

BETEL NUT PRODUCTION AND COST-RETURN ANALYSIS AT FARM LEVEL IN SOUTH-EAST REGION OF BANGLADESH: AN ECONOMIC APPRAISAL

by

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Abstract

A study was conducted in the south-east region in Bangladesh in the year 2000-2001 to assess the profitability of betel nut production. In the study location of 180 betel nut gardens from the four coastal districts, Chittagong, Barisal, Feni and Laxmipur, the average garden size was found to be 0.24 ha and covered 16% of the total farm area. In total, 34% of the gardens were under mixed plantation and 66% under single nut plantation and on an average there were 3,004 nut plants/ha area. Considering the sapling and other input costs, the average establishment cost of a garden was found to be TK 7,945.00/ha at current prices and it was TK 2.64 per plant. The average annual management cost for one hectare of betel nut garden was estimated to be TK 3,272.00 and the gross cost, including land value was found to be TK. 10,878.00/ha and TK.3.62 per plant. Gardeners obtained an average yield of 14.46 tons/ha and 4.81 kg/tree/year. So, the return from nuts was estimated at TK. 115,680.00/ha at farm gate price and return from by products was TK 483/ha. Taking the management cost as a variable item and return over it during optimum production period (18th-27th years), the annual return was found to be TK. 112,891.00/ha and TK. 37.58 per tree on sample gardens. In a financial analysis over the average garden life period of 38 years, the BCR, NPV and IRR were identified at 5.58, TK. 4,63,809.00 and 35% respectively and indicated that the betel nut cultivation is highly profitable at present.

Key Words: Betel nut, Production, Cost-Return, Analysis, Farmers' level, Region, Economic, Appraisal

Introduction

The betel nut (*Areca Catechu*) a palm that belongs to the Palmaceae family is grown all over Bangladesh. It can grow well in saline soil (Sebastian, 1991). A humid atmosphere and a moderate temperature are conducive for the cultivation of the betel nut, which is largely used in the South Indian and South East Asian Countries. In Bangladesh, the coastal districts of Khulna, Barisal, Patuakhali, Noakhali and Chittagong produce this crop in large quantities.

Betel nut locally known as "Supari" is used as a masticatory item. Although in Bangladesh economy, it is categorised as a minor cash crop, yet it has a social importance at various ceremonial occasions especially in traditional wedding celebrations in Bangladesh and in most other Asian countries. It has also some medicinal properties and has been used as a treatment for the passing of blood in urine, in veterinary medicine and as a source for dyes in several countries (Pearce, 1991). In Bangladesh, betel nut primarily has been used as a masticatory item and also as a source of dyeing material which the AAKOR has used to prepare dyes

through processing betel nut and its husk with chemicals^a. It has been observed that there is a good scope for betel nuts in the area of the manufacture of fabrics.

Local usage apart, there is a good export potential for betel nuts along with betel leaf. Under the free market economy, Bangladesh agriculture will have to face a serious challenge in the twenty first century. So, it is imperative to screen sustainable and potential crops which has a commercial value. Bangladesh had about 77 thousand hectares of betel nut garden^b area with a total production of 44 thousand metric tons from a native variety in 2000 (BBS, 2000). It was also observed that the growth rate (GR) of change per year in betel nut as estimated by exponential model $P = AE BT$ (Wonnacott, *et.al.*, 1979) for different parameters was significant. It was 1.93 percent for area and 2.00 percent for production, but the growth rate (GR) of change in yield was negative: 0.42 percent reflecting the absence of application of modern management practices and improved selected varieties in betel nut production. The betel nut production over the last decade in Bangladesh has witnessed an increase in production mainly due to the area effect. Year to year the fluctuation for betel nut price was of high order with CV about 13% showing the erratic behaviour of prices in the market (Table 1). However, sufficient information on area, production, marketing, costs and returns is lacking in this field to evaluate its potential as a commercial crop. So, a grass roots level study for this crop would help the researchers as well as the policy makers. As such, this study has been undertaken to generate accurate information on betel nut production, management practices, garden size, annual profitability etc., at different levels with the following specific objectives. This will help to evaluate the potential of betel nut as a commercial enterprise in the future.

Objectives

1. To estimate the annual production level of *areca* nut and survey the management at the level of household gardens.
2. To estimate the annual cost and return profile of betel nut gardens at farmers' level and identify the profitability of betel nut gardening.
3. To identify and suggest management and research priorities for this crop.

Materials and Method

Selection of Areas: Coastal districts in Bangladesh were selected as study areas and this selection was broadly based on the fact that *areca* nut farming has been well established in those locations for a long time. It has also been found that *areca catechu* is a saline loving palm (Sebastian, 1991) and grown better in the coastal areas in Bangladesh. So, four thanas^c namely Roypur, Feni Sodor, Bashkali and Kowkhali in the four coastal districts^d Laxmipur, Feni, Chittagong and Perojpur respectively were selected for this study.

^a A small scale dyeing and fabric factory named AAKOR and personal contract on 25 March, 2001.

^b Garden in this case is the specified area of land having perennial betel nut trees and in some cases coconut trees in mixed plantation within a farm. A farm is defined in this study, as a land area where total agricultural activities are taking place in rural area for livelihood of a farm family.

^c Thana is the administrative area which consists of several unions.

^d A district consists of several thanas or Upazillas and act as an administrative unit lower than a Division in Bangladesh.

Gardener Selection: A list of a total of 2,250 betel nut gardens from the four study areas was prepared with the help of respective local Agricultural Extension Department in each thana. The gardeners/farmers^e list was used as a sampling frame for the study. An 8 percent sample was drawn randomly from the list for each of the selected areas. Thus the total sample size for this study consisted of 180 betel nut gardeners. Forty five farmers from each of the two areas – Bashkhali and Feni Sodor, 40 farmers from Roypur and 50 farmers from Kowkhali were included in the total sample.

Data Collection: Each of the selected gardeners was visited and interviewed several times directly over a period of four months from December 2000 to March 2001. Data were collected with the help of a pre-designed questionnaire which was finalized after pre-testing. Information on farmers' background, garden size and year of establishment of the gardens, total number of betel nut trees as well as coconut plants (in case of mixed plantation), total harvest of nuts, management practices especially on pests and diseases control and on different inputs used and expenditures on operations was collected. Information on products disposal, prices of products, annual return from the betel nut garden and problems faced by the gardeners was also recorded. Some necessary data were also collected from secondary sources.

Techniques of Analysis: The sample farmers were grouped into small, medium and large groups on the basis of their actual land holding size. Small farmers were those having land area less than or equal to one hectare. The large farmers were having land area more than two hectares and the medium were having land area between one to two hectares only. The collected data were edited, summarized and analyzed to fulfil the objectives of the study. Both tabular and statistical techniques were used in analyzing the data. Betel nut gardens are the real estate to the farmers and after initial investment and establishment of the garden, the gardeners have to spend time and maintain a perpetuity of gardens throughout life span of trees. Gardeners have to wait a number of years before getting the first time production. An established gardener thus maintains an annual output flow, incurs goods and costs in the process i.e., the cost of inputs that went into growing the garden (Baumol, 1965) and gets the production through the life period of betel nut trees. Project appraisal procedure with a financial analysis was also used. In the financial analysis, benefit cost ratio (BCR), net present worth (NPW) and internal rate of return (IRR) were used to determine whether the investment in a garden of betel nut and the production for a considerable period were economically viable or not in the existing environmental and socio-economic conditions. The formulas were as follows:

$$\begin{aligned}
 \text{i) } \quad \text{BCR} &= \frac{\text{Present Worth of Gross Benefit}}{\text{Present Worth of Gross Cost}} \\
 &= \frac{\sum_{t=1}^n \frac{B_i}{(1+i)^t}}{\sum_{t=1}^n \frac{C_i}{(1+i)^t}}
 \end{aligned}$$

^e Gardeners and farmers are used synonymously

ii) NPV = Present Worth of Cash Flow

$$\sum_{t=1}^N \frac{(B_i - C_i)}{(1+i)^t}$$

iii) Internal Rate of Return (IRR)

$$\sum_{t=1}^N \frac{(B_i - C_i)}{(1+i)^t} = 0$$

Where, B_i = Benefit in each year, C_i = Cost in each year, n = Number of year,
 I = Discount rate ($t = 1, 2, \dots, n$).

The functional form of IRR

$$= \frac{\text{Lower Discount rate} + \text{Difference Between Two Discount rate} \times \frac{\text{Present Worth of Cash Flow at Lower Discount Rate}}{\text{Absolute Difference Between the Present Worth of Cash Flow at Two Discount Rates}}}{1}$$

(Gittinger, 1977)

Results and Discussion

The results obtained after analyzing the collected data in relation to the objectives of the study are discussed in this section. Specially the farm status, farm size, number of betel nut plants in an average garden, ownership of the garden and year of establishment, annual management costs, returns and profitability of betel nut production at farmers' level come under review.

Farm and Garden Size with Plants

Generally the size of farm is specified horizontally considering the land area owned, plus the land area rented in and minus the land area rented out. This principle is followed estimating the farm size of the sample farms. Thus, the area estimated indicates the extent of land are on which the farmer has his farming activities. In the sample studied, however, there 75 small farms (having a land up to 1.00 hectare in extent), 67 medium farms (estimated area ≥ 1.00 ha, and ≤ 2.00 ha) and 38 large farms (estimated area > 2.00 ha) respectively and the average farm size of the studied gardeners is 1.46 hectares. This average size varies according to farm size groups. It is 0.50, 1.36 and 3.54 hectares in small, medium and large groups respectively. The average betel nut garden size is 0.24 ha and covers 16 percent of the total farm area. The garden size varies in different farm size groups and a significant positive relationship is found between the farm size and the size of the betel nut garden (Table 2). This also in different survey areas. The highest average farm size is found in Bashkhali area and the second highest in Kowkhali. The betel nut garden size (0.32 ha) is also the highest in Kowkhali area (Table 3). However, when a

comparison is made among different areas considering the garden size as a percentage of the farm area, it is observed that in Roypur area gardeners use more farm area under betel nut than in other study areas. It is found that cent percent of the gardens are owned by the study farmers and more than 60% of the total betel nut gardens were established in 1970's, 20% in 1950's and the rest in the recent years (Appendix B).

In the study areas, the farmers have two types of gardens i.e., gardens with betel nut as a monocrop and mixed plantation with coconut plants. During investigation it was observed that 34% of total gardens in the study areas were under mixed plantation, specially in Kowkhali and Roypur areas. Farmers planted both betel nut and coconut plants in the same garden for intensive use of the garden area (Table 4). In the analysis, it was observed that there were 720 betel nut plants in an average garden of 0.24 hectare, in extent i.e., 3,004 nut plants in one hectare. However, this number varied in different farm size groups as well as in different study areas. The highest number of betel nut plants per hectare was observed to be in Roypur and Kowkhali areas (Table 5 & 6). Cent percent of the gardeners reported that except for the pest squirrel (*Callosciurus Pygerythrus*) and bat or Indian flying fox (*Petropus, Giganteus*), until now there have been no other pest and disease problems in the native sustainable variety of the betel nut crop.

Production Practices and Yield of Betel nut

Although betel nut is a storable cash crop in our economy yet it has been produced in this country without any special care. Generally the farmers plant nut sapling in the rainy season and in some cases apply cow dung and ash in the pit without any soil management and after care. The bunches of nuts come out just below the crown of the plants in the season of fructification. When betel nuts are ripe, the farmers harvest them. As at present there is no recommended technology for the farmers for betel nut plant establishment. The farmers, in most cases have been cultivating betel nuts on their own thinking and experiences. So the number of plants and space between plants per hectare area varied from farm to farm. In the study, it was found that maximum number of saplings were put down around the farm household or surrounding the ponds. The studied gardens were found to be 30 to 50 years old. Usually every year the farmers plant some sapling for filling up the space in the garden. No gardens were found with plants of the same age.

In the study, it was found that farmers planted 1-2 years old saplings of betel nut and from the 8th year of plantation betel nut started bearing. From the background and historical data of the gardens it is revealed that the effective fructifying time was from the 8th to 37th year (30 years) and lasted for 40-50 years. The 18 to 27 year aged plants gave the maximum yield and was considered as the optimum productive stage. The first ten years (8 to 17 years) gave about 25-30% lesser yield than the yield at optimum stage, again 3rd ten year (i.e. 28th to 37th years) aged plants gave about 30-35% lesser yield compared to the yield obtained at the 2nd ten years i.e., 18 to 27 year aged plants. The gardeners in study areas harvested matured nuts 3-5 times annually during the harvesting season (January - March). The average yield of betel nut harvested was estimated to be 14.46 tons per hectare which was much higher than the national average of 0.71 ton/ha. This is because of better private management practices and becoming the study sample being taken from betel nut concentrated growing areas instead of whole Bangladesh. This quantity of yield was found to vary among different farm size groups and significantly different in different study locations (Table 7). Comparatively the highest average betel nut yield was obtained by the gardeners in small groups. However, the gardeners in Kowkhali area got the highest average yield per farm than that of the gardeners in

other locations for such reasons as better management with the application of inputs like compost, cow dung etc, for conserving the moisture and the relatively congenial ecology.

Cost-Return Analysis

Establishment Cost

In this study, the average number of nut plants in one hectare was found to be 3,004 and the price difference for per sapling ranged from TK 0.5 to TK 2.00 and the weighted average cost for sapling was estimated to be TK 3,120.00/ha. Farmers used 2,964 kg/ha cow dung during the plantation of betel nut. It was also found that sample farmers were using compost and ash: 12.5 kg/ha and 7 kg/ha respectively. For establishing a betel nut garden of a hectare area, 56 man-days of human labour was required. Therefore, the average per hectare establishment cost of a betel nut garden was TK 7,945.00 (Table 8) and establishment cost of per plant was found to be TK 2.64.

Annual Management Cost

The study reveals that almost in each year, the farmers planted some new betel nut sapling. Sometimes a few trees were spoilt naturally or by climatic hazards. So they used to plant new sapling for filling up the gaps in garden. The average number of new plants in plantation annually was found to be 267/ha in the study areas. The sample farmers on an average were using cow dung, compost and ash at the rate of 432 kg, 14 kg and 5 kg respectively and only 7 man days per hectare for maintaining their betel nut garden (Table 8). It was also found that in the study areas betel nut was harvested by contract-labour. On an average 38 man-days were used in one hectare of betel nut garden for collecting nuts and cleaning the crown. The nuts were harvested on an average 3-5 times from each plant. Annual average garden management cost was estimated at TK 3,272.00 /ha and TK 1.09/plant/year. However, in both cases human labour was identified as the single major cost item in betel nut gardening.

Annual Return

The average yield of betel nut was found to be 14.46 tons/ha in the study areas and per tree yield was 4.81 kg/year. The return from nuts sale was TK 115,680.00 at the rate of TK 8,000.00/ton. The farmers sold old trees and leaves as by products from the gardens and got a return of TK 483.00/ha. Therefore, the annual average gross return reached TK 116,163/ha. If the annual management cost is considered as a variable cost, then the annual return over management cost on an average was found to be TK 37.58/plant in the study areas (Table 9).

Projection of Betel Nut Gardens

Gross Cost

From the historical data of the gardens, it was found that 8th – 37th year i.e., 30 years were the effective fructifying time. However, in this analysis the average productive life of a betel nut garden in study areas was found to be 38 years. After 38 years the farmers have to establish a new one. (Table 10). In the first year of plantation, there was no management cost. From the 2nd year to the 7th year of plantation, the management cost except the harvesting cost was also calculated. Thus up to the 7th year of plantation i.e., for a period of 6 years, the annual management cost was

estimated at the rate of TK 932.00/ha, and from the 8th year to the 38th year, the management cost including the harvesting cost was found to be TK 3,272.00/ha/year. Rental value of land and interest on operating capital were also estimated accordingly. Hence, the gross total cost for 38 years was found to be TK 413,350.00/ha. The average annual per hectare total cost was estimated to be TK 10,878.00 and per tree annual cost was TK 3.62.

Gross Return

Table 10 also shows the return of optimum period from 18th to 27th years of a betel nut garden. For 8th to 17th year, it was calculated at 25% lesser from the optimum (18th to 27th) return and for the 28th to 37th year, 30% lesser from the optimum return. In the 38th year, all the 3,004/ha trees were considered to be grubbed and unproductive and needed to be cut down and sold (price was assumed at TK 50.00 per tree). At the end of the project year, the return was calculated at 35% lesser from the optimum returns. Therefore, gross total return for 38 years was found to be TK 30,74,042.00 from one hectare betel nut garden. Then, the average annual per hectare gross return was estimated to be TK 80,896.00 and per tree-annual return was found to be TK 27.00. However, at the optimum period, the annual gross return was estimated at TK 116,163.00/ha and TK 38.67/tree (Table 10).

Financial Analysis

The financial analysis of the project was done considering the total life period i.e., 38 years and separated in fact for six groups of time and shown in Table 11. This table depicts detailed calculation of the BCR, NPV and IRR which were considered to justify the economic viability of investment in betel nut gardening. Benefit cost ratio was found to be 5.58, NPV was also found highly positive and the internal rate of return (IRR) which was considered as the yield of investment in garden was calculated to be around 35% which was very high (Table 11). Therefore, it may be concluded from the study that betel nut production at farm level is a profitable cash crop for improving farm income.

Conclusion

The betel nut cultivation reflects the absence of application of modern management practices and improved selected varieties of betel nut in cultivation at farmers' level. From this study, it was found that the farmers have an average garden size of 0.24 ha covering 16% of the total farm area in the South-East region in Bangladesh. More than 60% of the gardens were established in the 1970's, 20% in the 1950's and the rest in the recent past. The average productive life period is 38 years. However, the gardeners have to spend time and maintain a perpetuity of the gardens for the life span of trees and has to incur management cost including inputs cost each year after the establishment but an average betel nut gardener is getting TK.112,891.00/ha from an established garden as an annual return over the management cost. The higher BCR, NPV and IRR of financial analysis of the nut gardens indicates that the betel nut production at farm level is an economically viable and profitable venture for increasing farm income. However, some recommendations could be made from this study for the benefit of the national economy under future open market competition.

- (1) An effort may be taken to disseminate improved selected betel nut varieties to the farmers in plantation for a higher yield.
- (2) Management with the application of compost and cow dung gave a relatively better yield of betel nut as identified in this study yet, certain research

experiments may be taken to synthesise standard management and production practices for generating extension messages and promoting yield per unit of area.

- (3) Future research work may be taken to explore the possible industrial field for betel nut utilization for dyeing and medicinal requirements in the country, so that the producers can get a better market and prices for the products.

Table 1. Area, production, yield and average whole sale price of betel nut and their annual growth rate in the last decade (1990 - 2000) in Bangladesh*

Parameters	Area	Production	Yield	Prices
Mean	40108.30	27827.00	0.71	75237.70
SD	12262.77	5593.65	0.06	9562.23
CV (%)	3.06	20.10	8.45	12.71
GR (%)	+1.93	+2.00	-0.42	+1.55

* Estimated on the basis of appendix A.

Table 2. Distribution of average farm and garden size by different farm size groups and testing the significance of difference

Farm size	No. of farmers	Av. farm size (ha)	Av. garden size (ha)	T-statistics
Small (S)	75	0.50	0.16 (32)	tsm=0.938
Medium (M)	67	1.36	0.22 (16)	tml=2.766* *
Large (L)	38	3.54	0.48 (14)	tls=3.452***
All sizes	180	1.46	0.24 (16)	

Figures in the parentheses are percentage of farm size. *** Significant 1% level

Table 3. Average size of garden & garden as percent of farm size in different survey areas

Areas	No. of farms	Av. size of farm	Av. size of garden	Garden area as a percent of farm size
Roypur	40	0.75	0.17	23
Feni sodor	45	1.23	0.23	19
Bashkhali	45	2.13	0.24	11
Kowkhali	50	1.65	0.32	19
All areas	180	1.46	0.24	16

Table 4. Distribution of garden according to plantation of betel nut plants in study areas

Study area	Single plantation	Mixed plantation	Total
Roypur	29	11	40
Feni sodor	45	-	45
Bashkhali	45	-	45
Kowkhali	-	50	50
All	119	61	180
(%)	(66)	(34)	(100)

Figures in the parentheses are percentage of the total

Table 5. Average number of betel nut plants in survey garden according to farm size

Farm size	No of farms	Av. size of garden (ha)	Av. no. of betel nut plants in garden	Av. no. of plants/ha
Small (S)	75	0.16	372	2327
Medium (M)	67	0.22	668	3035
Large (L)	38	0.48	1751	3649
All sizes	180	0.24	720	3004

Table 6. Average number of betel nut plants in different survey areas

Area	No. of farms	Av. size of garden (ha)	Av. no of betel nut plants in garden	Av. no. of plants/ha	T-Value
Roypur (1)	40	0.17	847	4,982	$t_{12}=10.863^{***}$
Feni sodor (2)	45	0.23	236	1,027	$t_{23}=2.441^{**}$
Bashkhali (3)	45	0.24	149	620	$t_{34}=7.025^{***}$
Kowkhali (4)	50	0.32	1,128	3,526	$t_{41}=2.734^{***}$
All areas (5)	180	0.24	720	3,004	$t_{42}=5.739^{***}$
					$t_{13}=13.186^{***}$

*** Significant at 1% level, ** Significant at 5% level

Table 7. Average annual total yield of betel nut according to the farm size in study areas

Study Areas	Yield (ton/ha)				T-Value
	Small	Medium	Large	All	
Roypur (1)	23.67	22.03	8.44	18.05	$t_{12}=5.84^{***}$
Feni sodor (2)	3.10	3.58	2.94	3.20	$t_{23}=3.84^{**}$
Bashkhali (3)	1.68	1.63	1.89	1.74	$t_{34}=2.10^{**}$
Kowkhali (4)	57.27	32.04	15.22	34.84	$t_{41}=1.49ns$
All areas	21.43	14.82	7.12	14.46	$t_{42}=2.03^{**}$
					$t_{13}=7.13^{***}$

*** Significant at 1% level, ** Significant at 5% level, ns=not significant

Table 8. Average per hectare establishment and annual management cost of betel nut gardens in the south-east region in Bangladesh

Items	Establishment cost (TK)			Annual management cost (TK)		
	Quantity	Cost	Percent	Quantity	Cost	Percent
Betel nut sapling (No.)	3,004.00	3,102.00	39	267.00	275.00	8
Cow dung (Kg)	2,964.00	1,489.00	19	432.00	217.00	7
Compost (Kg)	12.00	3.00	*	14.00	7.00	-
Ash (Kg)	7.00	4.00	-	5.00	3.00	-
Human labour in planting (Man days)	56.00	3,347.00	42	7.00	430.00	13
Human labour in harvesting (Man days)	-	-	-	38.00	2340.00	72
Total		7,945.00	100		3,272.00	100

* Indicates less than 0.5

Table 9. Average annual management cost and return from betel nut garden

Item	Amount (TK)
Yield (ton/ha)	14.46
Price rate (TK/ton)*	8,000.00
Return (TK/ha)	115,680.00
Return from by-product (TK/ha)	483.00
Gross return (TK/ha)	116,163.00
Annual management cost (TK/ha)	3,272.00
Return over management cost (TK/plant)	37.58

* Farm gate price (TK 8,000.00/ton) of betel nut was considered in calculation.

Table 10. Projection and gross cost and return analysis over garden life period of betel nut gardens in study areas

Item	Garden life period						Total (38 yrs)
	1st	2-7th (6 yrs)	8-17th (10 yrs)	18-27th (10 yrs)	28-37th (10 yrs)	38th	
Gross Cost (TK)							
Establishment cost	7,945	-	-	-	-	-	7,945
Management cost		5,592	32,720	32,720	32,720	3,272	107,024
Rental value of Land@TK 7000/ha/yr	7,000	42,000	70,000	70,000	70,000	7,000	266,000
Interest of Operating Capital@ 8.5%*	1,270	4,045	8,731	8,731	8,731	873	32,381
Total	16,215	51,637	111,451	111,451	111,451	11,145	413,350
Gross Return (TK)							
Return (TK/ha)	-	-	867,600	1,156,800	809,760	75,192	2,909,352
By product (TK/ha)	-	-	4,830	4,830	4,830	-	14,490
Trees Sale at 38th yr	-	-	-	-	-	150,200	150,200
Total			872,430	1,161,630	814,590	225,392	3,074,042

* Present Bank interest rate 8.5% for saving account has been considered and rounding of figures was considered without point in the table

Table 11. Financial analysis of betel nut gardens in study areas

Duration in year/s	Gross Benefit (TK/ha/yr)	Gross Cost (TK/ha/yr)	Cash Flow (TK/ha/yr) (df) at 8.5%	Discount Factor	Net Present Worth at 8.5% df	Discount Factor (df) at 25%	Net Present Worth at 25% df	Discount Factor (df) at 30%	Net Present Worth at 30% df	Discount Factor (df) at 35%	Present Worth at 35% df
1st	-	16,215.00	-16,215.00	0.9,217	-14,945.00	0.800,000	-12,972.00	0.769,231	-12,473.08	0.740,741	-12,011.12
2-7th (6 yrs)	-	8,606.17	-8,606.17	4.1,969	-36,119.00	2.361,139	-20,320.37	1.441,166	-12,402.92	1.766,783	-15,205.23
8-17th (10 yrs)	87,243.00	11,145.10	+76,097.90	3.7,067	+282,070.00	0.748,789	+5,698.26	0.492,687	+37,492.47	0.332,231	-25,282.09
18-27th (10 yrs)	116,163.00	11,145.10	+105,017.90	1.6,394	+172,167.00	0.080,401	+8,443.50	0.035,739	+3,753.20	0.016,524	-1,735.27
28-37th (10 yrs)	81,459.00	11,145.10	+70,313.90	0.7,251	+50,984.00	0.008,633	+607.02	0.002,592	+182.28	0.000,822	-57.78
38th	225,392.00	11,145.00	+214,247.00	0.0,450	+9,651.00	0.000,208	+44.50	0.000,047	+10.02	0.000,011	-2.39
Total (38 yrs)					+463,809.00		+32,784.00		+16,562.00		-139.00

(i) BCR = 5.58 (ii) NPV at 8.5% = TK 463,809.00 (iii) IRR = 35%

APPENDIX A**Table 1. Betel nut area, production, yield and average whole sale price and their variation in the last decade (1990-2000) in Bangladesh**

Year	Area (ha)	% of variation	Production (M.ton)	% of variation	Yield (ton/ha)	% of variation	Prices (TK/ton)	% of variation
1990-91	35,813	-	24,020	-	0.67	-	69,045	-
1991-92	35,917	0.29	24,260	1.00	0.68	1.49	66,574	-3.58
1992-93	35,813	-0.29	23,855	-1.67	0.67	-1.47	66,463	-0.17
1993-94	35,813	0	25,610	7.36	0.72	7.46	72,238	8.69
1994-95	36,178	1.02	26,330	2.81	0.73	1.39	72,181	-0.04
1995-96	36,463	0.79	26,940	2.32	0.74	1.37	71,110	-1.48
1996-97	36,155	-0.84	27,255	1.17	0.75	1.35	68,396	-3.82
1997-98	36,017	-0.38	28,000	2.73	0.78	4.00	81,120	18.60
1998-99	36,018	-0.002	28,000	0	0.78	0	91,500	12.80
1999-00	76,892	113.48	44,000	57.00	0.57	-26.92	93,750	2.46

Source : BBS Crop Sum 2000 and DAM, Ministry of Agriculture

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