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Indigenous peoples as providers of environmental services in Amazonia: Warning signs from Mato Grosso

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INTRODUCTION

Deforestation in Brazilian Amazonia is currently advancing at a rate that alarms many because of its potential damage to biodiversity and climate and to the indigenous peoples who depend on forest for their cultural and physical survival (Fearnside, 2002a). Planned infrastructure projects would further speed deforestation, logging and other forms of degradation in the coming decades (Laurance *et al*., 2001; Nepstad *et al*., 2001). The roles played by the forest in providing environmental services, such as avoidance of global warming, maintenance of the hydrological cycle and biodiversity, represent an opportunity to obtain financial and political support for preventing forest loss (Fearnside, 1997a). Currently, the role of Amazonian forest in the global carbon cycle is closest to providing the basis for monetary flows (Fearnside; 1999a, 2001a,b). The July 2001 Bonn agreement rules out credit for avoided deforestation under the Kyoto Protocol's "Clean Development Mechanism" during the Protocol's first commitment period (2008-2012), but inclusion of such provisions could occur for 2013 onwards depending on negotiations to begin in 2005. Although the Convention on Biodiversity (CBD) lags behind the United Nations Framework Convention on Climate Change (UN-FCCC) as a potential source of financial flows, biodiversity concerns are sufficient to suggest that, with time, this role may also advance towards providing tangible rewards (Fearnside, 1999b).

So far, Amazonian indigenous peoples receive almost no reward for the environmental services they provide by maintaining forests. An exception is the international funds that have been granted through the G-7 Pilot Programme to Conserve the Brazilian Rainforest (PP-G7), which includes among its objectives the reduction of greenhouse gas emissions from deforestation (Brazil, MMA, 2002). As is also true for non-indigenous groups benefited by such funding sources, the recipients rarely understand the link between the benefits they receive and the environmental services of the forests they maintain, thus greatly reducing any strengthening effect that the funding might have on their motivation to maintain the forest (Fearnside, 2003a).

The Mato Grosso provides a unique view of the benefits and vulnerabilities of indigenous reserves as suppliers of environmental services. Mato Grosso is notorious as a state where deforestation is most rapid, due to the proximity of this state of sources of population migration and of markets for grains, beef and timber. The advance of soybeans and associated infrastructure has been especially strong in Mato Grosso due to climate and location factors (Fearnside, 2001c, 2002b; Schneider *et al*., 2000). Mato Grosso, together with the adjacent areas in southern Pará, has accounted for a substantial portion of the total forest loss in Brazilian Amazonia, as well as loss of non-forest ecosystems such as *cerrado* (central Brazilian savanna) (Fearnside, 1986, 1993). From 1999 to 2001, the Mato Grosso state environment agency (FEMA) undertook an unprecedented licensing and control program to induce larger landholders to comply with federal legislation on land clearing (Mato Grosso, FEMA, 2001). The pattern of clearing rate changes over the 1996-2001 period in counties (*municípios*) with differing amounts of previous clearing and differing levels of enforcement effort indicates that the program had a significant effect on deforestation (Fearnside, 2003b). If constant clearing at the 1999 rate is assumed as the baseline for comparison, the decrease in clearing in Mato Grosso over the 2000-2001

period avoided 43 million tons of carbon emission annually, equivalent to about half of Brazil's current emissions from fossil fuels (Fearnside and Barbosa, 2003).

In October 2002 the election as governor of Mato Grosso of Blairo Maggi, largest individual soybean entrepreneur in the World, made continued effectiveness of the FEMA program unlikely. The widespread belief among large landholders that Maggi's electoral victory was assured may explain a generalized increase in clearing rates throughout Mato Grosso in 2002 (Figure 1). Regardless of the fate of the licensing program in Mato Grosso under the Maggi administration, the response of deforestation rates at the county level over the 1999-2001 period offers an important demonstration that governments can control deforestation if they want to (Fearnside, 2003b).

[Figure 1 here]

Controlling deforestation in private properties by enforcing environmental legislation, as in the FEMA program, is only one of several approaches to reducing forest loss. Establishment and protection of various kinds of parks and reserves is another strategy. Protected areas potentially provide more assurance that forest will be maintained over the long term, making them particularly important for biodiversity (as opposed to carbon). Different underlying conceptions of the importance of time, which affects the relative importance of short-term versus long-term conservation, is a critical difference between the global warming mitigation and biodiversity conservation (Fearnside, 2002c,d; Fearnside *et al*., 2000). The location of higher biomass forests far from current deforestation frontiers and of threatened areas with high biodiversity near the frontiers also affects these priorities (Fearnside and Ferraz, 1995), as does the differing costs of forest protection and differing possible bases of comparison used in calculating environmental benefits (Fearnside, 1999a). Indigenous areas represent the most important category of protected and "semi-protected" areas, despite their not being considered "conservation units" (Fearnside and Ferraz, 1995; Ferreira *et al*., 2001; ISA, 1999).

THE ROLE OF INDIGENOUS PEOPLES

Indigenous reserves have a great potential role in avoiding deforestation because they cover about 20% of Brazil's Amazon region, their forests are, on average, much better conserved than those outside of reserves and protected areas, and the indigenous populations actively defend their areas against invasion. Although indigenous peoples have had a much better record of maintaining natural vegetation than have their non-indigenous counterparts, the data from Mato Grosso indicate that indigenous areas are not an automatic guarantee that clearings will be avoided.

The 2001 imagery interpreted by FEMA reveals large clearings in native vegetation (forest, "transition" and *cerrado*) appearing in several indigenous reserves in Mato Grosso (Table 1 and Figure 2). The Maraiwatsede reserve (Reserve No. 21 in Table 1 and Figure 2) had over 6000 ha cleared in a single two-year biennium (2000-2001), including two clearings of about 1800 ha each. In the Bakairi reserve (Reserve No. 5), approximately 6000 ha cleared in 2000-2001. This was in the form of large clearings of the type produced by large ranchers rather than small farmers. Several of the 56 reserves listed in Table 1

have very high clearing rates, expressed as a percentage of the reserve area cleared in a single biennium (2000-2001). It should be emphasized that most reserves have much less clearing. The most rapidly cleared reserve (Baikairi: Reserve No. 5) lost 11.3% of its area in a single biennium, even more than the county with a similar record: Ipiranga do Norte with 8.4%. Other reserves with dramatic deforestation surges in 2000-2001 were Irantxe (Reserve No. 15) with 6.1% cleared in the period, Juininha (Reserve No. 18) with 5.1%, Maraiwatsede (Reserve No. 21) with 4.0% Parecis (Reserve No. 29) with 3.6% and Perigara (Reserve No. 33) with 5.2%.

[Table 1 here]
[Figure 2 here]

In addition to clearing, logging is an important source of disturbance in indigenous areas. The Cinta Larga tribe's Roosevelt reserve near the border with Rondônia (Reserve No. 37 in Figure 2) a large logging scar appeared on the 2001 imagery, occupying the entire southwestern portion of the reserve.

DISCUSSION

Purists in indigenous protection sometimes assert that indigenous peoples and their lands should be protected solely on the basis of human rights, rather than on the basis of any utilitarian benefits they provide to the rest of the World. The fear is raised that, if the utilitarian benefits a group provides were perceived to have declined in importance, or if the value of converting the land to other uses were to be seen as more profitable, then the indigenous groups would be vulnerable if utilitarianism had become the rationale for their maintenance. However, it is important to realize that human rights and utilitarian benefits are not mutually exclusive sources of motivation for support. Human rights concerns set a lower limit to support, but recognition of their importance should not serve as justification for foregoing the potentially much larger values implied by environmental services.

While some indigenous peoples inhabit desolate or degraded areas with little biodiversity, biomass carbon stocks and other features that are valued for their environmental roles, those who inhabit tropical rain forest have much to gain from tapping the value of environmental services. Furthermore, the magnitude of the resources is potentially much greater than can be expected from other options that are realistically available to these people, including subsidies based on human rights concerns. Prior to the March 2001 decision of US president George W. Bush to withdraw from negotiations over the Kyoto Protocol's 2008-2012 first commitment period, carbon markets were expected to total over US$ 15 billion annually by 2010. While the US withdrawal greatly decreases this expectation for the first commitment period, and the July 2001 Bonn agreement rules out tropical forests altogether for that commitment period, markets from 2013 onwards could expand considerably above the previous expectations for 2008-2012. Even a tiny fraction of these funds directed to indigenous peoples would eclipse other likely revenue sources.

From the perspective of the interests of the indigenous peoples, the sustainable nature of forest maintenance, especially as compared with non-forested uses such as cattle

or soybeans, together with the compatibility of this use with traditional indigenous lifestyles, give this option tremendous advantages. Brazil's indigenous peoples support the inclusion of forest maintenance for carbon credit under the Kyoto Protocol's Clean Development Mechanism (CDM): the Coordination of Indigenous Peoples of Brazilian Amazonia (COIAB) signed a statement of Brazilian non-governmental organizations calling for such a provision in the CDM ("Manifestação ...", 2000), and has promoted a series of events and discussions of the issue in the region. It should be noted that no Brazilian indigenous peoples were represented in the Indigenous Peoples' Forum on Climate Change (an international association of indigenous groups, led by Southeast Asia) in its adoption of a contrary position (Indigenous Peoples' Forum on Climate Change, 2000a,b).

From the point of view of biodiversity conservation, the question of whether funds should be devoted to totally protected areas (i.e., areas without people) or to various forms of inhabited and/or managed areas, is a matter of continuing debate (see collections of views by Kramer *et al*., 1997 and Brandon *et al*., 1998). At one end of a spectrum, the future is seen as an inexorable march towards environmental degradation, with inhabited reserves only slightly postponing the time when these areas will arrive at their endpoint of virtually complete desolation (e.g., Terborgh, 1999). The opposing view sees creation of large areas under total protection as politically unviable, as tending to cause injustices for traditional populations already living in the areas selected, and as ultimately offering less protection for nature because they lack the popular support of local inhabitants who can defend the forests from invaders more effectively than government-paid guards (Schwartzman *et al*., 2000a; see critiques by Terborgh, 2000 and by Redford and Sanderson, 2000 and reply by Schwartzman *et al*., 2000b). In Amazonian forests outside of Brazil, indigenous peoples have been important defenders of forest in many locations (e.g., Van de Hammen, 2003 in Colombia), while adopting the destructive practices of non-indigenous settlers in others (e.g., Rudel and Horowitz, 1993 in Ecuador). Although hunting and other activities by traditional peoples can reduce biodiversity as compared to uninhabited forest, the convergence of many objectives between those seeking to secure the land rights of traditional peoples and those primarily concerned with biodiversity conservation offers great scope for alliances with gains for both interest groups (Redford and Stearman, 1993).

From the point of view of conservation, much better results can be achieved by using financial resources to pay directly for environmental services provided, rather than subsidizing conservation indirectly by promoting ecotourism, agroforestry, sustainable forest management and other uses that are environmentally-friendly as compared to presumed alternatives (Ferraro and Kiss, 2002). Essentially, "you get what you pay for", and the best way to conserve biodiversity, carbon stocks, and other forest values is to pay for these functions directly. Credible monitoring arrangements would be necessarily be a part of any system for direct-payments for environmental services (Fearnside, 1997b).

Negotiation with indigenous peoples is a crucial area for Amazonian conservation policy that has hardly begun. Indigenous lands represent much greater areas of natural ecosystems than do all of the types of conservation units combined, and the future fate of indigenous lands will therefore be the dominant factor in the ultimate fate of these

ecosystems. So far, indigenous peoples have had a much better record of maintaining the natural ecosystems around them than have other populations in Amazonia. However, it is important to realize that indigenous peoples are not inherently conservationist, as is sometimes assumed, and that they can be expected to respond to the same economic stimuli that induce other actors to destroy and degrade forests. Indigenous areas are already a major source of illegally logged timber from Amazonia (Cotton and Romine, 1999).

Logging and clearing in indigenous areas not only sacrifice tropical forest but also damage what is perhaps the greatest asset of indigenous peoples for securing sustainable revenues in the future: the credibility of these peoples as reliable forest guardians. Opting for short-term gains from environmental destruction would be a great error from the point of view of the well-being of the indigenous groups, in addition to its impact on global environmental concerns such as biodiversity and climate. It is precisely the ability of indigenous peoples to defend and maintain their forests that gives them an as-yet unremunerated role in providing environmental services (Fearnside, 1997a). In order to chart their future, they need to see that their conservationist role is valuable and is also the source of their support.

To date, indigenous peoples have been receiving no direct benefit from their environmental role as maintainers of forest. This is also the case for non-indigenous Amazonians. Were environmental services to become a significant source of financial flows, the economics of forest maintenance would be radically changed in favor of maintaining these areas (Fearnside, 1997a). The increasing losses of forests within indigenous areas is an indication of the urgency of achieving progress on mechanisms to provide compensation for environmental services.

CONCLUSIONS

Indigenous areas have great potential importance for conservation of biodiversity and for maintenance of the climate stabilization functions of tropical forest. Indigenous peoples have demonstrated much better ability to maintain forest than have non-indigenous groups. Capturing the value of these environmental services represents a vital opportunity to the indigenous peoples. Data from the state of Mato Grosso, while showing that indigenous reserves reserve mostly intact (3.2% of original vegetation lost by 2001), the rate of clearing in some reserves is alarmingly high: at the extreme, 11.3% of one reserve was cleared in a single two-year period. Several clearings of over 1500 ha appeared in reserves in 2001, indicating that some groups are allowing outside farmers to exploit their land (for a fee). The presumption that indigenous peoples are inherently environmentalist is flawed, and the events in Mato Grosso underline the importance of speedy integration of environmental services into the economies of the reserves and of the World.

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FIGURE LEGENDS

Figure 1 – Clearing of forest, transition and *cerrado* in Mato Grosso. At least a part of the decline from 1999 to 2001 can be attributed to the licensing and control programme. The upsurge in 2002 may be partly explained by expectation of a change of governor at the end of that year, which, in fact, occurred.

Figure 2 – Principal indigenous areas in Mato Grosso. Numbers correspond to the reserves in Table 1.

Table 1: Clearing in Indigenous Areas in Mato Grosso[(a)]

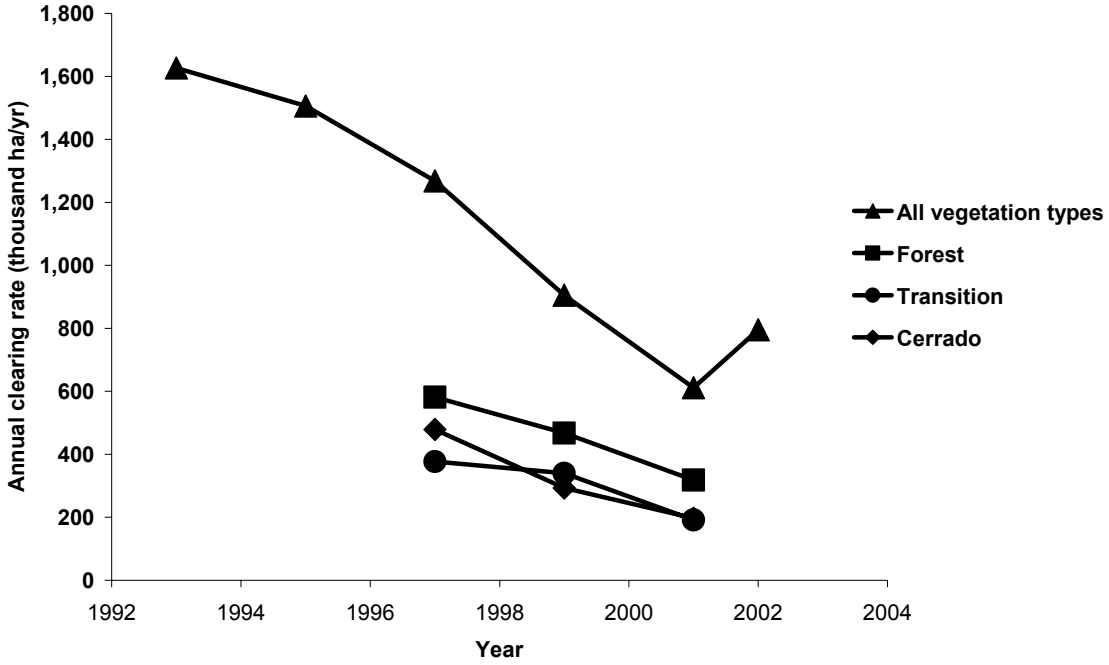
Reserve number	Indigenous Area	Area of reserve	Clearing in the 2000-2001 biennium		Cumulative total by 2001	
		(ha)	(ha)	(%)	(ha)	(%)
1	Apiaka-Kaiabi	109,245	219	0.20%	2,444	2.24%
2	Arara do Rio Branco	114,842	48	0.04%	390	0.34%
3	Areões	218,515	462	0.21%	1,132	0.52%
4a	Areões Ii	16,650	6	0.04%	971	5.83%
4b	Aripunã	750,649	439	0.06%	1,961	0.26%
5	Bakairi	61,405	6,922	11.27%	13,190	21.48%
6	Batovi	5,130	0	0.00%	109	2.12%
7	Capoto/Jarina	634,915	127	0.02%	3,243	0.51%
8	Chão Preto	8,060	8	0.10%	1,857	23.04%
9	Enawenê-Nawê	542,089	0	0.00%	0	0.00%
10	Erikbaktsa	79,936	74	0.09%		0.00%
11	Escondido	169,139	0	0.00%	27	0.02%
12	Estação Parecis	3,620	0	0.00%	2,852	78.77%
13	Estivadinho	2,032	0	0.00%	430	21.14%
14	Figueiras	9,859	0	0.00%	622	6.31%
15	Irantxe	45,556	2,796	6.14%	5,115	11.23%
16	Japuira	152,510	262	0.17%	5,899	3.87%
17	Jarudore	4,706	10	0.22%	3,802	80.79%
18	Juininha	70,538	3,611	5.12%	19,965	28.30%
19	Kayabi	466,434	1,520	0.33%	3,861	0.83%

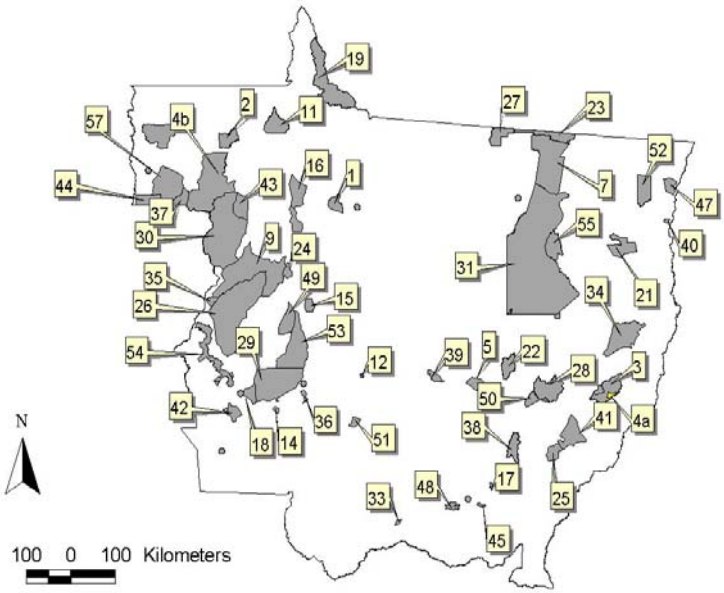
			*			
20	Lagoa dos Brincos	1,845	0	0.00%	0	0.00%
21	Maraiwatsede	168,000	6,645	3.96%	61,305	36.49%
22	Marechal Rondon	98,500	2,119	2.15%	27,300	27.72%
23	Mekragnoti	142,853 *	0	0.00%	6	0.00%
24	Menku	47,094	45	0.10%	427	0.91%
25	Merure	82,301	156	0.19%	3,718	4.52%
26	Nambikwara	1,011,961	4,824	0.48%	7,268	0.72%
27	Panará	132,593 *	222	0.17%	4,476	3.38%
28	Parabubure	224,447	120	0.05%	28,918	12.88%
29	Parecis	563,587	20,392	3.62%	60,449	10.73%
30	Parque Indígena Aripuanã	1,010,736 *	37	0.00%	10,893	1.08%
31	Parque Nacional do Xingu	2,639,306	2,035	0.08%	12,973	0.49%
32	Pequizal	9,887	0	0.00%	968	9.79%
33	Perigara	10,740	555	5.17%	1,602	14.92%
34	Pimentel Barbosa	328,966	0	0.00%	40,901	12.43%
35	Pirines de Souza	29,580	20	0.07%	766	2.59%
36	Rio Formoso	19,749	34	0.17%	1,232	6.24%
37	Roosevelt	85,433 *	0	0.00%	450	0.53%
38	Sangradouro/Volta Grande	100,280	27	0.03%	3,253	3.24%
39	Santana	35,471	19	0.05%	929	2.62%
40	São Domingos	5,705	86	1.51%	2,714	47.57%

41	São Marcos	168,478	10	0.01%	1,972	1.17%
42	Sararé	67,420	17	0.03%	4,232	6.28%
43	Serra Morena	148,300	318	0.21%	951	0.64%
44	Sete de Setembro	145,975 *	13	0.01%	2,331	1.60%
45	Tadarimana	9,785	0	0.00%	980	10.02%
46	Taihantesu	5,362	0	0.00%	369	6.88%
47	Tapirapé / Karajá	66,166	16	0.02%	2,492	3.77%
48	Tereza Cristina	25,694	0	0.00%	2,257	8.79%
49	Tirecatinga	130,575	150	0.12%	536	0.41%
50	Ubawawe	51,900	4	0.01%	8,760	16.88%
51	Umutina	28,120	3	0.01%	5,617	19.98%
52	Urubu Branco	157,000	1,727	1.10%	1,727	1.10%
53	Utiariti	412,304	0	0.00%	934	0.23%
54	Vale do Guaporé	242,593	256	0.11%	7,195	2.97%
55	Wawi	149,900	329	0.22%	8,392	5.60%
57	Zoró	355,790	0	0.00%	12,066	3.39%
TOTAL		12,389,229	56,686	0.46%	399.227	3.22%

(a) Data from FEMA. Clearing includes cutting of all classes of native vegetation: forest, “transition” (forest-*cerrrado* ecotones), and *cerrado*.

* Areas calculated by FEMA. All other areas are from decree creating the reserve.


1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Annual clearing rate (thousand ha/yr)
1992
1994
1996
1998
2000
2002
2004
Year
All vegetation types
Forest
Transition
Cerrado


19
2
11
57
4b
27
23
52
16
1
7
44
43
47
37
55
30
9
24
40
31
35
49
34
21
26
15
53
29
54
12
39
5
22
28
3
50
42
41
4a
36
38
18
14
51
17
48
33
25
45
N
100 0 100 Kilometers