SESSION 8

Paper (a)

ECONOMICS AND COSTS - ESSENTIALS OF COSTING FORMULA

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1. INTRODUCTION

Success in business depends upon a number of factors, high among which is planning. For a logging contractor planning will take several forms :-

(1) Planning the operation of the job;
(2) Planning for capital expenditure;
(3) Budgetting - The planning of costs and revenues;
(4) Profit planning.

Execution of the plans requires managerial skills. The success of any of the above plans and their execution is generally measured by the profit generated.

The aspect of logging planning that I want to talk about today is the part of the planning of costs and revenues that is concerned with costing. We will look at this from the viewpoint of what information is necessary for the logging contractor to plan his costs of logging machinery.

The N.Z. Logging Industry Research Association have published a "Costing Handbook for Logging Contractors", which provides a guide to suitable costing practices for contractors. What I am to say to you will not conflict with the handbook but will, I hope, add to what may be gained from its perusal and also make it easier for the contractors to face up to the task of cost planning.

Of necessity, because of the brief time allowed, I have to condense to a few pages that which usually covers many pages in text books. Also, I must mention that I am not discussing the accounting that assembles costs at year end to ascertain profit or tax liability.

Also, I will not distinguish between logging systems. As all use capital assets in the form of logging machinery which are utilised in the production of revenue and which must be translated into dollars of cost as the assets are used up.

2. OWNERSHIP COSTS AND OPERATING COSTS

The first distinction to be made is that between the costs attributable to ownership of the machinery and those incurred in operating it.

However, before looking at individual cost elements we need to determine a number of factors upon which these cost element calculations are based.

3. FACTORS TO BE CONSIDERED

3.1 Economic Life

The first task is to assess as accurately as possible the economic life of the machine. Appended is the definition of the term "economic life" as set out in the N.Z. Society of Accountants', "Statement of Standard Accounting Practice, No.3, Depreciation of Fixed Assets". For a logging contractor this is almost certainly the potential physical life of the asset. Expressed in its simplest form the question is asked, "How long do you expect to use the machine before having to sell or replace it?"

Dependant upon the assessment of economic life of the asset will be the calculation of depreciation and interest.

For illustration purposes later on let us assume a machine life of five years.

3.2 Depreciable Value

As we shall require to calculate a figure for annual depreciation we will need to determine the depreciable value of the machine. This value will depend upon :-

1. Whether the machine is brand new or some years old;

2. Whether it is a tracked machine or rubber-tyred.

For a new machine the depreciable value may be expressed as :-

- Delivered price of machine less rigging and tyre cost and less the anticipated or expected resale value at the end of the machine's working life. This is usually shown as a percentage of the new price.

For a used machine this aspect will be discussed under Depreciation.

3.3 Average Invested Capital

Is calculated to ascertain a cost of interest to be incorporated as against a charge in the planned costs. It must be recognised that unless the machine is fully owned and paid for by the contractor he will incur a charge for interest from the finance company.

By using average capital invested as the basis of the calculation this evens out the planned costs rather than having larger costs in the early years and lower costs in the later years of the asset's economic life.

There are two commonly accepted formulae for this calculation. The notation is common to both :

1. is $\frac{(I - R)(N + 1)}{2N} + R$ Average Invested Capital

where I = Initial investment (delivered price of machinery)
R = Resale value on retirement or replacement of the asset
N = Economic Life in years.

This is the basis of the calculations in the Logging Contractors handbook.

2. The other formula is $\frac{I + R}{2}$

The first formula results in a higher figure for average invested capital but takes into account both residual value and economic life of the machine. Both F.R.I. and LIRA prefer the use of the first formula.

4. OWNERSHIP COSTS

The costs incurred from ownership of logging machinery are depreciation, interest and insurance.

4.1 Depreciation

There are various methods of providing for depreciation but the two most common methods are :-

(a) The straight line method;

(b) The diminishing value method.

The latter method is that required by the Inland Revenue Department to be used in arriving at the assessment of income for tax purposes.

S.S.A.P.3 referred to earlier also states :- Para 2

> "...it is necessary to recognise as an expense in each accounting period a proportion of the total diminution of value which it is anticipated will occur over the several periods of an asset's economic life."

Para 2.1 (a) provides that in respect of Fixed Assets this shall be done by "including in the expenses for each accounting period a systematic charge for depreciation". 2.1 (e) "In the absence of special circumstances, the most suitable method for general application is the Straight Line method of calculating depreciation whereby a fixed proportion of the net cost or written up value of an asset is charged against revenue each year".

When a new machine is put into service the planned cost of depreciation is straightforward. It is the depreciable value of the machine divided by the term of the life of the machine in years to give an annual figure for depreciation, e.g. original cost $100,000, estimated residual value $20,000, life 5 years, depreciation $16,000.

The ownership of a machine which is one or more years old poses some different problems. This takes us into the area of inflation accounting which has and is continuing to cause much soul-searching and controversy among the accounting profession. I do not intend to get involved in this controversial subject so I will merely set out the method of dealing with inflated asset values in relation to cost planning as I see it.

Because the operating costs of machinery, and also labour costs, are brought into the cost planning exercise in current dollar terms it is also necessary to do the same with depreciation. If merely the first year, or historical cost of acquisition, is taken into account for depreciation calculations then no cognisance is taken of the effect of inflation on the cost of plant and machinery, which will become very evident when replacement plant must be purchased.

To do this the current purchase price of the machine must be obtained, depreciated to adjust for the age of the machine, and then depreciation calculated on the adjusted value.

e.g. Machine is 12 months old
Original cost was $100,000, residual value 20%
Depreciable value $80,000
Current purchase price $120,000, residual value 20%
Depreciable value at 12 months. $76,800, i.e. 4/5 of $96,000
Depreciation $19,200 to be brought into the planning costs.

4.2 Interest

As with depreciation, there are many ways of determining the figure for interest to be brought into planning

costs. The method adopted by LIRA and F.R.I. is to take a percentage of the average invested capital as we determined earlier. The percentage figure used should ideally be representative of the percentage interest rates currently being charged on funds borrowed from finance institutions.

There are two points to be considered here :-

(1) To ensure that current dollar costs are used in planning; there is a need to ensure that for interest, as with depreciation, the current replacement cost figure is used in the average invested capital calculation.

(2) The figure for average invested capital should therefore be recalculated regularly and the percentage interest rate used also reviewed from time to time.

4.3 Insurance

The assumption is made that machines are comprehensively insured, and that premiums will generally vary with value and consequently will change as the machine ages. By using the average invested capital this will give an average value on which a premium for cost planning could be based. The insurance company should be asked for a quote on this value. As average invested capital changes so the insurance premium will need to be updated. Alternatively, a percentage of average invested capital of between 3% and 4% should give a reasonable approximation.

All these costs of ownership are annual costs representing a full year's operation.

5. OPERATING COSTS

5.1 Fuel and Oil

Here again various methods can be found for assessing fuel and oil consumption costs. Most commonly the costs are calculated by first obtaining an hourly cost then converting this to annual cost so bringing fuel costs into line with other element costs. The hourly cost is obtained by multiplying the cost per litre of fuel and oil by the hourly consumption rate in litres.

The only problem here may be in ascertaining hourly consumption by the machine when operating. Ideally, maintenance of consumption records by the contractor will provide the best basis. Alternatively, the manufacturers specification for consumption rates could be used or the guide provided in the Logging Contractors Costing Handbook.

5.2 Tyres

An annual cost for tyres should be included. The experienced contractor will have an idea of machine tyre life and the cost of tyres can be assessed as follows :-

$$\frac{\text{Replacement cost of tyres} \times \text{number of tyres required}}{\text{Machine tyre life (in years of operating hours)}}$$

5.3 Wire Rope and Rigging

An annual cost for this item must be determined. There will be a number of factors influencing this cost such as operator skill and care, snagging and others and the contractor will have some "feel" for the life of his ropes, strops and rigging. Again, the LIRA Costing Handbook provides a guide to service life and from this the numbers of each item required can be assessed and multiplied by the current costs of each to provide an estimated annual cost.

5.4 Repairs and Maintenance

This is an area which frequently incurs large amounts of cost but which is generally the most obscure because of lack of reliable records. It then becomes a matter of estimation. De Vries (1973) has this to say, "A good way of expressing the cost of maintenance and repairs including the cost of labour, was recommended by the F.A.O. and consisted of expressing the maintenance and repair costs as a percentage of the depreciation charges".

Where there is some indication of expected R&M costs these should be used but failing this the approach suggested above will provide a basis for estimating these costs. Table 5 of the "Costing Handbook" provides some guidelines but the notes at the bottom of the table should be considered.

The cost element discussed in these pages are those which must be considered when costing logging machinery. However, the ownership of logging machinery often involves employment of a logging crew for which wages and other costs must be met.

5.5 Labour

All the costs of employing men must be included in the labour cost and includes payment for statutory and annual holidays, sick leave, bonus and overtime payments, allowances - such as clothing and tea money - and payments for labour-related costs such as A.C.C. levy and Workers Supplementary Insurance.

5.6 Operating Supplies

To maintain a logging operation for say, 12 months, incurs costs for items other than those mentioned above. These will include daily expendable items, such as files, cleaning materials, etc, and also assets such as loose tools, which may be lost or stolen and need replacing, and gang huts which may have a life of several years. For those items with a life in excess of 12 months an annual cost must be calculated. Where possible all these items should be listed and an annual cost assessed.

5.7 Overheads

It is generally impractical to endeavour to list and account for all the minor items of cost likely to be incurred by a contractor during the financial year. Consequently, to cover all these costs a general charge for overheads is estimated. Many and varied are the views held as to how this should be assessed. The most common method appears to treat this as a percentage of cost, whether it be machinery cost or total cost. This is something which each contractor must decide and assess, taking into consideration the size and scope of their operation.

6. OPERATIONAL WORKDAYS AND OPERATING HOURS

These are two factors which enable annual planned costs to be translated into daily or hourly operational costs.

6.1 Operational Workdays

If we assume that a contractor works his crew five days each week, Monday to Friday, then there are 260 possible workdays. From this must be deducted those days which will not be worked. This will include 11 statutory holidays and 15 annual leave days. This leaves 234 work days. There are bound to be a number of wet days when no work can be done and these should be allowed for. The number of operational work days are commonly between 220-240, depending on the contractors need to work extra days at weekends to make up for time lost due to wet days and breakdowns in equipment.

6.2 Daily Costs

Daily costs of operations may be calculated by dividing the total annual costs of operations by the number of operational workdays.

6.3 Operating Hours

The hours paid for to the logging crew may be, for example, nine hours per day. However, the effective operating hours per day for the machine is likely to be quite

a bit less than this due to the need to carry out routine maintenance, refueling, minor running repairs or waiting due to hold-ups. The effective operating hours are likely to be of the order of six to seven hours per operational work day. The number of annual operating hours is the estimated operating hours per day multiplied by the number of operational work days.

6.4 Hourly Cost of Operations

Hourly cost of operations is the total annual costs divided by the annual operating hours.

7. PROFIT

I have endeavoured in this paper to examine costs for planning. I have said nothing about profit but the aim of logging contractors generally will be to achieve the best profit possible. To this end, when pricing a job or tendering for a logging contract, a profit margin will be added after all costs are covered. The method of allowing for profit may be :-

(a) A percentage applied to average invested capital;
(b) A percentage applied to total assets employed;
(c) A percentage of estimated annual costs of operations;
(d) A lump sum figure assessed by the business owner.

Many factors will influence the selection of the profit margin so no guidelines could be set down. However, it is interesting to note from the recent "New Zealand Corporate Financial Statistics" published by The Reserve Bank, that the forestry and wood industries sector in 1981 showed an average return on total resources (after tax) of 6%, and an average return on shareholders funds of 14%.

REFERENCES

1. Statement of Standard Accounting Practices, No.3, Depreciation of Fixed Assets. August 1975. New Zealand Society of Accountants.

2. J. De Vries (1973), The Cost Implications of Owning and Operating Forestry Machinery in Australia. Forestry and Timber Bureau, Canberra, Leaflet No.108, 2nd Edition, Australian Government Publishing Service.

3. New Zealand Corporate Financial Statistics, 1981. Supplement to the Reserve Bank of New Zealand Bulletin April 1982.

APPENDIX I

Extract from Statement of Standard Accounting Practice issued by the Council of the New Zealand Society of Accountants.

No. 3
Depreciation of Fixed Assets

1.4 Most commonly the *economic life* of an asset is assessed and expressed on a time basis. In determining the relevant period, consideration should be given to:

a) In the case of physical assets, the potential *physical life* of that asset, that is, the period over which the asset can be expected to last physically, at a projected average rate of usage and assuming adequate maintenance.

b) In all cases, the potential *technical life* of the asset, that is, the period over which the asset can be expected to remain efficient having regard to technical obsolescence.

c) In all cases the expected *commercial life* of the asset, corresponding to the commercial life of its product or output (the possibility of alternative use of the asset in the operations of the business entity) needs to be kept in mind.

d) In the case of certain rights and entitlements, the *legal life* of the asset, that is, the period (as defined by statute or agreement) during which the right or entitlement exists, including any provision for renewal or extension of those rights and entitlements.

The *economic life* of an asset would normally be the shortest of the alternatives applicable and should be the life estimate of which the selected depreciation rate is based (an addition or modification to an asset may, on occasions, extend the economic life of that asset).