

Profile of Regularized Water Uses in an Area of Intense Agricultural Production in the Headwaters of the Pantanal in Mato Grosso

Perfil dos usos da água regularizados em uma área de produção agrícola intensa nas nascentes do Pantanal de Mato Grosso

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ABSTRACT: The granting of rights to use water resources is one of the instruments that aims to promote the quantitative and qualitative control of water and the right of access to this essential element for the life and maintenance of ecosystems. This study aimed to identify the regularized uses in the municipality of Campo Novo do Parecis and its interface with the use and occupation of the municipality's soil. Based on the analysis of grants and registration of insignificant funding in the municipality between the years 2012 and 2019. The results show that irrigation is the largest water user, accounting for 79.64% of the annual volume, followed by industry, with 7.8%, and urban supply, with 6.05%. Thus, it is possible to perceive the need for more effective actions directed at managing water resources to ensure water with adequate quality and quantity for the uses of current and future generations.

Keywords: Water Resources. Grants. Irrigation. Mato Grosso.

RESUMO: A outorga de direito de uso de recursos hídricos é um dos instrumentos que tem como objetivo promover o controle quantitativo e qualitativo deles, bem como o direito de acesso a esse elemento essencial para a vida e manutenção de ecossistemas. O trabalho foi desenvolvido com objetivo de identificar os usos regularizados no município de Campo Novo do Parecis e sua interface com o uso e ocupação do solo do município, a partir da análise das outorgas e cadastros de captação insignificante no município, entre os anos de 2012 e 2019. Os resultados demonstram que a irrigação se destaca como o maior usuário de água, contando com 79,64% do volume anual, seguido pela indústria com 7,8% e o abastecimento urbano com 6,05%. Assim, é possível perceber a necessidade de ações mais efetivas voltadas à gestão de recursos hídricos de forma a assegurar água em qualidade e quantidade adequada aos usos da atual e futura geração.

Palavras-chave: Recursos Hídricos. Outorga. Irrigação. Mato Grosso.

INTRODUCTION

Water is an essential natural resource for maintaining life on Earth. Since ancient times, it has been present at the basis of social and economic development and is currently one of the elements most used by society. Several discussions have been encouraged due to the need for users to realize that the current model of economic development, environmental degradation, and implemented policies are unsustainable (Pogian, 2013).

Therefore, integrated management of water resources is necessary to preserve social and economic well-being equitably without compromising the sustainability of ecosystems (Silva et al. 2015).

The Constitution of the Federative Republic of Brazil of 1988 establishes that the waters of rivers, lakes, and groundwater are assets of either the Union or the States. Therefore, it becomes the responsibility of the Public Authority, state or federal, to manage it. In this sense, users who intend to use water resources, whether to collect surface or underground water or release effluents that influence the existing water regime, need authorization - called Granting of the Right to Use Water Resources (Agência Nacional de Águas, 2011).

A grant is an administrative act that gives the applicant the right, for a pre-established period, to use water resources under the terms and conditions expressed in the act. Its use is subject to availability and the management body is assured of quantitative and qualitative control (Silva et al. 2015). In Mato Grosso, the issuing of permits began in 2007 with surface capture permits, and in 2011, permits for release and groundwater began to be issued (SEMA, 2018).

This instrument is important for sustainable development, as it is based on adequate management of water supply and compatibility with various sectors, given that there are often cases of concessions and authorizations incompatible with existing water availability (Bezerra et al. 2013).

The growth of the population, industrial activities, and the rapid evolution of agribusiness in Mato Grosso produced impacts and a series of pressures related to water resources, requiring actions by society and the state aimed at management. Mato Grosso registered growth above the Brazilian average (7%) in recent decades, with the agricultural sector being the main responsible for the increase in its GDP, determining the development model based on an agro-export model and national agricultural policies (IBGE, 2023).

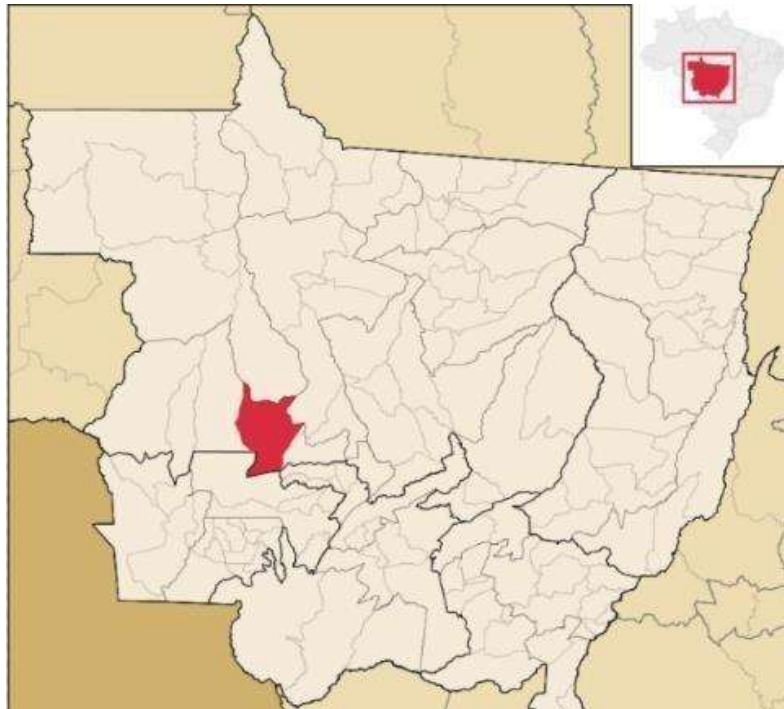
In this sense, analyzing the profile of water use as a finite resource in areas of high intensity of agricultural production is of utmost importance to determine possible usage trends and valuation of the quantities of water allocated for uses. Thus, this article aims to conduct a water use profile based on grants and records of insignificant water uses between 2012 and 2019 in the municipality of Campo Novo dos Parecis, Mato Grosso, seeking to draw a baseline of regulated water uses for the region.

MATERIAL AND METHODS

The municipality of Campo Novo do Parecis is in the State of Mato Grosso (**Figure 1**), in the Midwest region of Brazil. Its population is estimated to be 34,558 inhabitants. The economy is based on agriculture, with a Gross Domestic Product (GDP) per capita of R\$86,709.75 and 64.5% of revenue from external sources. It is located 390 km from the capital, Cuiabá, and has flat, slightly undulating topography, belonging to Chapada

dos Parecis, an Amazon basin. Its main rivers are the Sucuruína River, the Verde River, the Membeca River, and the Papagaio River (Prefeitura de Campo Novo do Parecis, 2018).

Figure 1. Campo Novo do Parecis city location



Source: Abreu (2006).

We used data from the State Secretariat for the Environment of Mato Grosso (SEMA) to analyze the grants and registrations of insignificant collections. It was made available in digital format by the Superintendence of Water Resources and refers to the database used by the Water Resources Control Coordination and the information available in the CNARH (Brazilian National Registry of Water Resources Users), entered by the Water Planning Coordination.

The database is in Excel format, in spreadsheets containing information regarding grants and registrations granted and rejected in Campo Novo do Parecis from the beginning of the issuance of grants in 2012 until April 2019. Consistency analyses were conducted on the databases provided, with some values being updated through searches conducted in the State Official Gazette [Diário Oficial do Estado].

RESULTS AND DISCUSSIONS

According to the database obtained, analyzing the number of granting processes and registrations of insignificant uses, 75 grants and 23 registrations were identified issued until April 2019 (**Figure 2**).

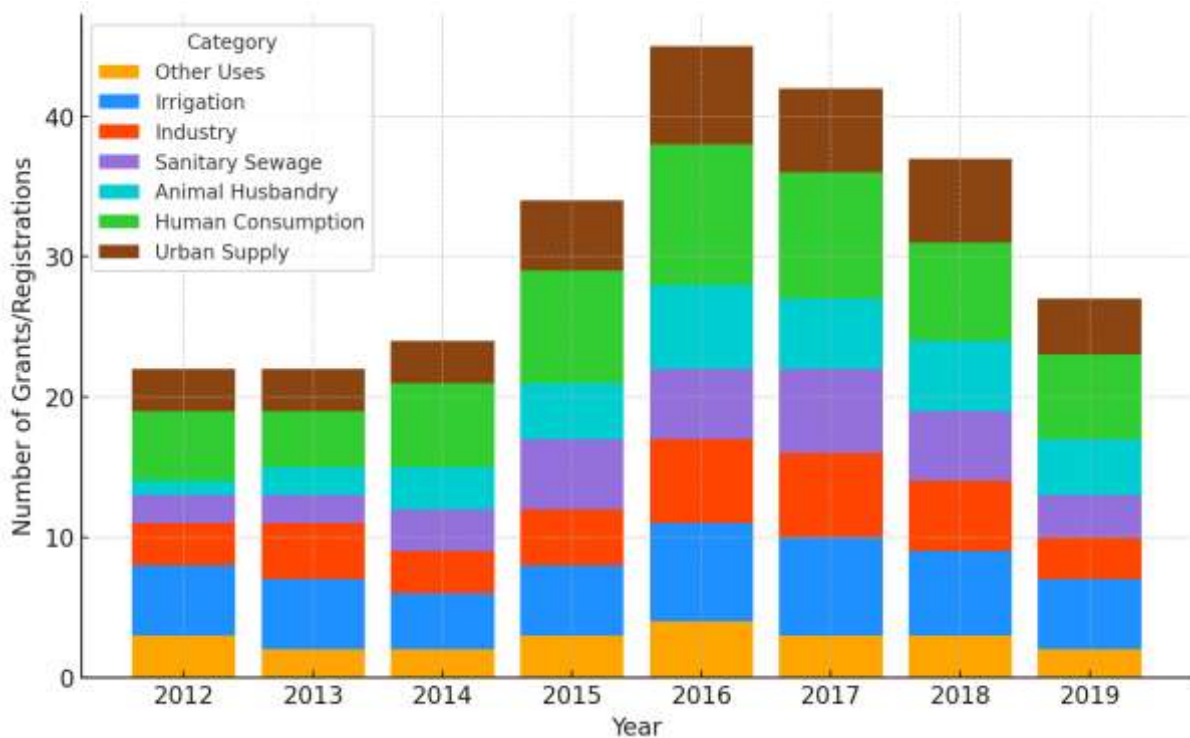
The data represented in the graph reveal some trends related to the distribution of the number of grants/registrations by category of use over time. There has been a gradual increase in the total number of grants/registrations since 2012, with a peak in

grant/registration numbers in 2016. This increase may indicate an intensification in the use of water resources or the implementation of stricter regulations during this period. From 2017 onwards, there was a notable drop in grants, particularly in 2018 and 2019.

Human Consumption and Urban Supply have a consistent presence and are the largest contributors almost every year, especially in 2016 and 2017. This makes sense, given that these two categories are directly related to the basic needs of the population. Sanitation also has relevant participation, especially in years with a higher total number of grants, such as 2015 to 2017, indicating the growing importance of sewage treatment.

The Irrigation and Animal Husbandry categories also show variations over time. In 2016, for example, irrigation made a strong contribution, which may be related to the need to increase agricultural production during periods of drought or higher demand for food. However, these categories show significant drops in later years, which may indicate a change in agricultural practices or water management for agricultural activities.

Figure 2. Evolution of grants and registrations issued in Campo Novo do Parecis, Mato Grosso



Regarding insignificant uses, in Mato Grosso, according to CEHIDRO Resolution No. 42/2011, the uses considered insignificant are those of up to 2.5 L/s for small population centers in rural areas and watercourses with Q95 greater than 300 L/s and up to 1.5 L/s for watercourses with Q95 up to 300 L/s. CEHIDRO Resolution No. 44/2011 establishes for groundwater that collections of up to 10 m³/day are considered insignificant. In Campo Novo do Parecis, the uses are considered insignificant, amounting to a total volume of 78,633 m³/year, which is not very significant, equivalent to 0.08% of the uses.

When analyzing the total volume (m³/year) granted (considering grants and registrations), both captures and releases, totaled 91,181,459 m³/year. Of this total, 79.64%

for irrigation, 7.8% for industry, 6.05% for urban supply, 3.49% for sewage, 2.19% for other uses, and 0.5% for human consumption and animal husbandry (**Table 1**).

Table 1. Grants and registrations in Campo Novo do Parecis

Purpose of use	Number of grants	%	Granted volume (m ³ /year)	%
Irrigation	32	32.6	72.613.853	79.63
Industry	6	6.2	7.114.758	7.8
Urban Water Supply	1	1	5.512.814	6.04
Sanitation	1	1	3.185.136	3.48
Animal Breeding	4	4.1	322.033	0.36
Human Consumption	29	29.6	440.473	0.5
Other Uses	25	25.5	1.992.392	2.19
Total	98	100	91.181.459	100

Agriculture is responsible for the highest values, given the municipality's vocation, as can be seen on the land use and occupation map (**Figure 3**). Irrigation is aimed mainly at sugar cane, soybean, and sunflower crops— the latter two crops are one of the principal forms of exporting water outside the river basins of origin, with the captured water being converted into virtual water, disregarding the process of exporting a public good (Rosa *et al.*, 2019, Vallino *et al.*, 2021).

The region has a predominance of withdrawal flows for irrigation, mainly for the central pivot method. The sources of the Teles Pires and Juruena rivers, in the Tapajós river basin (in Mato Grosso), in addition to Campo Novo do Parecis, other municipalities stand out, such as Nova Mutum, Tapurah, Nova Uiratã, Vera, Sorriso and Sapezal, with a pivot area of around 45,689 ha, with 456 pivots, that is, an average area of 100 ha (Agência Nacional de Águas, 2023).

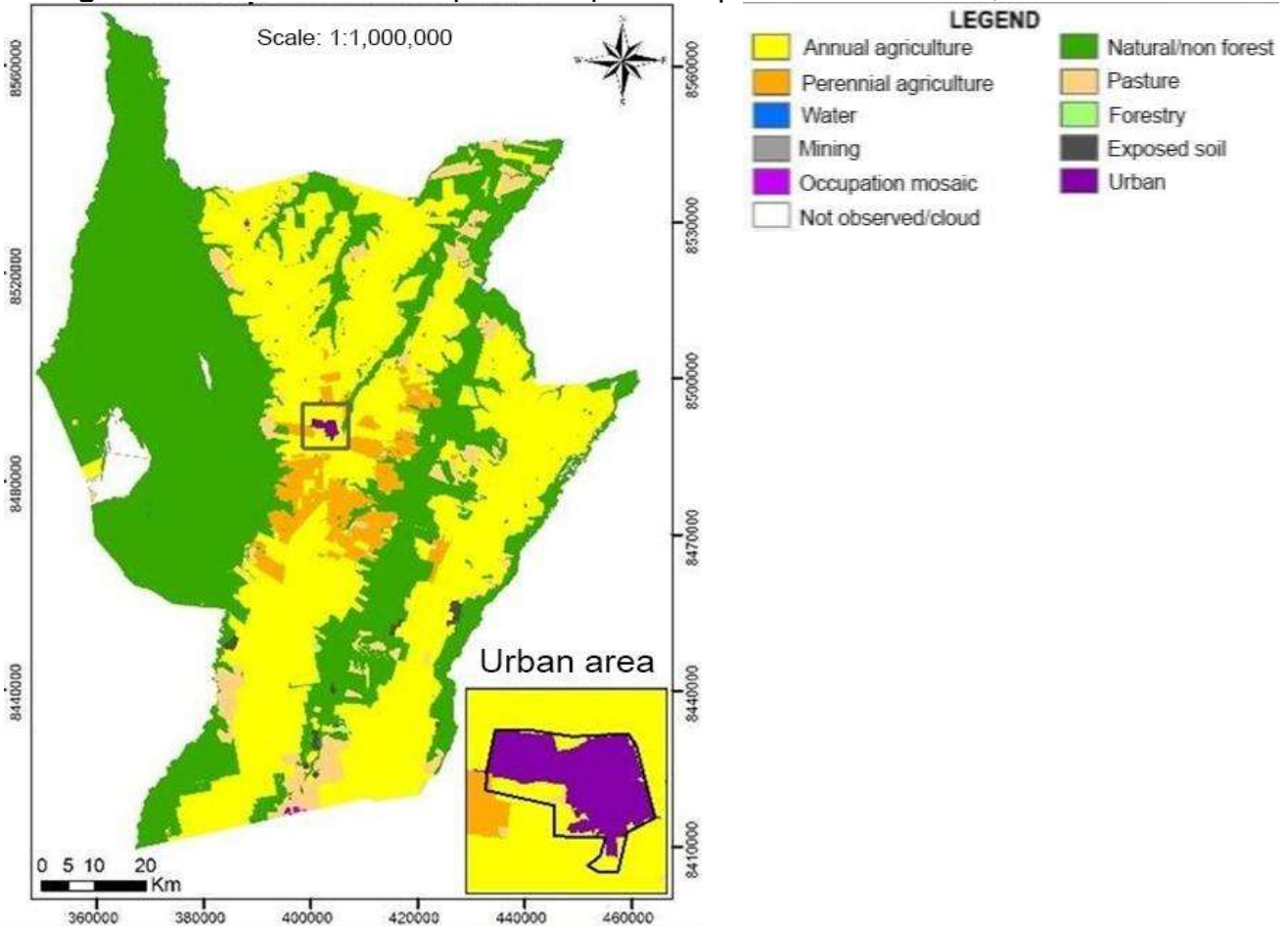
Regarding the source of supply, whether surface or groundwater, 84.2% of the annual volume is equivalent to surface capture and 15.8% to groundwater. The high surface percentage is due to the irrigation, which is predominantly surface, with two underground grants, which is not the current standard for the irrigation process in Mato Grosso. It was also observed that the municipality has 100% of its supply source for urban water supply from underground sources, consisting of 12 wells.

This situation is presented in the Municipal Basic Sanitation Plan (2017) of the municipality, which states that the underground source has always played an essential role in the municipality due to the good storage and production capacity of the Utiariti Aquifer (Parecis Aquifer System). The only source closest to the urban center is the Membeca River, approximately 5 km away, which currently receives effluent from the municipality's sewage system and rainwater drainage, and there is no technical study that allows assessing its viability or otherwise as a source of urban supply.

Agriculture is the sector that uses the most water in the State, with around 70% of consumptive use. This fact, combined with the high degradation of the spring regions, which are replaced by monoculture areas interspersed with extensive livestock farming,

contributes to problems such as silting of riverbeds, reduction in water supply, degradation of basins, contamination by chemical products of both surface and groundwater, and increased conflict in the use of water for irrigation (Alves *et al.* 2009).

Figure 3. Land use and occupation map of Campo Novo do Parecis, Mato Grosso



Source: Kuriki (2018).

Among the municipalities with the highest agricultural production (in terms of production value), the first two in the ranking are from Mato Grosso- the first is Sorriso, and the second is Sapezal. Campo Novo do Parecis stood out among the top five on the list of largest agricultural producers in the country, with GDP growth between 2014 and 2019 of over 23.35% (IBGE, 2023).

Grant requests must be analyzed through technical aspects linked to legal and management aspects of water resources. CEHIDRO Resolution No. 119/2019 is the document that establishes the technical criteria for granting requests for surface water bodies, which defines, for example, that the maximum flow rate that can be granted for consumptive uses will be a maximum of 70% of the reference flow rate Q95% for a section of the water body considered. However, the cascading effects of abstractions along the stretches are not considered. In a scenario of increasing water scarcity in the region (Monteiro *et al.*, 2022), the integration between technical criteria and ecological and climatic aspects must be made possible through tools that assist in specific and

global assessments of the impacts resulting from such transfers, such as the establishment of hydrological models that regard not only the quantity of water, but also its quality and water balance at the river basin level (Tucci, 1998, Moreira, 2005).

Therefore, it is possible to ensure decision-making, whether in terms of restriction or reorientation regarding activities that require the use of water or at are polluting, ensuring availability at levels and quantities appropriate for the respective uses. Furthermore, access to grant data on a public platform is essential, as studies on water availability in the region are scarce.

CONCLUSIONS

The economic scenario for agriculture in the region follows the forecasts at the state level, with positive prospects regarding the increase in the irrigated area, which refers to the strong dependence on water as an input for the production process, which is worrying from the point of view of the sustainability of aquifers given the severe drought that the Midwest of the country has been experiencing.

In this context, in which Mato Grosso's economic base is strongly linked to water, which is exported in the form of grains, investment in the state's management of water resources is extremely important, a priority among public policies, with investments in financial and technical resources, to act in preventive and corrective actions, so that water is guaranteed in the quantity and quality necessary to promote multiple uses, current and future, as an essential element for life, ecosystems, and production processes.

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