

# Economic Evaluation of Betel (*Piper betle* L.) Cultivation in Kurunegala and Gampaha Districts of Sri Lanka

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## ABSTRACT

Betel cultivation has become popular as a cash crop among Sri Lankan farmers due to its lucrative income generation capacity. This study was carried out to examine the economics of cultivation of betel (*Piper betle* L.) in major betel cultivating districts of Sri Lanka viz, Kurunegala and Gampaha. A survey was conducted with 70 farmers, 35 from each district, to identify the cost and returns and constrains for cultivation of betel. Socio-economic conditions of betel farmers in the study area were also studied. Present value of costs and benefits were calculated using discounting factor at an interest rate of 10 percent.

Result of the present study revealed that the cost of production per 1000 leaves as Rs. 212.98. Benefit cost ratio (BCR), Net Present Value (NPV), and Internal Rate of Return (IRR) showed that the cultivation of betel is profitable both in Gampaha and Kurunegala districts for export market. Results of the study further revealed that the most crucial factor affecting production of betel was scarcity of stakes as vertical supporting material, followed by high incidence of diseases, non-availability of suitable lands, high cost of fertilizer, high labour cost and lack of water for irrigation. Study on socio economic conditions of betel farmers revealed that 97 percent of farmers have attained higher education and 82 percent of farmers have more than ten-year experience on betel cultivation. Sixty three percent of the population satisfied with the extension services provided by Department of Export Agriculture.

**KEY WORDS:** Betel cultivation, Benefit Cost Ratio, Profitability, Present value, Socio- economic condition

## INTRODUCTION

Betel (*Piper betle* L.) belongs to the genus Piper of the family Piperaceae. It is a perennial aromatic creeper grown for its leaves (Perseglove, 1971). Sri Lankan betel industry has a long-standing history dating back to 340 AD and this crop is grown in Sri Lanka for its leaves, which are used for chewing purposes (Senévirathna and Rathnasoma, 2002). Betel has become a popular cash crop among Sri Lankan farmers because of its low initial cost of cultivation and the possibility of getting lucrative income when compared to other crops grown in this area. It has a good export market and year round harvesting capacity with short lag period (Anon, 1996). The two major districts producing export quality betel leaves in Sri Lanka are Kurunegala and Gampaha. The production of export quality betel was started at Mirigama, Minuwangoda and Divulapitiya areas in Gampaha district. Presently, the export quality betel leaves are mostly produced by farmers at Kuliypitiya, Pannala and Panduwasnuwara areas in Kurunegala district (Sumanasena, 2004). Our main importer of betel is Pakistan (Senévirathna and Rathnasoma, 2002) with 99 percent market share (Anon, 1996). In terms of foreign exchange earnings and employment generation, this industry earned Rs. 276.4 million from exports in the year 2003, which was higher than the export earnings from Cashew and essential oils (Anon, 2001). According to the agricultural experts, no broader economic and socio economic studies were undertaken on betel cultivation so far, even though betel has become one of the stable sources of income for betel growing farmers in Kurunegala and Gampaha districts.

This study was therefore, carried out to investigate the cost and returns and economic

profitability of betel cultivation. Further, the socio economic condition of farmers and the problems and constrains associated with betel cultivation in these two districts were studied.

## METHODOLOGY

The study was carried out in Gampaha and Kurunegala, which represent major districts of betel cultivation, from December 2004 to May 2005. A three stage stratified random sampling procedure was adopted. In the first stage of sampling representative districts were selected, followed by the selection of registered farmer organizations within the districts. Then, random selection of farmers was done within the selected farmer organizations.

A sample of farmers interviewed during the study was classified into three main categories according to the extent of cultivation (Table 1).

Table 1. Classification of farmers into categories

Category/ Scale of cultivation	Number of stakes per farmers
Large scale	More than 1000 stakes
Medium scale	Between 1000 and 500
Small scale	Less than 500 stakes

The total sample consisted of 70, with each district having 35 farmers. Number of farmers interviewed from both districts under each category is depicted in the Table 2.

The cost and returns of betel cultivation were calculated based on the information collected from farmers. For the computation, it was assumed that the wage rate per man-day as Rs. 300, average prices of betel for 1000 leaves as Rs. 1250 and Rs. 200 in export and domestic markets, respectively.

**Table 2. Number of farmers interviewed under each category**

Scale of Operation	District	
	Kurunegala	Gampaha
Large scale	21	21
Medium scale	08	09
Small scale	06	05
<b>Total sample</b>	<b>35</b>	<b>35</b>

The yield data were collected during the surveyed period. Benefit Cost Ratios (BCR) were calculated using the present value of costs and benefits, to identify the profitability of production of betel leaves.

$$BCR = \frac{\text{Present value of Benefits}}{\text{Present value of Cost}}$$

To confirm the industry worthiness, sensitivity analysis was carried out for both districts at 10%, 15%, and 25% high cost levels and 10%, 15%, 25% low benefit levels.

In order to identify the profitability of investment, for betel cultivation in Gampaha and Kurunegala districts, Internal Rate of Return (IRR) was calculated separately for both districts.

$$0 \text{ (zero)} = \sum_{t=1}^n \frac{PV}{(1+R)^t} - CI$$

Where,

PV = Present value

R = Interest rate

CI = Capital investment to be incurred immediately (IRR = Interest rate at the NPV equal to zero)

Calculated benefit cost ratio was used to identify the most profitable district, most profitable market, most profitable scale and overall profitability of betel cultivation.

The socio-economic conditions of betel farmers in both districts were analyzed. The constraints for production of betel were identified during the farmer survey and ranked according to their relative importance to the industry.

## RESULTS AND DISCUSSION

Cost of production (COP) of betel was computed using the data from a sample survey. It was assumed that one cycle of betel cultivation consists of three years. Hence, the COP computation had to take the full cost of the cultivation for the total period. The present value approach is used in the computation of the COP, since the cultivation includes multi period operations.

Betel is cultivated mainly in three scales, as indicated in Table 1. The type of labour used in these three cultivation scales is different from each other. Large scale cultivators used more hired labour in addition to the family labour, whereas the other two used more family labour with different intensities (Anon, 1996). However, in this research, all the labour cost including family labour was taken into cost of production. The labour cost was assumed at Rs. 300 per man-day for both districts. The percentage values of different cost components are given in Table 3 for each district separately.

### Labour man-days and labour cost

It has been estimated that betel requires about 394 man-days per 1000 stakes per 341 m<sup>2</sup> land in Gampaha district and 403 man-days in Kurunegala district (Table 3). The major cultural operations are harvesting and grading (51.5%) in Gampaha district followed by irrigation, (36.5%) weeding and plant protection (7.36%). In Kurunegala district irrigation (44.66%) is the major cost component due to the longer drought period and scarcity of water, followed by harvesting and grading (43.2%) weeding and other plant protection activities (6.7%).

**Table 3. Labour man-days per 1000 stakes of betel in Gampaha and Kurunegala districts**

Cultural operation	Gampaha		Kurunegala	
	Labour Man days	% to the total labour days	Labour man days	% to the total labour days
Land preparation	05	1.27	06	1.49
Planting	02	0.50	02	0.50
Irrigation and fertilizer application	144	36.50	180	44.66
Manuring	06	1.52	09	2.23
Weeding and other cost	29	7.36	27	6.70
Establishment of vertical support	01	0.25	01	0.25
Managing the frame	04	1.01	04	0.99
Harvesting and grading	203	51.50	174	43.17
<b>Total</b>	<b>394</b>	<b>100</b>	<b>403</b>	<b>100</b>

Source: Survey data

## ECONOMICS OF BETEL CULTIVATION

**Table 4. Input cost per 1000 stakes of betel in Gampaha and Kurunegala districts**

Cultural operation	Gampaha		Kurunegala	
	Input cost	% to the Total input cost	Input cost	% to the total input cost
Land preparation	364	0.56	818	1.21
Cost of stakes	5273	7.99	3636	5.37
Cost of fuel	7213	11.98	7960	12.89
Inorganic fertilizer	30128	50.06	30518	49.41
Cost of manure	6500	10.79	14924	24.16
Weeding and other	1129	1.93	746	1.21
Plant protection				
Managing the frame	1676	2.54	861	1.27
Transport cost	4833	8.18	1608	2.64
Fair charges	3529	5.97	1123	1.84
<b>Total</b>	<b>60645</b>	<b>100</b>	<b>62194</b>	<b>100</b>

Source: Survey data

Of the total input cost of Rs. 60645 and Rs. 62194 per 1000 stakes, fertilizer cost constituted 50.06%, 49.11% in Gampaha and Kurunegala districts, respectively. This may be due to the higher application of inorganic fertilizers (2 kg / 100 stakes / 2 weeks) which is extremely higher than the recommendation of DEA (420g / 100 stakes / 2 weeks). The results indicated that the average total cost of production of betel was Rs. 157909 per 1000 stakes in Gampaha district and Rs. 162543 in Kurunegala district for three-year cultivation period. Results of the present study showed that the cost of production was Rs. 196.32 per 1000 leaves in Gampaha district and Rs. 229.64 per 1000 leaves in Kurunegala district.

**Table 5. Cost of Production of Betel**

Particulars	Gampaha	Kurunegala
Total cost Rs/1000 stakes three years	157909	162543
No. of export quality leaves	377215	362471
No. of local quality leaves	427104	345318
Total production/three years	804319	707788
Cost of production (Rs/1000 Leaves)	196.32	229.64
<b>Average</b>	<b>212.98</b>	

Source: Survey data

### Analysis of Benefit Cost Ratio

Cost items identified during the study were the costs for land preparation, stakes, wires, labour, machinery, inorganic fertilizer, organic fertilizer, fuel, market charges, transport costs and others.

Benefit items for the betel cultivation were selling betel leaves with different qualities, specially "KALU" for export market and "KETTI" for local market.

Using the above costs and benefits, the Benefit Cost Ratio (BCR) was calculated for both Gampaha and Kurunegala districts separately. The results are given in Table 6. The calculated BCR for Kurunegala and Gampaha districts were 2.64 and 2.87 respectively. The Benefit Cost Ratio should be above one for a project to be viable or sustainable.

**Table 6. Benefit Cost Ratio for Betel cultivation in Kurunegala and Gampaha Districts**

	District	
	Kurunegala	Gampaha
P. V of benefits (Rs)	429520	453956
P.V of costs (Rs)	162543	157909
<b>BCR</b>	<b>2.64</b>	<b>2.87</b>

This reveals that the cultivation of betel is profitable for both districts. However, Gampaha district showed a higher profit than Kurunegala. All the cost values and benefit values were calculated at an interest rate of 10 percent.

The Benefit Cost Ratios for betel cultivation at local market and export market were identified separately. These benefit cost values for different markets are given in Table 7.

**Table 7. Benefit Cost Ratios for the type of market in betel cultivation**

Type of market	Local	Export
P: V Benefits (Rs)	77336	464207
P: V Cost (Rs)	124076	169146
<b>BCR</b>	<b>0.62</b>	<b>2.74</b>

The calculated Benefit Cost Ratios for betel cultivation at local and export market were 0.62 and 2.74, respectively. The BCR value for local market was less than one. Therefore, the cultivation of betel for local market is revealed to be un-economical.

The Benefit Cost Ratios for betel cultivation at large scale, medium scale and small scale categories were identified separately. And those values different are given in Table 8.

Calculated BCR for small, medium and large scales were 3.17, 2.9 and 3.34, respectively. The large-scale cultivation had the highest Benefit Cost Ratio followed by the small and medium scale cultivations.

**Table 8. BCR and Scale of the Cultivation**

Scale/Category	Small	Medium	Large
P.V Benefits (Rs)	50465	447656	470200
P.V Cost (Rs)	79112	155209	210849
<b>BCR</b>	<b>3.17</b>	<b>2.88</b>	<b>3.34</b>

**Sensitivity Analysis**

Sensitivity analysis was carried out separately for Gampaha and Kurunegala districts at 10%, 15%, and 25% additional cost levels and 10%, 15%, 25% less benefit levels. Results obtained from the sensitivity analysis are given in Table 9.

**Table 9. Sensitivity analysis for Benefit Cost Ratios**

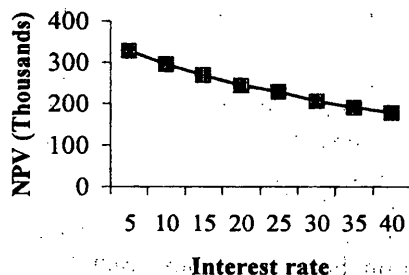
District	Benefit/Cost (P.V)		
	Cost +10% Benefit- 10%	Cost +15% Benefit-15	Cost + 25% Benefit - 25%
Gampaha	2.35	2.12	1.72
Kurunegala	2.16	1.95	1.58

The benefit cost ratios for Gampaha and Kurunegala districts were 2.35, 2.12, 1.72 and 2.16, 1.95, 1.58, at 10%, 15%, and 25% additional cost levels and less benefit levels, respectively. These values explained the profitability of betel cultivation even at high-risk levels in both districts. These figures clearly showed that betel cultivation is profitable even at high-risk levels.

These values were used to identify the Internal Rate of return (IRR) for betel cultivation. Further IRR was used to identify the investment profitability of betel. The graphical representations of the NPV vs. interest rate for both districts are given in Figure 1 and 2.

**Table 10. Net present value vs. Interest rate**

Interest Rate	NPV (Rs)	
	Gampaha	Kurunegala
05	328243	294752
10	296047	266957
15	268561	243458
20	244882	232766
25	229637	205237
30	206897	189713
35	191374	176053
40	177740	163961

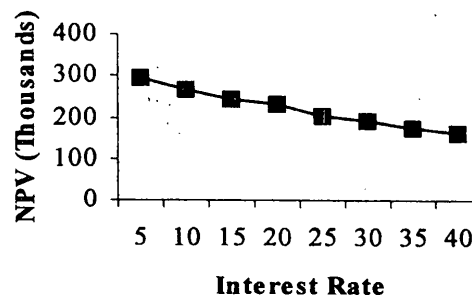


**Figure 1. NPV vs. Interest rate, Gampaha district.**

**Socio economic conditions of betel farmers**

The number of farm families in the sample was 70 and the total population was 352 consisting of 178 (50.5%) females and 174 (49.4%) males. The average family size of the entire sample was five, whereas in

national level four individuals per household was recorded (Anon, 2004).



**Figure 2. NPV vs. Interest Rate, Kurunegala district**

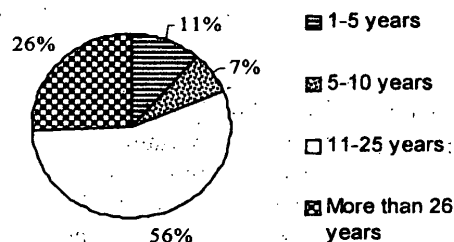
**Table 11. Frequency distribution of family size of households**

Family Size	All sample	Gampaha	Kurunegala
1	03	02	01
2	02	02	-
3	04	03	01
4	15	08	07
5	16	07	07
6	19	09	10
7	09	03	06
8	02	01	03

Source: Survey data

Table 12 shows the educational level of the sample population. The educational level in the study areas appeared to be quite high. Ninety-seven of the population had secondary education which is extremely higher when compared to national levels (42.2%) (Anon, 2004).

An attempt was made to examine the occupational pattern of the sample population. The number of respondents to this issue was 70 out of which 63 (90%) reported that the betel cultivation as their major occupation, while 10% reported it to be the secondary occupation. Government employees in the employed population were only 12 (4.9%) out of 283. As shown in Figure 3 the majority of farmers have experienced in betel cultivation for more than 10 years reflecting that they possess broad knowledge on betel cultivation.



**Figure 3. Experience in Betel Cultivation**

Source: survey data

## ECONOMICS OF BETEL CULTIVATION

The attitudes towards the extension services provided by Department of Export Agriculture (DEA) were evaluated.

**Table 12. Educational levels of sample population**

Level of education	All samples			Gampaha			Kurunegala		
	M	F	T	M	F	T	M	F	T
No schooling (excluding children)	-	-	-	-	-	-	-	-	-
Primary grades	04	02	06	03	-	-	01	02	03
Grade six to O/L	49	30	79	30	12	42	19	18	37
O/L passed	49	61	110	20	30	50	29	31	60
A/L passed	36	45	81	20	23	43	16	22	38
Graduate	03	04	07	03	04	07	-	-	-
<b>Total</b>	<b>141</b>	<b>142</b>	<b>283</b>	<b>76</b>	<b>69</b>	<b>145</b>	<b>65</b>	<b>73</b>	<b>138</b>

Source: Survey data M-Male F-Female T-Total

It showed a higher satisfaction of farmers towards the extension services provided by DEA. Sixty-three percent of the sample population satisfied with extension services provide by DEA. The higher satisfaction was due to 50% fertilizer subsidy and formation of farmer organizations during the year 2004. Ninety three percent of farmers undertook betel cultivation as their main cash crop, following their parents.

### **Constraints in the production of Betel**

Constraints in production, identified by the farmers were ranked according to their relative importance to the industry (Table 13). Over 88 percent farmers in Kurunegala district and 82 percent farmers in Gampaha district reported that the lack of stakes as vertical supports as their major constraint. High incidence of bacterial leaf blight disease was also a considerable problem for both districts. In addition, lack of lands, high cost of fertilizer, labour scarcity and lack of water for irrigation during dry season were the other major constraints reported by farmers in both districts.

**Table 13. Production related problems as reported by Farmers**

Problem	Gampaha %	Kurunegala %	Average %
Lack of stakes	82	88	86
High incidence of diseases	74	94	84
Lack of land	28	45	37
High cost of fertilizer	20	28	24
Labor scarcity	22	20	21
Lack of water	8.5	20	14

Source: Survey data

### **CONCLUSIONS**

The cultivation of betel for export market is more profitable in both Gampaha and Kurunegala districts. While it is not economically viable for local market. Hence, such farmers have to convert their fields to produce export quality betel. The average total cost of production of betel was Rs. 213 per 1000 leaves. Higher BCR values and IRR values over 40 percent reflecting higher profitability of the betel cultivation. By considering profit earning capacity of

betel cultivation, banks and other credit organizations can issue credits with minimum risks.

Betel requires about 400 man-days per 1000 stakes plot per three-year cultivation period. Input cost constituted only 38%. Of the total input cost, inorganic fertilizer cost constituted larger proportion due to higher applications, which is not recommended by DEA. Most of the betel farmers have more than ten-year experience on betel cultivation. Most of the farmers have obtained higher education in selected districts. Therefore, it is easy to produce export quality betel with high quality leaves with minimum technical assistance. The satisfaction towards the extension services provided by DEA should be increased further. Government or respective organizations have to conduct more research work to minimize the problem of scarcity of vertical supports and Bacterial wilt disease to facilitate cultivation of betel. Government and relevant organizations should pay much attention to improve betel industry by investing more on research and extension.

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