Review Papers

THE IMPACT OF THE LAW 10,267/2001 IN THE BRAZILIAN RURAL REGISTRATION

DAVID L. ROSALEN[1]

ABSTRACT: The publication of the Law 10,267 of 08/28/2001 changed the paradigm of rural registration in Brazil, because this law known as the "Law of Georeferencing" has created the National Registration of Rural Property, that unifies in a common basis different registrations present in several government agencies, such as the National Institute for Colonization and Agrarian Reform (INCRA), the Secretariat of Federal Revenue, the Brazilian Institute of Environment and Natural Resources, and the National Indian Foundation. Also, this new registration system has a graphical component which has not existed until such date, where the boundaries of rural property are georeferenced to the Brazilian Geodetic System. This new paradigm has resulted in a standardization of the survey and its representation of rural properties according to the Technical Standard for Georeferencing of Rural Properties, published by INCRA in compliance with the new legislation. Due to the georeferencing, the creation of a public GIS of free access on the Internet was possible. Among the difficulties found it may be observed the great Brazilian territory, the need for specialized professionals, and especially the certification process that INCRA has to perform for each georeferenced property. It is hoped that this last difficulty is solved with the implementation of the Land Management System that will allow automated and online certification, making the process more transparent, agile and fast.

KEYWORDS: georeferencing, registration, rural planning.

O IMPACTO DA LEI 10.267/2001 NO CADASTRO RURAL BRASILEIRO

RESUMO: A publicação da Lei 10.267, de 28-08-2001, alterou o paradigma do cadastro rural brasileiro, pois essa lei, conhecida como "Lei do Georreferenciamento", criou o Cadastro Nacional de Imóveis Rurais, que unifica, em uma base comum, diferentes cadastros presentes em vários órgãos governamentais, como do Instituto Nacional de Colonização e Reforma Agrária (INCRA), da Secretaria da Receita Federal, do Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais e da Fundação Nacional do Índio. Também, esse novo sistema cadastral tem uma componente gráfica até então inexistente, em que os limites do imóvel rural são georreferenciados ao Sistema Geodésico Brasileiro. Esse novo paradigma teve como consequência uma padronização no levantamento de campo e respectiva representação dos imóveis rurais, conforme a Norma Técnica para Georreferenciamento de Imóveis Rurais, publicada pelo INCRA, em atendimento à nova legislação. Graças ao georreferenciamento, possibilitou-se a criação de um SIG público de acesso gratuito via Internet. Como dificuldades, temos a grande extensão territorial brasileira, necessidade de profissionais especializados e, principalmente, o processo de certificação que o INCRA tem de realizar para cada imóvel georreferenciado. Espera-se que essa última dificuldade seja sanada com a implantação do Sistema de Gestão Fundiária, que permitirá a certificação automatizada e *online*, tornando o processo mais transparente, ágil e rápido.

PALAVRAS-CHAVE: georreferenciamento, cadastro, planejamento rural.

[1] Engº Agrônomo, Prof. Doutor, Departamento de Engenharia Rural, FCAV/UNESP, Jaboticabal - SP, davidrosalen@terra.com.br
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INTRODUCTION

The National Institute of Colonization and Agrarian Reform (INCRA) created by the Decree 110 of 07/09/1970 is a Brazilian federal agency whose mission is to implement the land reform policy, conducting national land planning in order to contribute to the sustainable development of Brazil rural areas. Thus, INCRA is the federal government agency responsible for the National Rural Registration System (NRRS) which stores various information of all Brazilian rural properties.

The NRRS is responsible for the emission of the Certificate of Registration of Rural Property (CRRP), a document required to dismember, lease, mortgage, sell or pledge rural property for sale and for approval of amicable or judicial sharing (succession by death), as the paragraphs 1 and 2 of article 22 of Law 4,947 of 04/06/1966, amended by Article 1 of Law 10,267 of 08/28/2001. Currently, the emission of the CRRP can be conducted via Internet and must be renewed annually.

The information of the rural properties present in NRRS include landowners, owners of the business domain or owners of any title of rural property, as described by Law 5,868 of 12/12/1972, and their personal data, as well as information on the structure of property (location, area, residents, legal status, registration number, etc.), use (explored cultures, location in areas of environmental preservation interest, legal registration or not of environmental reserve, etc.) and number of fiscal modules of the rural property, data used in the calculation of the Rural Land Tax (RLT). It is noteworthy that the property to be registered must submit their supporting documentation.

According to COUTINHO et al. (1999), a registration system comprises two parts, one descriptive and other graphic. In the case of NRRS, the graphic part would be required only in case of modification of the registration by area grinding; in this case the plant and the descriptive history of rural property should be provided.

This context has changed with the publication of the Law 10,267 of 08/28/2001, being the publication of this law what generated the change in the paradigm of Brazilian rural registration. This law created the National Registration of Rural Property (NRRP), which proposes the unification in a common basis of different registers present in several government agencies such as the Secretariat of Federal Revenue (SRF), the Brazilian Institute of Environment and Natural Resources (IBAMA), the National Indian Foundation (FUNAI) and NRRS. The NRRP will be managed by INCRA and the SRF. This unification is obviously a slow process, and began effectively around 2007 (INCRA, 2010a).

It is noteworthy that besides the unification of different registration databases, fact that alone constitutes a major breakthrough for the Brazilian territorial planning, NRRP also have a graphic component, that is, a property letter with a quality that was not present on Brazilian rural mapping. Thus, Law 10,267 provides that the defining vertices of the limits of rural property are compulsorily as "Law of Georeferencing."

Within this context, the aim of this study is to present the new paradigm that is being implemented in the Brazilian rural registration system, discuss some impacts that this new system will cause or is already causing within the Brazilian agrarian reality and their respective viability.

LITERATURE REVIEW

Evaluating the technological evolution of the Brazilian rural topography, we observed that until recently it was made without any recommendation or technical quality standards, for example,

the first Brazilian technical standard in the area came only in 1994 with the publication of the Standard Execution of Topographic Survey (ABNT, 1994), followed by the publication of the Specifications and General Standards for GPS Surveys (IBGE, 1998). INCRA had an internal standard for field survey, the Technical Standard for Topographic Survey (INCRA, 2001). These standards serve as the basis for drafting the Technical Standard for Georreferencing Rural Properties (TSGRP) in its first edition (INCRA, 2003).

Allied to this total absence of standardization of field surveys, the vast range of qualified professionals from different rural surveying formations led to a complete inconsistency of studies and, most often, the registration reality was not consistent with the geographical reality of the property. This technical deficiency can be seen in Figure 1, which shows a snippet of a perimetral descriptive history of a rural land soil prepared before the implementation of the Law of Georeferencing; it is possible to note the inappropriate and technically deficient composition.

This area that has (...), with the following perimeters and boundaries as follows: start on the right bank of a divisor stream with lands of Luiz Prata, and follows with the magnetic course S.E. 1.3º and 1,260m distance across a path of servitude, confronting the Capão Farm, of Dr. Durval Pereira or successors; and runs right by the fence, with the following courses and distances: general S.O. 55º, 220m; overall S.O. 81º and 276m; and S.O. 52º15" and 195 m; until breast dove tree, confronting with the Invernada Farm; there follows until the right bank with course N.O. 3º15" and 1,320m distance, to the right bank of the Divisa Stream, mentioned above, confronting with Paraguay Farm; then runs right down the stream, to the starting point (...)	The perimeter of the property described below, is georeferenced to the Brazilian Geodetic System (BGS), the vertices are represented in the projection system Universal Transverse Mercator (UTM), referenced to the central meridian -51°, with the horizontal reference SIRGAS2000 and all azimuths, distances, area and perimeter were calculated in the UTM projection plan. Begins the description of the perimeter in the vertex DOD-M-0085, co-ordinates N 7,775,085.935m and E 245,576.039m located in XXX Road; this follows by confronting with File 2035 with the following azimuths and distances: 82°52'24"and 543.741m to the vertex DOD-M-0033, co-ordinates N 7,775,153.394m and E 246,115.579m and this follows confronting (...)

FIGURE 1. Comparison of descriptive history: on the left, part of history before the standardization required by the Law of Georeferencing, and on the right, part of a standard history according to second edition of TSGRP.

It is noteworthy that the georeferencing and the consequent development of the graphical component of the new registration system should be developed according to a specific standard, the Technical Standard for Georeferencing of Rural Property, which is already in the third edition (INCRA, 2013c). The first (INCRA, 2003) and second edition (INCRA, 2010a) of TSGRP predicted the use of the system of projection Universal Transverse Mercator (UTM), and establish standards of positional quality, field survey procedures, technical reports and other documentation, most of them in digital format. Figure 1 shows part of a descriptive history within this new paradigm. It is noteworthy that until the second edition of TSGRP there was a specific standard for georeferencing in actions of land regulations applied to the Legal Amazon (INCRA, 2009b).

This new technical paradigm imposed by the Standard of Georeferencing caused major impacts on the implementation of the new legislation because there was a technical revolution in the area, requiring the updating of the professionals as well as the intense use of emerging technologies

for positioning, such as global positioning systems by satellites, GNSS systems (Global Navigation Satellite Systems). It is noteworthy that the professionals who work with topographic surveys for georeferencing of rural properties must be accredited by INCRA for this activity.

The accreditation is requested via Internet at INCRA site, and for the obtainment it must meet the decisions of the plenary PL-2,087 of 2004, and PL-0745 of 2007, of the Federal Council of Engineering and Agronomy (CONFEA). The different professionals, of superior or intermediate level, who may exercise the technical responsibility of determining the limits of rural properties for georeferencing, are listed in PL-2,087. This range of professionals should get the certificate of georeferencing with the Regional Councils of Engineering and Agronomy (CREA) under the following situations:

1) proof of having attended the contents mentioned in Decision PL-2,087 through regular undergraduate or technical of intermediate level courses;

2) proof of having attended the formative content cited by graduate or qualification/professional development courses;

3) request to the competent Specialized Chamber, confirming its specific professional experience in the area.

The contents cited by PL-2,087 are applied to: Georeferencing Topography, Cartography, Reference Systems, Cartographic Projections, Adjustments and Methods and Measures for Geodetic Positioning.

Another major impact was the georeferencing itself: first, it allowed the installation of a Geographic Information System (GIS), because until then the cartographic representations used in rural surveys were local topographical plans without any connection between them. Second, because it avoids the overlapping areas and thus helps in combating land frauds in the sense that allows determining the location, size and confronting the rural property unequivocally.

It is noteworthy that the issue of land fraud is a serious issue in the Brazilian reality, due to the continental dimensions of the country and the presence of extensive areas covered by tropical forests that hinder the process of mapping. As an example, it is suspected that in the state of Amazonas, of its 157 million hectares, about 55 million have been defrauded, which is roughly equivalent to the area of France (INCRA, 2009a). Another example, in the state of Pará, also in the Amazon region, according to the same source, a fraudster sold to dozens of successors approximately nine million acres of public land (area approximately equivalent to Portugal).

It is noteworthy that from the publication of the law the services of real estate registration, which in Brazil registrates the ownership of rural property, as well as its perimeter description via descriptive history, should contact the INCRA in order to update the changes performed in the real estate registrations. This fact is critical because many frauds occur with the connivance of the services of real estate registration (INCRA, 2009a). Figure 2 displays the GIS system screen developed by INCRA in order to provide via Internet and free of charge various information relating to the Brazilian rural registration; in this figure, for example, we observe the georeferenced properties (yellow polygons) in the city of Jaboticabal – state of São Paulo (SP), in Brazil (delimited by a red line) in the year of 2012.

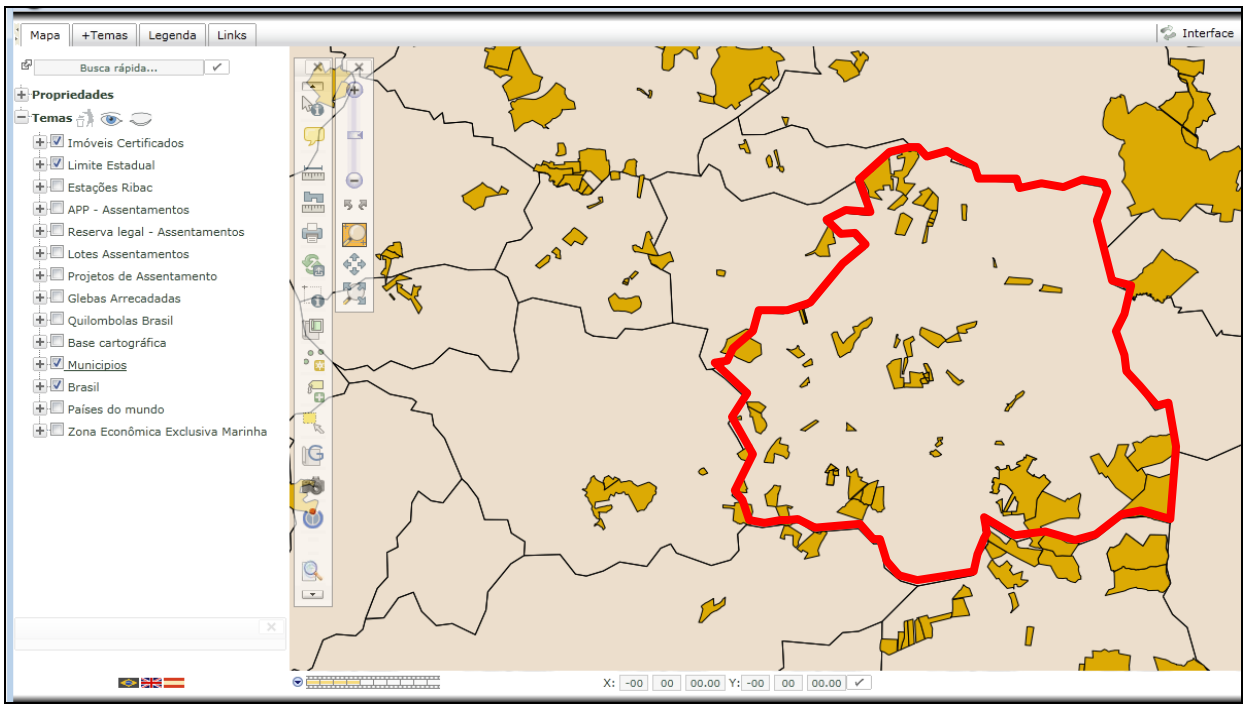

FIGURE 2. GIS screen available by INCRA via Internet where you can check the georeferenced properties in Brazil. Source: ROSALEN et al. (2012).

Another point to be discussed in this new paradigm implemented by the law of georeferencing is displayed highlighted by the following quote:

> In cases of dismemberment, installment or rememberment of rural properties, the identification defined in paragraph *a* of section 3 of part II of § 1 shall be obtained from descriptive history, signed by a qualified professional and with the appropriate Annotation of Technical Responsibility-TRA, containing the coordinates of the vertices defining the boundaries of the rural properties, georeferenced to the Brazilian Geodetic System and positional accuracy to be fixed by INCRA, guaranteed exemption from financial costs to owners of rural properties whose totality of area does not exceed four fiscal modules (§ 3, Article 3, Law 10,267 of 08/28/2001).

As the above quote, Law 10,267 provides an exemption from financial costs of georeferencing to owners of rural properties equal to or less than four fiscal modules, properties classified as small (Law 8,629 of 02/25/1993). For example, in the city of Jaboticabal-SP, whose tax module is 14 ha, properties with areas up to 56 ha would be considered small.

Within this entire context, it is necessary to analyze the feasibility of the new legislation. The first point to be evaluated is the geodetic infrastructure needed and available to georeferencing. The Brazilian Geodetic System (BGS) is managed by the IBGE and in the BGS there are two basic types of planimetric stations of geodetic control, the not active and the active stations. The difference between these stations is that the active one has a GNSS L1L2 antenna installed that continuously collects observations, and through a computerized system these observations are provided via Internet at IBGE's own website for the user to perform their post-processing together with their field data. Both types of stations are called "SAT Stations", i.e. obtained by GNSS systems, and the active stations belong to the Brazilian Network for Continuous Monitoring (BNCM). All service provided by BNCM is free.

Table 1 displays the Brazilian states and their areas (IBGE, 2012a), the number of agricultural establishments (IBGE, 2007) and available geodetic infrastructure (IBGE, 2012b and IBGE, 2013). Throughout this paper we will consider, for purposes of study, the number of agricultural establishments provided by IBGE (2007) as the number of rural properties.

TABLE 1. Available geodetic infrastructure and their number of agricultural establishments per unit of the Brazilian Federation.

State	Area (km²)	Nº of Agricultural Establishments	Nº of SAT[1] Stations	Area/nº of SAT[1] Stations (km²)	Nº of SAT Stations RBMC[2]
Acre	164,122	29,488	26	5,869	2 (1)
Alagoas	27,779	124,317	21	1,322	1 (1)
Amapá	142,828	3,560	24	5,951	2 (2)
Amazonas	1,559,162	67,955	66	23,799	4 (1)
Bahia	564,831	765,498	272	2,076	8 (6)
Ceará	148,921	383,010	143	1,041	4 (1)
Distrito Federal	5,788	3,943	60	97	1 (1)
Espírito Santo	46,099	84,795	101	456	1 (1)
Goiás	340,103	136,244	150	2,267	2 (1)
Maranhão	331,936	288,698	96	3,458	3 (2)
Mato Grosso do Sul	357,146	65,619	133	2,685	2 (2)
Mato Grosso	903,330	114,148	104	8,686	7 (4)
Minas Gerais	586,520	550,529	193	3,039	10 (2)
Pará	1,247,950	223,370	91	13,711	5 (3)
Paraíba	56,469	167,477	20	2,822	2 (0)
Paraná	199,317	373,238	116	1,718	4 (4)
Pernanbuco	98,146	308,978	49	2,006	2 (2)
Piauí	251,577	246,229	30	8,384	2 (2)
Rio de Janeiro	43,780	58,887	117	373	3 (3)
Rio Grande do Norte	52,811	83,364	27	1,955	2 (1)
Rio Grande do Sul	268,782	442,564	128	2,201	3 (3)
Rondônia	237,591	87,397	34	6,988	4 (2)
Roraima	224,301	10,492	61	3,677	1 (1)
Santa Catarina	95,703	194,533	72	1,324	3 (2)
São Paulo	248,197	231,402	203	1,223	15 (3)
Sergipe	21,918	101,499	16	1,369	1 (1)
Tocantins	277,622	56,896	22	12,619	2 (1)
Brasil	8,502,728	5,204,130	2,375	3,585	96 (53)

[1] Stations SAT not actives in a good situation and inspected after the year 2000.

[2] The number of stations BNCM that allows the cinematic positioning or DGPS in real time indicated between brackets (RBMC-IP).

Source: adapted from IBGE (2007), IBGE (2012a), IBGE (2012b) and IBGE (2013).

A positive impact of the Law of Georeferencing was the increase that the Brazilian geodetic infrastructure suffered. Comparing the data of ROSALEN et al. (2010) with the data from Table 1, in 2010, 1,551 stations were recorded and in 2012, 2,375 stations, representing an increase of 53%. Even so, considering that the area of coverage for use of GNSS L1 receivers (radius normalized to 20 km) is of 1,257 km², it appears that only five units of the federation (Ceará, Distrito Federal, Espírito Santo, Rio de Janeiro and São Paulo) have values below this mark (area/number of not active SAT stations). According to ROSALEN et al. (2010), this situation becomes even more

serious, because the distribution of SAT stations is not homogeneous throughout the territory, focusing often next to capitals, education/research institutions, hydroelectric centrals, etc. Figure 3 can illustrate this situation.

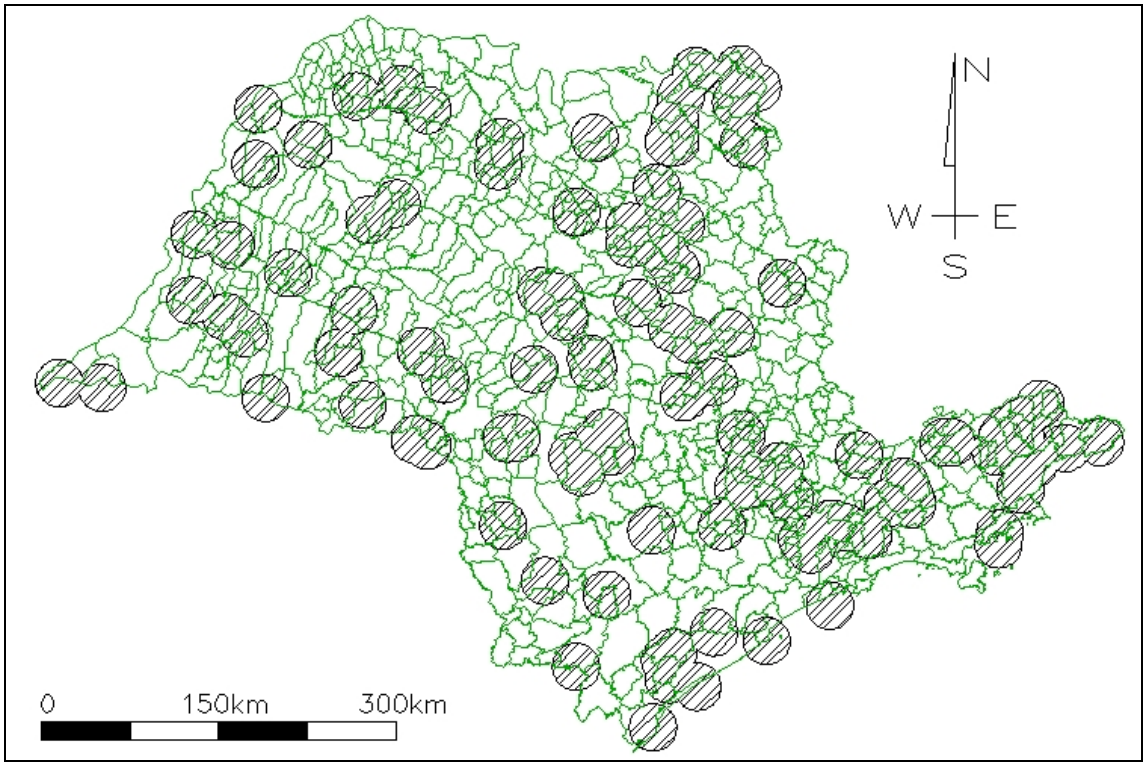

FIGURE 3. State of São Paulo Map with the location of the coverage areas of not active geodetic stations SAT (hatched circles) considering a radius of 20 km. Source: ROSALEN et al. (2010).

Thus, the sole use of GNSS L1 receivers for georeferencing using this infrastructure is difficult and the density of these stations by the professional is needed.

Regarding the SAT BNCM stations, there were 72 in operation in 2010 (ROSALEN et al., 2010.); currently, there are 92, therefore an increase of 28%. Thus, BNCM provides full coverage of the territory, considering a range of 500 km and 1,000 km (normalized values) for the coverage areas of each station. Therefore, it is essential to professionals working in georeferencing the use of GNSS L1L2 receivers, for this category of receptors allows the use of data provided by BNCM. It is noteworthy that the IBGE makes available, in addition to the passive and active stations, two more services: BNCM-IP, which allows real time positioning RTK (real-time cinematic relative) or DGPS (differential GPS) via Networked Transport of BNCM via Internet Protocol (NTRIP) and Precise Point Positioning (PPP).

It is noteworthy that in the present paper, we computed all geodetic stations approved by IBGE, thus belonging to the BGS. Thus, the GNSS state networks, as well as geodetic stations established by public or private initiative, once approved, are included in the paper. It is noteworthy that the INCRA Network Community Bases (RIBaC) was integrated to the BNCM and uncertified stations may not be used to georeference rural properties.

The second aspect to be evaluated is the availability of accredited professionals to georeferencing work. Table 2 shows the number of establishments to be georeferenced and the

number of accredited professionals; there are a total of 7,878 professionals approved for accreditation (INCRA, 2013).

TABLE 2. Number of agricultural establishments to be georeferenced and accredited professionals for georeferencing per unit of the Brazilian Federation.

State	Area (km²)	Nº of Agricultural Establishments to be Georeferenced	Nº of Profissional	Nº of Establishments /Professional
Acre	164,122	29,252	26	1,125
Alagoas	27,779	124,290	25	4,972
Amapá	142,828	3,552	29	122
Amazonas	1,559,162	67,822	51	1,330
Bahia	564,831	762,301	349	2,184
Ceará	148,921	382,480	78	4,904
Distrito Federal	5,788	3,603	162	22
Espírito Santo	46,099	84,460	133	635
Goiás	340,103	128,526	581	221
Maranhão	331,936	287,163	133	2,159
Mato Grosso do Sul	357,146	55,832	262	213
Mato Grosso	903,330	106,309	595	179
Minas Gerais	586,520	545,239	1,132	482
Pará	1,247,950	222,066	359	619
Paraíba	56,469	167,153	23	7,268
Paraná	199,317	371,129	595	624
Pernambuco	98,146	308,871	94	3,286
Piauí	251,577	245,240	124	1,978
Rio de Janeiro	43,780	58,785	128	459
Rio Grande do Norte	52,811	82,994	72	1,153
Rio Grande do Sul	268,782	440,012	550	800
Rondônia	237,591	86,457	107	808
Roraima	224,301	10,470	55	190
Santa Catarina	95,703	193,916	427	454
São Paulo	248,197	219,809	1,512	145
Sergipe	21,918	101,436	25	4,057
Tocantins	277,622	53915	251	215
Brasil	8,502,728	5,143,082	7,878	653

Source: Adapted from IBGE (2007), IBGE (2012a) and INCRA (2013).

Considering that in 2011 there were 6,603 accredited (ROSALEN, 2011), there was an increase of 19.3% from 2011 to 2013. However the demand for this category of professionals is still high. For example, dividing the total number of establishments by the total professionals, we found the value of approximately 653 rural properties by professional. There is still the aggravating factor of the large difference in the number of accredited professionals between the different units of the Federation. For example, in the State of Paraíba, there are only 23 professionals to georeference 167,153 rural properties, with 7,268 properties by professional.

The third and final aspect to be evaluated is that according to Law 10,267 the georeferencing documentation of rural properties should be submitted to INCRA for certification. This certification

basically consists in verifying that the perimeter of the property does not overlap another property, environmental preservation areas, indigenous reserves and quilombo areas.

INCRA has distributed throughout the Brazilian territory, around thirty Regional Superintendencies (RS). Within the RS there is a Division of Spatial Agrarian Structure, and this has the Certification Committee, responsible for certification. Certification is required for all properties above 500 ha. Decree 7,620 of 11/21/2011, published on the date from which would also be required the georeferencing for properties with less than 500 ha, recorded an extension of the deadlines in the following ways:

1) 11/20/2013 for properties with an area of two hundred and fifty to less than five hundred hectares;

2) 11/20/2016 for properties with an area of less than one hundred to two hundred and fifty hectares;

3) 11/20/2019 for properties with an area of twenty- five to less than one hundred hectares;

4) 11/20/2023 for properties with less than twenty- five hectares area.

It is noteworthy that, once deadlines expire, the real estate registry officer is prohibited, according to Decree-Law 5,570 of 10/31/2005, the practice of following recording acts:

1) dismemberment, installment or rememberment;

2) transfer of total area;

3) creation or alteration of the description of the property, resulting of any judicial or administrative proceeding.

Table 3 displays the number of properties certified until now (INCRA, 2013).

The certification process has been relatively slow, for example, the RS 08 is responsible for the state of São Paulo, one of the most developed states of the Federation. This RS, through its certification committee has certified 11,593 rural properties of a total of 231,402 properties, i.e. only 5.01%. However, if it was considered as number of real estates the data from the Census Survey of Agricultural Production Units of the State of São Paulo (LUPA) of 2007/2008, São Paulo would have 324,601 Units of Agricultural Production (UAP), and from there we would have only 3.57% of certified properties. Remembering that the LUPA does not consider recreation rural property such as INCRA considers (SÃO PAULO, 2008).

Nationally, there were 28,147 georeferenced properties in 2011 (ROSALEN, 2011); hence, in two years, there was an increase of 32,901 properties, i.e. an increase of over 100%. However, the percentage of georeferenced real estates is insignificant (1.17%), despite twelve years of rule of law. This result may be a little more critical, considering as the number of rural properties the data of INCRA itself, i.e. 5,498,505 properties (INCRA, 2012), leading to a percentage of 1.11% of properties certificated.

TABLE 3. Rural properties certified per unit of the Brazilian Federation.

State	Area (km²)	Nº of Agricultural Establishments	Nº of Certified Rural Properties	Certified Rural Properties (%)
Acre	164,122	29,488	236	0.80
Alagoas	27,779	124,317	27	0.02
Amapá	142,828	3,560	8	0.22
Amazonas	1,559,162	67,955	133	0.20
Bahia	564,831	765,498	3,197	0.42
Ceará	148,921	383,010	530	0.14
Distrito Federal	5,788	3,943	340	8.62
Espírito Santo	46,099	84,795	335	0.40
Goiás	340,103	136,244	7,718	5.66
Maranhão	331,936	288,698	1,535	0.53
Mato Grosso do Sul	357,146	65,619	9,787	14.91
Mato Grosso	903,330	114,148	7,839	6.87
Minas Gerais	586,520	550,529	5,290	0.96
Pará	1,247,950	223,370	1,304	0.58
Paraíba	56,469	167,477	324	0.19
Paraná	199,317	373,238	2,109	0.57
Pernambuco	98,146	308,978	107	0.03
Piauí	251,577	246,229	989	0.40
Rio de Janeiro	43,780	58,887	102	0.17
Rio Grande do Norte	52,811	83,364	370	0.44
Rio Grande do Sul	268,782	442,564	2,552	0.58
Rondônia	237,591	87,397	940	1.08
Roraima	224,301	10,492	22	0.21
Santa Catarina	95,703	194,533	617	0.32
São Paulo	248,197	231,402	11,593	5.01
Sergipe	21,918	101,499	63	0.06
Tocantins	277,622	56,896	2,981	5.24
Brasil	8,502,728	5,204,130	61,048	1.17

Source: Adapted from IBGE (2007), IBGE (2012a) and INCRA (2013).

The low rate of certified properties in twelve years under law can be explained by the data discussed above, as the training and availability of professionals, and especially the limited infrastructure of INCRA for certification of georeferenced rural properties. Also, by the lack of interest of the owners in georeferencing their properties, because the georeferencing work involves field survey and assembly of an administrative process; therefore, it is an expensive job, and the owner will realize it when the need arises.

It is noteworthy that, according to the data relating to the Brazilian agrarian structure of 2003 of INCRA and compiled by Girardi (2008), 92.6% of Brazilian rural properties have area less than 200 ha (small rural property); thus, the RSs of INCRA have worked to certificate a really reduced percentage of rural properties across the total existing in Brazil. Reinforcing this point, according to São Paulo (2008), the State of São Paulo has 98.1% of properties with less than 500 ha.

Due to this situation, INCRA has promoted a number of initiatives for greater agility in the certification processes such as simplification of the certification process from the publication of the Standard Execution 92 of 02/22/2010, and the second edition of TSGRP and the alteration of Instruction 24 of 11/28/2005, by Normative Instruction 66 of 12/30/2010, removing the obligation of farmers to provide technical parts (plants and georeferenced history) in updating the CRRP, when this do not verse about alteration of the area in the cases cited above. Also, INCRA established task forces to contain the liability of pending certifications such as the Task Force of the State of Mato Grosso, in which 42 servers were designated for this purpose, and analyzed until early 2010 about 3,159 cases between accreditation and updating information. Another strategy was the establishment of terms of technical cooperation, as agreed between INCRA and the Brazilian Army, for the analysis of approximately 20,000 properties certification processes over 500 ha, present in the regional superintencies of INCRA.

However, most of the renewal certification process was initiated by the publication of the third edition of TSGRP (INCRA, 2013c) and the respective technical manuals. The Technical Manual of Limits and Confrontations (INCRA, 2013th), which specifically addresses the recognition of limits and the Technical Manual of Positioning (INCRA, 2013b), which indicates the different positioning methods to be adopted in the field survey for the purpose of georeferencing. In the previous editions of TSGRP, the contents of the technical manual of positioning were included in the technical standard. In the current edition, TSGRP talks mainly about technical definitions and limits of absolute positional accuracy required for the different types of vertices defining the rural property. Also, from this edition, the merger of TSGRP with the Standard technique for georeferencing in actions of land regulations applied to the Amazon (2009b) occurs.

This new edition of TSGRP and their manuals presented a series of major changes. From these, we can mention the change of the concept of rural property, from now on we adopted the concept of rural property prescribed by the Law of Public Records (Law 6,015 of 12/31/1973) and not by the concept presented in the Statute of the Land (Law 4,504 of 11/30/1964). Also, it should be considered as confrontational the property and not the owner, and that the limit type of confrontation is to be mandatorily mentioned in the descriptive history and the plant (INCRA, 2013).

Another fundamental alteration is no longer using the UTM projection system, now being indicated the adoption of a Local Geodetic System (LGS), thus the horizontal distances and flat area are calculated based on the topographic plan established in the georeferenced rural property. It is noteworthy that for the adoption of the LGS it is necessary the use of altitudes, so the georeferencing is no longer a planimetric, but a planialtimetric survey. Regarding the survey methods is now accepted, as the situation, surveys performed by Remote Sensing (INCRA, 2013b).

Finally, the certification process itself was modified with the publication of Normative Instruction nº 77 of 08/23/2013. In this, the entire certification process can be automated and online, through the Land Management System (LMS). This system allows the electronic data analysis, verifying the occurrence of overlap, and generates technical parts (descriptive history and plants). Thus, the process takes on greater transparency, agility and quickness.

CONCLUSIONS

The Law of Georeferencing provided a great technical advance of Brazilian rural registration, especially in relation to the graphical component of registration, i.e. requiring the mapping of rural properties within a strict rule which imposes a standard of quality consistent with current geotechnology. Also,

georeferencing alone provided the development of a GIS for public access, making the registration information, textual and graphical, available to the Brazilian society with a degree of transparency hitherto unpublished, in addition to fulfilling the great aim of combating rural real estate fraud.

Regarding the geodetic infrastructure available, with the introduction and the expansion of BNCM, this is found mainly in the more developed states. In relation to the number of suitable professionals for georeferencing, we suggest an intensification of formation of these professionals, including the opening of new courses of Cartographic Engineering and Surveying in the country, mainly in units of the Federation who have professionals in smaller quantities.

It is expected that with the implementation of certification via LMS, this process becomes appropriate to national needs, because of the dimensions of Brazil (850 million hectares) and limited infrastructure of INCRA to do the certification. Avoiding thus the collapse of the Brazilian rural real estate market, since the change of ownership requires georeferencing and its certification. What prevented this collapse so far is that there is no mandatory certification for the vast majority of Brazilian rural properties.

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