

CHAPTER 27 – Plant Coverage and Soil Usage in the Biome of Caatingas

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Amongst the Brazilian biomes, the Caatinga is one of the least known from scientific standpoint and has been treated with low priority for purposes of biodiversity conservation. In spite of it, the Biome of Caatingas is highly endangered because of inadequate use of natural resources and the little area (less than 1%) under the protection of conservation units.

Recently, the Biome of Caatingas was divided into eight ecoregions (Introduction), helping strategies for biodiversity conservation. This ecoregion approach for conservation encourages taking into consideration links between species and natural communities. By the other hand, every ecoregion embraces different natural communities. They have heterogeneous compositions and lack an updated cartographic basis, constraining the recognition of smaller natural units which are more suitable for reserves.

The only data and cartographic information of caatinga are derived from the soil and agroecological surveys performed by EMBRAPA and the project RADAMBRASIL. They were carried out in the decades 1970 and 1980 and have very small scale (less than 1:1,000,000). Only for few areas of the Biome of Caatingas, there are newer surveys and in greater scale focusing on the remnants of natural vegetation, such as in those surveys carried out in the States of Bahia and Pernambuco.

The project for survey the plant coverage and soil usage in the Biome of Caatingas was approved by the program PROBIO of the MMA and started its activities in 2005. It is executed through a network of research institutions under the coordination of UEFS and APNE. It aims to fill the gap of geographical information through the creation of georeferenced database in mesoscale, allowing different themes according to the official cartography and the presentation of theme maps of vegetation and soil usage following IBGE nomenclature.

The main goal of this project is to acquire confident data about caatinga, creating maps of natural remnants of vegetation and land usage in 1:250,000 scale, including basic characterisation of the vegetation typologies mapped. To achieve this goal, many techniques of satellite image analysis and geoprocessing (treatment and analysis of digital maps) with the support of field work are being used.

The implemented activities were (i) the survey of previous initiatives for mapping caatinga; (ii) the processing of satellite digital images; (iii) the validation of the interpreted classification; and (iv) the integration of the data.

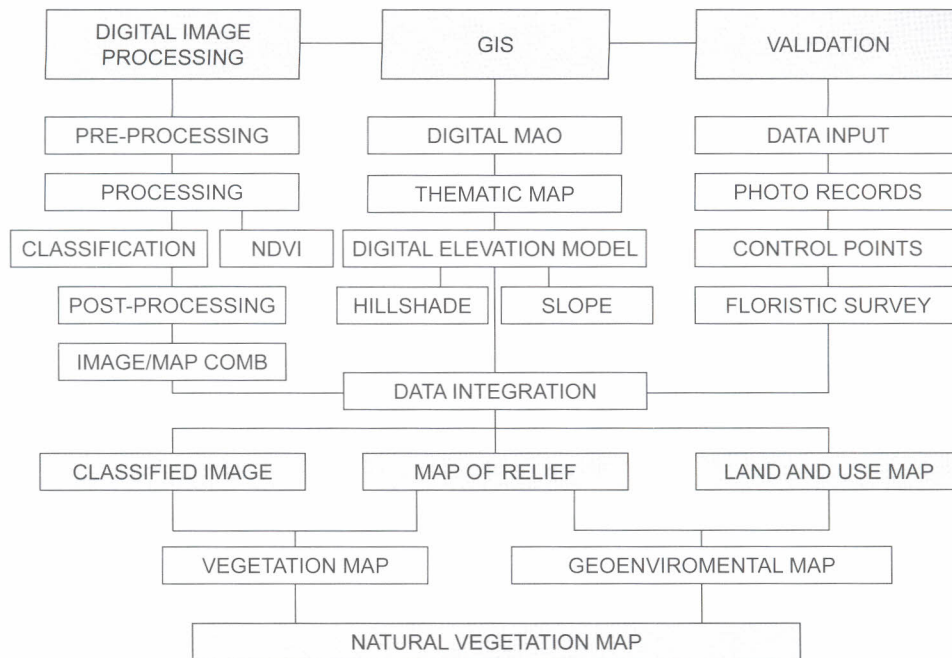
Technical Patterns of Mapping

To ensure the quality of the final products, the following technical patterns of mapping were used:

- Cartographic projection: geographic and UTM, with Datum SAD 69, with the vector files attached with the projection files;
- Minimal mapping unit (MMU) was < 40 ha, taking into consideration the final scale of 1:250,000;
- Digital data for verification fit 1:1,000,000 scale;
- The accuracy of classification ("theme accuracy") used the Kappa statistics with the lowest limits of 85% of agreement;
- The assumed Standard Cartographic Exactness was 0.5 mm of the scale, that is, 125 m in the ground;
- The vector files were build with topological consistency; that is, without overlapping or gaps between the polygons; absence of empty polygons or polygons with area equal to zero; absence of loops or arcs, etc.
- The vegetation was classified according to the IBGE technical manual of vegetation;
- The edition of the charts followed the layout of IBGE with minor alterations;
- The map-image was composed in digital format (.pdf) using colour balance R-3, G-4, B-5.

Partial Results

This project is carried out by a team of several institutes involving 47 persons (15 researchers, 12 technicians, 18 undergraduate students and two advisors) acting in the following disciplines: geoprocessing, phytogeography and evaluation of altered areas. This team is working in three geoprocessing labs under the coordination of the UEFS, Embrapa/Solos and Embrapa/Semi-árido (details in the CD).



Fluxgram of the project activities

Fifty-four scenes of Landsat satellite were processed generating 55 charts. Final maps include the creation of map-images of vegetation remnants at 1:250.000 scale, besides semi-mosaics and one synthesis map. Products are available in digital media within SIG environment with a supporting database which contains basic and accessory information. Files prepared for plotting will be available, helping the diffusion of final products. Maps resulted from classification assisted by computer upon the satellite images LANDSAT 7 ETM+ made in 2002 and geoprocessing NASA's digital models¹ of land surface after being validated by field works performed by the specialists in floristics, phytogeography and phytosociology who check at selected points using probabilistic criteria to give confidence to the mapping at working scale.

To the present, the following results were obtained:

- Methodological results: (i) standardization of a method to be applied to map caatinga vegetation; (ii) production of a procedure manual; (iii) production of use guide for the software; (iv) a library of checkpoints; (v) training of people.
- Operative results: (i) digital elevation modelling for the caatinga area; (ii) mapping of about 70% of the total area; (iii) validation of one third of the charts.

¹ NA – The models derived from shuttle's mission with topographic radar.

Final Remarks

The production of caatinga maps in mesoscale, with theme information about vegetation, is a remarkable initiative for the knowledge of this biome. It has valuable consequences to several areas of research on the Brazilian biodiversity and for surveys of natural resources. The use of satellite images and other digital products allowed short-term results and the comparison between patterns found in caatinga to those in other Brazilian regions, besides provide a synthetic vision of transitions between the ecoregions.

The availability of a database in GIS (Geographic Information Systems) format opens a perspective of a vast array of new analyses and correlation between the biodiversity data and the environmental conditions, not to mention the possibility of a continuous updating, including inclusion of new data.

Despite the short time of execution, this project presents consistent results pointing to core remnants of native vegetation that deserve protection, besides important areas for maintenance of ecosystems and that are currently under tension. It emphasizes the need to convert this initiative to a long term program with periodical updates and mapping in larger scales, as 1:100.000, approaching the conservation of caatinga at different levels.