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## Geographic distribution of reference units of the technology transfer program in crop-livestock-forest integration systems

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### 1. Introduction

The adoption of practices or methods of cultivation varies depending on the conditions of available technologies in agricultural production environment of various biomes, and according to soil and climatic characteristics of the regions, socioeconomy and culture of the population. Because of the variability of these conditions, understanding the distribution of natural resources has become very important for the soil management and availability of water for the sustainability of agricultural activities. The conventional tillage by plowing and disking, followed by conservation practices that minimize soil loss by erosion, can be replaced with advantage by tillage system, without practices of soil management such as plowing and disking. Therefore, there is need of vegetation cover preceding the planting, usually pasture, it's dried by the use of herbicides promoting his death, covering ground and protecting it from the damaging effects of erosion (Marchão et al., 2008). This remnant residue in decomposition, returns nutrients to the soil extracted by grazing, allowing through decomposition and mineralization of roots, formation of many channels, responsible for conducting water and nutrients to deeper layers of the soil, besides increasing soil aeration.

The project to transfer technology to systems that integrate crop, livestock and forest was distributed throughout the national territory aiming insert Technological Reference Units (URT's) to evaluate the performance of the interaction between different agricultural activities and create foundations for the transmission of knowledge. Aiming to promote the renewal and protection of natural resources, optimizing the income of farmers and promoting sustainability of the property, the crop-livestock-forest integration system (iLPF) increases the results in production through the enhancement of soil use, allowing for diversification of crops suitable for each region of the country. In the context of technology-transfer and insertion of the URT's, viewing their spatial distribution allows better management of the actions of program to fill gaps in areas where, due to socio-economic weaknesses, this system becomes more important. The URT's are concentrated on South, besides observing a significant number in the states of Rio Grande do Sul, Minas Gerais and Paraná. In terms of physiographic and socio-economic characteristics, the URT's are in the greatest quantity in the area of Atlantic Forest, where there is great pressure on natural resources, allowing a clear gain with iLPF system.

For processing and visualization of geographic distribution of iLPF units used a Geographic Information System (GIS), which contains tools with many applications in agriculture (Assad and Sano, 1998), because it is based on concepts of geosciences and technology information for the junction of several logic, mathematical, spatial and statistics functions for resolving issues focused to planning and decision making within territorial scope.

### 2. Methodology

SP 5811  
p. 389



Aiming to spatialize database of geographical information about the URT's, was tabulated the coordinates through latitude and longitude of each of the farms, totaling 183 technological units of crop-livestock-forest integration system. From this basic information was organized into GIS the iLPF points model, which holds the location attribute, and thus may overlap to various states and regions of Brazil, organized in polygons format. As a way of query and verification it's used the vector base of municipalities (IBGE, 2010), performing the selection by State and Region. In Figure 1, flowchart of the operations which allows the understanding the sequence of the data spatialization works.

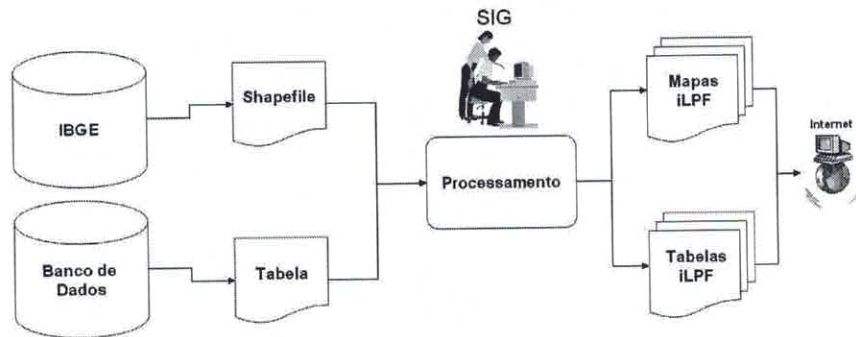


Figura 1. Flowchart that indicate the sequence of work.

### 3. Results and Discussion

The iLPF experiments are well distributed throughout the country, with a greater concentration in the Brazilian Atlantic Forest, where most of the population and where there is a greater pressure on natural resources (see Figure 2 and Table 1). In the area of each biome are some peculiarities in terms of soil and water, as well as terrain, very steep relief in the area of Atlantic Forest, and averagely steep in Cerrado and Caatinga, but with sandy soil and fragile in the latter cited, while maintains low rainfall. All these features indicate how the benefits of deploying of this iLPF system may benefit the agricultural activity in these regions, providing greater protection to natural resources, improving farmer income. Through the crossing of tables it's verified the existence of a large number of units in the states of Rio Grande do Sul, Minas Gerais and Paraná, with the establishment of 75, 18 and 15 units, respectively. The Região Sul shows a significant number of URT's, with high density if compared to other regions of Brazil, which holds just over 20 farms each. However, some municipalities have excelled in inserting farms to the project, including Passo Fundo (RS) with 8 units, Senador Guiomard (AC) with 5 units, and Campo Grande (MS) totaling 4 farms. The municipalities of Ernestina (RS), Nonoai (RS), Nova Boa Vista (RS), São Carlos (SP) and São João Del Rei (MG) have, so far, 3 URT's. Are registered in the iLPF project so far 183 URT's, distributed in 135 municipalities.



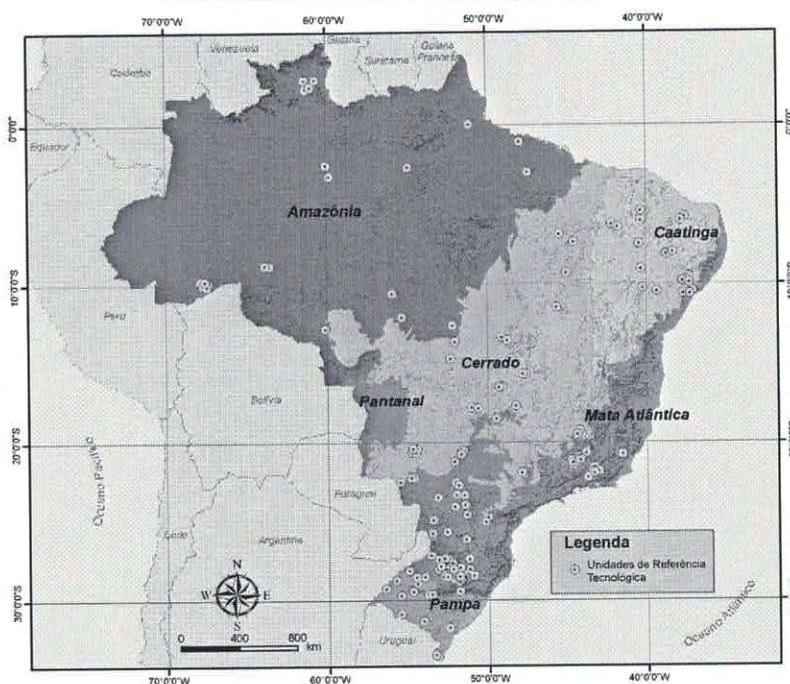


Figura 2. Geographic distribution of URT's along the Biomes in Brazil.

Table 1. Quantity of URT's by biome.

Biome	Nº of URT's
Amazônia	22
Caatinga	17
Cerrado	29
Mata Atlântica	101
Pampa	14
Pantanal	0
Total	183

New URT's will be incorporated into the iLPF project, and in so far as that additional experiments are installed, the database system for integrated crop-livestock-forest will be powered along with the location information with the latitude and longitude of these farms

#### 4. References

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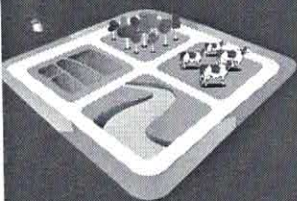
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#### Acknowledgements

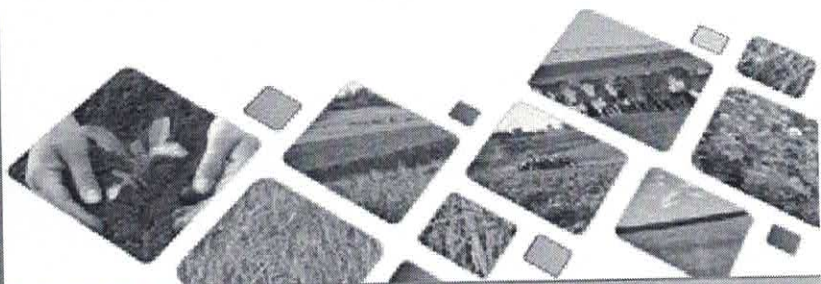
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