Does it cost or does it pay?

An investigation of the costs and benefits of reduced impact logging

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HERE has been increasing interest in reduced impact logging (RIL) in the last decade. Given the political and market demand for the change, we need to further articulate the nature of RIL and address some important questions. For example, what have the harvesting studies carried out to date told us about the cost-effectiveness of RIL? Perhaps more importantly, what have they not told us? Does RIL cost or does it pay?

Quantifying the difference

Table 1: Median values for various parameters in conventional (CL) and RIL obtained from examples in the scientific literature.

Parameter	Total no of observations (CL/RIL) ¹	Unit	CL	RIL	Differences in %
Logging intensity	130 (93/37)	m ³ /hectare	45	37	-18
Logging intensity	101 (56/45)	trees/hectare	8	8	0
Logging cycle		years	35	34	0
Costs—planning	10 (2/8)	\$US/m ³	1.44	1.72	+19
Costs—felling	10 (3/7)	\$US/m ³	0.60	1.16	+93
Costs—skidding	11 (5/6)	\$US/m ³	4.64	4.46	-4
Costs—total ²	23 (10/13)	\$US/m ³	19.73	28.23	+43
Damage—residual stand	75 (42/33)	% of residuals	49	29	-41
Damage—stand	15 (8/7)	trees/trees felled	22	9	-59
Damage—site	58 (39/19)	% of area	18	8	-56
Canopy opening	25 (14/11)	% of area	25	16	-36
Lost timber	33 (25/8)	% of removal	25	15	-40
Utilisation rate	35 (17/4)	% of felled timber	47	60	+28
¹ The number of data sets obtained from the literature; numbers in brackets refer to the number of observations of CL and RIL respectively.					

In order to answer this key question, we analysed 266 publications dealing with RIL. We aimed to:

- define and characterise RIL;
- review existing literature to extract the quantitative information on RIL;
- develop a prototype model for recording data of RIL and conventional logging operations; and
- compile a general cost profile of different logging machines.

Defining and characterising RIL

Based on the work of various authors (Armstrong & Inglis 2000; Elias 1999; van der Hout 1999; Reid & Rice 1997;

The main characteristics of RIL

- · Stand entries at pre-determined cutting cycle
- · Landings planned
- · Harvest planning includes tree-marking, location mapping and determination of felling direction
- Less than 1/3 of stand basal area removed
- · Pre-harvest operational inventory conducted
- · Climber-cutting if required
- · Skid trail length minimised
- · Advanced access road construction
- Operations only allowed under favourable conditions
- Maximum utilisation of all trees felled
- Minimal residual damage
- Rehabilitation conducted to 'fix' negative impacts
- Worker and supervisor training conducted
- Post-harvest assessment carried out

Ruslim et al. 1999; Sist et al. 1998; Sist 2000; Vanuatu Department of Forests 1999; Webb 1997), the following definition of RIL was chosen:

RIL is the intensively planned and carefully controlled implementation of harvesting operations to minimise the impact on forest stands and soils, usually in individual tree selection cutting.

Under RIL, stands should be harvested only on a predetermined cutting cycle, which generally should be no shorter than 20 years. No more than one-third of stand basal area should be removed at any one entry and a pre-harvest operational inventory should be conducted. Access road construction should be done well in advance of harvesting and climbers should be cut, if required, two years before harvest. Tree-marking, location mapping and determination of preferred felling directions should be linked to the layout of an optimum number of extraction (skid) trails. Once the logs are removed, they should be placed on landings of minimal size. Logging operations should only be conducted under favourable conditions (eg when soils are dry). Forest workers and supervisors should be well trained and capable of conducting post-harvest assessments.

Results

The information given in the various studies was analysed using parameters that corresponded to the characteristics described in the box. Table 1 presents median values for observed results.

Discussion

Since there is no standard protocol for assessing the impacts of logging, the challenge is to compare data from a wide and disparate range of studies. Although the findings presented here can only be considered indicative of general trends, a number of conclusions can be drawn:

- RIL is more expensive than conventional logging if only the operational costs are considered and a short-term perspective is taken;
- RIL has considerably less impact on the residual stand and site and creates smaller canopy openings. This enhances regeneration and, in some cases, allows an earlier re-entry with a higher second cut; and
- RIL considerably increases the recovery of timber felled and reduces the percentage of lost logs, increasing productivity and income for the logging operator.

Considering the long-term economic implications of site and stand damage, and increased timber recovery, it is argued that in many cases RIL is economically competitive with conventional logging.

A standard protocol for assessing the impacts of RIL and conventional logging should be further developed. A prototype statistical framework, which is being designed as a web-based statistical tool, can be obtained by contacting the authors of this article. With a solid statistical base, more

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elaborate harvesting models can be built to include critical variables such as the cost of lost logs, timber utilisation, stand and site damage, and canopy opening size.

The annotated bibliography compiled by the research reported in this article can be found at http://www.fao.org/forestry/FOP/FOPH/harvest/x0001e/X0001E00.htm

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