

Recommendations of the land use in conformity with use capacity to limit natural resources degradation in Itatiba/SP/Brazil

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ABSTRACT

This paper presents the recommendations of the land use in conformity with use capacity to limit the natural resources degradation in county of Itatiba/SP/Brazil, situated 46° 40' W and 22° 55' S, with area 323 km² and estimated population 71.644 people (89% urban and 11% rural). The results of classes of use capacity were: 19.4% - II, 5.4% - III, 27.2% - IV, 12.8% - VI, 21% - VII and 1.9% - VIII. The relative limit factors mains to classification of land-use capacity were: soil type, fertility, and erosion risk. The classes of land use were obtained of CBERS 2 (2004) satellite image, where the results were: 56.3% pasture, 12.5% forest, 11% reforestation, 4.9% exposed soil/cropland, 1.5% river/dam, 1.6% road e 12.3% urban area. In general, the topography in Itatiba/SP/Brazil is not favorable for agriculture, thus implementing best management practices to stabilize soil and prevent erosion are important to protect natural resources. Land use and your capacity were evaluated, improper areas identificated, and, at the same time, recommendations were making to they won't go to be sources of natural resources degradation in county of Itatiba/SP/Brazil.

Keywords: Land use planning, natural resources degradation, recommendations of land use.

INTRODUCTION

Regardless of the type of operation to be determined in soil, their rational use should be a determining factor, because misuse can cause damage to that to be solved consume considerable time and money (Silva et al., 1979).

The rational use of land is the clever use of soil, to achieve the maximum performance permanently. The ideal is to seek always the point at which there is compatibility between the maintenance of ecological balance and agricultural productivity, industrial and even the urban occupation (Galetti, 1973).

Second Rocha (2005) in the midst of excessive technological advancement, the expansion of the agricultural frontier and the phenomena of disturbance of metropolitan regions, there to establish measures of general practice, which can promote the conservation of soil, namely the rational and sustainable use of soil. Thus, an accurate assessment of the site chosen should consider, among other things: soil type and slope, soil use and type of vegetation cover, proximity to water bodies and the presence of wildlife.

The qualitative point of view, the disciplinary measures of land use, depends on the final quality of water in rivers and lakes, because they reflect the human activities carried out, each producing specific effects (Porto, 1991).

Unfortunately, in general, the occupation of land in the country is so inadequate, because the inappropriate use of land is accelerating its depletion leads invariably to the conditions of environmental instability.

The Atibaia/SP river - Piracicaba/SP watershed is an example of this problem, due to intense urbanization their water resources are suffering loss of quality, by increasing the solid load of mineral origin (due to erosion processes) and organic (resulting from pollution sources) and, similarly, the quantity, the degradation/destruction of fresh water areas.

Thus, given the importance of Atibaia/SP river to Piracicaba/SP watershed, with responsible for the supply of different communities (Campinas/SP, Valinhos/SP, Itatiba/SP and the others) and also the main natural drainage channel the county of Itatiba/SP, it was decided to conduct this study where as land use and your capacity were evaluated, improper areas identified, and, at the same time, recommendations were making to they won't go to be sources of natural resources degradation in county of Itatiba/SP/Brazil.

MATERIALS AND METHOD

Area and location – Itatiba/SP

Itatiba County is in the State of São Paulo/Brazil, and encompasses an area of 323 square kilometers (km²) and 34 kilometers (km) of the Atibaia river. The county has an estimated population of 71,644 people, with approximately 89% in urban areas, and 11% rural areas. It is located in meridian 46° 40' W and in parallel 22° 55' S. Land use in the county is very mixed due to the recently accelerated economic raise, and the environmental transformations. Figure 1 shows the location of Itatiba in the State of São Paulo.

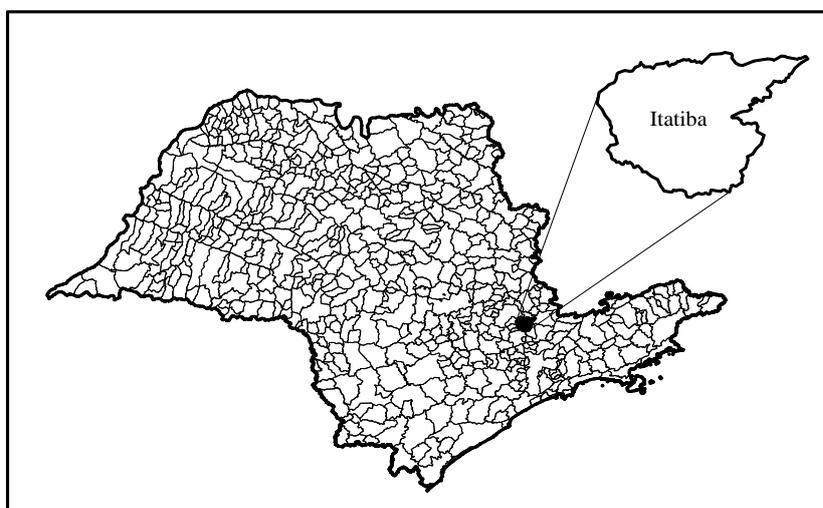


Figure 1. Location of Itatiba in State of São Paulo/Brazil

Classes of land-use capacity

Based on CAPUSO 1.0 software (Lepsch, 1991, adapted by Giboshi, 2005), where from the crossing of data: classes of slope and soil types, together with limiting factors (susceptibility to erosion, impediments to mechanization, and others) could generate a plan of classes of land-use capacity.

Classes of land use

Based on satellite image obtained from the CBERS 2 (2004), recorded by processing of digital images in a GIS, as modules for automatic interpretation supervised, to a greater discrimination between different types of vegetation cover, and the same time, allowing the interpretation issues second legend pre established, thus generating the classes of land use for that period.

RESULTS AND DISCUSSION

Then, in the Table 1 and 2, respectively, the slope-gradient and soil type values are presented as follows.

Table 1. Values of slope-gradient

Classes of Slope (%)	Area (%)
0 a 3	2
3 a 6	28
6 a 9	32
9 a 12	14
12 a 18	18
18 a 25	4
> 25	2

Table 2. Values of soil type and soil loss tolerance

Soil Type	Area (%)	Tolerance (Mg/ha)
PVA – 22	13.3	6.6
PVA – 44	0.10	6.6
PVA – 8	11.8	5.7
LVA – 17	62.5	9.8
Área Urbana	12.3	-----

In 38% of county's area the slope-gradient is of more than 9%, thus there are in these areas a management adequate uses and soil conservation practices it required.

The Podzolic soil represents 25% in study area and erode easily, mainly that located in slope-gradient of more than 9% and 6,6 Mg/ha of soil loss tolerance. The soil loss tolerances are based in studies of Bertoni and Lombardi Neto (1990).

The Figures 2 and 3 are showing the land use and land-use capacity maps of Itatiba/SP county and in the Table 3 and 4, respectively, the land use and land-use capacity values are presented in 2004 - Itatiba/SP.

Table 3. Values of land use - 2004

Classes	Area (%)
Pasture	56.3
Forest	12.5
Reforestation	11
Expose Soil/Annual Culture	4.9
Dam	1.5
Roads	1.6
Urban Area	12.3

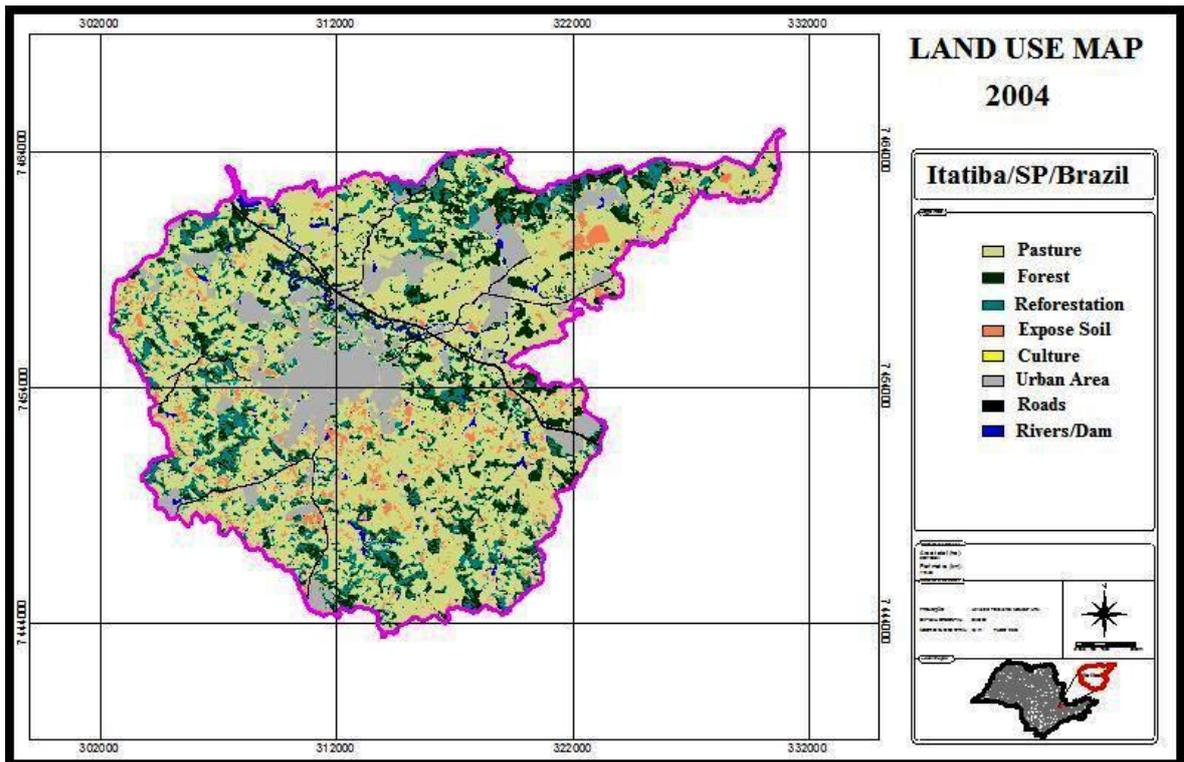


Figure 2. Land Use Map of Itatiba/SP/Brazil – 2004

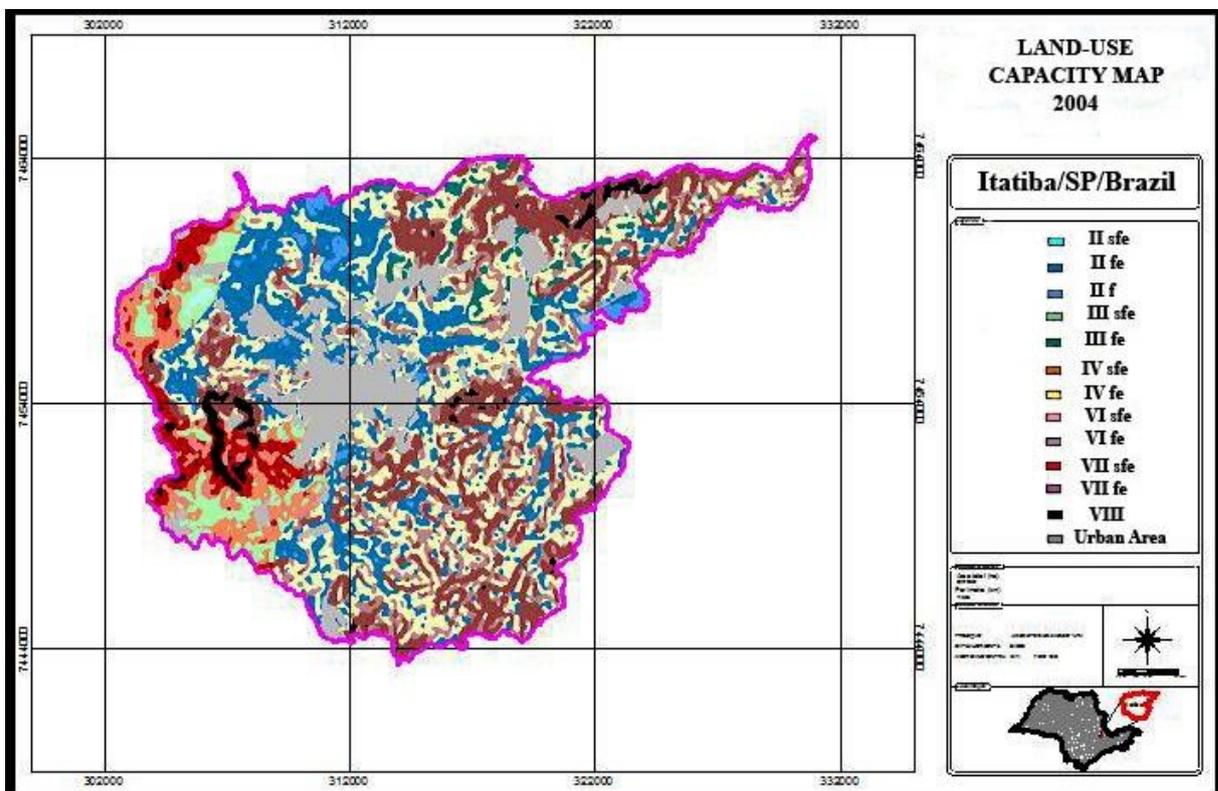


Figure 3. Land-Use Capacity Map of Itatiba/SP/Brazil - 2004

Table 4. Values of land-use capacity

Classes	Area (%)
IIsfe*	0.2
IIf	17.9
IIIf	1.3
IIIIsfe	3.5
IIIIf	1.9
IVIsfe	3.3
IVIf	23.9
VIsfe	1.7
VIIf	11.1
VIIIsfe	3.8
VIIIf	17.2
VIII	1.9
Urban Area	12.3

*s-soil, f-fertility, e- erosion

Some agricultural activities in vulnerable areas has decreased in recent years, according to Silva (2003) agricultural activities decreased, which reduced the rate of erosion and the use of agrichemicals in these areas.

The relative limit factors mains to classification of land-use capacity were: soil type, fertility and erosion risk.

In only 19% of county's area is adequate use for annual, semi-perennial or perennial cultures, in 27% is adequate land use for pasture or reforestation and with restrict use for annual or semi-perennial cultures and in 21% is adequate land use for environmental preservation.

CONCLUSION AND RECOMMENDATIONS

In general, the topography in Itatiba/SP/Brazil is not favorable for agriculture, thus implementing best management practices to stabilize soil and prevent erosion are important to protect natural resources.

According to the IBGE (Brazilian Institute of Geographycal and Statistic) the Itatiba/SP's population increased at the rate of 4% per year.

According to Siviero (2006) about 29% of the Itatiba/SP county had high risk of degradation of its water resources, especially in its natural channel – Atibaia/SP river. Then efforts should be made by public authorities and population in order to implement recommendations of practical measures general indicated, so that agriculture and urbanization can develop it without any sources of degradation in this region.

General recommendations of land use

- Definition appropriate zones: cultivation in areas II - rotation of crops to re-balance the chemical composition and nutrient content; urbanization/development in areas IV and environmental preservation in areas VII and VIII - gardens, tourist use and environmental reserves as a refuge for wildlife;
- Recuperation of vegetation cover in degraded areas and on the banks of water bodies;
- Establishment of retention and sedimentation basins – mainly in slope-gradient greater than 15% (Marsh, 1998);
- Programs for environmental education and wastewater treatment projects need to be implemented;

- Land use policies and regulations should be established and implemented to minimize non-point source pollution controls and disposal of industrial effluents – mainly from textile industries;

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