THE USE OF THE INTERNET TO PUBLISH GEOINFORMATION FROM COFFEE ENVIRONMENTS OF BRAZIL

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Abstract: The Internet, since its popularization in the 1990's, until today, has reached unimaginable proportions, constituting a technology through which relevant information and research data can be published and exchanged among those who generate them and those who are far from research centers. As a modern vehicle of information, it constitutes an interactive and cost effective environment in which data can be updated quickly and easily at any moment. From the spread of this technology came the concept of vortals: portals with specific contents. The EPAMIG geoprocessing laboratory (GeoSolos) uses geotechnologies to map and characterize coffee environments of the State of Minas Gerais, in Brazil. The objective of this work was to present the GeoSolos vortal, created to publish the results of the studies on coffee agroecosystems carried out by the GeoSolos research group. The software Spring Web was the tool chosen to display the maps and related geographic information, enhancing the interest of the vortal. The Spring Web is a free software, created by the Brazilian Space Research Institute (INPE). It was concluded that the GeoSolos vortal facilitates the exchange of information between reseachers and all the members of the coffee agribusiness and that the Spring Web adds interactivity to the vortal, although its usability was considered poor.

1. Introduction

The first coffee plants and seeds from Central America and the Guianas arrived in Brazil in the 18th century, around 1730. But it was only in the 19th century that coffee attracted the interest of big farmers. It rapidly became the main agriculture activity in the country, responsible for half of its exportation revenue. Today, coffee is the second largest natural product market in the world and Brazil is its biggest producer, responsible for 30% of the international market. It is also the second largest consumer market, after the United States.

The State of Minas Gerais is Brazil's main coffee producer. In the last few years the regions of Alto Paranaíba and Triângulo, called "*Region of cerrado coffee*", showed the greatest expansion of the crop, with higher growth rates of both, cropped area and productivity. The region *Sul de Minas* nevertheless is still the best suited to coffee, disposing for the crop 55,8% of its total infrastructure (FAEMG, 1996).

The researchers of the geoprocessing laboratory of EPAMIG/CTSM - Geosolos - carry out studies using geoprocessing technologies to characterize the environment and evaluate the coffee fields of the main producing regions of Minas Gerais. After the mapping of coffee areas and characterization of the physical environment, the maps produced were overlayed and geographic analysis were carried out to assess the relationships between the coffee fields and the agroecosystems in which their are inserted. At the end of the work, maps and graphs of these areas that present, respectively, visual characteristics

and quantitative results, were produced. With these results it was possible to make correlations between the environment and coffee areas.

Study areas were selected, according to their environmental characteristics and importance for the State in terms of coffee production. Experimental areas in the regions Sul de Minas, Alto Paranaíba and Zona da Mata were chosen. The region Sul de Minas was divided into three subregions, Machado, São Sebastião do Paraíso and Três Pontas, according to differences in the environment and the producing systems. In the region of Alto Paranaíba, the area around the city of Patrocínio was selected and in the Zona da Mata region, the area of Manhuaçu was selected. In Machado, São Sebastião do Paraíso, Patrocínio and Três Pontas, the study area was approximately 520km^{2,} but in Manhuaçu, due to characteristics of the relief, the study area was 100km^2.

The research results produced since 2000 have been published in congress and some journals. Nevertheless, paper printed publication of the maps and graphics produced is very expensive and has imposed limits to its dissemination. Access to this material would be restricted to those who can purchase or consult it in libraries. Updating these results is also difficult, as it would require new versions and publications. Therefore, an alternative means of publishing these results was necessary.

Publication through a Vortal on the Internet divulges results at lower costs, is more dynamic and makes them accessible to the general public. Through the vortal, the public will also be able to understand the whole process up to the generation of maps and graphs, as well as geoprocessing itself.

The Geosolos Vortal presents all the maps and graphs, generated by the research group of the laboratory, statically through a webpage and dynamically through a Brazilian map manager called SpringWeb.

The objective of this work is to show the use of the web as an alternative way of publishing the results of coffee research in Brazil so that they may reach all the members of the coffee agribusiness.

2. VORTALS

In the 1990's the Internet became popular around the world and, from this new technology and its content, came the term Vortal. Although there are many definitions of vortals, the one adopted in this work is the following:

> "A space of articulation and communication that comprehends access to technical, administrative and/or cultural information related to an institution, theme or economic sector". (Cem, 2003).

The term vortal appeared in the United States in 1994. At first, the only function of vortals was to guide Internet users, gathering sites and presenting them in order to facilitate the search for a specific content. Vortals would be the starting point from which users could construct their own hypertext. In other words, the use of the Internet starts with the vortal: research, communication, entertainment (Póvoa, 2000, cited by Barbosa, 2003). In Brazil the vortals started in the same way as in the USA, *i.e.* as search mechanisms.

The rapid changes of the vortal model lead Reynolds & Koulopoulos (1999) to identify four phases of the Web vortal: boolean search (based on association of the terms "AND", "OR" to restrict or extend the research universe), navigation by categories, personalization and expanded functions to other areas of information. This is how the different types of vortals are created to conform various applications (Barbosa, 2003).

According to Lima (2003), vertical portal or vortal is a website that provides information and resources for a specific public, a service focused on the consumer preference. The vortals typically provide news, research and statistics, instruments for debates, newsletter, online tools and other services that educate users from a determined sector. The term vortal is not a new concept. It is the demand for them that is new and is increasing. Because vortals are specialized, the probability of finding specific information is greater, offering higher quality information in less time.

3. MATERIAL AND METHODS

3.1 Softwares used

There are some softwares that facilitate the implementation of web pages. Some of them help in the creation of the HTML code, others in the creation of the page art and others in the format and editing of the images. In the implementation of the Geosolos Vortal the Macromedia Dreamweaver MX and the Macromedia Fireworks MX were used. The maps in the vortal were generated in the Geographic Information System SPRING and are available through webpages and the map server SpringWeb.

Macromedia Dreamweaver MX

The software Dreamweaver (Dreamweaver, 2003) is intended for the creation of Web sites with resources that help the creation of the HTML code through a graphic interface. Macromedia reserves all right to this software.

Macromedia Fireworks MX

The software Fireworks (Fireworks, 2003) simplifies and optimizes the process of creation of Web images, enabling the application of effects and visualization of the quality of the image, among others. Macromedia reserves all rights to this software.

Geographic Information System - SPRING

The SPRING software is a GIS developed by the National Institute of Spatial Research - INPE (SPRING, 2003), which besides the usual functions of other GIS, incorporates special routines for digital image processing and map generation and printing.

SPRING has some modules, called IMPIMA, SCARTA and IPLOT that facilitate the entrance and exit of information. Those relevant to this text are SCARTA and IPLOT. The SCARTA module is a mapmaker that interconnects with the main SPRING module. This connection is done through the data generator (database), so the mapmaker will not reprocess and alter data. Its function is to edit and obtain a high quality graphic presentation product. This module generates the map in the extension file “ipl” that is afterwards opened in the IPLOT. The IPLOT is the module that exports the map in various image format archives, like JPEG, GIF, BMP, TIF, among others. As a geoprocessing system, SPRING is not simply a computer system projected to generate maps but, especially, an analysis tool that helps in making decisions (INPE, 2003).

SPRING WEB

The SPRING WEB is a software written in Java that enables the visualization of geographic data, developed by the Department of Image Processing at INPE and stored in a remote server (SPRING WEB, 2003). SPRING is composed of a main window (Map Window) and various auxiliary windows (SPRING WEB, 2003). An *applet* is a programme, written in Java and inserted in a Web page to be executed when that page is accessed (Oliveira & Oliveira, 2003). The programme uses an ASCII format easily reproduced by the user. With the Spring Web, it is possible to publish on the Internet the results generated in the SPRING software that, by itself, exports and generates the archive to be read in the SPRING WEB.

The data transfer is carried out by the Internet and visualized by a browser, without the need of specific programmes. The user only needs to access the site of the software and execute it. The SPRING WEB code is transferred to the user’s machine, along with the basic geographic information. As the visualization of new plans of information is requested, they are also transferred and visualized in the user’s machine. Since the layers can vary in size, the efficiency of SPRING WEB is directly related to an efficient Internet connection (SPRING WEB, 2003).

To use this software, the JAVA 2.0 environment plug-in is necessary so that the navigator can execute the applications.

3.2 Maps Generation

The land use and land cover maps in the GeoSolos Vortal are interpreted visually, using georeferenced field patterns, to obtain the corresponding plan of information (PI). The satellite images in the composition 3B-4R-5G are treated in the SPRING image/contrast module. The image is contrasted and interpreted visually to the discrimination of the different land use and land cover classes. The spectral behaviour of each predominant land use class observed in the study area, especially coffee, is observed. The quantitative information of each PI is obtained through the thematic area calculation module. After a preliminary interpretation, the established patterns are verified to define the targets to generate the final thematic land use map of the study areas. The predominant classes mapped and verified in the field (Productive coffee, Coffee in formation, Forest, Urban area, Dams, Reforestation and Other uses) are stored in a digital database. With the stored data a map can be generated with the desired characteristics through the data module. The relief maps are generated through contours digitalized from topographic maps. The soil maps are generated based on geomorphopedological modelling that takes in consideration the distribution of soil classes in the regional landscapes, relating declivity classes, parent material and processes of soil formation, as observed in the field.

With the land use, relief and soils maps, overlaying is carried out through SPRING LEGAL Language, through which the coffee agribusiness can be evaluated and visualized in maps. Stored in the SCARTA, the maps are exported to the IPLOT module, where they can be saved in whatever image format the user prefers.

3.4 Methodology

The vortal was created for the researchers at GeoSolos to publish and divulge their results, especially to the public that composes the coffee agribusiness, as well as to other researchers. As the GeoSolos laboratory is linked to EPAMIG, an institution belonging to the Agriculture System of the Government of Minas Gerais, it does not seek financial profit with the publishing of results on the Web. As it has a specific target public and its content is directed to geoprocessing and the application of this technology in mapping and characterization of coffee environments, the vortal is considered a vertical one.

All the maps were standardized in scale, size, color of the keys and classes using SPRING, its map generation module SCARTA and its data exit module IPLOT. All the maps were exported in GIF format because, in this way, the file is smaller and the loss in the quality of the images does not affect their content. The maps were also edited in the *software* Macromedia Fireworks to reduce their size. SPRING WEB files of all the laboratory's projects, with their respective study areas, were generated, a process facilitated by the SPRING software that generates and exports the page in HTML.

The maps in the vortal are, therefore, displayed in static and dynamic form. In the former, a webpage for each year of research in each study area was created. These pages contain all the maps and graphs, as well as explanations of the results presented. The webpages were implemented using the software Macromedia Dreamweaver and the maps were reduced to facilitate access. However, a link was implemented in each map so the user can see the image in its original size with all its details. Figure 1 shows an example of a map in static format in the GeoSolos Vortal.

The results in dynamic format were divulged through Spring Web software. This software was chosen for its characteristics:

- It increases the vortal's interactivity;
- The Spring Web is a free software
- The software allows overlaying of various maps;
- Data generation is facilitated by Spring;
- Its technical assistance is simple and fast through the Internet.

Figure 2 shows the Spring Web's main screen.

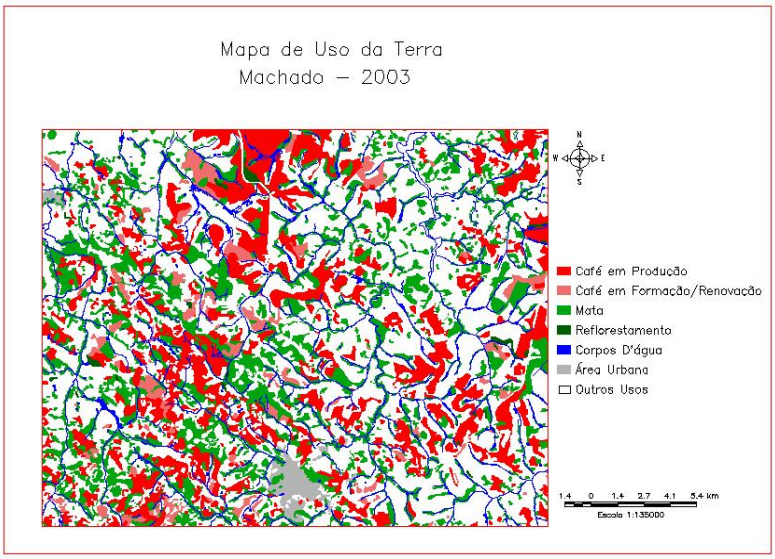

Figure 1: Land use map of the study area of Machado/MG – Brazil in April 2003.

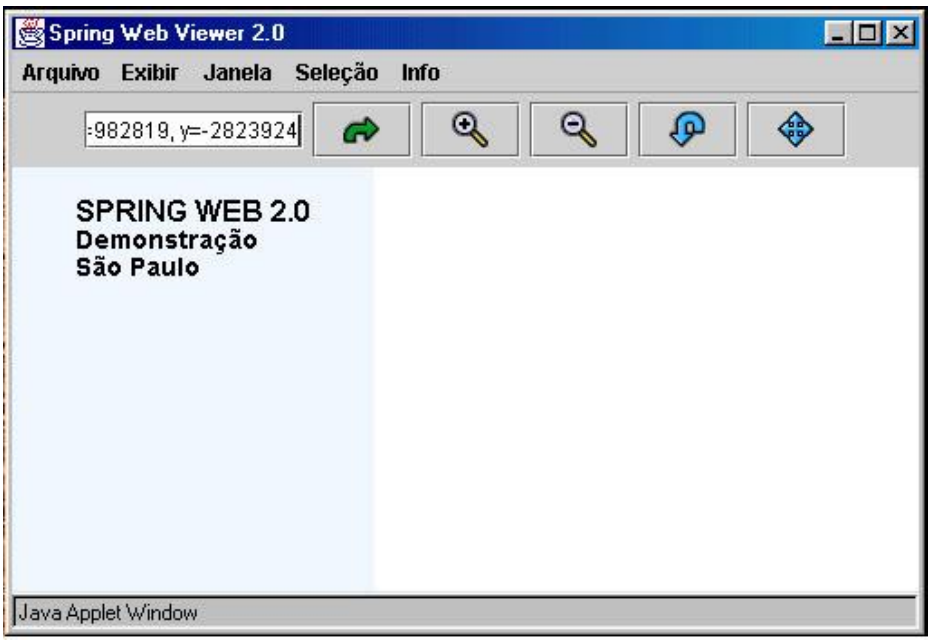

Figure 2: Spring Web 2.0 main screen.

4. RESULTS

The GeoSolos vortal was implemented in December/2004 on the electronic site www.epamig.br/geosolos with all the maps generated since 2000, when the research programme began. The methodology used in mapping and characterization of coffee lands in the state of Minas Gerais is also presented, as well as an interactive map of the administrative units of the state (*municipios*), where the user can obtain information on coffee of each unit. The vortal has also a forum to facilitate the communication between the various sectors of the coffee agribusiness. Figure 3 shows the GeoSolos Vortal main menu.

Because it was launched recently, the GeoSolos vertical vortal only divulges the team's research results to other researchers and to the public involved in coffee production. The other objectives, such as a greater interaction between scientists, coffee

farmers and their associations**,** as well as a better understanding of remote sensing and geoprocessing in mapping of crops and characterization of the environment, will be achieved through the forum. However, according to Lima (2003), the creation of such a community can take some time.

Figure 3: GeoSolos Vortal main menu available at the site www.epamig.br/geosolos.

The use of SPRING WEB for publishing data dynamically, satisfies only partially the demands of the laboratory since it lacks an intuitive interface (which makes it harder to use) as well as some functions deemed important by the GeoSolos team. One of these functions would be the overlaying of PIs. For example, if the user needs to overlap a land use map in the software's main window with a declivity map of the region, the latter conceals the land use map because the SPRING WEB does not export data in lines, only in polygons. However, when the projects are generated in SPRING, the use of SPRING WEB is interesting due to the facility in generating files.

5. CONCLUSIONS

- The vortal integrates in a clear and interactive way the results and information, generated by geotechnologies, of the research carried out by the GeoSolos team, as well as information relevant in the processing of these results.
- The GeoSolos Vortal facilitates the exchange of information between researchers and the public distant from research centers.

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