

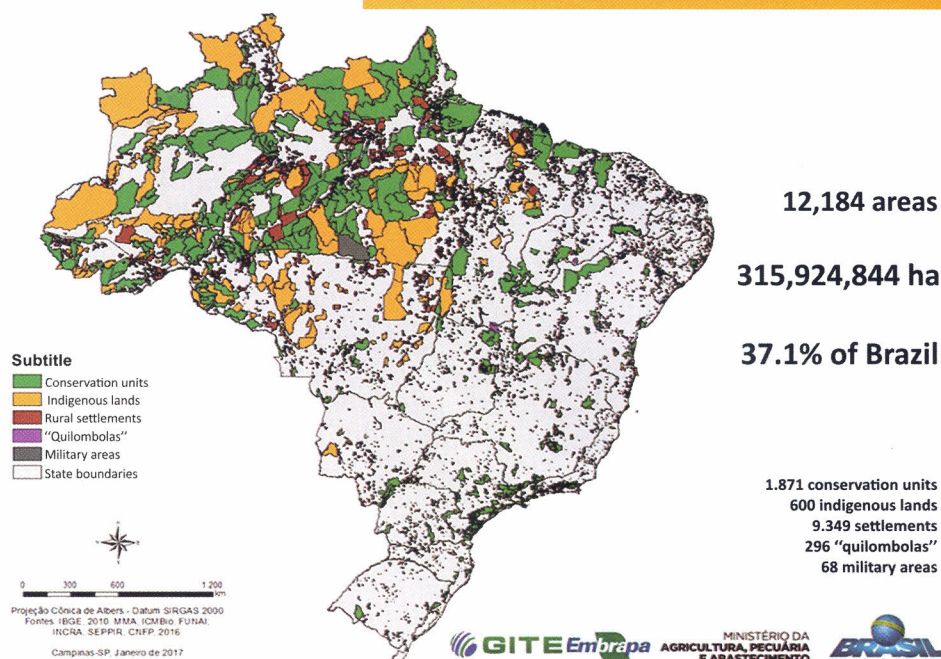
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# **AGRICULTURE AND ENVIRONMENTAL PRESERVATION: FIRST RESULTS OF AN UNPARALLELED ANALYSIS IN BRAZIL**



Thinking about agricultural development in Brazil requires theoretical and spatial knowledge of three concepts that are inseparable but unmistakable: Land assignment, its occupation and use. These three concepts, which will be presented in detail, have been used in the work of territorial intelligence developed by Embrapa's team of Strategic Territorial Intelligence Group (GITE), which has a vast collection of spatial data to help synthesize and diagnose any region of Brazil.

National territory showing conservation units, indigenous lands, quilombola communities and agrarian reform settlements area in 2017



## Land Allocation

Over the last 25 years, the federal and state governments have legally allocated more than 37% of the national territory to conservation units, indigenous lands, quilombola communities and agrarian reform settlements. These numbers were stratified and categorized according to their destination, where the provision of these data being the responsibility of the competent bodies.

According to data collected in April 2017 from the Ministry of the Environment (MMA), 1,871 conservation units (PAs) occupied 154,433,280 ha, representing 18% of Brazil (including Environmental Protected Areas - APAs) or 13.1%, when we disregard the APAs. In Brazil, in most cases, PAs exclude human presence, while in Europe, Asia and the United States there

may be agriculture, villages and various activities in national parks, without evoking the extensive tourist visitation.

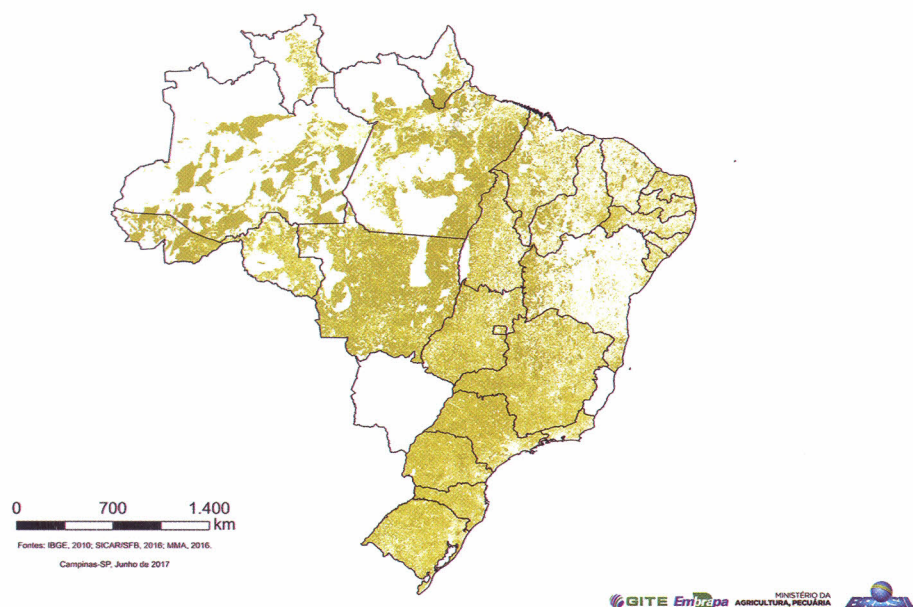
According to the National Indian Foundation (FUNAI), there were 600 indigenous lands (TIs) demarcated until April 2017, which occupied approximately 14% of the national territory, equivalent to an area of 117,956,054 ha.

The International Union for Conservation of Nature (IUCN) designates as protected areas the set of lands legally attributed both to conservation units and to traditional populations in Brazil, indigenous lands. In the national territory, protected areas total 257,257,508 ha in 2,471 territorial units covering an area equivalent to 30.2% of Brazil, which already discounts for overlaps. In comparison, the nine countries

with more than 2.5 million square kilometers in the world dedicate, on average, 10% of their territories to protected areas. With more than 30% of protected areas (CUs + TIs), Brazil is, as it was, the world champion of environmental protection. In addition, protected areas of the country cover territories with great economic potential, which is not the case in most other countries, where they cover inhospitable and desert areas (Australian Desert, China Desert, Siberia, Sonoran Desert and Mojave, Northern Alaska, Andean Relief, etc.).

The allocation of land extrapolates the exclusive concepts of protection. There are areas for land reform and quilombola areas. According to the National Institute of Colonization and Agrarian Reform (INCRA), there are 9,349 agrarian settlements, of various natures and

## RURAL LAND AREA IN BRAZIL



in several stages of implantation. The settlements occupy 88,410,217 million hectares, or 10.4% of Brazil. According to the Secretariat for Policies for the Promotion of Racial Equality, the 268 quilombola areas already decreed until April 2017 occupied an area of 2.6 million hectares.

There are still more than 2,000 military areas belonging to the Army, Navy and Air Force, located in urban and rural areas. Of these, 68 are more significant, with public forests, and amount to 2,923,701 ha or 0.3% of Brazil, according to data from the Brazilian Forest Service.

The geocoded data collected and made available by the GITE indicate the existence of 12,184 areas legally assigned in the categories described above, occupying a total of 315,924,844 ha, with the overlaps removed. This total area corresponds to 37.1% of the country.

The map of Brazil allows us to visualize the complexity and territorial fragmentation of the current situation, illustrating the size of the territorial and land management challenge generated by legal land allocation processes. While these initiatives seek to solve land and agrarian management problems and conflicts, they generate new challenges for territorial management and governance, especially regarding the future of the nation, whether for agricultural, logistic, national security and many other issues.

In addition to the areas already allocated, there are still additional requests to create or expand conservation units, indigenous lands, agrarian settlements and quilombola areas. There is also a need to reconcile this territorial reality with the growth of cities, with the allocation of places for food and energy generation, for the establishment, passage and expansion of logistics,

transportation, supply systems, storage and mining.

### Land occupation

While attribution is determined by governmental instances, land occupation must be thought for the part left over, where human and productive activities are structured. The agricultural activities are an interesting case, being a good example of how these concepts of allocation, occupation and land use have overlaps and intersections. Within settlements and quilombolas (legally attributed areas) there are agricultural activities as there are also in the 62.9% unattributed. These activities related to agriculture and livestock occupy these territories, but their uses are the most diverse.

From the analyzes carried out in the recently published data of the Rural Environmental Cadaster (CAR), it was possible to verify that approximately half of Brazil is occupied by agriculture and livestock. This means that the sum of the areas of Brazilian rural properties totals about 50% of the territory. It should be noted that rural activities occupy but do not use the whole area. This is because, within the properties, there are several occupancy classes and categories, some of which are destined for environmental preservation, such as permanent preservation areas,



legal reserve areas, hill tops, sloping areas, water and, of course, the forest surplus.

### Land usage

Until recently, in Brazil, it was impossible to estimate with considerable precision the use of land. Every 10 years, the IBGE Census makes an exhaustive survey of land use in Brazilian agricultural establishments, but it is declaratory information, recorded in a questionnaire, without a precise cartographic base. Moreover, given the spatial, temporal and technological dynamics of Brazilian agriculture, some of these data are quickly outdated.

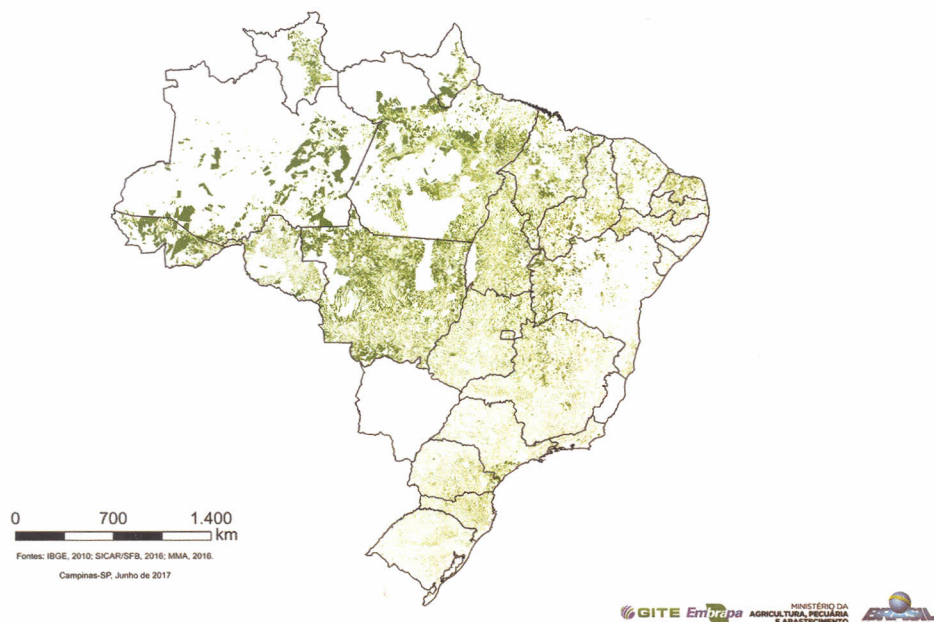
The possibility of updated knowledge of the areas effectively

used and intended for preservation by agriculture in rural properties has made significant progress with the advent of "CAR", which is one of the most relevant fruits of the new Forest Code, Law 12,651, dated May 25th, 2012 as of April 30th, 2017, 4,104,247 of rural properties,

totaling 407,999,690 hectares, were registered in the National System of Rural Environmental Cadaster, SICAR, under the responsibility of the Brazilian Forest Service (SFB) of the Ministry of Environment (MMA).

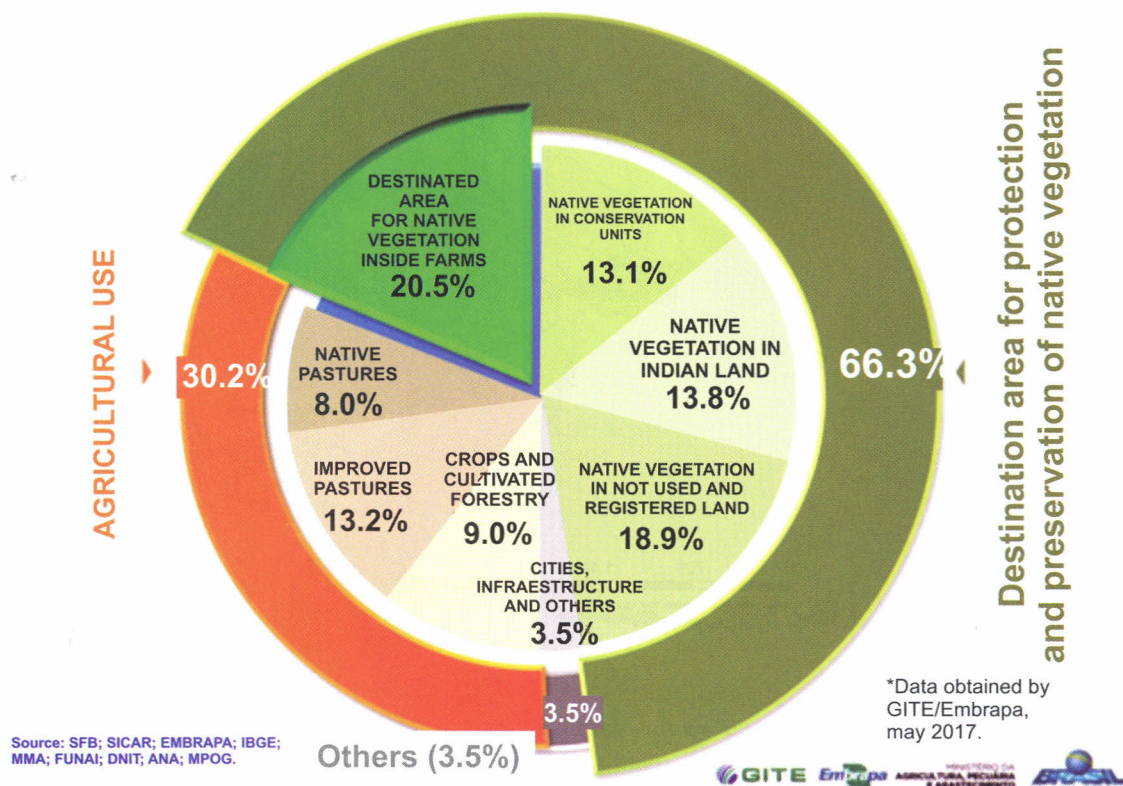
Thanks to this enormous database, managed and made available by the Brazilian Forest System, the perspective of a qualification and quantification of the areas destined to the preservation of the native vegetation within the rural properties in cartographic bases was opened for the first time. The "CAR" of each rural property gathers information from 18 categories of land use and occupation. The download of this data, spread over 5,570 municipalities, resulted in files reaching 180 Gigabytes. With this complex set of geocoded data (big data), the GITE team has developed a clear methodology, produced accurate numerical and cartographic results,

## PRESERVED VEGETATION AREA ON RURAL LANDS



**“Regarding natural vegetation, Brazil protects and preserves 66.3% of its territory, being one of the largest producers of food in the world and still champion of preservation. Agriculture occupies only 9% of the country surface.”**

## OCCUPATION AND LAND USE IN BRAZIL\*



and works as a public company to disseminate these results to general and specific audiences. In this way, the methods and results are available to the whole society at <https://www.cnpm.embrapa.br/projetos/car/>.

The results impressed positively on both the environment and farmers. A total of 176,806,937 hectares of preserved vegetation were found in rural properties, equivalent to about 20.5% of the national territory (or about 22% when subtracted from the states of Mato Grosso do Sul and Espírito Santo, which up to that time were not available on SiCAR as it can be viewed on the map.

These areas for the preservation of native vegetation, registered by each rural property in SICAR, also represent a formal and administrative

commitment to recovery and environmental conservation undertaken by all farmers. Commitment duly registered and monitored. It is expressed in areas of permanent preservation, legal reserves, vegetation and surplus remnants, which encompass several lacustrine and palustrine ecosystems, with their flora, fauna and specific biodiversity. There are already more than 176 million hectares preserved throughout the country and the extension and functionalities should increase with the operationalization of the Environmental Regularization Program (PRA). Many of these preserved areas, mainly in the South and Southeast, are located in territories of highly intensified agriculture. This information is of

great importance, since it indicates that in these places the area will be dedicated to the preservation of the environment.

In the case of Rio Grande do Sul, if we took all the properties registered and made them a single rural property, we would discover that 20% of the whole area of this rural property is dedicated to preservation (3,431,185 ha). This meets the legal requirement for these properties, which requires that there be 20% of areas preserved by the sum of legal reserve and permanent preservation areas. This data can be seen in detail at <https://www.cnpm.embrapa.br/projetos/car/estados/RS/rs.html>.

About 64% of the state area (17,335,427 ha) is occupied by agriculture. And this number will increase as more rural properties are



registered in the CAR. But it is already possible to see how agriculture is helping to preserve vegetation. The maps of areas for the preservation of vegetation in rural properties show a great coherence in the patterns of distribution, with connection and continuity of native vegetation formations along the hydrographic network.

The "CAR" is a complex instrument and a very vast database and has opened a very wide range of connections and possibilities for research and analysis in territorial intelligence. For example, it becomes possible to cross data from municipalities that have large coffee production to find out how the issue of environmental preservation in the activity is being carried out. Other

examples could be of quantifying the preservation in cuts of municipalities, microregions or biomes. In this cross of biomes, for example, it was verified that a great part of the rural properties of the RS state inserted in Pampa did not classify their native vegetation (native fields) as APP, RL or as surplus vegetation, reducing the preserved area of this biome, which is conserved livestock for centuries.

### **Conclusions on the allocation, use and occupation of land in Brazil**

*Over the Brazilian territory, 26.7% have their attribution, occupation and use for the protection of vegetation in conservation units and indigenous lands. Another 18.9% is occupied by areas of vacant land and areas not yet registered in the CAR. 50.7% are engaged in agriculture and livestock, which, however, use only 30.2%, since 20.5% are dedicated to the preservation of vegetation.*

*According to data from Embrapa's Strategic Territorial Intelligence Group (GITE), about 20% of Brazil is destined for the preservation of vegetation within rural properties. It is also estimated that 13.2% of planted pasture and about 8% of native pasture are conserved by livestock in harmony with the native environment, whether cerrado, caatinga, pampa, etc. All this gigantic agriculture in Brazil, with its 240 million tons of grains, with cane, coffee, fruit, vegetable and planted forests, occupies only 9% of the country.*

*We protect more than all the countries of the world in legal requirements and, moreover, we preserve even more within the rural properties. It is an very important observation with data, maps and numbers and that needs to be disclosed to the whole society. They are, therefore, facts.*

*Brazil, in vegetation, protects and preserves 66.3% of its territory, being one of the largest producers of food in the world and still champion of preservation.*

*The results obtained by the approach of territorial intelligence and management on the "CAR" will allow the identification, qualification, quantification, mapping and monitoring of land use and the preservation of vegetation in the country. But, above all, these data allow us to show the irreplaceable role of agriculture in the preservation of native vegetation. There are more than 176 million hectares preserved inside rural properties, 20.5% of the country. The state of Rio Grande do Sul stands out in these numbers by preserving about 20% of the vegetation on the farms (more than 3.4 million hectares), even more if we add to it what is conserved by livestock in the Pampa biome.*