level because of low seed yield and value. Break even analysis indicates that average price of white seed should be minimum 85.34 tk/kg in Manikganj.

In Tangail the average total cost of white jute seed production was recorded 99175 tk/ha. Labor cost was the major cost for white jute seed production that associated 57.85% of total variable cost and land rent cover 24.91% of total cost. Noncash labor cost was also estimated from the prevailing labor wage as a shadow price for family labor. Among fixed cost land rent was account for major portion whereas depreciation covers only very little amount because farmer use only a few machinery for white jute seed production. Pesticide, seed, and irrigation cost account for negligible amount considering the total cost. Some farmers used their own seed that consider as non-cash cost. Most of the jute seed cultivars in Tangail utilized their own land in farming that value was considered as non-cash cost and land rent was low because for white jute seed production farmers mainly make use of their marginal land.

This study exposed the seed yield of white jute in three consecutive years in Tangail fluctuated from 620 to 678 kg/ha and in average it was 647 kg/ha with a prevailing average market price of 98.33 tk/kg, allowing farmers to have a revenue of 63619 tk/ha. Considering the seed equivalent yield of fibre and stick total seed equivalent yield of white jute was 1256 kg/ha in Tangail. Average benefit cost ratio for white jute production was 1.25. Break even analysis indicates that average price white seed should be minimum 78.4 tk/kg in Tangail.

In average white jute seed production of two locations expenses for labor and land rent were the highest (Table 3), accounting for 61.49 and 22.29% of the total production cost. Similar labor cost was also found by Islam and Uddin 2019. In Tangail land rent was higher compare to the Manikganj because Tangail is more agriculture dependent area than Manikganj and land productivity is higher. Fertilizer cost of white jute seed production is very low because jute is an eco-friendly crop that needs very low dose of fertilizer additionally it’s add organic matter to the soil. Land preparation cost was similar in both areas on an average it was 6.67% of the total cost. Pest management cost was very low (0.68%) percent of total cost because in direct seeding method pest infestation very low. Total variable cost cover 77.27% that is almost about 3.5 times higher than total fixed cost. Average total fixed cost of two locations was 92599 tk/ha. Total cash cost cover 59.27% of total cost of white jute seed production and in non-cash cost family labor cover 60.87% of total non-cash cost.

Seed price variation in two locations was very marginal, average seed price of two locations was 99.17 tk/kg. Seed production was higher in Tangail over Manikganj and average seed production of two locations was 627 kg/ha. This yield is low compare to the yield obtain by karim et al. and Islam et al. Average seed equivalent yield of jute fibre and jute stick was 505 kg/ha. Normally value of white jute fibre varies from 42 to 55 tk/kg but in case of seed production fibre is the by-product. That fibre is low quality fibre because crop remains in the field more than 120 day as result cuttings percentage increase for that reason its value is low. Average jute fibre price was 27.12 tk/kg. Considering the jute fibre and stick average gross return of two locations was 112260 tk/ha. Gross return and gross margin was higher in Tnagail over Manikganj due to high jute seed and byproduct yield. This study found average breakeven price of white jute seed was 82 tk/kg seed. The results regarding the breakeven price reflect the minimum price required to recover the unit cost of production. Result showed that BCR was higher in Tangail and average BCR of white jute seed production was 1.21. Islam and uddin reported 1.25 BCR for white jute seed production. BCR for white jute seed production was low because farmer did not use update production technology for that cause seed yield was low moreover quality of was not up to the mark for that value of seed was low. Labor wages was higher in these locations that increased the cost of production.
### Table 1: Cost and return of white jute seed production in Manikganj (2013-2015)

| Items                                | 2013         | 2014         | 2015         | Average       |
|--------------------------------------|--------------|--------------|--------------|---------------|
|                                      | Cash Non    | Total        | Cash Non    | Total         | Cash Non    | Total  | Percentage |
|                                      | Cash        | Cash         | Cash        | Cash          | Cash        | Cash   |
|                                      | 0           | 0            | 0           | 0             | 0           | 0      |
| 1. Variable cost (VCS)*              | 3375        | 2250         | 5625        | 35750         | 2125        | 5700   | 34960      | 2215      | 5711        | 34820 | 2196        | 5678        | 66          |
|                                       | 0           | 0            | 0           | 0             | 0           | 0      | 0           | 4          | 4           | 4      | 8           | 8           |            |
| Labor                                | 600         | 200          | 800         | 500           | 250         | 750    | 300         | 465       | 765         | 466   | 305         | 771         | 0.90        |
| Land preparation                     | 5500        | 600          | 6100        | 5600          | 650         | 6250   | 5750        | 560       | 6310        | 5616  | 603         | 6219         | 7.2         |
| Fertilizer                           | 4900        | 540          | 5440        | 3850          | 507         | 4357   | 4234        | 351       | 4585        | 4328  | 466         | 4794         | 5.60        |
| Pesticide                            | 62          | 62           | 500         | 500           |             |        | 187         |           | 187         | 0.22  |            |              |            |
| Irrigation                           |             |              |             | 750           |             |        | 250         |           | 250         | 0.30  |            |              |            |
| Total Variable cost (TVC)            | 4481        | 2384         | 6865        | 46950         | 2265        | 6960   | 45244       | 2353      | 6877        | 45688 | 2334        | 6901         | 80.2        |
| 2. Fixed Cost (FCS)*                 | 3000        | 8250         | 1125        | 4600          | 1415        | 1875   | 5200        | 1480      | 2000        | 4266  | 1240        | 1666         | 19.4        |
| Land rent                            | 3000        | 8600         | 1160        | 4600          | 1452        | 1912   | 5200        | 1512      | 2032        | 4266  | 1274        | 1701         | 19.8        |
| Depreciation cost                    | 3000        | 8600         | 1160        | 4600          | 1452        | 1912   | 5200        | 1512      | 2032        | 4266  | 1274        | 1701         | 19.8        |
| Total Fixed Cost (TFC)               | 3000        | 8600         | 1160        | 4600          | 1452        | 1912   | 5200        | 1512      | 2032        | 4266  | 1274        | 1701         | 19.8        |
| Total cost (TVC + TFC)*              | 4781        | 3244         | 8025        | 51550         | 3717        | 8872   | 50444       | 3865      | 8909        | 49935 | 3608        | 8602         | 4           |
| Price of seed (p) (Tk/kg)            | 85          | 105          |             |               |             |        | 110         |           |            | 100   |            |              |             |
| Price of Fibre (Tk/kg)               | 20          | 30           |             |               |             |        | 30          |           |            | 26.67 |            |              |             |
| Price of stick (Tk/kg)               | 7           | 5            |             |               |             |        | 6           |           |            | 6     |             |              |             |
| Production (kg/ha)                   | 625         | 610          | 590         | 608           |             |        |             |           |            |       |             |              |             |
| Seed (s)                             | 1005        | 1100         | 1070        | 1058          |             |        |             |           |            |       |             |              |             |
| Fibre                                | 1900        | 2020         | 2010        | 1976          |             |        |             |           |            |       |             |              |             |
| Stick                                | 236         | 314          |             |               |             |        | 291         |           |            | 282   |             |              |             |
| Seed equivalent yield of fibre (f)   | 156         | 96           |             |               |             |        | 109         |           |            | 118   |             |              |             |
| Total Seed equivalent yield (y)      | 1017        | 1020         | 990         | 1008          |             |        |             |           |            |       |             |              |             |
| Gross Return (y*p)/Tk/ha             | 8644        | 5            | 10710       | 10890         |             |        |             |           |            |       |             |              |             |
| Gross margin (profit)                | 6193        | 18373        |             | 19806         |             |        |             |           |            |       |             |              |             |
| Break-even quantity (kg/seed)        | 944         | 845          |             | 810           |             |        |             |           |            |       |             |              |             |
| Break-even price (Tk/kg seed)        | 78.91       | 87           |             | 90            |             |        |             |           |            |       |             |              |             |
| Benefit–cost ratio (B:C)             | 1.08        | 1.21         | 1.22        | 1.17          |             |        |             |           |            |       |             |              |             |
Table 2: Cost and return of white jute seed production in Tangail (2013-2015)

| Items                               | 2013     | 2014     | 2015     | Average  | 2013     | 2014     | 2015     | 2013     | 2014     | 2015     | Percent age |
|-------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-------------|
| 1.Variable cost (VCs)*              |          |          |          |          |          |          |          |          |          |          |             |
| Labor                              | 35100    | 24750    | 59850    | 34154    | 22155    | 56309    | 33960    | 21995    | 55955    | 34404    | 22967       | 57371       | 57.85       |
| Seed                               | 622.5    | 200      | 822      | 407      | 471      | 878      | 446.2    | 412      | 858      | 492      | 361         | 853         | 0.86        |
| Land preparation                   | 5550     | 510      | 6060     | 5864     | 310      | 6174     | 5960     | 297      | 6257     | 5791     | 372         | 6163        | 6.21        |
| Fertilizer                         | 8050     | 8050     | 8590     | 8590     | 3900     | 7341     | 7341     | 7993     | 7993     | 7993     | 8.06        |
| Pesticide                          | 1018     | 1018     | 1290     | 1290     | 900      | 1090     | 1090     | 1090     | 1090     | 1090     | 1.08        |
| Irrigation                         | 336      | 336      | -        | -        | 1290     | 1290     | 1290     | 1290     | 1290     | 1290     | 4.52        |
| Total Variable cost (TVC)          | 50679    | 25460    | 76139    | 50306    | 2270     | 72601    | 59927    | 3980     | 89973    | 50294    | 23700       | 73994       | 74.61       |
| 2.Fixed Cost (FCs)*                |          |          |          |          |          |          |          |          |          |          |             |
| Land rent                          | 6009     | 12609    | 18618    | 12567    | 16183    | 28750    | 10029    | 16730    | 26759    | 9535     | 15174       | 24709       | 24.91       |
| Depreciation cost                  | 564      | 564      | 475      | 475      | 372      | 372      | 471      | 471      | 471      | 471      | 0.48        |
| Total Fixed Cost (TFC)             | 6009     | 13173    | 19182    | 12567    | 16659    | 29226    | 10029    | 17103    | 27132    | 9535     | 15645       | 25180       | 25.39       |
| Total cost (TVC + TFC)*            | 56688    | 38634    | 95322    | 62874    | 39586    | 102470   | 59927    | 39808    | 99735    | 59829    | 39346       | 99175       |             |
| Price of seed (p) (Tk/kg)          | 80       | 105      | 110      | 80       | 105      | 110      | 110      | 98.33    |          |          |             |
| Price of Fibre (Tk/kg)             | 20       | 31.67    | 31       | 20       | 31.67    | 31       | 31       | 27.56    |          |          |             |
| Price of stick (Tk/kg)             | 7        | 4        | 5        | 7        | 4        | 5        | 5        | 5.33     |          |          |             |
| Production (kg/ha)                 |          |          |          |          |          |          |          |          |          |          |             |
| Seed (s)                           | 643      | 678      | 620      | 647      | 643      | 678      | 620      | 647      |          |          |             |
| Fibre                              | 1530     | 1573     | 1600     | 1567     | 1530     | 1573     | 1600     | 1567     |          |          |             |
| Stick                              | 3323     | 2878     | 3250     | 3150     | 3323     | 2878     | 3250     | 3150     |          |          |             |
| Seed equivalent yield of fibre (f) | 382      | 474      | 450      | 439      | 382      | 474      | 450      | 439      |          |          |             |
| Seed equivalent yield of stick (v) | 290      | 109      | 147      | 170      | 290      | 109      | 147      | 170      |          |          |             |
| Total Seed equivalent yield (y) (s + f + v) | 1315 | 1261 | 1217 | 1256 | 1315 | 1261 | 1217 | 1256 |          |          |             |
| Gross Return (y*p) (Tk/ha)         | 105200   | 132405   | 133870   | 12350    | 2        |          |          |          |          |          |             |
| Gross margin (profit)              | 9878     | 29935    | 34315    | 24327    | 9878     | 29935    | 34315    | 24327    |          |          |             |
| Break-even quantity (kg/ha)        | 1191     | 975      | 906      | 1008     | 1191     | 975      | 906      | 1008     |          |          |             |
| Break-even price (tk/kg fibre)     | 72.5     | 81.2     | 82       | 78.4     | 72.5     | 81.2     | 82       | 78.4     |          |          |             |
| Benefit–cost ratio (B:C)           | 1.10     | 1.29     | 1.34     | 1.25     | 1.10     | 1.29     | 1.34     | 1.25     |          |          |             |
Table 3: Average cost and return of white jute seed production in Manikganj and Tangail

| Items                              | Manikganj          | Tangail           | Average          |
|------------------------------------|--------------------|-------------------|------------------|
|                                    | Cash   | Non Cash | Total | Cash   | Non Cash | Total | Cash   | Non Cash | Total | Percentage |
| 1. Variable cost (VCs)*            |        |          |       |        |          |       |        |          |       |            |
| Labor                             | 34820  | 21968    | 56788 | 34404  | 22967    | 57371 | 34612  | 22467    | 57079 | 61.49      |
| Seed                              | 466    | 305      | 771   | 492    | 361      | 853   | 479    | 333      | 812   | 0.87       |
| Land preparation                  | 3616   | 603      | 6219  | 5791   | 372      | 6163  | 5703   | 487      | 6190  | 6.67       |
| Fertilizer                        | 4328   | 466      | 4794  | 7993   | 7993      | 6160  | 466    | 6626     | 7.13  |            |
| Pesticide                         | 187    | 187      | 1069  | 1069   | 1069      | 628   | 628    | 0.68     |       |            |
| Irrigation                        | 250    | 250      | 524   | 542    | 542       | 396   | 396    | 0.43     |       |            |
| Total Variable cost (TVC)         | 45668  | 23342    | 69011 | 50294  | 23700    | 73994 | 47978  | 23753    | 71731 | 77.27      |
| 2. Fixed Cost (FCs)*              |        |          |       |        |          |       |        |          |       |            |
| Land rent                         | 4266   | 12400    | 16666 | 9535   | 15174    | 24709 | 6900   | 13787    | 20687 | 22.29      |
| Depreciation cost                 | 346    | 346      | 692   | 471    | 471       | 408   | 408    | 0.44     |       |            |
| Total Fixed Cost (TFC)            | 4266   | 12746    | 17012 | 9535   | 15645    | 25180 | 6900   | 14195    | 21095 | 22.73      |
| Total cost (TVC + TFC)*           | 49935  | 36089    | 86024 | 59829  | 39346    | 99175 | 54878  | 37948    | 92826 |            |
| Price of seed (p)(Tk/kg)          | 100    |          |       | 98.33  |          |       | 99.17  |          |       |            |
| Price of Fibre (Tk/kg)            | 26.67  |          |       | 27.56  |          |       | 27.12  |          |       |            |
| Price of stick (Tk/kg)            | 6      |          |       | 5.33   |          |       | 5.67   |          |       |            |
| Production (kg/ha)                |        |          |       |        |          |       |        |          |       |            |
| Seed (s)                          | 608    |          | 647   | 627    |          |       |        |          |       |            |
| Fibre                             | 1058   |          | 1567  | 1312   |          |       |        |          |       |            |
| Stick                             | 1976   |          | 3150  | 2563   |          |       |        |          |       |            |
| Seed equivalent yield of fibre (f)| 282    |          | 439   | 359    |          |       |        |          |       |            |
| Seed equivalent yield of stick (v)| 118    |          | 170   | 146    |          |       |        |          |       |            |
| Total Seed equivalent yield (y)   | 1008   |          | 1256  | 1132   |          |       |        |          |       |            |
| Gross Return (y*p)(Tk/ha)         | 100800 |          | 123502| 112260 |          |       |        |          |       |            |
| Gross margin (profit)             | 14776  |          | 24327 | 19661  |          |       |        |          |       |            |
| Break-even quantity (kg/ha)       | 860    |          | 1008  | 933    |          |       |        |          |       |            |
| Break-even price (tk/kg fibre)    | 85.34  |          | 78.4  | 82     |          |       |        |          |       |            |
| Benefit–cost ratio (B:C)          | 1.17   |          | 1.25  | 1.21   |          |       |        |          |       |            |

CONCLUSION

This study investigated the cost and return structure of white jute seed production systems in two location of Bangladesh. Higher variable costs were incurred in Tangail over Manikganj because more variable inputs were used during production. Labor costs represent the largest percentage share of variable costs in both locations. This study revealed that farmers received marginal amount of profit in white jute seed production. Seed production should be increased by using modern technology and use of machinery should increase to reduce the cost of production.

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