

EVOLUTION OF DEFORESTATION AND NATURAL RESOURCES DEGRADATION IN RONDONIA

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ABSTRACT:

This study aims at analyzing the deforestation evolution correlated to the proposal of a territorial planning implanted by Rondônia Social-Economical and Ecological Zoning – SEEZ – decree number 4.297 signed in July 2002), regulated in 2002. In order to determine the indicators of degradation (deforestation), we opted for the analysis of maps of deforestation elaborated in the years: 1973, 1991 and 1999. We used digital classification of sensor image TM/Landsat (scenes 230/68, 231/67, 231/68, 232/66 e a 232/67, bands – 3, 4 e 5), and digitalized in a Geographic Information System – GIS/SPRING version 4.0 e COREL DRAW-10. The SEEZ/RO establishes three zones: zone – 01, destined mainly to agriculture and cattle raising activities, zone – 02, composed by special areas and zone 03 represented by areas of restricted use (Conservation Unity). The deforestation in Rondônia increased in the period from 1978 to 1999, when the deforested area passed from 420.000 hectares to 5.418.059 hectares, respectively, which corresponds to 23, 71% of the state of Rondônia.

Key words: Deforestation, Colonization, Zoning

INTRODUCTION

From the 1960s several factors have determined the process of occupation of the state of Rondônia, more precisely in 1966, when the then President Castelo Branco established a set of laws which would promote the social-economic development of Brazilian Amazon¹. In

¹ Named by German Botanist Humboldt of Hileia

this set of laws the agricultural and cattle raising plan appeared, initially implanted in the Southwestern Amazon, of which the State of Rondônia is an important part, thus starting the germs of anthropic intervention process over the Amazon forest system.

The execution of the rules established by the government were similar to the model of implantation of the National Institute for Colonization and Agrarian Reform – NICAR – which was created to by the law number 1.110 decreed and signed on 9th July 1970 and which was the former Brazil Institute of Agrarian Reform - BIAR. The execution of this development plan was started with the implantation of the Pilot Project of Colonization in the central part of the State of Rondônia, Ouro Preto among other towns, where INCRA in the 1970s implanted the Integrated Project of Colonization – IPC. These plans stimulated the timber production in Rondônia, which in the year 1974 was the third producer of the country with 4.0008.975 m³

This period was marked by the beginning of timber exploitation which was intensified in the following decades. Besides it promoted the demographic expansion in this region which reached index of distinction among those registered in the history of the country – 15,80% originating from the strong migratory flow impelled by programs of settlement and colonization developed by the government, which made the number of landless family become bigger than the availability of land and financial incentives. This phenomenon left many peasants, mainly in the centre of the country, still today, without perspective of settlement.

In this context the present research has the aim to analyse the evolution of deforestation relating to the territorial planning proposal introduced with Rondônia Socio-Economic Ecological Zoning regulated in 2002.

MATERIALS AND METHODS

In order to have the forest degradation indicators (deforestation) we decided for the analysis of pre-existing deforestation maps, elaborated in the years 1991 and 1999 through the process of digital classification, generated from the TM/Landsat sensor, by using the non-classified digital classification, of the K-media type, made to the Legal Amazon in special to the region of (Escada & Alves, 2003; Medeiros & Câmara, 1996). We also used deforestation maps in the year of 1973, scale 1: 500.000 produced through images caught from the area of study by the MSS/Lansat sensor and later digitalized in a geographic information system-GIS.

The used images in this research correspond to the five scenes, to know: 230/68, 231/67, 231/68, 232/66 and 232/67 of the TM/Landsat 5 sensor. Band 3, strap of the spectral region 0,63-0,60 (red), band-4 strap of spectral region 0,76-0,90mm (close to average infra-red). In this way we selected for the period of the dry season corresponding to 15 images between the months of June to September according to the table – I

**Table I – Deforestation scenes caught by MSS/TM/Landsat
Sensor in Rondônia**

Scenes/Images	Date of Survey	Type of Sensor
232/66 e 232/67; 231/67 e 231/68; e a 230/68.	1973	MSS/Landsat
232/66 e 232/67; 231/67 e 231/68; e a 230/68	1991	TM/Landsat
232/66 e 232/67; 231/67 e 231/68; e a 230/68	1999	TM/Landsat

Source: INPE / Prodes (2004)² e Rondônia (1997a)

For the image process and deforestation indicators analysis we used the SPRING version 4.0 software, as well as the geo-referencing in the construction of the scene mosaic selected in order to have a better visualization. In the types of use forest covering we used the software Corel/Draw version 10.

The Proposal of Ecological Socio-Economic Zoning – SEEZ, was fragmented in three great zones: Zone 1, composed by the areas of farming and cattle raising use, agro-forest and forest, which present four sub-zones: sub-zone 1.1, sub zone 1.2, sub zone 1.3 and the sub-zone 1.4. The zone 2, composed by the areas of special use, was destined to the conservation of natural resources under the sustainable management and also presents two sub-zones: sub zone 2.1 and sub zone 2.2. The third zone presents two sub-zones: 3.1 and 3.2 and is composed by institutional areas protected by the restricted use under the control of the Federal Government, the States and Municipalities, according to the Complementary Law number 233 of June 6th 2000.

RESULTS

The area of study (Rondônia state) lies in the Western Amazon between the parallels 7o58’ and 13o 43’ of Latitude South, the Meridian 59oo 50’and 66o 48’of Greenwich West

² It is important to remark that the images used as sources for the definition of the deforestation indicators were extracted from INPE/Prodes (management project of Deforestation of the Spatial Research Institute corresponding to the already mentioned years and set of scenes...

Longitude having a territorial area of 238.512.80 km², corresponding about 2,86% of Brazilian surface and 6,79% of the Northern Region. Nowadays Rondônia has 52 municipalities (Rondônia, 1996).

Broadly speaking, the deforestation in the Amazon Bay, specially in Rondônia, derives from several causes, among them we can distinguish four: 1) the growth of population due to the arrival of migrants, mainly from the Southern, South-eastern and North-eastern Brazilian regions, attracted by the policy of colonization developed by the Dictatorial Government. This caused a growth of 324% between the years from 1970 to 1980, 2) the growth of the timber industry allied to the improvement of the road which allowed major access to farmers and peasant to the areas so far inaccessible; 3) the deforestation movement to the interior of our study area, which previously concentrated the central part of the state of Rondônia, along the 364 Highway and started to move to the valley of the Guaporé, Mamoré and Madeira Bay. Finally the fires caused by the population in the management of pastures and farming areas. (Diegues, 1999, Lisboa, 1990; Batista, 2001; Vasconcelos and Novo, 2004).

DEFORESTATION EVOLUTION IN RONDONIA

Based on the data obtained from the results of the supervised classification of the scenes 230/68.23/67, 23/68, 232/67 and the 232/67 - 1973 (INPE/PRODES 2004²; Nunes, 2004; Brasil, 2001) (Figure - 01) captured by the MSS/Landsat sensor, composition RGB, and whose processing was developed with the help of SPRING software, we certified that until the end of the decade of 1970, more precisely in the year of 1978, the process of degradation of the native forest covering, was still very incipient corresponding to about 1,76% in relation to the territorial area of the State of Rondônia.

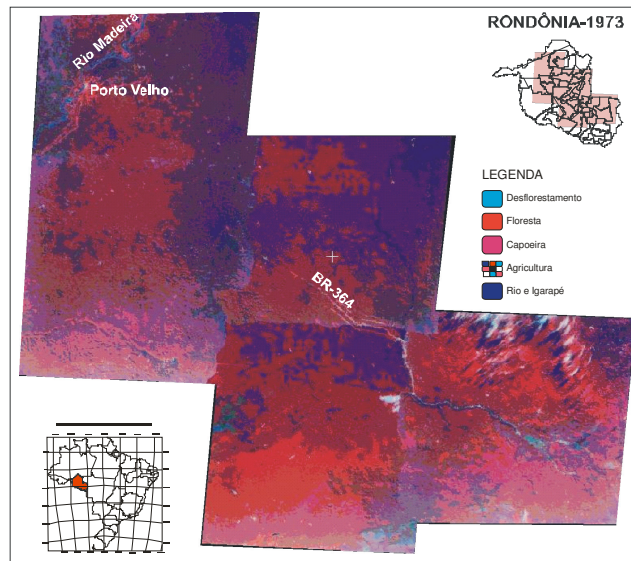


Figure – 01: *Deforestation in Rondônia in the year of 1973.*

In general, the process of use and occupation of the earth through official colonization was started in the year of 1970 and intensified in the decade of 1980 has driven the index of deforestation of this region forward up to 12,5%, an index which along this period presented a strong tendency to grow, reaching 14,04 of the territorial area of the state of Rondônia in the year 1990. The deforestation registered for the period in debate may be visualized through the analysis of special scenes 230/68, 231/67, 231/68, 232/66, 232/66 and the 232/67 – 1991 captured by sensor TM/Landsat (figure- 02) (INPE/PRODES, 2004²; Nunes, 2004).

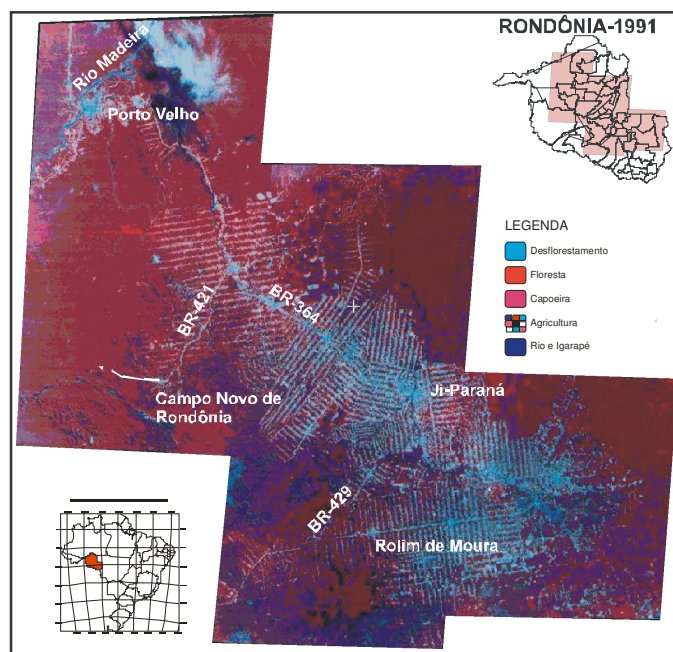


Figure – 02: *Deforestation in Rondônia in the year of 1991.*

In the decade of 1990, the new model of economy, based on ranching and cattle-raising activity and the incentive to the great investment in infra-structure, besides keeping the population growth, also promoted the diversification in the use and occupation of the soil, mainly in the activity of the cattle raising, where we have observed the growth of the pasture area, between the years 1985 and 1997, reaching 14,22% increasing to 16,00% in the year 2000. Such activity made the percentage of the deforested area, estimated in 14, 50% in the year of 1991, reach 23,82% in 1999 (figure – 03)(Rondônia, 1997; Rondônia, 2000).

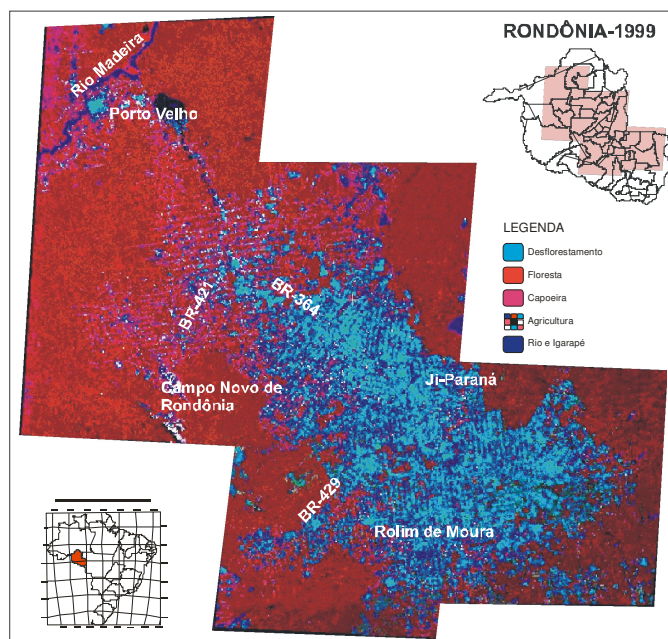


Figure – 03: *Deforestation in Rondônia in the year of 1999.*

With the aim of containing the disordered occupation process of land and in order to break the advance of deforestation, by the end of POLONOROESTE, it was elaborated, the first approach to the Ecological, Socio-Economical Zoning – SEEZ, having as the central aim to promote a long-run sustainability, beside the definition of the conservation area the state preservation in the scale 1:1.000.000. In this context, the necessity of a more detailed complementation of SEEZ/RO emerged. The second approach to SEEZ happens, in this turn, in the scale 1:250.000.

Based on the methodological proposal that we employed in the second approach to SEEZ, the territorial area of Rondônia was divided into three zones, to know: zone 01, equivalent to 50,45% of the studied area, destined to the ranching and cattle raising , agro-forestry and forestry; zone 02, corresponds to 14,60% of the analysed area, destined to special

uses such as the conservation of natural resources and possible uses under the sustainable management and the zone 03 equivalent to 34,95 of the territorial extension analysed and composed by areas protected from restrict use and controlled by legislation instituted by the Federal Government, the State of Rondônia and the Municipalities (Brasil 2002)

We have been observing the data of deforestation in the studied area which is a group of eleven municipalities totalizing 11.598 square kilometres, representing 4,86 of the territorial area of Rondônia and presenting a rate of deforestation which varies from 72,18% to 91,32% (table - II) and with the geographic localization in the sub-zone 1.1 of the Rondônia Ecological Socio-Economic Zoning. This corresponds to the areas with zones having different types of soil use, especially in the activities linked to ranching and cattle raising, carrying varied degree of occupation and of natural vulnerability to erosion. This sub-zone, according to the Complementary Law 233 of January 6th 2000, forecasts the deforestation up to 80% and conservation and recuperation of 20% of vegetal covering.

Table II – Areas of Greatest deforestation rate in Rondônia– 72,18 % a 91,32%

Municipalities	Área Km²	Até 1996	Deforestation growth				Total	Deforestation (%)	SEEZ Sub-zones
			1997	1998	1999	2000			
Castanheiras	901,20	618,11	11,31	9,56	1,82	9,63	650,45	72,18	1.1
Colorado D'oeste	1.442,40	1.003,63	15,62	0,97	6,72	20,16	1.047,10	72,59	1.1 e 1.4
Nova União	804,10	547,92	11,13	12,81	1,59	6,82	580,28	72,16	1.1
Novo Horizonte	833,50	644,63	6,65	9,47	0,20	2,60	663,56	79,61	1.1
Ouro P. Oeste	1.978,20	1.519,65	34,13	6,92	0,13	7,35	1.568,19	79,27	1.1
Presidente Médici	1.693,40	1.254,41	26,69	17,77	7,85	15,00	1.321,74	78,05	1.1
Primavera de Rondônia	615,40	435,26	9,56	0,0	3,29	9,58	457,71	74,38	1.1
Rolim de Moura	1.478,30	1.230,81	7,92	10,75	3,53	19,68	1.272,70	85,57	1.1
São Felipe D'Oeste	546,50	465,19	5,76	0,0	0,34	9,24	480,54	87,93	1.1
Teixeirópolis	455,80	394,62	16,41	2,17	0,16	2,85	416,22	91,32	1.1
Urupá	849,70	628,41	1,82	4,66	23,71	6,02	643,29	75,71	1.1

Source: Rondônia (2000a).

The districts of Cacaupônia, Nova Brasilândia, Santa Luzia D'oeste, Vale do Paraíso and Curumbiara together have an area close to 7.245 square kilometres, corresponding to 3,03% of the territorial study area, which has been presenting deforestation rate which varies from 52,63 to 69,54. Among these areas we can distinguish the district of Cacaupônia, set in the sub-zone 1.1 and 1.2 (the sub-zone 1.2 forecasts up to 60% of deforestation as well as the conservation and recuperation of the forest canopy of 40%) Curumbiara and Santa Luzia D'Oeste. These areas, besides being in the sub-zone 1.1,

present part of their territories in the sub-zone 1.4 (the Sub-zone 1.4 forecasts deforestation of only 20%, conservation and recuperation ob about 80% of its territorial area) (table - III).

Table III – Areas with greatest deforestation in Rondônia – 52,63% a 67,16%

Municipalities	Área Km ²	Until 1996	Increase of deforestation				Total	Deforestation (%)	SEEZ Subzones
			1997	1998	1999	2000			
Cacaulândia	2.010,40	917,67	32,97	41,35	13,49	52,62	1.058,11	52,63	1.1 e 1.2
Corumbiara	3.079,70	1.644,09	29,56	13,52	19,30	35,20	1741,67	56,55	1.1 e 1.4
Santa Luzia D' Oeste	1.187,70	734,47	29,92	7,422	8,928	16,97	797,72	67,16	1.1 e 1.4

Source: Rondônia (2000a).

Based on presented data we can affirm that all the selected municipalities revealed rates of deforestation higher than 50% of its territorial area. Taking into consideration the Law 4.771 of September 15th 1965³, which was in effect until 1996 (Medaur, 2002) which determines the conservation up top 50% of the forest area for each property, its change through the Law 7.803 of 18th July 1989, which elevated the percentage of low cutting to 80% (Brasil, 2004) of forest areas of Legal Amazon, it is not difficult to affirm that the mentioned legislation is not being respected in a big part of the region. In addition to this, the very complementary law, which regulates the Socio-Economic Zoning of state, is in conflict with the forest code and its legal alteration.

FINAL CONSIDERATIONS

The sate of Rondônia has presented high rate of deforestation which characterizes an area that has passed through intense colonization formed by farmers who came from other regions of the country, mainly from the Southeast and South.

Due to the growth of the territorial deforested area, some measures have been taken in order to control the deforestation in the state. These measures are, for example, the creation of conservation areas in zone 3 of the ecological Socio-Economic Zoning, considering that a big part of the state lies in the zone 1, corresponding to the areas deforested and consequently presents a big natural fragility to erosion, with a tendency to desertification process, but mainly ecological degradation.

Besides, as a form of controlling the development of the state, the non-degradation of

¹ Legislation which instituted the 1965 Forestry Code

environment as a whole, it was created the zone 2 of the zoning corresponding to the areas of conservation of natural resources. The current challenge is not only to manage and minimize the deforestation in Rondônia or in the Amazon, but also to understand how the new investments in infra-structure in the Western Amazon, such as Hydro-electric dams of the High Madeira, the Urucu pipe-line gas-conductor, will be catalyzing elements of more than one disordered and diffuse migratory process which makes the so famous conceit of sustainable development impractical.

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