






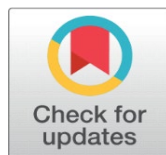


INPUTS COST SENSITIVITY ANALYSES OF BETEL LEAF PRODUCTION: A STUDY ON SELECTED FARMERS AT THE DISTRICTS OF KUSHTIA-JHENIDAH IN BANGLADESH

Dr. Md. Abdus Sabur ¹, Dr. Md. Mizanoor Rahman ², Dr. Md. Abu Sina ³ , Md. Nazmul Huda ⁴ , Md. Kamal Uddin ⁵

^{1,2,3} Professor, Department of Accounting & Information Systems, Islamic University, Kushtia, Bangladesh

^{4,5} Assistant Professor, Department of Accounting & Information Systems, Islamic University, Kushtia, Bangladesh



ABSTRACT

The study aims to evaluate the inputs cost sensitivity of betel leaf production of selected farmers in Bangladesh. Purposively two districts like Kushtia and Jhenidah were chosen for study area. Both primary and secondary data were used, and primary data were collected from 120 farmers. For analyzing data 9 variables were used like Material cost, Labor, Land cost (Lease), Fertilizer, Insecticide, Irrigation Cost, Depreciation of Primary cost, Selling and Distribution cost, other cost as input costs and one variable (Sales) was used as output variable. The analysis has been done by applying descriptive statistics, Cobb-Douglas production function and marginal physical productivity (MPP) to identify nature of production function and influential sensitive input costs. The summation of all regression co-efficient included in the model, $\sum\beta_i=1.35$ indicated that the production function is in the state of increasing return to scale. The highest MPP value was found in other cost (64.95) followed by insecticide (3.22); selling and distribution cost (2.69); labor cost (1.25) and fertilizer (1.20) which are very sensitive inputs and have the strong influence on output variables.

Keywords: Betel Leaf, Sensitivity Analysis, Production Function, Marginal Physical Productivity, Input Costs

Received 16 March 2022

Accepted 16 April 2022

Published 04 May 2022

Corresponding Author

Md. Nazmul Huda,

nazmuliu07@gmail.com

DOI

[10.29121/granthaalayah.v10.i4.2022.4554](https://doi.org/10.29121/granthaalayah.v10.i4.2022.4554)

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Copyright: © 2022 The Author(s). This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).

With the license CC-BY, authors retain the copyright, allowing anyone to download, reuse, re-print, modify, distribute, and/or copy their contribution. The work must be properly attributed to its author.



1. INTRODUCTION

Betel leaf is an important cash crop to the farmers of Bangladesh that has a vital economic value and positive impact on the economic development of the country. Being a cash crop, betel leaf plays an important role in the economy and livelihood of a large number of people involve in productions as well as in the consumers utility segments in Bangladesh. For the quality superiority and flavour of Bangladeshi betel

leaf, it has a wide range of market demands in many countries of Asia and Europe [Mahfuza et al. \(2020\)](#). The pioneer betel leaves exporting countries are Saudi Arabia, UAE, Pakistan, England, Italy, Germany, India etc. [Banglapedia \(2021\)](#). The nature of input costs is very important for growers of betel leaf in a certain area of the country. The farmers of the different areas in Bangladesh are engaged to contribute betel leaves with various environments and situations of input costs. Without adequate knowledge of input costs management, the farmers are not able to attain expected level of benefits. The study results in this regard, it is hope that it will be helpful for the growers of betel leaf.

The human labour, machinery, chemical, chemical fertilizer, and water for irrigation were the most important inputs that significantly contributed to yield of sunflower whereas the farmyard manure, seed and land are not consistent with the output of sunflower. Moreover, the input costs water for irrigation, machinery and chemical fertilizer had strong influence on the output variables [Mousai-Avval et al. \(2011\)](#). The major problem of agricultural production in Iran is water scarcity. Hedonic pricing approach and sensitivity analysis had been applied to identify the effective variables those had the remarkable contribution on output. The findings indicated that by reducing dryness and so increase water consumption could help to decrease water irrigation in a long ran period [Kakhki et al. \(2010\)](#). In this study a model has been developed through Cobb- Douglas production functions whereas better utilization of resources and reduction of wastage are confirmed [Zecevic et al. \(2019\)](#). By this study an attempt was taken to examine the profitability of farmer based common bean seed production in Kenya. It was estimated that profitability was dependent on access to irrigation and good agronomy [Katungi et al. \(2011\)](#). Through this work, the researchers found out the right location of an agribusiness firm providing agricultural technology where the optimal solution was Muhlenberg Country [Shockley et al. \(2007\)](#).

Based on above mention literature reviewed, it is found that there was no comprehensive study had yet been conducted on betel leaf cultivation with economic model and sensitivity analysis under the districts of Jhenidah-Kushtia in Bangladesh. Thus, the researchers choose the area with topic entitled “Inputs Cost Sensitivity Analyses of Betel Leaf Production: A Study on Selected Farmers at the districts of Kushtia- Jhenidah in Bangladesh”.

2. OBJECTIVES OF THE STUDY

The main objective of the study is to evaluate the inputs cost sensitivity of betel leaf production of selected farmers in Bangladesh.

2.1. THE SPECIFIC OBJECTIVES OF THE STUDY ARE AS FOLLOWS

- 1) To overview the production costs related to betel leaf production of the selected farmers in Bangladesh during the study period.
- 2) To examine the inputs costs behaviour on output with respect to the estimated models and sensitivity analysis.
- 3) To identify the major problems faced by the farmers in growing betel leaf and finally
- 4) To suggest some policy, guidelines, and recommendations to enhance betel leaf production in Bangladesh.

3. TECHNIQUES AND MATERIALS

The formulae of estimating the sample size are
$$N = \frac{Z^2 pq}{d^2} \tag{i}$$

Where, N= Desired sample size; Z= Standard normal deviate usually set at 1.96, which corresponds to 95% confidence level, p= Assumed proportion in the target population estimated to have particular characteristic, d=Degree of accuracy in estimated population. [Islam \(2011\)](#)

Here, Total population=1998; targeted population=171; Z=1.96; p=0.915; q=0.085 and d=0.05 then from (i), N=120. Those 120 farmers were selected applying purposive sampling techniques from Kushtia and Jenidha districts in Bangladesh. The data regarding selected input variables Material cost (X1); Labour (X2); Land cost (Lease) (X3); Fertilizer (X4); Insecticide (X5); Irrigation Cost(X6); Depreciation of Primary cost (X7); Selling and Distribution cost (X8) Other cost (X9) whereas out variable sales were collected from 120 farmers during the study period 2020-2021. The data were converted to per decimal input cost and output for each of the selected variables in BDT (Bangladeshi Taka). Then the analysis has been done by applying descriptive statistics, Cobb-Douglas production function and marginal physical productivity (MPP) to identify nature of production function and influential sensitive input costs. The modified log-linear model derived from Cobb-Douglas production can be expressed as below:

$$\ln Y = \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 \ln X_6 + \beta_7 \ln X_7 + \beta_8 \ln X_8 + \beta_9 \ln X_9 + e \tag{ii}$$

Where Y= Output (Sales); $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8$ and β_9 are the regression coefficients of Input costs X₁, X₂, X₃, X₄, X₅, X₆, X₇, X₈ and X₉ respectively. The properties of the Cobb-Dougal production function are quite well known β_i 's is the (partial) elasticity of output with respect to each of inputs that is, it measures the percentages change in output for, say, 1 percent change in each input, holding the other inputs constant. The sum ($\beta_1 + \beta_2 + \beta_3 + \dots + \beta_9$) gives information about the returns to scale, that is, the response of output to a proportionate change in the inputs. If this sum is 1, then there are constant returns to scale, that is, doubling the inputs will double the output, tripling the inputs will triple the output, and so on. If the sum is less than 1, there are decreasing returns to scale, doubling the inputs will less the double the output. Finally, if the sum is greater than 1, there are increasing returns to scale, doubling the inputs will provide more than double the output [Gujarati \(2003\)](#).

The Marginal Physical Productivity (MPP) can be represented as in following mathematical form:

$$MPP_{x_j} = \frac{GM(Y)}{GM X_j} \times a_j \tag{iii}$$

Where, MPP_{xj} is marginal physical productivity of jth input a_j, regression coefficient of jth input, GM(Y), geometric mean of yield, and GM(X_j), geometric mean of jth input costs on per decimal in BDT basis (Singh et al.,2004). The geometric mean each calculated with applying the formula,

$$G.M = \sqrt[n]{X_1 \cdot X_2 \cdot X_3 \dots \dots \dots X_n} \tag{iv}$$

Gupta and Gupta (2005)

The greater MPP value of inputs cost has the higher influential and sensitive impact on out.

4. ANALYSIS AND INTERPRETATIONS

Table 1

Table 1 Economic and Descriptive Measures of Inputs Cost and Output of Betel Leaf Production (Tk. BDT/ decimal)					
Items	Min.	Max.	GM	C.V	% Of T
Sales	5000	12000	6946	19	-
Material cost(X1)	571	1000	736	13	22.80
Labour (X2)	583	1500	828	14	25.65
Land cost (Lease) (X3)	500	1050	702	6	21.75
Fertilizer(X4)	200	583	324	18	10.04
Insecticide(X5)	40	250	88	22	2.73
Irrigation Cost(X6)	12	120	38	49	1.18
Depreciation of Primary cost(X7)	125	357	217	18	6.72
Selling and Distribution cost(X8)	125	833	198	33	6.13
Other costs(X9)	35	220	97	34	3.00
Total cost of production	2192	5914	3228	8	100
Operating Profit	2808	6086	3719	31	-
Non-operating income (Sales of other crops)	142	880	386	34	-
Productivity=Sales/ Total cost of production				2.15	
Benefit to cost ratio				1.15	

Sources: N=120, Compiled from field survey; % of T= total average production cost.

Table 1 shows the economic and descriptive measures of inputs cost and output of betel leaf per decimal in BDT. It is found from the analysis; the percentage of labour cost is the highest of 25.65% followed by material cost 22.80% and land cost by 21.75% and so on with lowest of irrigation cost 1.18%. The co-efficient of variation is better for land cost (6%) and worst for irrigation (49%). The economic productivity and benefit to cost ratio were found to be 2.15 and 1.15 indicating a better position of betel leaf cultivation of the undertaken study.

Table 2

Table 2 Economic Model and Sensitivity Analysis of Inputs Cost and Output of Betel Leaf Production				
Ln Y= β₁lnX₁+ β₂lnX₂+ β₃lnX₃+ β₄lnX₄+ β₅lnX₅+ β₆lnX₆+ β₇lnX₇+ β₈lnX₈+ β₉lnX₉+e				
Items	β- coefficient	t-ratio	MPP	VIF
Material cost(X1)	0.104	7.78*	0.92	1.482
Labor(X2)	0.15	11.89*	1.25	1.323
Land cost (Lease) (X3)	-0.023	-1.75**	-0.23	1.441
Fertilizer(X4)	0.056	4.55*	1.2	1.25
Insecticide(X5)	0.041	2.73*	3.22	1.839
Irrigation Cost(X6)	0.005	0.37	0.91	1.263
Depreciation of Primary cost(X7)	0.029	2.63*	0.92	1.024

Selling and Distribution cost(X8)	0.077	5.56*	2.69	1.576
Other costs(X9)	0.911	68.67*	64.95	1.463
R Square	0.987			
Adjusted R Square	0.986			
$\sum \beta_i$	1.35			

Sources: N=120, Compiled from field survey; % of T= total average production cost.

The result of the economic model and sensitivity analysis of inputs costs and output of betel leaf are depicted in the Table 2. The co-efficient of determination or R square is estimated as 0.987 which implies that the variables included in model collectively contributed to 98.7 percent of total variance explained of the output. It is revealed from the results that material cost(X1), labour (X2), fertilizer (X4), depreciation of primary cost(X7), and selling and distribution cost (X8) have the positive and significant impact at 1% level on output. On the other, hand irrigation cost(X6) has the insignificant positive impact and labour cost(X3) has the negative impact on output. The highest MPP value was found in other costs (64.95) followed by insecticide (3.22); selling and distribution cost (2.69); labour cost (1.25) and fertilizer (1.20) which are very sensitive inputs and have the strong influence on output variables.

The results of the summation of all regression co-efficient included in the model, $\sum \beta_i=1.35$ indicated that the production function is in the state of increasing return to scale.

5. MAJOR FINDINGS

It is found from the analysis; the percentage of labour cost is the highest of 25.65% followed by material cost 22.80% and land cost by 21.75% and so on with lowest of irrigation cost 1.18%. The co-efficient of variation is better for land cost (6%) and worst for irrigation (49%). The economic productivity and benefit to cost ratio were found to be 2.15 and 1.15 indicating a better position of betel leaf cultivation in this area of Bangladesh. It is revealed from the results that material cost(X1), labour (X2), fertilizer (X4), depreciation of primary cost(X7), and selling and distribution cost (X8) had positive and significant positive impact at 1% level on output. On the other hand, irrigation cost(X6) had the insignificant positive impact and labour cost(X3) had the negative impact on output. The highest MPP value is found in other costs (64.95) followed by insecticide (3.22); selling and distribution cost (2.69); labour cost (1.25) and fertilizer (1.20) which are very sensitive inputs and have the strong influence on output variables.

The results of the summation of all regression co-efficient included in the model was found to be 1.35 indicated that the production function hold in the state of increasing return to scale.

6. CONCLUSION, SUGGESTIONS AND RECOMMENDATIONS

The inputs cost analysis of betel leaf production is very important job for the betterment of the cultivators. Among the inputs, other costs, selling-distribution costs, labour costs and fertilizer cost are highly sensitive to influence the output of the betel leaf production. These costs have positive impact to hold the production function in the stable position of increasing return to scale. To maintain the production function increasing return to scale it is important to make a good

management of these inputs cost. To implement a better cost management, the following suggestions and recommendation are to be provided:

- 1) The labour cost should be reduced and carefully managed it to have a better impact on output.
- 2) A good irrigation system should be introduced for uniform water supply for the betel leaf cultivation.
- 3) The concern authority should be attentive and taken necessary actions for upholding the better position of cost-benefit situation and productivity.
- 4) The influential and sensitive costs like other costs; insecticide costs; selling and distribution costs; Labour and fertilizer costs should be managed carefully.
- 5) It should be given preference to have a continuation of the production function of betel leaf cultivation in the state of increasing return to scale.
- 6) The concern authority should make policy implication to make the farmers higher interest providing adequate easy loan systems, training, and reward.
- 7) The proper initiative should be taken to introduce to set up research and development wing for this sector.

REFERENCES

- Banglapedia (2021). National Encyclopedia of Bangladesh.
- Gujarati, D.N. (2003). Basic Econometrics. New York.
- Gupta, S.P & Gupta, M.P (2005). Business Statistics, Sultan Chand & Sons New Delhi
- Islam, M.N. (2011). An Introduction to Research Methods, Dhaka, *Mullick Brothers*.
- Islam, Q.M.S., M.A. Matin, M.A. Rashid, M.S. Hoq and Moniruzzaman (2015). Profitability of Betel Leaf (*Piper betle* L.) Cultivation in Some Selected Sites of Bangladesh. *Bangladesh Journal of Agricultural Research*, 40(3), 409-420. <https://doi.org/10.3329/bjar.v40i3.25416>
- Kakhki, M.D., Shahnoushi, N., & Khajehroshanee, N. (2010). Valuation of Water and and its Sensitivity in Agricultural Sector A Hedonic Pricing Approach. *American Journal of Agricultural and Biological Science*, 5(1), 20-24. <https://doi.org/10.3844/ajabssp.2010.20.24>
- Katungi, E., Karanja, D., Wozemba, D., Mutuoki, T. & Rubyogo, J.C. (2011). A Cost - Benefit Analysis of Farmer based Seed Production for Common Bean in Kenya. *African Crop Science Journal*, 19(4), 409 – 415
- Mahfuza, E. J., Sayem, S. M., & Hassan, M. F. (2020). Trend of Betel Leaf Production in Bangladesh : Prospects and Challenges. *Research in Agriculture Livestock and Fisheries*, 7(2), 209-223. <https://doi.org/10.3329/ralf.v7i2.48861>
- Mousai-Avval, S.H., Rafiee, A., Jafari, A. & Mohammadi, A. (2011). Econometric Modeling and Sensitivity Analysis of Costs of Inputs for Sunflower Production in Iran. *International Journal of Applied Engineering Research, Dindigul*, 1(4), 759-766.
- Shockley, J., Saghaian, S., & Dillon, C. (2007). Cost Sensitivity Analysis on the Optimal Location of Technology Providers in Kentucky. *Research in Agricultural and Applied Economics*.
- Singh, G., Singh, S. & Singh, J. (2004). Optimization of energy inputs for wheat crop in Punjab. *Energy Conversion & Management*, 45(3), 453-465. [https://doi.org/10.1016/S0196-8904\(03\)00155-9](https://doi.org/10.1016/S0196-8904(03)00155-9)
- Zabir, A., Rahman, S., Tasnim, A., Sonia, J.F., Antor, S.C., & Mahmud, A. (2019). Economics of Production and Marketing of Betel Leaf in Selected Areas of

Bagerhat District, *Bangladesh. Journal of Agricultural and Rural Research*, 3(1), 28-35.

Zecevic, M, Pezo, L., Bodroza-Solarov, M., Brlek, T., Krulj, J., Kojic, J., Maric, B. (2019). A Business Model in Agricultural Production in Serbia, Developing towards Sustainability, *Economics of Agriculture*, 66(2), 437-456. <https://doi.org/10.5937/ekoPolj1902437Z>