

Mapping of Areas for Permanent Preservation in Coffee Producing Regions of South Minas Gerais, Brazil and Identification of Land Use Conflicts

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SUMMARY

Climate changes and land use discussions has subsidized studies for soil and environmental characterization of regions. Geotechnologies have proved be a good tool for this kind of approach. The coffee consume in the world is in continuous expansion and increasing the consumer market requires for a high quality coffee. According to Brazilian forest code (Federal Law N°. 12.651/2012 and CONAMA N° 303/02), these areas are for environmental preservation. Thus, to keep a quality product, it's necessary also a sustainable techniques of production. In south of Minas Gerais, Brazil, was carried out a mapping of Permanent Preservation Areas (PPA) and coffee plantations in municipalities of Lambari, Heliódora and Jesuânia aiming to identify the land use and forest fragments. The mapping was done by ArcGis 9.2 software using as base RapidEye images. Analysis of results showed that Coffee is the second largest agricultural activity present in PPA, with few areas that have been preserved, showing low levels of compliance with resolution CONAMA N°. 303/02 the large size of Brazil and its lack of information for making decisions on the rural environment and the geotechnologies present themselves as an important tool, fast and accurate. The data discussed are pre-existing models which allows evaluating the land use serving as bases for environmental planning.

INTRODUCTION

Currently environmental issues such as the soil conservation and microbasin preservation have been much discussed. However, in Brazil there are still few studies involving monitoring of PPA's, which contributes to the occurrence of problems such as the occupation of inappropriate areas with erosion risks and of the soil exposure, pollution of hydric resources and invasion of permanent preservation areas. The integrated management of the natural resources using geoprocessing techniques, has had significant progress in view of the problems resulting from the occupation of the basins, the increase of water use and the impact on the environment.

The consumption of coffee in the world is in continous expansion and the consumer market increasingly demands a coffee drink of high quality. Brazil is the largest world producer of coffee, responsible for 30% of the international market. The state of Minas Gerais stands out in the Brazilian scenario as the largest national producer of coffee, involving more than 104 thousand rural establishments and directly influencing 75% of the municipal district

economies, the south of Minas Gerais being the largest producer of the state. The the majority of coffee producers of the south of Minas Gerais are small producers, producing in altitude areas, such as hilltops and hillsides, where there are the better quality coffees. Those areas, according to the Environmental Legislation (Federal law 12.651/12 and Resolution CONAMA nº303/2002), are intended for environmental preservation.

The Permanent Preservation Areas (PPAs) are defined by the Resolution CONAMA 303/2002 areas with forests or other forms of vegetation destined to biodiversity protection and soil and water conservation, and that by their topographical position within the property, should be preserved.

The demarcation of the preservation areas on hilltops, mountains, along ridgelines and river courses is a complicated process to undertake using only conventional methods. Studies that seek to aid the environmental characterization of a specific region using geotechnologies have been conducted with good results, due to the data generation speed and its low cost.

In this regard, mapping of soil use and covering of the municipal districts of Heliódora, Jesuânia and Lambari situated in the South of the state of Minas Gerais, Brazil, was conducted with the objective of mapping and identifying the coffee growing use conflict in the Permanent Preservation Areas, defined by the effective environmental legislation, generating data to evaluate the coffee growing suitability in the area and to support a plan for sustainable environmental management.

MATERIALS AND METHODS

The studied area comprises the municipal districts of Heliódora (22°04'01''S and 45°32'31''O), Jesuânia (22°04'01''S and 45°32'31''O) and Lambari (22°04'01''S and 45°32'31''O), located in the South of the state of Minas Gerais, Rio Verde Basin.

A field survey was conducted for reconnaissance of the area. The land use mapping was used to verify the antropic activities that generate the PPA occupation conflicts.

To generate the survey maps of the land use and occupation, SRTM satellite images were used, with a resolution of 90 m, in the TIFF format and with a articulation compatible to the scale of 1:250.000, acquired through the website Brazil in Relief (<http://www.relevobr.cnpem.embrapa.br/>), of the Brazilian Agricultural Research Company (EMBRAPA).

All of the water bodies (rivers, channels, lakes, ponds, reservoirs and flooded areas) were vectorized. With the objective of carrying out the correction of the hydrographic network the planialtimetric topographical charts SF-23-V-D and SF-23-Y-B were used. The digital processing of the images and vectorization of the thematic maps were conducted in ArcMap 9.3.

The Permanent Preservation Area (PPAs) maps were generated for hillsides, hilltops, water courses and springs; the parameters for delimitation of these areas were given by the Law 12.651/2012 and Resolution CONAMA 303/2002. The data obtained individually in the mapping of the PPA classes were contained in a single map, generating a map of Permanent Preservation Areas. The quantitative analysis of the preservation areas was conducted through the direct comparison of the total value found per PPA class. The analyses and processing were generated in ArcGis 9.3.

For the mapping of the coffee growing areas, images from the RapidEye satellite were used, following the methodology used by the CAFESAT Project.

RESULTS AND DISCUSSION

The region presents a total area of 521.00 km², of this total 281.25 km² are made up of PPAs, that corresponds to 53.96% of the studied area.

According to the Brazilian Forest Code (6) PPAs have the environmental function of preserving the hydric resources, thus guaranteeing the conservation of elements of nature and human well-being, PPAs thus being areas that should be preserved.

Figure 1 presents the spatialization of PPAs (PPA classes studied) in the municipal districts of Heliadora, Jesuânia and Lambari.

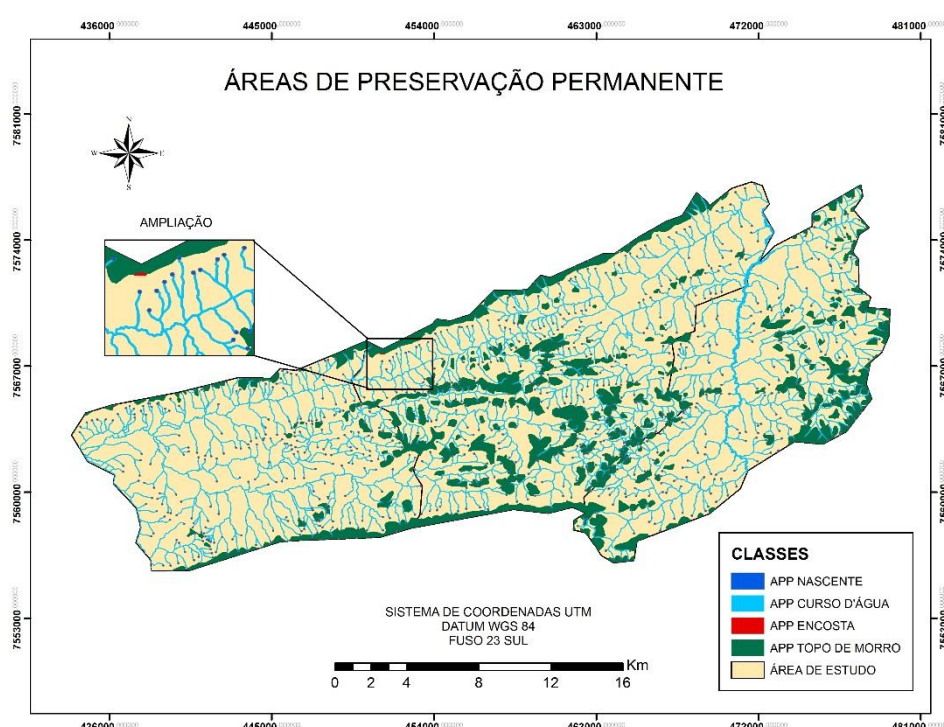


Figure 1. Map of Permanent Preservation Areas of municipalities Heliadora, Jesuânia and Lambari, Minas Gerais, Brasil.

The PPA class hilltop presents the largest area among the PPAs, corresponding to 48.75% of the total microbasin, while the PPA class that has the lowest representation in area is the hillside (over 45°), representing 0.13% of the total of the PPA areas. Those two PPAs classes present as very deteriorated, and this is a serious environmental problem, because the steepness, or degree of inclination of the land, has great influence on the soil erosion process, and in these areas the presence of the native vegetation would have a primordial role of soil protection and erosive process minimization.

PPAs of springs and water courses present high representativeness, not only for the extension of the area, but also for their fundamental role in the preservation of the environment and for dealing with a hydric resource, primordial in the maintenance of life. The PPA areas that

involve the preservation of springs correspond to 2.79% and those of water courses represent 48.32%.

Figure 2 presents the coffee growing spatialization in the areas of the studied municipal districts.

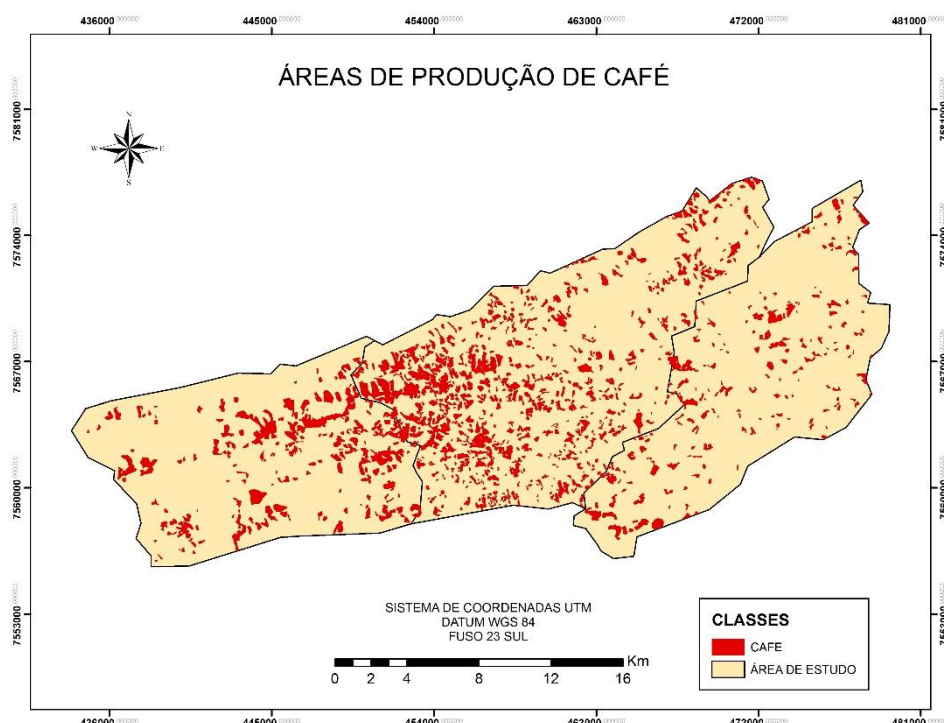


Figure 2. Map of coffee crop location in municipalities Heliodora, Jesuânia and Lambari, Minas Gerais, Brazil.

A large part of the agricultural cultivation occupies Permanent Preservation Areas, and in spite of the ecological importance of PPAs, those areas conflict with the coffee growing in the studied area, since coffee growing was the dominant use class, occupying 14.5% of the total PPAs. Various works show that cultivated areas occupy a good part of the PPAs.

These results are a relevant contribution for decision making regarding the correct administration and planning of the land occupation and use in the region, allowing the indication of priority areas for conservation and restoration, because PPAs possess important ecological functions.

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