

## COMMUNICATION I

### Financial Analysis of Managing Bamboo Stands in a Natural Forest

#### ABSTRAK

*Kertas ini membincangkan analisis kewangan bagi pengurusan projek buluh dalam kawasan hutan asli. Bagi tujuan penganalisaan projek, kos-kos sebenar bagi penyediaan petak penyelidikan buluh Institut Penyelidikan Perhutanan Malaysia (FRIM), bertempat di negeri Kedah telah digunakan. Keputusan analisis menunjukkan projek ini berdaya maju sekiranya pelaburan dibiayai dengan pinjaman pada kadar faedah rendah walaupun pada harga minima RM 0.80/batang. Projek ini amat menguntungkan jika harga buluh dapat mencapai paras yang lebih tinggi atau hasil dapat ditingkatkan.*

#### ABSTRACT

*This paper discusses the financial analysis of managing bamboo stands in natural forest. Throughout the analysis, actual costs incurred by the Forest Research Institute Malaysia (FRIM) in setting up trial plots in Kedah were studied. Results from the analysis show that the project is financially viable at a price of RM 0.80/culm provided that the project is financed at a lower interest rate. The project would be very attractive if bamboo culm could fetch a higher price or if yield could be improved.*

#### INTRODUCTION

Bamboo, formerly categorized as a minor forest produce and now replaced by the more appropriate term 'non-wood forest products' has recently become increasingly important. Bamboo is used in making chopsticks, toothpicks, skewers and blinds. The use of bamboo as an industrial raw material for these products continues to be significant.

Available resources of Bamboo in the natural forest of Peninsular Malaysia are significant. McGrath (1970) estimated that the total area of bamboo in Peninsular Malaysia is about 20,250ha. Razak and Abdul Latif (1988), estimated the area under bamboo was about 329,000 ha. The standing stock was estimated at 7.0 million tons (average 20 tons per ha). Out of the 7.0 million tons only 6,000 tons comprise commonly used species with an estimated value of RM 3 million.

The vastly different figures clearly indicate that there has been no thorough assessment of bamboo resources in Peninsular Malaysia. The National Inventory II (1981-82) carried out by the Forestry Department has only given a general estimate of available resources of rattan and bamboo. Therefore, an updated information on these resources is vital for long term planning of the bamboo-based industries.

The Government has increasingly emphasised the development of small-scale industries based on wood, rattan and bamboo since 1985. Bamboo in the past has been used as supplementary material in housing construction (scaffolding), in the making of numerous home utility items, handicrafts, bridges, rafts, water-pipes, vegetable-growing supports, traps, blow-pipes, and musical instruments. To date, there are about 1032 bamboo-based industrial units varying in scale in Peninsular Malaysia (Wong, 1988). Most of these industrial units are located close to areas of bamboo extraction for ease of transportation.

One of the important requirements for the viability of these bamboo-based industrial units is the sustainability of bamboo supplies. Salleh and Wong (1985), Hsiung (1987). Sustainability of bamboo supply can be ensured by establishing bamboo plantations and improving the existing stands through silvicultural efforts.

The Forest Research Institute Malaysia (FRIM) has initiated setting up trial plots in Kedah with the objective of managing natural bamboo stands for sustained supply of high and uniform quality culms. This paper evaluates the financial feasibility of managing bamboo stands in a natural forest through systematic silvicultural operations. Cash-flow estimates and the results

from this analysis can provide information for potential investors of bamboo plantations of the future.

### METHODS

Management data on the bamboo stands relate to actual labour costs incurred in setting up trial plots in the state of Kedah by the Forest Research Institute Malaysia (FRIM). Costs of building, vehicles and a fire tower relate to costs incurred on an existing teak plantation in Jitra, Kedah.

All costs incurred and revenue received throughout the duration of the project were discounted to present values. Two discount rates were used in calculating the Net Present Value and the Benefit Cost Ratio. The discount rates used were 15.0 percent (assuming current costs of capital or cost of borrowing) and 10.0 percent (if the project is financed at a lower interest rate or subsidised by the government (ISIS, 1986)). Three of the most commonly used measures of a project's worth, namely (i) Net Present Value (NPV) (ii) Benefit Cost Ratio (B/C Ratio), and (iii) Internal Rate of Return (IRR) were used in this analysis (Gittinger, 1984). Sensitivity analysis was also carried out to examine the impact of changes in price, yield and cost.

### MANAGEMENT COSTS

The management of bamboo stands in a natural forest can be broadly classified into three stages viz.: (i) site preparation which includes survey, road construction and application of fertilizer; (ii) silvicultural treatments; and (iii) harvesting. It is assumed that the project will be established in a logged-over forest.

Detailed data on the expected cost per annum for managing 100 ha of bamboo stands in a natural forest leased out for five years are presented in Appendix 1. The project area is assumed to be established partly in year one and two at the rate of 50 ha/year. The following paragraphs summarize principal characteristics of the data.

#### (i) Stage I : Site preparation.

Stage I of the project involves four main operations:

##### (a) Site-survey

Site-survey of the project area is assumed

to cost about RM 30/ha which is based on a wage-rate per man day of RM 15.00. Two casual labourers are needed to complete the survey of one hectare within three days.

##### (b) Site-preparation

Costs of site-preparation, include land clearing (RM 264/ha), cleaning (RM176/ha), recruitment counts of number of shoots (RM 66/ha) and recruitment counts of existing culms in clumps (RM 176/ha). The total cost of site-preparation for the project is therefore RM 616/ha.

##### (c) Fertilizer.

Applications of fertilizer (N : P : K) at a cost RM 200/ha in the proportion of 15 : 15 : 15 are carried out in year one and year two.

##### (d) Road maintenance

The average cost of repairing the existing ex-logging roads was about RM 25/ha with an annual maintenance estimated at RM 6/ha. The repairs to the existing ex-logging roads was contracted out to a private company.

#### (ii) Stage II : Silvicultural treatments.

Number of weedings required is dependent on the type of forest area. For this project 50 percent of the area will be subjected to weeding in the first year while the other 50 percent will be in the second year. The cost of each weeding is estimated to cost approximately RM 176/ha. Silvicultural thinnings are carried out both at year one and year two at the cost of RM 264/ha.

#### (iii) Stage III : Harvesting

Harvesting is carried out throughout the leased period. Based on field observations the average number of bamboo clumps/ha is estimated at about 200/ha. This will produce an equivalent of about 1,600 culms/ha. The minimum number of clumps was observed at about 46/ha. Field observations indicated that by carrying out silviculture operations, viz as application of fertilizer, weeding and thinning improved the yield by at least 30 percent.

Harvesting of these 200 clumps requires five man-days with four full time casual labourers. The cost of harvesting is about RM 220/ha.

(iv) *Other expenses incurred are as follows*

a) *Fire Protection*

For the purpose of this project, a fire-lookout tower at the cost of RM 5,000 will be set up.

b) *Salary and Wages*

The bulk of the total cost for managing the bamboo stands constitute salaries and wages. Salaries and wages for this project are based on one supervisor (RM 600.00/month) and four labourers (RM 300.00/labourer/month). It is assumed that salaries and wages would increase at a normal six percent per annum (Personal Communication<sup>1</sup>)

c) *Field Vehicles, Equipment, and Building*

Since the area under this project is on a five year lease, a second-hand lorry is sufficient for transportation within the project area. The lorry will be purchased at RM 30,000 and it is assumed that it will last for the whole project duration. Therefore the residual value is zero. For the harvesting operations, two chainsaws at RM 300/each will also be purchased. The economic life of these chainsaws is about five years with zero residual values.

No permanent building is required for this project. A temporary wooden building costing about RM 20,000 will be built to cater for office space and the storing of field equipment. It is assumed that the building has a zero residual value.

d) *Administration and other expenses*

Administration and other expenses include the cost of maintenance of building (10% of building cost), vehicles (5% of vehicle cost), equipment (5% of equipment cost), fees paid to the Forestry Department (e.g. royalty, license, etc), stationery, telephone, and other sundry items.

(v) *Price Determination*

The price of bamboo culm varies among States. The present price quoted by the Forestry Department ranges from as low as RM 0.80 (farm price) to as high as RM 1.20 per culm (ex-mill). For the purpose of this analysis, the price of bamboo is taken at M\$0.80/culm.

## RESULTS AND DISCUSSION

### *Financial Analysis*

Based on the various costs mentioned earlier, the total cost of operating 100 ha of bamboo stands for five years amounts to RM 518,172. Management and Operational costs in year one and year two make up about 62 percent of the total cost. The high cost recorded for these two years is mainly due to the high initial operational costs of managing the bamboo stands.

Using a price of RM 0.80/culm and an average production of 1,600 culm/ha, the total revenue for the whole project is RM 576,000. This will give a net cash flow of RM 57,828 or an average of RM 578/ha. The IRR for the project is 13.88 percent. The NPV values at 10.0 percent and 15.0 percent are RM 11,926 and RM -3,014 respectively (Table 1). The B/C ratio at 10.0 percent discount rate is 1.03 and at 15.0 percent is less than one. Thus, the project is financially feasible only if funding is at low discount rate or the project is subsidized by the government.

TABLE 1  
Results of financial analysis of bamboo  
plantation in natural stand

Investment criteria	
Discounted at 10.0 %	
NPV (M\$)	11,926
B/C Ratio	1.03
Discounted at 15.0 %	
NPV (M\$)	-3,014
B/C Ratio	0.992
IRR (%)	13.88

### *Sensitivity Analysis*

A sensitivity analysis with respect to price, total cost and yield was carried out to further examine the financial viability of the project. The results of the sensitivity analysis are summarised in Table 2.

The IRR values increase considerably when an increase in culm price is assumed, making the project more financially feasible. The sensitivity analysis also suggests that, if a culm of bamboo could fetch a price of RM 1.20, managing the existing stands would be a very lucrative business.

TABLE 2  
Sensitivity analysis of managing the bamboo stand with respect to price, total cost and yield

Variable Simulations	NPV at 15.0% (M\$)	NPV at 10.0 % (M\$)	IRR
Based (\$0.80)	-3,014	11,926	13.88
Price increased by			
10% (\$0.88 )	34,328	54,629	28.05
15% (\$0.92)	52,999	75,981	35.41
25% (\$1.00)	90,341	118,685	50.90
50% (\$1.20)	183,697	225,455	96.80
Total Cost increased by			
10%	-40,657	-29,586	1.31
15%	-59,479	-50,341	4.16
25%	-97,123	-91,853	13.88
50%	-191,234	-195,632	34.80
Yield increased by			
10%	34,328	54,630	28.05
15%	52,999	75,981	35.41
25%	90,342	118,685	50.90
30%	153,210	192,651	72.26

By varying the total cost of the project, it seems that the project is not financially viable at a discount rate of 10 percent. An increased in yield of about 10 percent on the other hand, would increase the IRR value.

### CONCLUSION

The results of the financial analysis of managing bamboo stands in a natural forest show that the investment is financially viable and feasible if the capital is subsidised or financed at a low interest rate. If bamboo culms could fetch a higher price or if the yield could be improved financially with silviculture operations then the project would be very attractive. Based on this analysis, this project offers more returns in comparison with the planting of rattan in a rubber plantation which yields an IRR of 12.76 percent (Salleh and Aminuddin 1988).

At present, bamboo has been utilized extensively and the demand for the raw material has increased yearly. With the government policy of promoting small-scale industries such as basket making, chopsticks, skewers and tooth picks production, it is anticipated that the bamboo-based industries using this source as raw material would

ultimately face the problem of sustained bamboo supply. It is timely for investors to take the opportunity to manage the existing bamboo stands or to establish bamboo plantations, thus ensuring sustainable supplies of bamboo.

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(Received 24 July 1990)