BEDLOAD SEDIMENT YIELD IN A LOGGED-OVER TROPICAL FOREST

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Sediment transported in a stream consists of two types of sediment, namely suspended and bedload sediments. Suspended sediment is supported by the upward components of turbulent current and stays in suspension for an appreciable length of time. Bedload sediment moves in a rolling or saltating mode. It is a major output of erosion processes resulting from human as well as natural activities. However, the bedload value is seldom reported in most sedimentation investigations in this region.

Forest harvesting involves construction of logging roads and skid trails, tree cutting, and skidding and transportation of logs. It has been reported as one of the factors causing soil erosion and sedimentation in rivers downstream (Megahan 1972, Rice *et al.* 1972, Anderson & Potts 1987). Consequently, this may lead to impairment or alteration of water quality, affecting fish and wildlife habitats. This note aims at quantifying the bedload sediment yield resulting from selective logging activity in a small catchment of tropical rain forest in Peninsular Malaysia. The sediment yields are also quantified. The logging effect on sediment yield has been reported by Baharuddin and Abdul Rahim (1994).

The study was carried out at Catchment 1 of Jengka Experimental Basin located at Tekam Forest Reserve, Pahang. The physical characteristics of the catchment are given in Table 1. Tractor logging was carried out in the catchment from July to August 1986. Approximately 25% of the stocking had been removed during the logging operations. A gauging station consisting of a 120° V-notch weir and a 4 × 3 m sediment trap was constructed at the outlet of the catchment. Rainfall was measured using standard gauges at five stations, three of which were equipped with tipping-bucket recording gauges. Bedload sediments were measured from the sediment trap at intervals of six months from July 1980 to June 1989 (Figure 1).

Table 1. Physical characteristics of Catchment 1 of Jengka Experimental Basin

Area (ha)	28.4
Elevation (m.a.s.l.)	
Highest	285.0
Lowest	85.0
Mean	176.2
Mean slope (%)	28
Aspect	Southeastern
Drainage density (km km^{-2})	6.8

Figure 1. Bedload sediment accumulated in the sediment trap

The total annual rainfall for a nine-year period from 1980/81 to 1988/89 water year ranged from 1789 to 3190 mm with an average of 2508 mm. The average days of rain per year was 180 days and the highest was 210 in 1987/88 water year.

The mean monthly yield of bedload sediment significantly increased ($p<0.05$) from 11.2 kg ha^{-1} $month^{-1}$ before logging to 18.2 kg ha^{-1} $month^{-1}$ after logging (3 years period). The annual bedload sediment yield ranged from 101.6 to 189.6 kg ha^{-1} y^{-1} before logging and from 142.6 to 299.7 kg ha^{-1} y^{-1} after logging (Figure 2). For the same period the suspended sediment yield ranged from 39.5 to 218.0 kg ha^{-1} y^{-1} and from 227.4 to 379.0 kg ha^{-1} y^{-1} for pre- and post-logging respectively. The results show that about 60% of the total sediment yield in the pre-treatment period constituted bedload, and in the post-treatment period the bedload proportion was reduced to 45%. A similar finding was reported by Abdul Rahim *et al.* (1985) in the Berembun catchments. They found that bedload sediment yield ranged from 20 to 90% of total sediment yield in the undisturbed forest. This shows that bedload sediment constitutes a major part of the total sediment yield (combination of suspended and bedload sediments) in a natural forest, whilst in logged-over forests, as a result of forest harvesting activities, suspended sediment yield is higher than the bedload sediment yield.

Although bedload sediment constituted only 45 % of the total sediment yield after logging, the value was still higher than that before logging, particularly in the second and third year after logging (Figure 2). Generally, bedload sediment is the major output of soil erosion in an undisturbed forest but this study showed that suspended sediment contributed to a substantial increase in the total sediment yield from a logged-over forest.

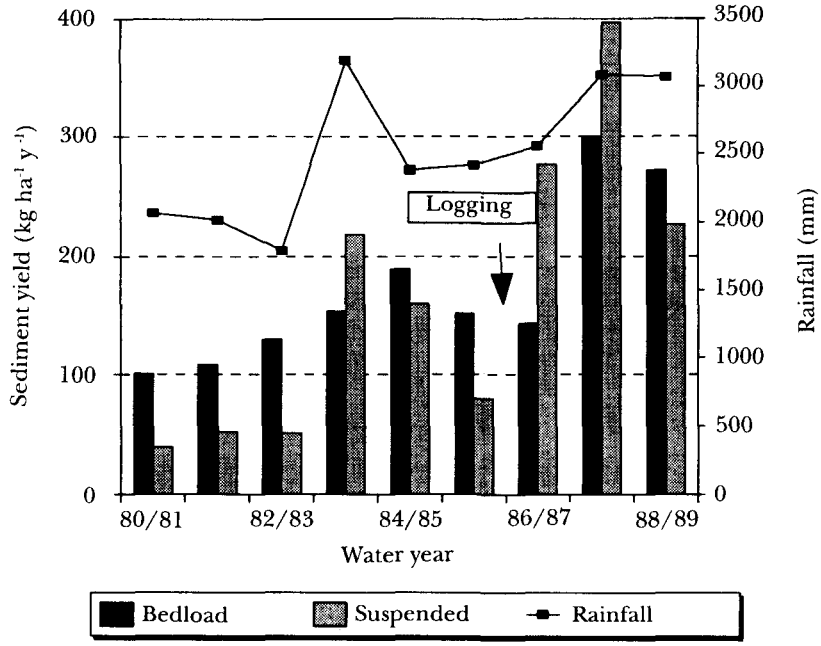

Figure 2. Annual rainfall, bedload and suspended sediments yield of the Jengka Experimental Basin

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