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Environmental and Geography Effects of Health Arising from the Sugar Alcohol Sector in the municipalities of Nova Glória, Ipiranga de Goiás and Rubiataba, Goiás state

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Abstract *— The present study refers to a parallel to be evaluated, which is the correlation between the activities of the sugar and alcohol plants and the sugarcane plantations, environmental damage and the local health population in the municipalities of Nova Glória, Ipiranga and Rubiataba, Goiás state, in other words, if there were changes in the aspects related to collective health and that may directly or indirectly be related to this environmental aspect. and, in a specific character, to characterize the level of environmental diagnosis in the sugarcane plantations in the municipalities of Nova Glória, Ipiranga and Rubiataba that serve the Cooper Rubi plant; analyze the Environmental Management System (EMS) with Cooper Rubi, with emphasis on preventive actions that are developed in order to reduce damage to the environment; and finally, to analyze health statistics referring to diseases of respiratory diseases and its correlation with the sugar industry in this region.*

I. INTRODUCTION

The choice for the Microregion of Ceres -GO was due to the fact that, through this study, we sought to ascertain the impacts that the sugarcane agribusiness has represented in environmental and health terms for the municipalities of Nova Glória, Ipiranga de Goiás and Rubiataba. It is important to reiterate that the State of Goiás according to data from [1] is the second largest producer of sugar cane in Brazil, with estimates for this year of 2018, production of 71.14 million tons. With this, the state of Goiás has shown its representativeness in the national scenario of the sugarcane culture, this due to the favoring that the tropical climate presents and suitable to the culture, in addition to the fact that the topography relief collaborate together with mechanization due to low costs and low environmental impact. The planted area presented in 2017 0.2% lower, this due to the lack of provision for expansion areas, but this did not diminish the character of productivity, since it is expected to reach 0.9% more in 2018.

In view of this scenario, it can be observed that the sugarcane agribusiness is representative of socioeconomic development, however, the focus of this study is to assess direct and indirect impacts on the environment, as well as the population's health. According to estimates, the cerrado biome by the year 2035 should lose more than 6 thousand hectares to the sugarcane crop in the process of deforestation. In addition to that areas destined to agriculture, pastures and reforestation are converted into sugarcane plantation areas. What has been observed is that the cerrado biome has been occupied quietly, where the economic interest has outweighed the environmental, and this has caused a gradual imbalance in this environment [2]. In the case of the sugarcane agribusiness, the

production of sugarcane has represented an important economic aspect, including in the micro-region of Ceres - GO [3]

Due to the more comprehensive and holistic perspective of geography and health, the need arises to write this study and thereby demonstrate how geography and, more recently, geoprocessing, as a subarea of knowledge - has been gaining importance when applied to the area of health. In recent years, the number of books dedicated to geoprocessing and public health or epidemiology has been increasing, however, there are still very few that end up available to academics, technicians or the general population [4].

Thus, a mapping process was carried out with the municipalities of Nova Glória, Ipiranga and Rubiataba, which is fundamental for a more global analysis, that is, the map is a tool that demonstrates the special distribution of a particular phenomenon, in the case highlighted plantations and installations of sugarcane plants, with greater precision than the merely descriptive, as well as its determinants [4]. Monitoring for losses and alteration of natural resources is essential for a country with a large territorial extension such as Brazil.

II. METHODOLOGY

The methodology used was of a documental character with a descriptive and quali-quantitative approach, having as a source of data the Municipal Secretaries of Environment and Water Resources of the municipalities of Ipiranga de Goiás; Nova Gloria and Rubiataba, and, still use of monitoring the deforestation of Brazilian biomes by Satellite. We also sought data from epidemiological analyzes regarding the health of the population in the three municipalities, comparing changes that occurred in the last ten years and on-site observations of the municipalities under study.

2.1 Study Area

The present study has as analysis area the municipalities of Nova Glória, Ipiranga de Goiás and Rubiataba located in the State of Goiás, in the Ceres –GO microregion, as shown in fig. 1 and 2:

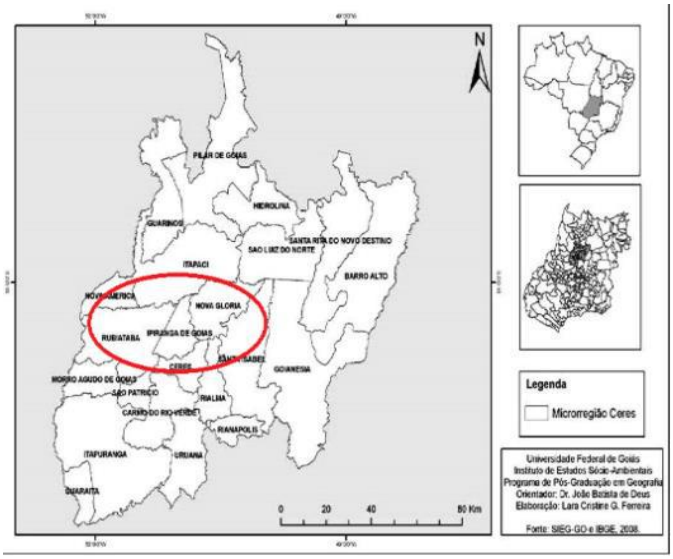

Fig.1: Ceres - Micro region Location - Study area[5]

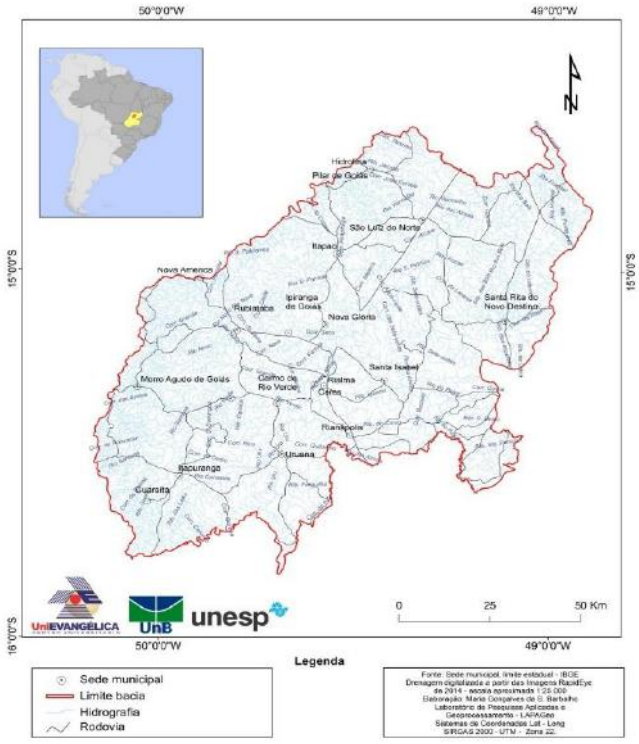

Fig.2: Ceres/GO Microregion Geographic Location [6]

In this area there are more than 223,000 inhabitants, which are distributed in an area of approximately 13,224 km2, representing a demographic density of 16.87 inhabitants / km2, and, therefore, the fifth most populated in the state of Goiás, presenting broad growth and urbanization.

The municipality of Nova Glória has an area of 412,975 km2, and, according to the 2010 IBGE Census, it has a population of 8,514. It is located in the São Patrício Goiano Valley, in the Midwest Region. It is located 185 km from the capital of the state of Goiás, and 35 km from

the city of Ceres-GO. The emancipation of the municipality occurred through Decree Law no. 6,882 on February 19, 1941, a driving factor being the creation of the National Agricultural Colony of Goiás (CANG). The founder of the municipality was João Schettine, who gave the name to the municipality in honor of his homeland. However, its emancipation and dismemberment of Ceres-GO, dates from July 1, 1983.

The municipality of Ipiranga de Goiás has an area of 241.3 km2, according to the IBGE Census (2010) 2,884 inhabitants. It is located 174km from the capital Goiânia and 18km from the municipality of Ceres -GO. The origin of the municipality was also due to the creation of CANG, in the 40s, and, only on July 21, 1997 through Law no. 13,137 sanctioned by the governor of the time Maguito Vilella is that the municipality was emancipated.

Rubiataba is a larger municipality when compared to Nova Glória and Ipiranga de Goiás, with an area of 748.3 km2 and a population of 19,747 according to IBGE data. It is located 27 km from the municipality of Ceres-GO, in the São Patrício Valley region and 220 km from the capital of the State of Goiás, Goiânia. The origin of the municipality also happened in the 40s due to the desire to create the agricultural colony, but its emancipation was only on October 12, 1953, by the then governor of the State Pedro Ludovico Teixeira, according to Law no. 807/1953.

2.2 Cooper Rubi Plant

The Cooper Rubi plant is located on Highway GO-434, Km 24, s / n in Rubiataba, and its business is the production of sugar and alcohol. The company has 1700 direct employees and 600 indirect employees. It was founded in 1983 with 70 members in that period. It currently belongs to Japungu Agroindustrial, in Paraíba and processes around one million tons of sugarcane per year, planted on about 17 thousand hectares, which are located in Rubiataba and in neighboring municipalities, as can be seen in the Figs. 3 and 4 below:

Fig.3: Cooper Rubi Panoramic view, Rubiataba, Goiás state. [7]

Fig.4: Rubiataba –GO alcohol industry (satellite image) (2018). [8]

The planting areas are located in the three municipalities and also on leased land from family farmers, who are designated as partners. In the area located near the Cooper Rubi plant, devastation of the cerrado can be seen, as can be seen in Fig. 5.

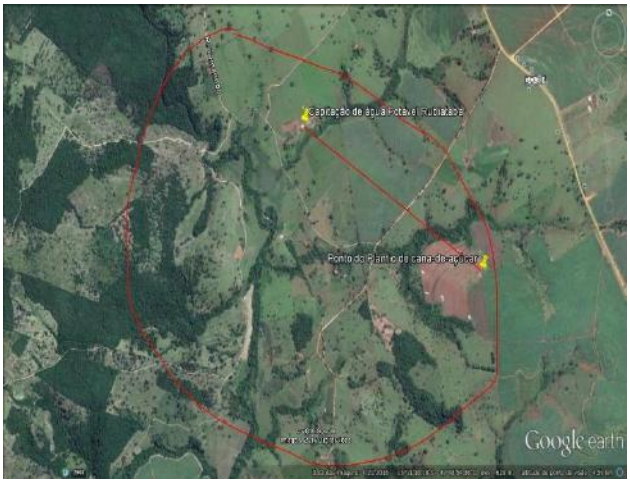

Fig.5: Sugarcane planting point located in Rubiataba, GO. [8]

III. RESULTS AND DISCUSSION

3.1 Sugarcane Plantation Area in the Municipalities of Nova Glória, Ipiranga de Goiás and Rubiataba

In the area of Nova Glória, Ipiranga de Goiás and Rubiataba it is no different. The area of sugar cane showed a considerable increase, according to data from [9], which carries out annual monitoring on the cultivation of sugar cane, as shown in the table below:

Table 1: Sugarcane area in Nova Glória, Ipiranga de Goiás and Rubiataba between the years2003/04 a 2013/14. [9]

IBGE Code	City	Available for harvest (ha)[1]			Total (a+b+c)	Under reformation (d) (ha)	Total Cultivated (e) (ha)
		Soca(a)	Reformed(b)	Expansion (c)			
Sugarcane area in the state of Goiás – Crop year 2003/04							
5214861	Nova Glória	2.783			2.783		2.783
5218904	Rubiataba	3.230			3.230		3.230
5210158	Ipiranga de Goiás	1.965			1.965		1.965
Sugarcane area in the state of Goiás - Cropyear 2013/14							
5214861	Nova Glória	10.990	621	338	11.950	2.271	14.221
5218904	Rubiataba	5.045	586	151	5.782	810	6.591
5210158	Ipiranga de Goiás	5.042	158	139	5.339	273	5.612

a) Soca: is the class of sugarcane crops that have already undergone more than one cut, that is, it is the cane that has sprouted from a plant or from a soca;
(b) Reformed: this is the class of one-and-a-half plant cane crops that were reformed in the previous crop year and are available for harvest in the current crop;

According to the data shown in the table, it can be seen that the municipality of Nova Glória was the one that had the greatest expansion of sugarcane planting, and as you can also see in Fig. 5, which shows the municipality's data for 2013 .

According to Fig. 6, it can be observed that the municipality of Nova Glória has a large plantation of sugar cane, this because the area planted in that municipality also serves the Vale Verde de Itapaci distillery and Cooper Rubi, from Rubiataba, and more characteristic is the shape of the clog, with a bit of representativeness also from that under renovation.

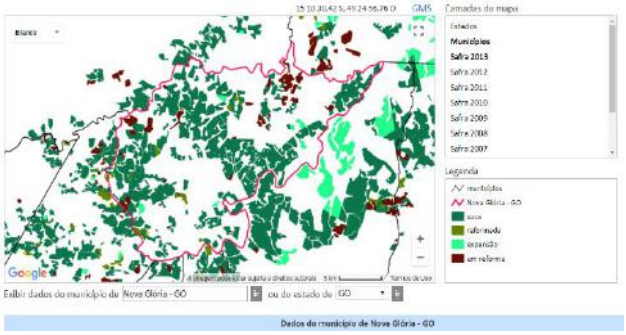

Fig.6: Sugarcane planting areas and profile in the municipality of Nova Glória -GO. [9]

In Fig. 7 below, it already represents the municipality of Ipiranga de Goiás, which compared to the municipality of Nova Glória is presented in a smaller number.

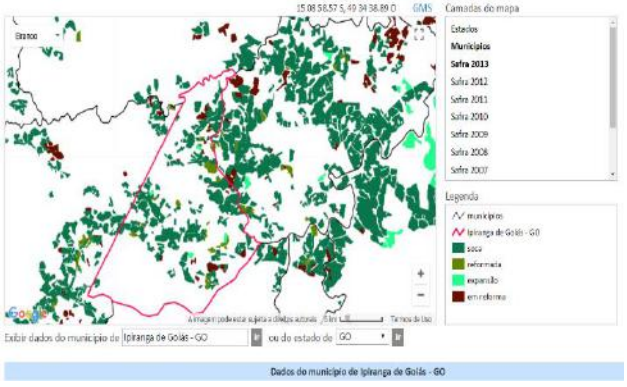

Fig.7: Sugarcane planting areas and profile in the municipality of Ipiranga –Goiás [9]

And, finally, there is the municipality of Rubiataba, state of Goiás, in which if the plant, its plantation area is much smaller compared to the other two municipalities

(c) Expansion: is the class of sugarcane crops that are available for harvesting for the first time;
(d) Under reform: it is the class of sugarcane crops that will not be harvested due to the reform with a year-and-a-half cane plant or because they are destined for another use. (a + b + c) Total available for harvest; (a + b + c + d) Total cultivated.
(Nova Glória and Ipiranga de Goiás), as can be seen in Fig. 8 below:

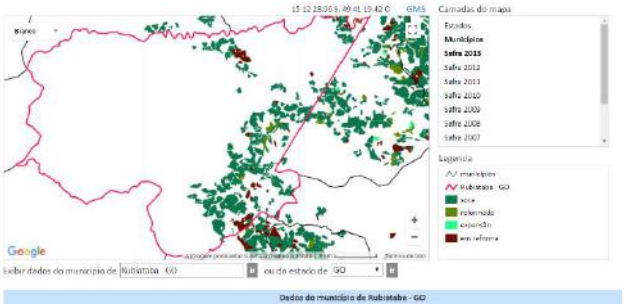

Fig.8: Sugarcane planting areas and profile in the municipality of Rubiataba, GO. [9]

Such data can also be seen in Fig. 9 below, which shows the distribution of sugar cane production throughout the territory of Goiás, it appears that the cultivation is more widespread in the regions of the southwest and northeast of Goiás. In the Ceres –GO microregion region, where the municipalities of Nova Glória, Ipiranga de Goiás and Rubiataba are located, the last two are still the most representative, being in the parameter of 553,360.01 to 1,121,120.00t. And, Rubiataba presenting production of up to 553,360.01t.

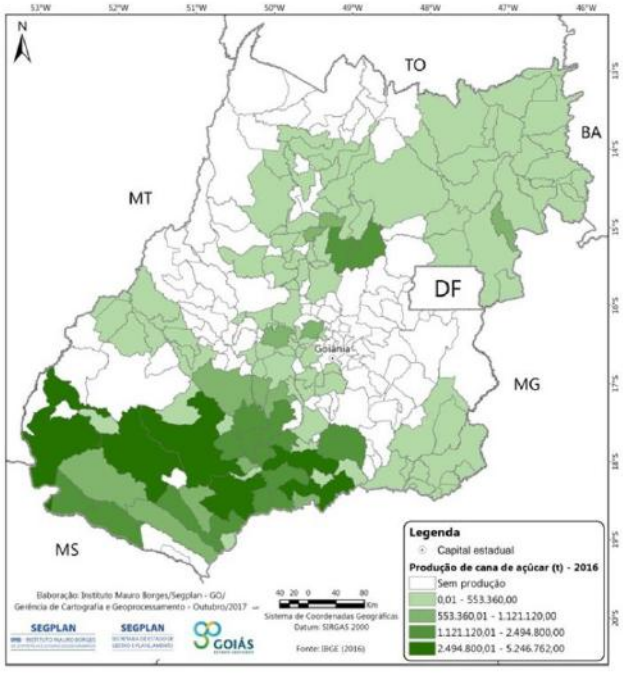

Fig.9: Sugarcane production throughout the state of Goiás [10]

In conducting the research with the company, it was observed that it does not have an Environmental Management System (SGA), which refers to a program focused on environmental issues. However, according to the person in charge of the company, there is a concern on the part of the company regarding issues of water, soil and environment, where risk management is carried out before activities and operational processes, which include harvesting and transporting raw materials, to the area. industrial processing. There is also concern about riparian forests, with a view to the preservation of water resources and biodiversity, in addition to the planting of sugarcane crops, the organization respects the permanent preservation areas (APPs) in which the riparian forests are located.

In addition, there is evidence suggesting that the intensification of activities related to sugarcane farming is severely damaging some areas of remnants of the cerrado region of the South Goiana mesoregion, sharply fragmenting the extensions of legal reserves and permanent preservation such as forests. ciliary [11].

In the current context, the discussion of a new environmental awareness is presented through sustainable development, with an emphasis on rules to seek to understand and reflect on the preservation of nature. Environmental problems are present in organizational decisions, the concern for a pleasant and clean environment is no longer just for environmentalists. Therefore, the environmental issue goes beyond geographical, economic, social and political limits, making it more visible and affecting all areas of human activity.

The most recent concern on the part of the company is the search to reduce atmospheric emissions, both in the transport process, as in production and fires. This is because the burning of sugarcane straw causes the emission of gases in the atmosphere, which would be reduced through mechanized harvesting, which occurs in 50% of the harvest. However, the company has the intention of completely replacing manual cutting with mechanical cutting in 2018. To reduce environmental impacts, the company is still recovering the banks of rivers, and has a team working on reforestation.

As pointed out [12] the expansion of sugarcane cultivation presents serious environmental problems and occupation of Cerrado domains, which are pastures and agriculture, and this expansion impacts fauna, flora and water resources. The burning of sugarcane straw causes air pollution, decreasing air quality, in addition to causing significant deaths of wild animals in the Cerrado biome, as shown in Fig. 10 below:

Fig.10: Burning of sugar cane straw, Rubiataba, state of Goiás. [7]

Another observed factor refers to the transformations of the landscapes, where the sugarcane plantations have occupied a considerable part of the rural areas of the municipalities of the micro region, contrasting in some moments even with the urban borders. This impacts on the relationship between countryside / city.

The plant aimed at recovering and reducing the damage caused to the environment has a project for a nursery that has an annual production of 40,000 seedlings of pro-cerrado plants that are distributed to the population of the municipalities surrounding Rubiataba, and also distributes to schools during the school year, with lectures on the importance of preserving the environment.

At the plant, the company has also developed actions aimed at reducing damage to the environment, such as gas washing, which consists of a system where the gases resulting from the burning of biomass are filtered before being released into the atmosphere. In the long term, the implementation of the Sugarcane Research Unit has been sought in partnership with the Federal Institute of Education of Goiás.

Among the harms to the environment in relation to the sugarcane production process is the burning of sugarcane, which is included in Law n. 11.241 of 2002 a control and planning need for this process, being that legislation foresees that the substitution until 2021 by the mechanizable process. Currently, the elimination of 80% of the fires is recommended, and must also respect some factors, that is, burning is prohibited one kilometer from the urban perimeter or from reserves / places occupied by indigenous people; 100 meters of electric power substation domain locations; it is also not allowed to carry out fires at 50 meters from reserves, ecological parks and conservation units; 25 meters of areas of telecommunication stations; and 15 meters from electric power transmission and distribution lines and from areas occupied by highways and railways. However, it is observed that the fires still happen irregularly, as can be seen in the Fig. below:

Fig.11: Fires carried out irregularly in the city of Rubiataba –GO[14]

There are then aggravations to the environment due to the burning process, triggering respiratory diseases among workers and the local population. It is observed that in the initial years of implantation of the plant, compared to the last years, there were more rates of diseases resulting from exposure to smoke, fire and flames (X00-X09) in the municipalities of Ipiranga de Goiás, Nova Glória and Rubiataba , as can be seen in the tables below.

Table 2: SUS Hospital Morbidity due to External Causes - Causes: X00-X09 Exposure to smoke, fire and flames) in the municipalities of Ipiranga de Goiás, Nova Glória and Rubiataba from 1999 to 2007[14]

Municipalities	1999	2000	2001	2002	2003	2005	2006	2007	Total
521486 Nova Glória	1	1	3	1	-	-	-	-	6
521890 Rubiataba	-	1	10	3	1	2	1	2	20
Total	1	2	13	4	1	2	1	2	26

Table 3: SUS Hospital Morbidity due to External Causes - Causes: X00-X09 Exposure to smoke, fire and flames) in the municipalities of Ipiranga de Goiás, Nova Glória and Rubiataba from 2008 to 2017 [14]

Municipalities	2008	2010	2013	2014	2015	2017	Total
521486 Nova Glória	-	-	-	-	1	3	4
521890 Rubiataba	1	1	5	1	1	2	11
Total	1	1	5	1	2	5	15

According to the study and data collection performed, it was observed that the labor of the Cooper Rubi plant is largely coming from the municipality of Rubiataba, Ipiranga, Nova Glória and Itapaci. Between Rubiataba and the municipality of Nova Glória, there is a prevalence of sugarcane plantations, however, being intensive from the municipality of Ipiranga.

The cerrado biome, despite being one of the richest and most diversified ecosystems in the world, has been transformed on a large scale where several species of native animals and several species of plants can disappear, if serious and concrete measures aimed at the conservation of this biome are not taken.

The fact is that the Cerrado is being deforested in its virgin areas, replacing agriculture, anthropized, destroyed, as large agricultural properties are taking over the territory for grain monoculture.

As described [15]:

This decrease in incidence is perhaps justified by the mechanization implantation process that the plant has presented in recent years, as can be seen in the report below:

> Cooper-Rubi is gradually mechanizing the cutting of cane. According to his representative, the number of workers in the harvest will soon be reduced from 800 to 300. This radical reduction occurs in all producing states, with greater speed in the flat regions, especially favoring the mechanization of cane cutting . This and other questions about the conditions of sugarcane workers are addressed later in the case study on São Paulo. There is nothing better for sugarcane, for cane fields, than cutting cane by hand. It doesn't waste anything, it doesn't have the problem of soil compaction. However, there is the problem of worker fatigue, of burning cane. Now mechanization is a must (Cooper-Rubi's administrative-financial manager).

Thus, this result may be a consequence of the control that Cooper Rubi has shown regarding the decrease in the aggravations of its production process, as well as a decrease in the practice of burning by mechanization in the harvest.

> Deforestation and the urban and agricultural uses of water in the hydrographic basins of this Region are reducing the level of groundwater, which has been affecting natural ecosystems even when they are in Conservation Units. The decrease in the depth of the water table directly influences the structure of the plant communities in the Wetlands of the Cerrado.

Studies address the issue of deforestation in the Cerrado. The first carried out by IBGE made an environmental diagnosis of the basin in the stretch between Barra do Garça (MT) and Luís Alves (GO). Regarding the situation and use of land in the area, this reveals a high degree of compromise of the natural environment in relation to the effects of anthropic action. Only 8.95% of the land was conserved. The 91.05% was used for

agriculture, urban centers as well as uses of plant and mineral extraction. Of this total, 62% were classified as areas under alert, due to the high rate of deforestation in disregard for environmental legislation, due to the inappropriate use of its agroecological potential and / or use with impactful intensive agriculture [6;16]

As represented by Fig. 12 below, which describes the distribution of deforestation in cerrado regions.

Fig.12: Distribution of deforestation in 2008 in the Cerrado[17]

As for deforestation, it has grown over the years and with the arrival of sugarcane monoculture the situation has worsened. This deforestation causes the loss of biodiversity, soil, water resources and opens the region to the expansion of the fires caused.

In addition to severe climatic changes in the region, river springs are affected by pollution and others are even diverted or dried up; the local stream dries up in September and deforestation causes a serious ecological imbalance and the destruction of local biodiversity, as shown in the Fig. below:

Fig.13: Devastation near the source [18]

The farms are completely taken over by the sugarcane monoculture and the cases have been destroyed. [18] also emphasizes the monoculture exploitation, being that it has characterized greater expansion of the plantation of sugar cane, thus having a predominance of one culture over the others. Intensive monoculture causes an imbalance in the soil and micronutrient deficiencies, as plants with unbalanced nutrition are sensitive to pests and diseases making the use of pesticides much more intense with constant applications.

The increase in social and environmental problems caused especially by human action on nature is today a notable lack in everyone. Another factor that can be described is the burning, common in the Cerrado Region. Fire is one of the determinants of the vegetation of the Cerrado, along with the seasonality of the rains and the soil poor in nutrients. Changes in these factors can result in severe damage to the structure and dynamics of vegetation.

Was also described that the expansion of sugar-energy agribusiness has favored a series of impacts, which highlights land concentration, overexploitation of the workforce and territorial disputes between sugarcane and food crops. [19]

In particular, with regard to the State of Goiás, it was possible to verify the expansion of sugarcane cultivation in pasture and grain areas with strong impacts on the Cerrado's biodiversity. On the one hand, there was the replacement of soybean, corn, cotton, subsistence agriculture, and on the other, the occupation of areas considered priority for the conservation of biological diversity in an area of native vegetation [20].

Currently, sugarcane crops have been occupying the cerrado areas with the predominance of sugar

cultivation. This process has impacted vast areas of the state of Goiás, with an expected increase in these agricultural activities with greater expansion of sugar cane. This, although producing alternative energy, renewable, less polluting, has generated intense processes of deforestation, substituting family production for monoculture, damaging the quality due and interurban, rural / urban migration processes internal and external to the state of São Paulo. Goiás [21]

It can be said that the instruments for implementing the principles of prevention and precaution, as is the case with the Environmental Impact Study and its report, are not intended to prevent the development of economic and social activities. Therefore, close monitoring of the new sugarcane expansion areas is necessary, as well as the restoration of areas of permanent preservation and legal reserve in the areas occupied by sugarcane.

In view of these factors, it is important to develop research aimed at the characterization, conservation, recovery and sustainable development of the Cerrado, being important the domain of knowledge about the ecological processes that govern the structuring and functioning of biotic and abiotic relations in the biome. In the modern world, society needs to recover the concept of sustainability and taking care of the environment is not part of our will, it is the duty of every citizen who occupies space on this great planet called Earth.

It is thus observed that even with the lack of an Environmental Management System (SGA), the company has guidelines and policies aimed at preserving the environment and the cerrado biome. However, deforestation and fires still occur, which directly impact the plant's physiognomy, as it is possible to observe soil compaction through heavy machinery traffic, during planting, and also in the harvesting process, in addition to observing reduction of biodiversity, caused by deforestation and also due to the implantation of sugarcane monoculture. Another note that deserves an approach is the intensive use of pesticides in the production of sugarcane that cause pollution in groundwater and CO2 emissions into the atmosphere, however, this aspect still does not have much approach and preventive policies.

Cities suffer practically throughout the year from the occurrence of fires in the cane fields. And this has an impact on the health of the population and workers, which can cause respiratory diseases mainly due to exposure to smoke, fire and flames. There should be an increase in hospitalizations for Respiratory Diseases in the period of burning of sugarcane. And, even in the face of such evidence, there are inefficiencies of public policies regarding the assessment of risks that directly affect human health.

It is concluded, then, that the sugarcane agribusiness has representativeness in terms of socioeconomic development, however, it has caused direct and indirect impacts on the environment, as well as the population's health with an increase in respiratory diseases.

Burning sugarcane residues is a widespread practice in the world, especially in developing countries, but not exclusively in them. This type of burning contributes significantly to pollution in southeastern Louisiana, in the United States, where the practice has suffered increasing objections from the population [22], State law allows such a practice, claiming that there is no scientific evidence of negative impacts. To provide information on possible health effects, a study was carried out based on hospital visits of 6,498 patients diagnosed with asthma, during the years 1998-1999, in a hospital in the city of Houma, in the same North American state.

Temporal analysis and a control table with three standard deviation limits were used to analyze existing observations. For two years, the monthly average of hospitalizations for asthma was 270.8. Women made up 56.9% of patients and babies had the highest rates, with 1,639 visits, followed by the group of children between five and ten years old. The months with the highest number of hospitalizations were October to December (33.06% of hospitalizations), indicating an increase in the trend of hospitalization for asthma in the months of burning cane straw.[22]

In another study carried out in Piracicaba, SP, daily hospital admissions for respiratory diseases were quantified, in children and adolescents (below 13 years of age) and in elderly people over 65 years old, using data from the Department of Informatics of the Unified System of Health (Datasus). The analyzes indicated that biomass burning and resuspension of soil eroded material are responsible for 80% of the fine particulate material (PM 2.5). Relative risk of hospital admissions for respiratory diseases in children and adolescents was significantly associated with the interquartile variation of PM 10, PM 2.5, aluminum black carbon, silicon, manganese, potassium and sulfur. An increase of 10 µg / m3 in PM was associated with a 21% increase in hospitalizations. In the elderly, the relative risk of hospitalizations for respiratory diseases was associated with the interquartile range of PM10, black carbon and potassium. The burning period had 3.5 times more hospitalizations than the one without burning [23]. However, the author warns of confounding factors such as air temperature and precipitation, since much of the burning period coincides with winter and drought, which were not controlled in the study.

Was analyzed spatial correlations when aggregating in a geographic information system: fires, areas in sugarcane and hospital admissions for respiratory diseases registered by Datasus, from 2000 to 2004, in the state of São Paulo and in regional scale in Bauru. On both scales, it was possible to verify a higher incidence of hospitalizations for respiratory diseases in areas where there is burning in sugarcane. [24]

Other studies have made measurements of atmospheric emissions of different pollutants from the sugarcane burning process, without pointing out health effects. However, due to its results, possible risks to human health can be inferred. Despite being restricted and presenting cautious conclusions, the studies analyzed indicate health risks, in adverse atmospheric conditions, caused by the burning of sugarcane straw.

These risks can be greater for children, the elderly and asthmatics and have the consequence of a greater demand for healthcare services. Until recently, studies with sugarcane were mainly concerned with workers in the production process, as observed with sugarcane cutters who are at higher risk of lung cancer as a result of burning foliage [22]

With the worsening and greater awareness of the planetary environmental crisis, especially of changes in the climate due to polluting human activities, there is an increase in the production of biofuels. Among biofuels, sugarcane is the one that has shown the greatest growth. However, its burning has been receiving growing opposition from public opinion that alleges its environmental impacts and the health of the population in its surroundings, despite the still tenuous performance of Brazilian health agencies in this discussion. In the state of São Paulo, due to pressure from environmentalists, in 2002, a law was passed that provides for the gradual elimination of the use of fire, as a facilitator of cutting cane, until 2021 for mechanizable areas and until 2031 for non-mechanized areas [25].

The few studies on the effects of sugarcane burning give some indication of its impact on the health of the general population, but still leave many questions. On the other hand, research on the effects of burning biomass on health, especially on uncontrolled forest fires, [26] can assist in the definition of health policy for the theme and guide future research.

Was concluded that individuals exposed to biomass smoke experienced greater difficulty in daily activities, but that the effects on general and respiratory health were more difficult to interpret. [24]

IV. CONCLUSION

The agricultural residues burning, since it is an old practice and very widespread in countries with tropical climates to control pests and eliminate crop residues, there are public health issues that need to be better studied at this moment when expanding the production of biofuels.

In addition, future studies on the problem need to focus, in addition to diseases and symptoms of respiratory diseases, especially exacerbation of asthma cases, other effects and risks, such as neoplasms, cardiovascular diseases, impacts on the daily activities of affected people, re-hospitalization of elderly and biological risks.

The substitution of burning by the harvester will certainly benefit the health conditions of people living in the sugar cane areas. However, in order to guarantee the improvement of the health of the cutters, programs for their re-qualification and absorption must be developed and applied urgently.

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