Identification of Areas for Permanent Preservation in Coffee Producing Regions of South Minas Gerais, Brazil

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SUMMARY

Planning for the sustainable use of natural resources requires knowledge and organization of up-to-date information about the environment. Due to the need for rural properties to comply with environmental legislation, the aim of this work was to developed a methodology to identify Permanent Preservation Areas (PPA) of hill tops and river banks occupied by coffee production. A digital elevation model of the municipality of Lambari, Minas Gerais, Brazil was created in a geographic Information System (GIS), using data from contour and system drainage of topographic charts from IBGE. The classes of PPA studied were hill tops and river banks. A map of copy from the INPE was used to identify areas occupied by coffee production, which can be viewed on the CAFESAT website. This mapping was conducted using Lansat images from 2005 and 2006. The municipality of Lambary shows an area of 21,380 hectares (ha), out of which 2,724.66 are PPA of river banks and 4,461.26 are PPA of hill tops. The PPA represent 33.61% of the total area of the municipality, being 12.74% of riverbanks and 20.87% of hill tops. In this region, coffee occupies an area of 3,936.77 ha, corresponding to 18.42% of the total area. Coffee is present in 381.36 ha of the PPA of margins of river banks and 1,116.92 ha of hill tops. That is, it occupies 14 and 25.04% of the respective PPA. This study enabled the development of methodologies to quantify the PPA of hill tops and riverbanks, which can be used for planning sustainable mountain coffee farms and compliance with environmental legislation, especially as regards to Permanent Preservation Areas.

INTRODUCTION

The planning of the agricultural activities is an action of extreme importance for the preservation of the natural resources in our country. The Brazilian legislation, in essence, is composed of command and control instruments. However, for being a territory of continental proportions, the monitoring of activities linked to the rural environment do not always present the necessary efficiency required to comply with current legislation.

The discussions concerning the high forest fragmentation and deforestation indices, and the debates about preservation and conservation of the natural vegetation, above all those situated along the water courses, springs and in areas of altered topography, have been prominent, being one of the pillars for technicians, researchers and environmentalists that extol their importance for protection of the hydric resources.

To understand the real situation of the plant covering and the degradation state of the landscape in a specific area, it is of fundamental importance to accomplish the land use and covering analysis. To know its dynamics favors the proper administration of the space through the adoption of measures that will guarantee the preservation and maintenance of the environment. The current environmental and socioeconomic impacts of these uses cause concern on a local, regional and global scale. Therefore, soil use should relate to the purpose attributed to its covering and vocation, be it an agricultural production area or as an environmental preservation area. And in this sense, geotechnologies offer a series of tools that greatly assist the adequacy of land use on rural properties, classifying the productive areas and the Permanent Preservation Areas.

The Permanent Preservation Areas (PPAs) are defined by the CONAMA Resolution 303/2002 as 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.

Even being protected by the legislation, it is observed that these areas have been anthropically altered. Countless factors were responsible for the suppression of a large part of the areas destined for permanent preservation. The expansion of the agricultural borders due to economic pressure was one of the great motivating factors for the change in the land use.

Recomposing PPAs constitute an important action in view of the benefits that they provide to the environment. According to in countries of continental dimensions, the representation and characterization of PPAs on maps becomes indispensable, because it aids in the territorial planning, inspection and field actions.

In line with that, the present study aimed to develop a methodology to identify hilltops and stream margins occupied by coffee plantation PPAs and assess their compliance with the Brazilian Forest Code in those areas by analyzing the land use and cover using geotechnology.

MATERIALS AND METHODS

The studied area encompasses the municipal district of Lambari located in the South of the state of Minas Gerais, Rio Verde Basin, São Lourenço Microregion. Lambari is between the geographical coordinates 45° 21' 00" W and 21° 58' 33" S.

Land use mapping was used to verify the anthropic activities that generate PPA occupation conflict. A field survey was conducted for reconnaissance of the area.

For this work, contour curves and drainage networks from the Brazilian Institute of Geography and Statistics were used (IBGE) corresponding to the municipal district of Lambari, besides coffee mapping data gathered by the National Institute of Space Research (INPE) available on the CAFESAT Website and the resolution number 303/02 of CONAMA that defines the parameters for PPA delimitation. All of the water bodies (rivers, channels, lakes, ponds, reservoirs and flooded areas) were vectorized. The topographical chart SF-23-V-D-VI-3, in digital format (scale 1:50.000), was also used. Analyses and processing were generated in ArcGis 9.3.

From the contour curves and drainage networks, a Digital Elevation Model (DEM) of the municipal district was generated. This procedure was conducted through the *topo to raster* interpolator, generating a DEM with spactial resolution of 20 meters.

With the data from DEM the hilltop methodology was used for delimitation of the Permanent Preservation Areas, in other words, in agreement with resolution No. 303/02 of CONAMA, when there are occurrence of two or more hills or mountains in which the summits are separated by distances under five hundred meters, the PPA will be equal to the group of hills or mountains, that are delimited from the contour curve that represents two thirds of the height of the hill in relation to its base.

For the PPA map of water courses, a 30 m wide buffer was applied to each margin of the river, for water courses with margins of up to10 meters, and a buffer of 50 m of width to each margin, for water courses with margins from 10 to 50 meters, in agreement with the CONAMA Resolution 303/2002.

The data obtained individually in the mapping of the PPA class of were contained in a single map, generating a Permanent Preservation Area map. The quantitative analysis of the preservation areas was conducted through the direct comparison of the total value found per APP class.

The results of the permanent preservation area delimitation were crossed with the coffee mapping, obtaining the areas which are in conflict with the existing environmental legislation.

RESULTS AND DISCUSSION

The municipal district of Lambari presents an altimetric variation of approximately 707 meters. The total area of the municipal district is 21,380 hectares (ha), of these 2,724.66 ha are water course PPAs and 4,461.26 ha are hilltop PPAs.

PPAs represent 33.61% of the total area of the municipal district, 12.74% of these being water course margins and 20.87% hilltops. In the municipal district, coffee occupies an area of 3,937.77 ha, that corresponds to 18.42% of the total area. Coffee is present on 381.36 ha of water course margin PPAs and 1,116.92 ha of hilltops, in other words, 14 and 25.04% of respective PPAs. The Figure 1 presents the PPA and coffee spatialization in the Lambari municipal district.

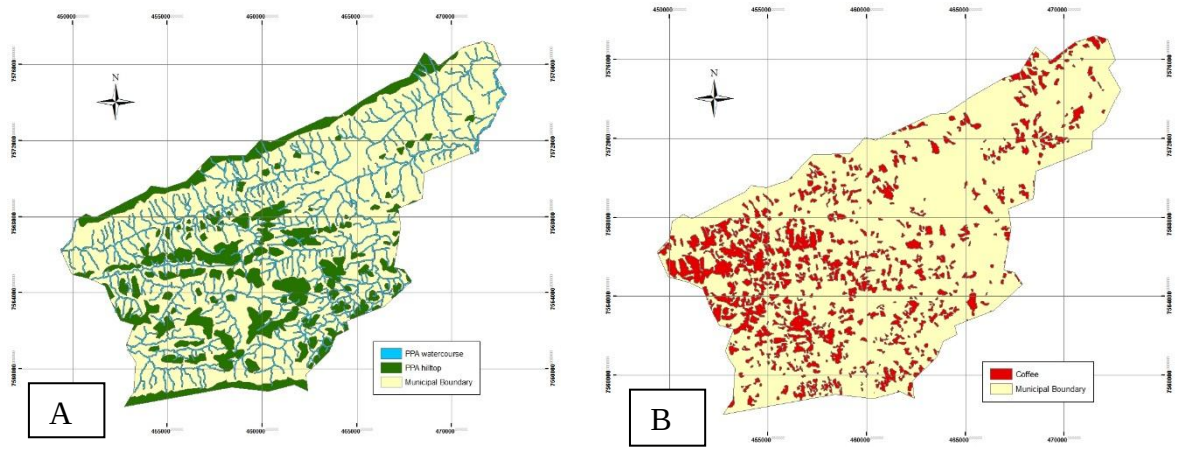

Figure 1. Map of hilltop and stream Permanent Preservation Areas (A) and coffee plantation location map in the municipality of Lambari, Minas Gerais, Brazil (B).

In spite of the ecological importance of PPAs, conflict exists between those areas and coffee growing in the municipal district of Lambari. also verified that cultivated areas occupied a large part of PPAs.

Figure 2 presents the intersection of the of PPA and coffee maps of the municipal district, demonstrating the areas where coffee production infringes the legislation. It can be seen that the coffee growing practiced in the area is one of the main factors responsible for the transformation of the natural landscape. It is important to emphasize that that activity is considered one of the largest economic resources of the area. However, farming activities are considered a great threat to the maintenance of the biodiversity in the tropics.

The PPAs basically prevent the erosion of sloped land and the silting the rivers, they ensure the hydric resources, propitiate gene pool flow, thus providing environmental services of utmost importance. The current use of PPAs generates serious environmental problems such as the erosion and compacting of the soil, besides damaging the springs and beds of the water courses.

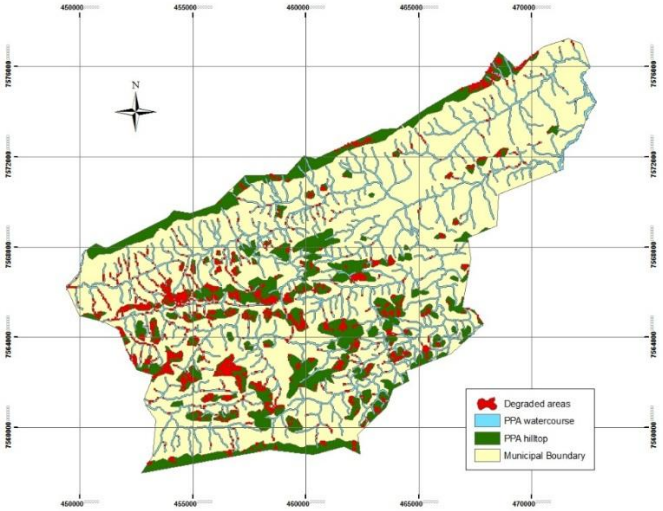

Figure 2. Map of the intersection between the permanent preservation areas and coffee production in the municipality of Lambari, Minas Gerais, Brazil.

The irregular occupation compromises hydric resources, due to the incompatibility of those agricultural activities resource conservation and protection. The conflicting areas should be converted to natural vegetation. However, it is worth noting that a large part of the coffee producing farms precede this law, therefore, the main focus of the supervisory agencies should be the monitoring, so that the increase of the deforestation due to coffee production in this municipal district does not occur. Promoting the control and monitoring of natural resource use, mainly in PPAs, is indispensable, thus allowing the execution of the environmental legislation and the preservation of biodiversity.

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