EXPLOSIVE DEFORESTATION IN RONDÔNIA, BRAZIL

Philip M. Fearnside
National Institute for Research
in Amazonia (INPA)
Caixa Postal 478
69011 Manaus-Amazonas
BRAZIL

Enéas Salati
Center for Nuclear Energy in
Agriculture (CENA)
Caixa Postal 96
13400 Piracicaba - São Paulo
BRAZIL

September 4, 1985
December 31, 1991

Published: Explosive Deforestation in Rondônia, Brazil
. Environmental Conservation 12(4): 355-356 (1985).
Short Communications & Reports

It is obvious to those who work in Amazonia that deforestation is increasing in an explosive way in the region, especially in the State of Rondônia. Quantitative information has been lacking, however, on how much the cleared areas have increased in recent years. Remote sensing is the only practical means for obtaining such information for large areas such as Rondônia, whose 244,000 km^2 area is approximately that of West Germany.

Rondônia serves as a gateway to the Amazon Region for the increasing flood of migrants leaving Brazil's central-south region. Beginning in 1970, Rondônia has been the site of a series of government-sponsored settlement programs for small farmers assigned to 100 ha lots (Valverde, 1979; Mueller, 1980). Government lands in many parts of the state outside of the colonization areas have been sold to large landholders through the process of licitação (closed tenders). Pasture is the most common replacement for forest, both in the large landholdings and in the colonization areas--thus maximizing the human population's impact on the forest (Fearnside, 1983).

Unauthorized squatters, both large and small, commonly occupy forested land; deforestation is used as the principal means of securing land tenure claims. A rapidly expanding network of roads is facilitating the entry of migrants (and speculators) to previously untouched forest areas, including biological reserves and Amerindian reservations (Fearnside and Ferreira, 1984). The paving of the Marechal Rondon (Cuiabá-Porto Velho, or BR-364) Highway and much of the expansion of the associated network of feeder roads has been financed by the World Bank under the POLONOROESTE regional development program (International Bank for Reconstruction and Development, 1981).

Deforestation information from 1983 LANDSAT satellite images has recently become available for Rondônia (Brazil, Ministério da Agricultura, IBDF, 1985). The 13,995 km^2 deforested by 1983 (5.74% of the state) implies a slightly greater than linear increase since the previous available estimate, made using 1980 images (Brazil, Ministério da Agricultura, IBDF, 1982; see Fearnside, 1984). The rapid increase is apparent when two previous LANDSAT surveys are considered, using images from the years 1975 and 1978 (Tardin et al. 1980; cf. Fearnside 1982). Fig. 1 presents the available LANDSAT data for Rondônia.

A dotted line is included to the year 1970, which is before the existence of LANDSAT satellites. It is known that deforestation in 1970 was minimal based on side-looking airborne radar (SLAR) images taken by the RADAMBRASIL project (Brazil, Ministério das Minas e Energia, DNPN, 1973-82). The 1970 cleared area can be considered zero, particularly if one uses as an operational definition of "deforested" areas, the criteria inherent in the LANDSAT data making up the remainder of the graph. LANDSAT Multispectral Scanner (MSS) interpretation techniques underestimate deforestation by confusing primary forest with the secondary vegetation covering older deforested areas (Fearnside, 1982; Tucker et al., 1983: 3). The fact that the deforested area in 1970 was really greater than zero would imply an even more explosive exponential trend than that suggested by Fig. 1.

The LANDSAT studies have also underestimated deforestation, by using some images from years previous to the dates reported for state-level data (used in Fig. 1). This is the procedure used

to fill gaps that cloud-cover creates in the data-set. In the "1980" estimate by the Brazilian Institute for Forestry Development (IBDF), for example, 19 of 45 images used (42%) were from 1979 rather than 1980 (Brazil, Ministério da Agricultura, IBDF, 1982).

All of the information in Fig. 1 antedates the surge of immigration and deforestation that followed the September 1984 completion of the paving of the Marechal Rondon (Cuiabá-Porto Velho, or BR-364) Highway. In spite of any underestimation in deforestation estimates, the accelerated deforestation evident in Rondônia would lead to complete disappearance of the forest in that State within a few years should the same trend continue. The accelerating trend is due to positive feedback loops inherent in the system of forces that now drive the process. Only if this system is changed will the deforested areas be prevented from growing until they reach the last scrap of forest!

ACKNOWLEDGEMENTS

We thank the Sociedade Brasileira para o Progresso da Ciência (SBPC) for permission to republish Fig. 1 and the portions of the text translated from Fearnside & Salati (1985). Our research in Rondônia is funded by the Science and Technology Component of POLONOROESTE.

REFERENCES

BRAZIL, MINISTÉRIO DA AGRICULTURA, INSTITUTO BRASILEIRO DE DESENVOLVIMENTO FLORESTAL (IBDF) (1982). Programa de Monitoramento da Cobertura Florestal do Brasil: Alteração da Cobertura Vegetal Natural do Estado de Rondônia, Relatório Técnico. IBDF, Brasília. 68 pp. (Maps [of '1980' images], Scale: 1:250,000).

BRAZIL, MINISTÉRIO DA AGRICULTURA, INSTITUTO BRASILEIRO DE DESENVOLVIMENTO FLORESTAL (IBDF) (1985). Estado de Rondônia: Mapa de Alteração da Cobertura Vegetal Natural. (Map [of 1983 images], Scale: 1:1,000,000). IBDF, Brasília.

BRAZIL, MINISTÉRIO DAS MINAS E ENERGIA, DEPARTAMENTO NACIONAL DE PRODUÇÃO MINERAL (DNPM), PROJETO RADAMBRASIL (1973-82). Levantamento de Recursos Naturais. DNPM, Rio de Janeiro. 23 vols. illustr., Maps, Images (Scale: 1:100,000).

FEARNSIDE, P.M. (1982). Deforestation in the Brazilian Amazon: how fast is it occurring? Interciencia 7(2), pp. 82-88. 2 figs.

FEARNSIDE, P.M. (1983). Land use trends in the Brazilian Amazon as factors in accelerating deforestation. Environmental Conservation 10(2), pp. 141-148. 4 figs.

FEARNSIDE, P.M. (1984). A floresta vai acabar? Ciência Hoje 2(10), pp. 43-53. 11 figs.

FEARNSIDE, P.M. & FERREIRA, G. DE L. (1984). Roads in Rondônia: Highway construction and the farce of unprotected reserves in Brazil's Amazonian forest. Environmental Conservation 11(4), pp. 358-360. 1 fig.

FEARNSIDE, P.M. & SALATI, E. (1985). Rondônia: Sem florestas na próxima década? Ciência Hoje 4(19), pp. 92-94. 1 fig.

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT (IBRD) (1981). Brazil: Integrated Development of the Northwest Frontier. Latin America and Carribean Regional Office, IBRD (The World Bank), Washington, DC, USA: vi + 101 pp. illustr.

MUELLER, C.C. (1980). Recent frontier expansion in Brazil: the case of Rondonia. pp. 141-153 in Land, People and Planning in Contemporary Amazonia. F. Barbira-Scazzocchio (ed.) Centre of Latin American Studies Occasional Paper No. 3. University of Cambridge, Cambridge, UK. xvi + 313 pp. illustr.

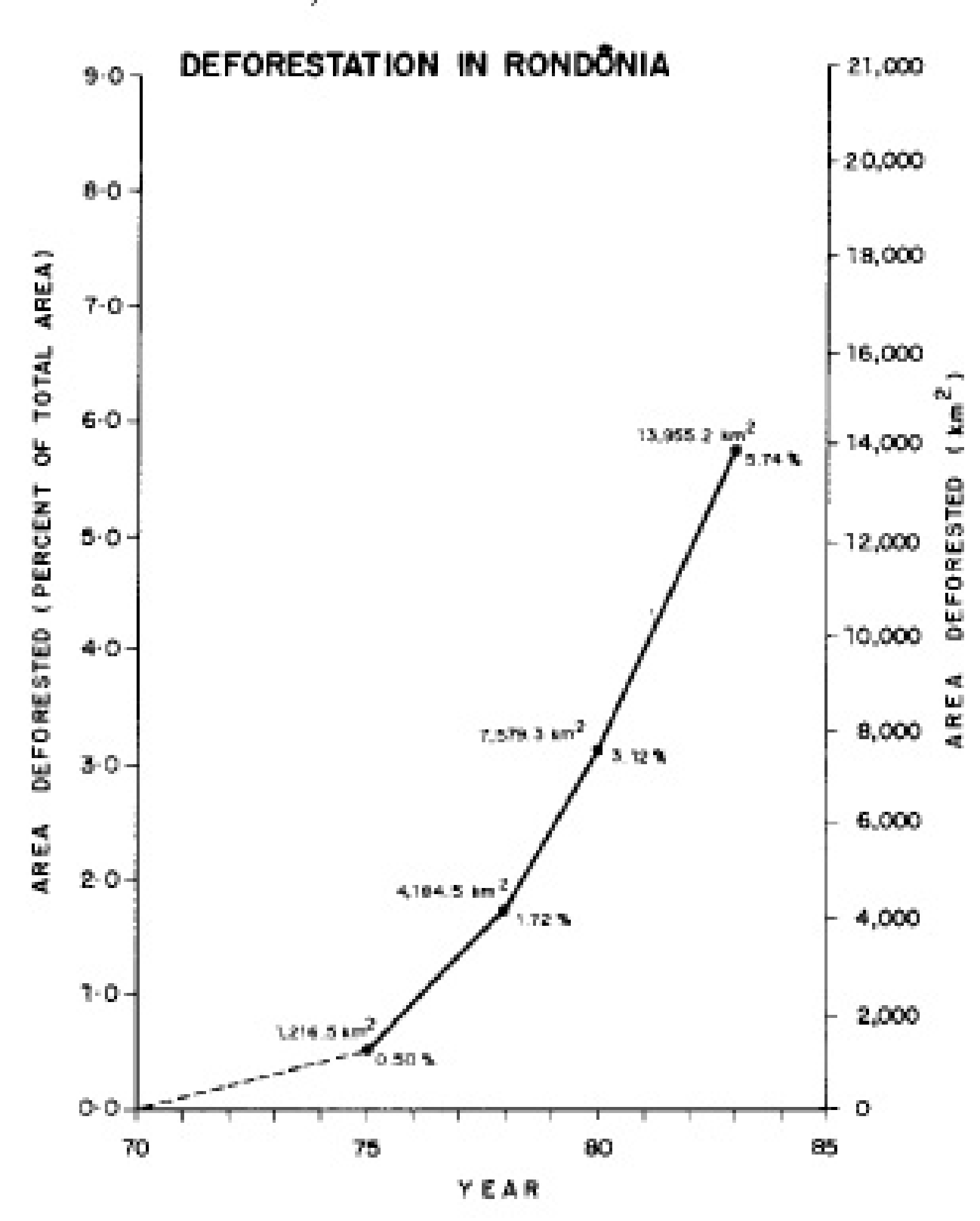
TARDIN, A.T., LEE, D.C.L., SANTOS, R.J.R., DE ASSIS, O.R., DOS SANTOS BARBOSA, M.P. DE LOURDES MOREIRA, M., PEREIRA, SILVA, D. & DOS SANTOS FILHO, C.P. (1980). Subprojeto Desmatamento, Convênio IBDF/CNPq-INPE 1979. Instituto Nacional de Pesquisas Espaciais (INPE) Relatório No. INPE-1649-RPE/103. INPE, São José dos Campos, São Paulo. 44 pp. 5 figs.

TUCKER, C.J., HOLBEN, B.N. & GOFF, T.E. (1983). Intensive forest clearing in Rondonia, Brazil, as detected by satellite remote sensing. National Aeronautics and Space Administration (NASA) Technical Memorandum 85018. Goddard Space Flight Center, Greenbelt, Maryland, USA. 11 pp. Appendix, 18 figs.

VALVERDE, O. (ed.) (1979). A Organização do Espaço na Faixa da Transamazônica, Volume 1: Introdução, Sudoeste Amazônico, Rondônia e Regiões Vizinhas. Instituto Brasileira de Geografia e Estatística (IBGE), Rio de Janeiro. 258 pp. illustr.

FIGURE LEGEND

Fig. 1. Deforestation in Rondônia as measured from LANDSAT imagery. The dotted line to 1970 (prior to LANDSAT's existence) reflects the minimal clearing at that time (see text). The explosive growth in cleared area is apparent.


DEFORESTATION IN RONDÔNIA
AREA DEFORESTED (PERCENT OF TOTAL AREA)
AREA DEFORESTED (km²)
YEAR
9·0
8·0
7·0
6·0
5·0
4·0
3·0
2·0
1·0
0·0
21,000
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
70
75
80
85
1,216.5 km²
0.30 %
4,184.5 km²
1.72 %
7,579.3 km²
3.12 %
13,955.2 km²
5.74 %