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Why Poor Logging Practices Persist in the Tropics

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Abstract: *Despite abundant evidence that both the environmental damage and the financial costs of logging can be reduced substantially by training workers, pre-planning skid trails, practicing directional felling, and carrying out a variety of other well-known forestry practices, destructive logging is still common in the tropics. Based on our collective experience with loggers in tropical forests, we discuss seven possible reasons for this seemingly irrational behavior. The principal reason poor logging practices persist is apparently that the widely heralded cost savings associated with reduced-impact logging relative to unplanned logging by untrained crews may not be realized under some conditions. In particular, where compliance with logging guidelines restricts access to steep slopes or prohibits ground-based timber yarding on wet ground, reduced-impact logging may be synonymous with reduced-income logging. Given that under such conditions loggers may not adopt reduced-impact logging methods out of self-interest, fiscal mechanisms for promoting sustainable forest management may be needed.*

Porque Persisten las Prácticas Madereras Deficientes en los Trópicos

Resumen: *A pesar de las abundantes evidencias que muestran que tanto el daño ambiental, como el costo financiero de la tala pueden ser sustancialmente reducidos mediante el entrenamiento de trabajadores, la planeación anticipada de senderos de arrastre, la tala direccional y una gran variedad de prácticas forestales bien conocidas, la tala destructiva es aún común en los trópicos. En base a la experiencia colectiva de los autores con taladores en bosques tropicales, parecen existir siete razones por las cuales sucede esta aparentemente irracional conducta. Supuestamente la razón principal por la cual las prácticas deficientes de tala persisten se debe a que el ampliamente anunciado ahorro en el costo de la cosecha asociado con la tala de impacto reducido, relativo a la tala sin planeación por grupos de trabajo sin entrenamiento podría no ocurrir bajo ciertas condiciones. En particular, en situaciones donde el seguimiento de las guías de tala restringen el acceso a pendientes pronunciadas o prohiben el arrastre de los troncos sobre suelo mojado, la tala de impacto reducido podría ser sinónimo de tala de ganancia reducida. Dado que bajo estas condiciones los taladores podrían no adoptar los métodos de tala de impacto reducido en base a un puro interés personal, se necesita de mecanismos fiscales para promover el manejo sustentable de los bosques.*

Introduction

Although foresters have been recommending implementation of methods to reduce the effects of logging for decades (e.g., Bryant 1914; Nicholson 1958; Redhead 1960; Ewel & Conde 1980; Hendrison 1990; Heinrich 1995; Haworth 1999), good logging practices are still the exception rather than the rule in most of the tropics. Even the most ardent critics of natural forest management as a conservation strategy in the tropics (e.g., Rice et al. 1997; Bowles et al. 1998; Frumhoff & Losos 1998) advocate application of reduced-impact methods when and where logging does occurs. We address the question of why, after nearly a century of extolling the virtues of reduced-impact logging practices, poor logging practices persist in the tropics (e.g., Poore et al. 1989; Johnson & Cabarle 1993). We present the litany of rea-

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sons given to us for poor logging over our collective 80 years of experience in tropical forest management, research, and training. The potential biases of this subjective method cannot be denied, and we do not claim that our list of excuses is complete, but we hope that our impressions will clarify this critical issue.

By reduced-impact logging (RIL), we mean implementation of a series of pre- and postlogging guidelines designed to protect advanced regeneration (i.e., seedlings, saplings, poles, and small trees) from injury; to minimize soil damage; to prevent unnecessary damage to nontarget species (e.g., wildlife and nontimber forest products); and to protect critical ecosystem processes (e.g., hydrology and carbon sequestration). Most RIL guidelines call for at least the following measures: pre-harvest planning of the routes of skid trails and the locations of log yards; directional felling to facilitate timber yarding and to protect potential crop trees; restrictions on movements of ground-based yarding equipment on steep slopes and during wet weather; and post-logging closure operations to drain roads and skid trails and to remove potential impediments to stream flow. Training and supervision of logging crews are viewed as critical for reducing the deleterious effects of logging (Pinard et al. 1995). Rather than discuss these guidelines and their implementation in more detail here, we refer readers to the Model Code of Forest Harvesting Practices recently published by the Food and Agriculture Organization (Dykstra & Heinrich 1996) and to other similar sets of harvesting guidelines (e.g., Marn & Jonkers 1981; de Graaf 1986; Pinard et al. 1995; Bertault & Sist 1997; Amaral et al. 1998). Where RIL techniques have been employed during logging of lowland tropical forests, the amount of damage to advanced regeneration and soils has generally been reduced by about 50% relative to conventional logging (e.g., Johns et al. 1996; Pinard & Putz 1996; Elias 1997; Winkler 1997). Employing RIL techniques is not equivalent to sustainable forest management but, in many forests it would constitute a substantial step toward this coveted goal (e.g., Putz 1994).

When asked why they do not employ RIL techniques, commercial loggers give answers that, in our opinion, vary greatly in their justifiability. This paper is organized around six of the most common reasons or excuses given to us for poor logging, with emphasis on ground-based yarding techniques. We address the most common reason we have heard—that RIL is too expensive—in substantial detail. We add a seventh reason that concerns us but that we have not yet heard explicitly mentioned by loggers.

Reason 1: RIL Is too Expensive

Researchers in Sarawak (Marn & Jonkers 1981), Sabah (Malvas 1987), Suriname (de Graaf 1986; Jonkers 1987; Hendrison 1990), and Brazil (Barreto et al. 1998; Boltz 1999) provide evidence that RIL is less expensive per unit volume of timber yarded to the roadside than conventional, unplanned logging. The immediate financial benefits of RIL derive mostly from the high costs of fueling and maintaining bulldozers and rubber-tired skidders (henceforth referred to collectively as "skidders") relative to labor costs for planning and supervision. Lost logs, avoidable damage to the boles of felled trees, and inefficient bucking (cutting logs into merchantable lengths) account for additional savings when RIL techniques are applied (Gerwing et al. 1996; Bertault & Sist 1997).

Why have loggers generally disregarded the repeatedly demonstrated benefits of RIL? Perhaps the primary financial beneficiaries of the expected RIL savings are not the same people who decide whether or not RIL methods are to be used. Or, perhaps the actual cost savings of RIL are less than those calculated from small-scale research plots when derived under typical industrial logging conditions and at the scales at which most commercial loggers operate. In other words, there may be a defensible basis for the claim by some loggers that RIL more appropriately should stand for reduced-income logging.

In most large-scale tropical logging operations, fellers and skidder drivers are paid on the basis of the volume of timber yarded to log landings. Because skidder drivers generally do not pay for their own fuel, the benefits of increased fuel efficiency derived from using pre-planned skid trails accrue to the logging contractor. From the perspective of timber fellers, RIL training reduces the risks of injury, but wet-weather shutdowns reduce wages. On the other hand, decreased log breakage during felling and decreased likelihood of losing logs benefits fellers and skidder drivers as well as forest owners and concession holders.

The financial benefits of RIL for logging contractors may be reduced when trained forest workers demand higher wages and some other benefits (e.g., insurance, safety equipment, etc.; Cedergren 1996). Furthermore, if logging crews racing to beat inclement weather or for some other reason feel pressure to log quickly, RIL planning is beneficial only if it does not entail work slowdowns while stock maps are drawn, felling directions are determined and indicated, and skid trails are planned. Mill owners with delivery schedules to meet and mill workers to pay (whether or not there are logs to process) are likely to be concerned about any changes in logging operations that slow or interrupt log deliveries to the mill gate. These complicating issues of perspective in evaluating the financial benefits of RIL do not pertain to forest owners or the general public. Based on the many environmental benefits of RIL compared to conventional logging, including the expected increases in future timber yields when regeneration is protected

from logging damage, forest owners and the public have every reason to support RIL. The exception to this general conclusion might be forest owners with insecure tenure or other reasons to discount the value of future harvests (e.g., Boscolo & Vincent 1998).

Some of the differences between RIL and conventional logging are likely to be greater on level ground than on steep terrain. When conventional selective logging is conducted on moderately level ground, skidder drivers seem prone to search for logs while creating an ever-increasing density of skid trails. In contrast, when yarding is conducted on steep slopes, fewer viable paths are available to even the most environmentally unconcerned skidder drivers. This constraint may explain why in Sabah, Malaysia, although the proportion of soil disturbed by bulldozers during a large-scale RIL experiment was reduced by 50% compared to areas subjected to conventional logging (Pinard et al. 1999), conventional logging disturbed only 19% of the soil surface rather than the 40–50% observed in other logging areas (Sabah Forest Department 1989). Similarly, the need to reinforce extraction paths with felled trees when logging swamp forests might also dissuade skidder drivers from disturbing a high proportion of the area (Brown 1955; Webb 1997).

Although skidder drivers in conventionally logged areas often yard logs from precipitous terrain, RIL guidelines for such slopes generally call for timber yarding techniques in which logs are suspended off the ground. Although the direct financial costs of ground-based yarding increase with increasing slope, skyline yarding is reportedly somewhat more expensive, and helicopter yarding is much more expensive per unit volume of timber harvested (Aulerich et al. 1975; Conway 1982). Where aerial yarding technologies are not readily available, loggers constrained to ground-based yarding who consider adoption of RIL techniques may balk at the volume of timber to be foregone on steep slopes. Furthermore, some forest owners may object to the reduced profits resulting from foregoing harvesting on adverse terrain (Tay 1999). Similar resistance to the introduction of aerial yarding techniques has been successfully overcome in many temperate forests where forest-cutting practices are controlled by the state (Conway 1982).

Because of decreasing soil trafficability with increasing moisture content (e.g., Greacen & Sands 1980), RIL guidelines generally restrict ground-based yarding during wet weather. Where logging operations are normally shut down for the rainy season, as in many tropical forests, this restriction is not problematic (DeBonis 1986). In contrast, where rainfall seasonality is not pronounced or the rainy season is long, logging typically continues on saturated soil. Despite the environmental damage and somewhat higher yarding and hauling costs, loggers may not want to suspend their operations when the soil is wet. Calculations of the financial consequences of such temporary and unscheduled shutdowns need to include both labor costs and the less obvious costs of disrupting deliveries of logs to mills. On the positive side of the equation are the reduced road maintenance costs where hauling is halted during wet weather.

Even if the strict financial costs of felling and yarding timber to a roadside increase when operations are planned and carried out by trained and supervised workers, the long-term costs to the forest owner of uncontrolled logging are generally excessive. Furthermore, if the costs of regenerating stands after logging are included in the comparison of RIL and conventional logging, then RIL is certainly cost-effective. Adding in the values derived from protecting soils, biodiversity, and ecosystem functions makes uncontrolled logging economically absurd. Nevertheless, partially because loggers are seldom forest owners, long-term forest management plans that are actually followed remain something of a rarity in the tropics.

Reason 2: There's Nothing Wrong with Current Logging Practices

As long as there are rich primary forests in the tropics to exploit, and as long as rent-capture mechanisms of forest owners remain weak (e.g., Gillis 1992), logging profits are likely to remain high or excessive (e.g., Veríssimo et al. 1992). With high profits, many loggers will be unlikely to admit that anything is wrong with conventional practices and to voluntarily adopt RIL methods. Forest ownership or the securing of long-term and tradable concessions may increase the likelihood of forest exploiters becoming forest managers, but it is nevertheless difficult to wean individuals and governments from fantastic short-term profits.

Lately there has been no shortage of diatribes against tropical forestry (e.g., Rice et al. 1997; Struhsaker 1997; Bowles et al. 1998), but perhaps the critical information about damage to the resource base caused by uncontrolled logging and the benefits of RIL techniques are not reaching the right people. Many researchers publish their results in international scientific journals (such as this one) and otherwise try to disseminate their findings, but for various reasons the message is not getting through or having the desired effect. We hope the logging industry will respond to the more truly collaborative, industrial-scale demonstrations of RIL now underway in many parts of the tropics (e.g., Elias 1997; Winkler 1997). Above all, it is clear to us that everyone interested in maintaining healthy forests and forest industries needs to do everything possible to get the word out that in many places there is indeed a great deal wrong with current logging practices and that environmentally sound alternatives are available.

Reason 3: Lack of Governmental Incentives to Change Logging Practices

We would accept this excuse for not adopting RIL methods if the words "that cannot be disregarded or circumvented" were added after the word "incentives." Most countries in the tropics have laws and regulations that disallow many of the most familiar poor logging practices (e.g., Hardaway et al. 1994). Unfortunately, command-and-control approaches to changing forestry practices have had little effect in most parts of the tropics, where institutional failure is common (Palmer & Synnott 1992; Barreto et al. 1998). The new forestry laws in Bolivia and Costa Rica which provide tax incentives for forest protection and environmentally sound forest management are promising but not yet fully tested attempts to change forest-use practices. Perhaps the various international agreements pertaining to forests, such as the Global Convention on Climate Change, will support these and other national efforts to prevent forest degradation (Amilen 1997), but this remains to be seen.

Positive incentives for better forest management, such as certification (e.g., Viana et al. 1996) and RIL-based carbon offsets (e.g., Putz & Pinard 1993), also seem promising but have not yet had a large effect on the industry. Again, market-based incentives are unlikely to be influential as long as profits are excessive, because timber is essentially being mined from primary forests, and governments capture only a portion of the relatively modest rents due (e.g., Repetto & Gillis 1988). Following this logic, perhaps the recent surge of third-party forest certification activity in Bolivia (in which about 1 million ha of forest is certified as well managed by the Forest Stewardship Council) was motivated by the high costs of hauling wood products over the Andes, lack of good roads to logging areas, and low harvestable volumes of commercial timber due to previous exploitation and wildfires.

Reason 4: The Forest Will Be Converted Anyway

Deforestation for agriculture continues in much of the tropics by both planned means (e.g., for oil palm and pulpwood plantation establishment) and unplanned means (e.g., by spontaneous colonization). In areas destined for conversion, it is understandable that loggers make no effort to protect advanced regeneration and potential crop trees. In contrast, damage to soil and hydrological processes, two common consequences of uncontrolled logging, cannot be justified under any circumstances. Furthermore, unnecessarily damaging the resource base through poor logging practices increases the likelihood of unplanned deforestation by decreasing the future profitability of forestry compared with other, nonforest land uses (e.g., Dickinson et al. 1996).

Reason 5: Available Equipment Is Unsuitable for RIL

Although special tools can contribute to reducing the deleterious environmental effects of logging (e.g., skyline yarding systems; Sessions & Heinrich 1993), substantial reductions in damage through use of existing equipment have been demonstrated repeatedly (e.g., Pinard et al. 1995; Barreto et al. 1998; Sist et al. 1998). Nevertheless, there are some sites where ground-based yarding is not possible without causing excessive environmental damage (e.g., on steep slopes), and there are some conditions under which yarding operations should be postponed (e.g., when soils are saturated). Fortunately, directional felling to protect future crop trees and to facilitate yarding, the use of pre-harvest planning of skid trails, and the use of skidder-mounted winches to reduce soil damage are components of RIL that can be implemented with standard equipment.

Reason 6: Lack of Training and Guidance by RIL Experts

To improve worker safety and to reduce logging damage, the need for training in logging operations cannot be over-stressed. According to the International Labour Organization (1990), tropical forest logging is among the world's most dangerous occupations (e.g., 5–10 reported fatalities per million cubic meters harvested in Sarawak, Malaysia, during the 1976–1989 period). More training programs are needed for both workers and managers, but both groups need first to be motivated to improve their methods. When demand for more RIL training becomes apparent, we implore national and international organizations to ensure that it is provided.

As researchers and trainers concerned with tropical forest management, we take to heart the claim that forest managers are not given enough guidance from RIL experts. Apparently, new and improved modes of dissemination of knowledge about RIL need to be developed and implemented. For example, although there is no substitute for hands-on training, training videos and brochures about RIL techniques should be readily available. The target audience must include workers, managers, and decisionmakers from both private and public sectors. If forest owners were fully cognizant of the damage being done to their otherwise renewable resources and were aware of how easily this damage could be reduced, perhaps they would not be so complacent.

Reason 7: Lack of Focused Pressure for Better Logging from Environmental Groups

Many people are not familiar with proper forest management practices. Stark scenes of huge clearcuts are so haunting that it is difficult for many to distinguish between good and bad logging practices. In the dozens of articles published on the effects of logging on wildlife in the tropics (for recent reviews, see Grieser Johns 1997; Fimbel et al. 2000), only one study was carried out in a forest from which timber was harvested according to RIL guidelines (Crome 1996). Instead of lobbying for better forest-management practices, Northern environmentalists only repeat the familiar rallying cry to stop logging and establish more national parks in the tropics (e.g., Dickinson et al. 1996; Rice et al. 1997; Bowles et al 1998). There are nevertheless continuing efforts to shift attention from even more detail on the deleterious effects of uncontrolled logging to solutions to the problem of how to manage tropical forests without causing unacceptable environmental damage (e.g., Uhl et al.1997).

Conclusion

The long-term benefits of changing from unmitigated forest exploitation for timber to forest resource (sensu latu) management will be realized by everyone, including the forest industry. Increasing communication between loggers, concession holders, forest owners, forest researchers, environmentalists, and policymakers will further the cause of reducing the deleterious environmental effects of uncontrolled logging. Widespread adoption of RIL might nevertheless require financial incentives such as those that could be provided in the name of enhanced carbon sequestration in forests logged carefully relative to that in forests subjected to conventional logging (e.g., Brown 1998; Stuart and Moura-Costa 1998). Well-managed forests can provide income as well as many of the forest resources and ecosystem services that society increasingly demands, but what is required is nothing less than a cultural change from timber mining to forest management.

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