ECONOMICS OF RAINGUARDING : A COMPARATIVE ANALYSIS

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The comparative-cost advantages of two types of rainguarding of rubber trees are analysed on the basis of a field survey. Using the survey data and secondary information, an investigation of the average yield which will justify rainguarding is also carried out through discounted cash flow analysis. The study found that the minimum average yield required for recommending rainguarding is 675 kg/ha.

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INTRODUCTION

Rainguarding is one of the techniques suggested for enhancing rubber production by increasing the number of tapping days. An estimated 75 to 100 tapping days are lost every year during the rainy season and rainguarding is recommended if 25 or more tapping days are lost every year (Sethuraj & George, 1980). Two types of rainguarding are followed in India:

(a) Polythene sheet rainguarding; i.e., fixing the polythene sheet above the tapping cut so as to cover the tapping panel (Fig. 1), and

(b) Tapping shade rainguarding; i.e., fixing the tapping shade above the tapping panel so as to divert the flow of water (Fig. 2).

With a view to finding the economics of the two types of rainguarding a field study was undertaken in Palai-Thodupuzha region

of Kerala in 1988, with the following objectives:

(1) Relative cost differences between the two types of rainguarding,

(2) Performance of these types and

(3) Yield level at which rainguarding will be justified.

METHODOLOGY

A sample population of 50 smallholdings was selected randomly from the Palai-Thodupuzha region of Kerala, with equal representation for polythene sheet rainguarding and tapping shade rainguarding. The data were collected by interviewing the growers and visiting the fields.

The average yield at which rainguarding is profitable has been calculated by the approved method of economic evaluation of investment viz., the discounted cash flow analysis (Kahlon & Singh, 1980). The

Fig. 1. Polythene sheet rainguard

Fig. 2. Tapping shade rainguard

cost and benefit figures are estimated using the details on cost, yield/ha and stand/ha available with the Rubber Board. The income received and the cost incurred were discounted to facilitate comparison and the benefit-cost ratio (BCR) was worked out applying the formula (Harsh *et al.*, 1981):

$$B = \sum_{t=8}^{32} \frac{B_t}{(1+r)^t}$$

$$C = \sum_{t=1}^{32} \frac{C_t}{(1+r)^t}$$

$$BCR = \frac{\sum_{t=8}^{32} \dfrac{B_t}{(1+r)^t}}{\sum_{t=1}^{32} \dfrac{C_t}{(1+r)^t}}$$

where B = Benefit,
       C = Cost,
       r = Discount rate and
       t = Period

The average yield which makes the BCR equal to unity was then calculated. The average yield at this level defines the minimum yield to be obtained from a rainguarded plot. The minimum average yield to recommend rainguarding has then been calculated on the assumption of 20 per cent yield increase from rainguarding.

RESULTS AND DISCUSSION

The relative cost of the two types of rainguarding show that the cost of tapping shade rainguarding is 84 per cent higher, compared to the cost of polythene sheet rainguarding in the initial year (Table 1).

Table 1.   **Rainguarding cost (Rupees) per tree**

Cost components	Tapping shade	Polythene sheet
Tapping shade/polythene	3.67	1.41
Cloth, staples, adhesive, etc.	0.55	0.54
Wage	0.95	0.86
Total	5.17	2.81

It has been observed that the rainguarded trees are more vulnerable to panel diseases (Sethuraj & George, 1980).   In order to protect the trees from the potential threat of panel diseases, systematic application of panel protectants is necessary at frequent intervals.   Table 2 gives the relative costs for panel protection.

Table 2.   **Panel protection cost (Rupees) per tree per year.**

Cost components	Tapping shade	Polythene sheet
Panel protectant	0.12	0.13
Wage	0.29	0.31
Total	0.41	0.44

Though rainguarding costs vary between the two types, the protection costs differ only by 3 paise per tree.   In this context, it is interesting to note that 4 per cent of the tapping shade users and 24 per cent of the polythene sheet users reported that they did not apply panel protectants.

The total cost per tree of small growers for rainguarding and panel protection is thus estimated to be Rs. 3.25 for polythene sheet rainguard and Rs. 5.58 for tapping shade rainguard.

The rainguarding costs vary according to the girth of the trees and the location of the holding.   The wage rate varies from place to place depending upon the local availability of skilled labour.   Hence it will be desirable to define a 'range' of costs.   The exercise is done in Table 3.

It was reported that the tapping shade could last for three years if handled properly while refixing.   On an average, in the second year, 20 per cent of the first year's shades and in the third year 30 per cent of the remaining first year's shades had to be replaced.

In the case of polythene sheets 66 per cent of the respondents reported that they used the material only for a single year.   The rest claimed that they used 40 per cent of the initial year's material in the second year, changing the 'fixing side' of the sheet.   In

Table 3.   **Range of rainguarding costs excluding protection costs (Rupees)**

Type	a	s	t	ts	Range (95% confidence interval)	
Tapping shade	5.17	0.48	2.06	0.99	4.18 —	6.16
Polythene sheet	2.81	0.10	2.06	0.21	2.60 —	3.02

a   =   arithmetic mean
s   =   standard deviation
t   =   't' value of the distribution
Range = a — ts — a + ts

the case of both tapping shade and poly-thene sheet, the position of fixing has to be altered in the successive years.

On the basis of the above details given by the growers the three year average cost to be incurred by a holding (with 1 ha size and 310 stand) for rainguarding is worked out for both the types. Since the tapping shades have a life of three years, the three year average cost figures are computed to enable comparison (Table 4). The prices are as-sumed to be constant.

rainguards can be used in the fourth year. To derive reliable and comparable cost figures, allowance must be given to the value of the reclaimable polythene sheets and shades at the end of the third year. The value of the reclaimable stock and the adjusted three year average cost figures are computed and pre-sented in Table 5.

Here also the cost of rainguarding with tapping shades has an additional cost burden of Rs. 105.83 compared to polythene sheets.

Table 4. **Three year average cost of rainguarding (for holding with 1.00 ha size and 310 stand) in Rupees**

	TAPPING SHADE				POLYTHENE SHEET			
	1st year	*2nd year	*3rd year	Average per year	1st year	*2nd year	*3rd year	Average per year
Tapping shade/ polythene	1137.70	227.54	318.56	561.27	437.10	262.26	332.20	343.85
Cloth, staples, adhesive, etc.	170.50	170.50	170.50	170.50	167.40	167.40	167.40	167.40
Wage	294.50	294.50	294.50	294.50	266.60	266.60	266.60	266.60
Total	1602.70	692.54	783.56	1026.27	871.10	696.26	766.20	777.85

* The second year and third year cost figures of Tapping Shade/Polythene sheet are computed as shown below:

Tapping shades : 2nd year = 1137.70×0.20
: 3rd year = $227.54 \times 0.20 + 910.16 \times 0.30$

Polythene sheets : 2nd year = 437.10×0.60
: 3rd year = $437.10 \times 0.40 + 262.26 \times 0.60$

The three year average figures suggest that polythene sheets are cheaper by Rs. 248.42. Even if we deviate from the original assump-tion and assume that the polythene sheets are used only for a single year then also there is a cost difference of Rs. 155.17 in favour of polythene sheets.

In the case of tapping shades a part of the second and third year's shades can be re-used in the fourth and fifth years. Similarly a part of the third year's polythene sheet

But if the polythene sheets can only be used for a single year, tapping shade rainguarding stands at an advantage of Rs. 31.72.

In order to facilitate comparison between the two types, the cost figures are taken at 10 per cent compound interest and then discounted at 10 per cent. The second and third year cost figures are adjusted for the value of the remaining stock at the end of the third year. The results show that polythene sheet rainguarding will be cheaper even if

the entire sheets are to be replaced every year (Table 6).

On an average it was found that 46 additional tapping days were gained during the year under study. The number of additional tapping days was higher than the normal due to the prolonged monsoon in the reference year. In a normal year around 30 to 45 additional tapping days can be gained from rainguarding.

Estimation of the average yield which will justify rainguarding

The life of a rubber tree is assumed to be 32 years and its economic life is fixed as 25 years. The discount rate taken for the analysis is 11 per cent. The first seven year cost of planting and maintenance is estimated to be Rs. 29950/ha. For the mature period four types of costs are added to derive the yearwise cost — maintenance cost, tapping and collection cost, processing cost and rainguarding cost. The cost of tapping shade rainguarding is the one taken for the analysis. The average cost of tapping shade rainguarding is calculated as Rs. 3.12 per tree (adjusted average cost per tree + protection cost). The average price of 1988, with allowance for scrap content, is taken for the estimation (Rs. 17/kg). The income obtained from the sale of rubber trees and rubber seeds is also accounted.

Table 5. **Adjusted three year cost figures (Rupees)**

Type	Total 3 year cost	Average cost	Value of the remaining stock*	Adjusted average cost
Tapping shades	3078.80	1026.27	560.67	839.38
Polythene sheets	2333.56	777.85	132.90	733.55 (871.10)

Figure in the bracket shows the average three year cost if all the sheets are replaced every year.
*The value of the remaining stock is computed as shown below:

$$332.20 \times 0.40 = 132.90$$
$$[227.54 (1-0.20)] 0.70 + [318.56 \times 0.80] +$$
$$[(1-0.20) 318.56] 0.70 = 560.67$$

Table 6. **Discounted Cost (Rupees)**

Cost	Tapping shade rainguarding	Polythene sheet rainguarding	Polythene sheet rainguarding*
Three year cost	2696.52	2200.68	2613.30
Three year cost plus Compound Interest	3398.55	2698.55	3171.67
Discounted cost	2941.30	2273.65	2644.99
Cost per year	980.43	757.88	881.66

* Polythene sheet rainguarding with 100% replacement.

Our objective is to find out the average yield level at which BCR equals unity. This will be the level of yield which would justify the adoption of rainguarding. The exercise is done using the actual yield figures obtained from a study 'Commercial evaluation of planting materials'. The 25 year average yield comes to 1189 kg/ha. Here,

$$B = \sum_{t=8}^{32} \frac{B_t}{(1+r)^t} = 73937$$

$$C = \sum_{t=1}^{32} \frac{C_t}{(1+r)^t} = 51262$$

BCR = 73937/51262   = 1.442

Here the BCR is greater than one. The exercise was repeated by lowering the yearly yield by equal percentage until an average yield of 810 kg/ha was reached at which the BCR equals unity.

B = 50488
C = 50559
BCR = 50488/50559 = 0.999 (approx. 1)

Thus 810 kg/ha/yr is the average yield which will justify the adoption of rainguarding (at the 11 per cent discount rate). This is the minimum average yield which should be obtained from a rainguarded plot. In order to obtain 810 kg/ha/yr from a rainguarded plot there should be an yield of 675 kg/ha/yr before the adoption of rainguarding, on the basis of our assumption of 20 per cent increase in yield from rainguarding. Thus the minimum average yield to recommend rainguarding is 675 kg/ha/yr.

CONCLUSION

The main conclusions of the study are:

1. The cost of initial year tapping shade rainguarding is 84 per cent higher compared to polythene sheet rainguarding.

2. There is only marginal difference between the two types of rainguarding as far as panel protection cost is concerned.

3. A higher percentage of the polythene sheet users is not practising tapping panel protection.

4. The adjusted three year average cost estimate gave results in favour of polythene sheet rainguarding. But if the sheets have to be replaced entirely every year the tapping shade rainguarding will be having lower cost. When the cost figures are taken with compound interest and discounted, the results are again in favour of polythene sheet rainguarding.

5. Under normal conditions we can expect 30 to 45 additional tapping days from rainguarding.

6. Using discounted cash flow analysis, it is estimated that a rainguarded plot should have an average yield of 810 kg/ha. On the assumption of 20 per cent yield increase from rainguarding, the study shows that to adopt rainguarding, an average yield of 675 kg/ha/yr should be available.

ACKNOWLEDGEMENT

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