English Version

The technology of space information as support to the forestry in the rural property

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Abstract

This work presents some economical, technical and socio-environmental bases on the rural property that justifies their use also for forestry purposes, and discusses the importance of the geoprocessing as a technology tool of information that subsidizes this planning and the sustainability of this activity. The valorization of the forestry in the society should extol the expansion of the planted area and consequently increase the offer of products, the popularization of the advantages of the certified products also for the consumer in the internal market, and the recovery of the native remainders in the sense of promoting their productive use and with sustainability criteria. For that, it necessarily needs a valorization of the geotechnologies, as base for the socket of decision in the rural property.

Key words: forest implantation; geoprocessing; precision silviculture; sustainability.

Introduction

Silviculture is the area of knowledge which studies the production of goods and services of the planted forests (also known as reforestation or forest cultivation), and of natural forests and their remaining (SEITZ, 1984; ÂNGELO, 1985). Historically, this science had great increase in the country with the Federal Law 5,106 from September 2nd, 1966, which instituted the policy of fiscal incentives for reforestation (VEIGA et al., 1975). This policy prevailed until the decade of 1980 and provided the formation of massive essences as pine and eucalyptus in areas which usually would not be exploited to agriculture due to variables as land price, distance from markets, types of soil and relief.

The planning of a rural property must consider the dynamics of appropriation and use of the agricultural lands, the products that the society can benefit from it. In this context, the silvicultural practices may be widely used in the property, as an alternative to the production of renewable resources, decreasing the pressure over the forest remaining (BERENHAUSER, 1971; LOCH, 1988).

On the other side, there are activities which promote in the rural property a possible environmental exhaustion, and which characterize the most common model of economical exploitation of these areas (SOBRAL et al., 2002). In Agenda 21 (GOVERNO DO PARANÁ, 2001), result of the United Nations Conference on Environment and Development, dated of 1992, in its chapter 35, *Science for Sustainable Development*, it is described the function of the sciences in the support of prudent management of the environment. To achieve this goal, some of the tools mentioned were the technologies of information which aid in the management of the geographic space.

This work has as objective to present some economic, technical and socio-environmental bases in the rural property which justify its use in silviculture, and discuss the importance of geoprocessing as tool of information technology which subsidizes the planning and sustainability of this activity.

Discussion

Silvicultural systems enable the production of wood for sawmill, lamination, charcoal for energy, wood pulp, plywood, particleboard and various non-wood products, as for instance, erva mate (*Ilex paraguariensis* A. St.-Hil.) in the South region (BERENHAUSER, 1970).

In a first moment, the enterpriser must be prepared to support the implantation of the afforestation, with activities of seedling production, land preparation, construction of road network, cultural treats before and after planting (by the

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joint management of insects, diseases and weeds), as well as it must be well oriented to conduce the appropriate management of the forest, through regimes of pruning and specific thinning to each goal of the production. Besides that, the use of methods of prevention and combat to forest fires is of major importance to guarantee the security of the investment, reducing risks and preserving the environment.

It is essential that there is, for a rural/forest owner, a control, a monitoring of his greater equity, which is his properties, farms. The map, therefore, waives justifications, and is work tool for operation, fiscalization, activity planning and management of the productive activity (OLIVEIRA-FILHO et al., 2003a).

Currently, with the new concepts of work and the transformations of the modern world which turns to digital technologies, not only large companies need to update their procedures. The information technology must achieve any enterprise in rural properties. The space information – the map – must be integrated to the data about water resources, road network to access other properties, productive units (blocks), etc, with an overall space vision to planning and control of the production.

The use of geotechnology techniques in the forest management aiming to improve the production and control of processes involved is named precision silviculture. In this sense, costs with production factors involved (inputs as fertilizers and defensives) may be reduced and optimized, increasing the production and facilitating the decision making. A large part of the small properties sill makes planning with a topographic sketch with local coordinates (FERRARI, 1997; OLIVEIRA-FILHO et al., 2008).

With wide discussions over the Law 10,267/01 of Rural Properties Georeferencing, mainly in the small property, Oliveira-Filho et al. (2003a, Figure 1) discussed, e.g., the advantages of the cartographic base formed, considering it an indispensable need in the process. This Figure (*ibid*) shows a chart with the layout of the production of a cartographic base by plants of sketches of local coordinates. Thus, a single proprietary, weather person or entity, would have only a source of cartographic information with all its properties joint, independent if they are close or distant from each other. This Law, besides of this advantages above, brings the submeter precision dimension in order to minimize territorial conflicts.

Having not only maps, but also information which allows to diagnose the rural property over any aspect, becomes a significant difference when this

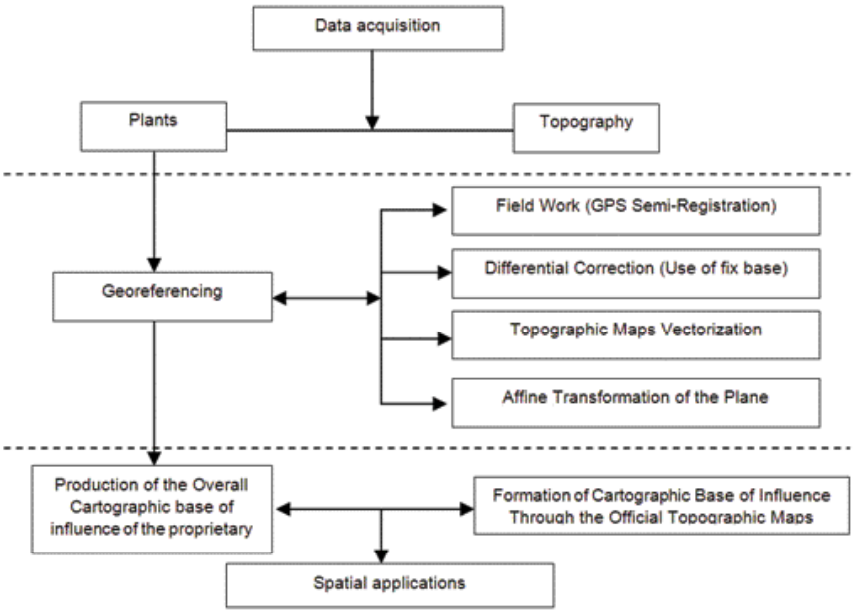

Figure 1. Schematization of the formation of a cartographic base by plants or sketches of local coordinates

property passes to update its own space information in digital media. By that, it is easier to manage a large number of operations and production cycle with the characteristic rotations of the silvicultural production (OLIVEIRA-FILHO et al., 2003b).

The silvicultural planning inside a rural property must ensure the preservation of natural resources as soil and water quality, and conservation of the biodiversity in present and future. For Peters and Pires (2005), the projects must respect and attend the exigencies of legal instruments, mainly the Forest Code (Federal law number 4,771/1965). In its 2nd article, it treats about the areas of permanent preservation (APPs), which are areas covered or not by native vegetation, with environmental function of preserve the water resources, the landscape, the geological stability, the biodiversity, the genic flow of fauna and flora, protect soil and ensure the well-being of the human populations (concept included by the Provisory Measure n° 2,166-67, from 2001). The areas destined to the APPs in a property are:

- Along the rivers and water streams, with distance which range from 30 to 600 meters, depending on the river width;
- Mountain tops;
- Slopes with declivity superior than 45° or 100% (in the line of larger declivity);
- Restingas;
- Edge of plateaus;
- Regions with altitudes superior to 1,800 m.

Even though it is understandable the importance of riparian areas in the regulation and stabilization of the flow of water bodies in rural areas (MARQUES and SOUZA, 2005), it is important to mention the inapplicability of this article in specific situations in urban areas, where sometimes the rivers are already channeled, or the existence of riparian areas may favor the development of animals which transmit diseases (mice and rats), or still are areas which many times end up used as deposit of trash by people with less ecological conscience. These incongruities must be seriously discussed by the legislative power in order to promote the improvement of this Law, in the sense to conciliate the preservationist effects and the sectors of production.

Undoubtedly, the Forest Code should distinguish urban and rural areas, and allow state and municipality regulatory, opening the discussion to technique councils which know better the local realities. Regarding the existence of ecological/economical zoning (EEZ) of the rural and urban areas – instrument of territory organization prescribed by its turn in the article 9 of the National Policy of the Environment (PNMA, Federal Law n. 6,938 on August 31st, 1981) – it is likely that the municipality may define with greater technique criterion the limits of the riparian areas.

It becomes important, therefore, to seek the valorization of the technique councils with the environmental city department, which would be responsible for elaborate the mentioned zoning, if, in some way, it could also be controlled and supervised.

In its 16th article, the forest code discusses the Legal Reserve as the area located on the interior of a property or rural possession, with exception of the permanent preservation, necessary to the sustainable use of the natural resources, conservation and rehabilitation of ecologic processes, to the conservation of the biodiversity and to shelter and protection of native flora and fauna (also including the Provisory Measure n. 2,166-67, from 2001). These limits vary for each region of the country, for instance:

- 80% of the property area in the states of the legal Amazon;
- 20% of the property area in the states of the South region;
- In the areas of LR it is not allowed the clearcutting, i.e., the complete suppression of the vegetation. As these areas are likely to be managed to productive purposes, the silvicultural pertinent practices (enrichement, cleaning, pruning and thinning, besides management of the natural regeneration) are important services available to reconcile the economic interest and the conservation of flora and fauna.

Considering the process of deforestation occurred in several regions of the country, another important service is the LR recomposition in the rural properties where this no longer exists (LARA PIRES et al., 2001; MALINOVSKI et al., 2006). Thus, the annotation of this areas on the margin of the entry of registration of the rural property, the property registration authority, and the use of

silvucultural practices (as those presented by Flor, 1985; Lamprecht, 1990; Silva and Gomes, 2007) which accelerate the process of flora ecologic succession, will allow in the future the management for the production of wood and non-wood products.

It can be seen, therefore, that to guarantee the preservation of the natural resources it is necessary to demarcate areas of permanent preservation (APPs), which include the margins of the watercourses and the top of the hills, or areas with slopes superior to 45 degrees inside the property, besides demarcate the area of Legal Reservartion (LR), which are enabled by the use of techniques of geoprocessing. With the use of buffers, it is possible to automatically determine the entire APP over the watercourse, according to the relative distance to the width of this water body (Figure 2). This tool has also been applied with use of applications of the CAD type – Computer Aided Design - with relative ease. The hill tops may also be easily demarcated based on the interpretation of contour lines.

The problem appears when demarcating areas above 45º of declivity. For that, it is important to elaborate the map of declivity of the property. One of the ways to obtain the declivity map is to elaborate the number or digital model of the terrain – MNT to the altimetric variable by the vectorization of the model contour lines of the terrain. MNT presents the altimetric information interpolated and spatialized with high accuracy previously determined. This is possible in environment of geographic information system. By MNT, it may be generated altimetric and slope thematic maps.

Regarding to the financial retours earned, the rural producer must be prepared to wait medium and long term (seven to 25 years or more, depending on the objective of the production) which are demanded by the silvicultural projects to attend the principle of maximization of the profit with the optimization of the productivity (OLIVEIRA-FILHO et al., 2006).

Directed geoprocessing techniques and with specific goals may be used to elaborate models of

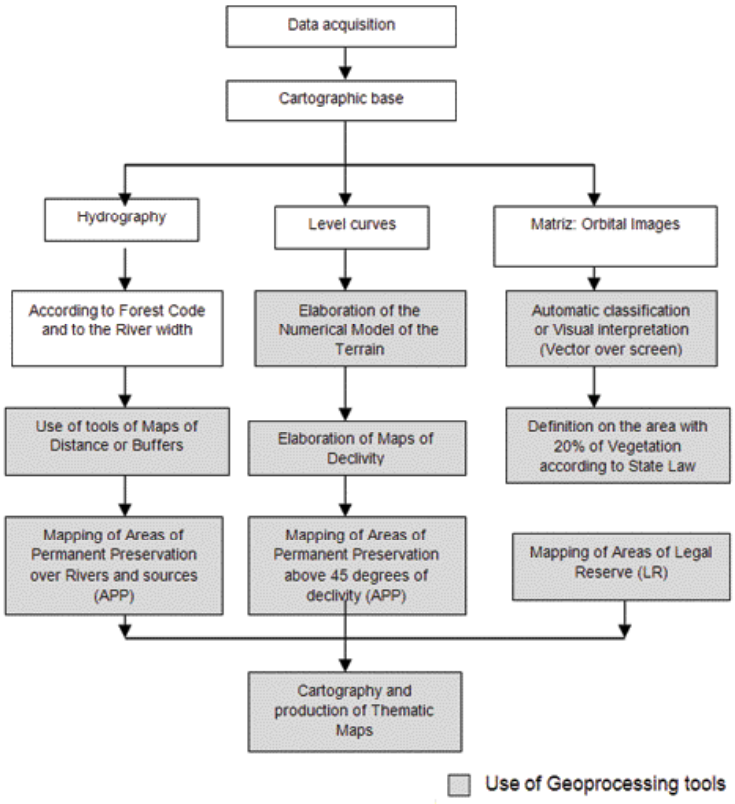

Figure 2. Use of geoprocessing tools to determine the APPs and LRs.

space data with applications directed to the rural administration of even to management o planted or native species, as it is the case of silviculture. Considering as an alternative the forest products non-timber, Oliveira-Filho et al. (2008) used a data base to manage and administrate activities from the silviculture of mate in a natural environment, regarding the space control over the crop cycle and its intensity, obtaining condition of expected leave matter production (Figure 3). It can be verified that Geographic Information Systems (GIS) are integrators of different types of information inherent to a same region or a specific geographic space, and provide a set of operations of data analysis and processing considerably powerful.

The use of a database associated to graphic elements which represent the real world to perform simulations, when directed to the production planning in planted forests, provides data about the assortment of wood for lamination, sawmill and energy. In fact, these techniques have been valued by medium and large entrepreneurs of this sector, although, there is still a way to expand these technologies to the rural property, in a general way. Besides the space control of the production, Oliveira-Filho et al. (2003a) remind that the space information technologies give support to daily actions in field, and they may provide maps for monitoring activities as forest implantation (pre and post-sowing, cultivation, harvest, among others, Figure 4).

Socio-environmental factors

One must be reminded that the process of certification appears as a mean to identify the source of the forest products by the society. Thus, conscientious consumers may opt for products which come from a forest management in which the environmental and social bases, apart from the economic, are considered. Among the System of Forest Certification, the one most found in market is the FSC - Forest Stewardship Council. However, one cannot forget Cerflor, Brazilian certification program, implemented by the Brazilian Silviculture Society, in partnership with other institutions and government agencies. The certified areas and the number of companies aiming the certification have been growing in exponential scale, motivated by the valorization of these products in the international market, mainly.

Finally, there is still an important and promising way of silviculture development for the small rural producer (in areas smaller than

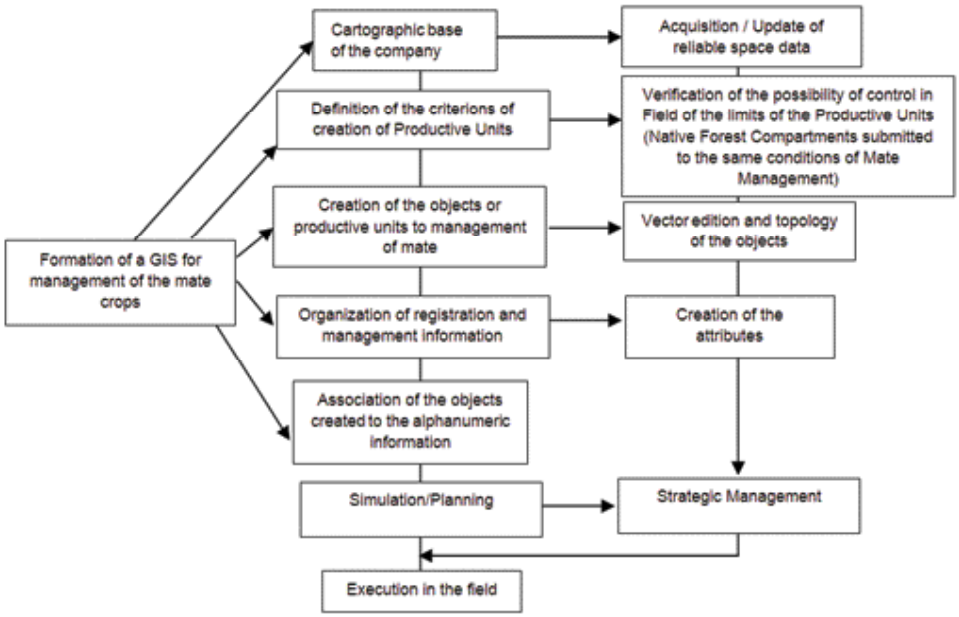

Figure 3. Scheme of the use of GIS in the mate silviculture planning

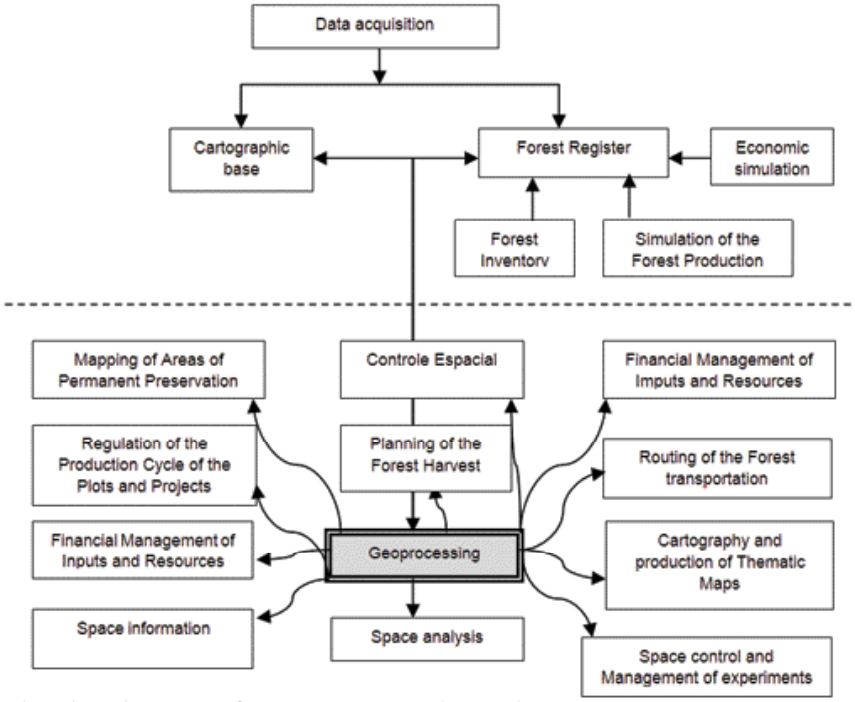

Figure 4. Silvicultural applications of geoprocessing in the rural property

50 hectares), once that through the Agloforestry Irrigated Systems (AISs), it is possible to expand the ecological and socioeconomical benefits of these practices in order to contribute with the generation of income and fixation of the man in the countryside. In this situation, Faria (2008) affirms that it becomes increasingly important the projects of university technologic extension, which conciliates activities of teaching, research and extension in the pursuit of these goals.

Final considerations

Some economic, technique, environmental and social bases which characterize the silvicultural planning in rural properties were presented, as well as some of space information technologies of silviculture support, so that there is greater space control and accuracy of these activities.

The valorization of silviculture in the society must advocate the expansion of the planted base and consequent increase in the supply of products, divulgation of the certified products advantage also for the consumer in the internal market, and the recuperation of the native remaining to promote their productive use and with criterions of sustainability. This way necessarily needs a valorization of the information, as base to make the decisions in the rural property.

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