

# **EROSIVE PROCESSES IN THE RURAL AREA OF THE MUNICIPAL DISTRICT OF BALSAS - MA**

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## **INTRODUCTION**

The Geography represents the beginning of all the other sciences that you/they treat of the organization of the terrestrial space, is the science that studies the Earth in his/her diversity in ways, physical interactions and human interventions.

The man, through their activities, is capable to modify the landscape in way positive or negative, the Geography studies the modifications of social and physical order of the landscape and the Geomorphology, as subdivision of this science, he has as object the organization of the atmosphere in a dynamic perspective.

Conceitly, the Geomorphology studies the processes and the relief forms. They are Objects of the geomorphology the processes that take charge of sculpting those reliefs, he wants are for the destructive forces, he wants for the constructive processes.

Through the knowledge obtained with the development of the science geomorphology, the existent relationship was observed between the vegetation and the superficial drainage. It is possible to express the idea clearly that the vegetation offers partial protection for the soil avoiding erosions, what is of extreme importance for the environmental studies.

The man's slowest permanence in certain places, abandoning the system nomadic, he/she began when this noticed that the seeds left at some places germinated and they originated new plants. Observing that phenomenon, the man began noticing at places where it could cultivate the first domesticated plants, for this gave beginning to the process of deforestation of the history in the humanity, it was initiate the agriculture with the planting of the wheat and of the barley, main grains of the feeding of the old people.

In the beginning, the techniques used in the agriculture were rudimentary, based in the it burns of areas to deforest, in the preparation of the earth made being followed the job of the steep plow by ox or horse manually. With passing of the years those techniques they were perfect, but some communities still stay without technology, being possible to verify right delay in relation to the modern techniques.

Along the territory from Maranhão, the agricultural, due job of great variety of techniques is verified her extension and diversity. In most of the Slope From Maranhão, it is well-known the accomplishment of the drill and of the use of the fire for the preliminary cleaning of the land, being followed the planting with job of the hoe and of the own hands to sow, while in the south of the State the reality is totally different being had the available most modern technology.

Before the beginning of the export agriculture in the south of Maranhão, or Interior of Good Pastures as the area was known, he grew the livestock, that he had beginning with the pastoral front expansion originating from of the valley of the river San Francisco, reaching Maranhão for the southeast of the State, starting from 1730, with the installation of great number of farms.

The livestock in the area had prominence in the century XIX, however, due to the great problems faced by the cattle farmers, mainly regarding the infrastructure absence for the cattle transport to the commercial fairs. The soy planting only came to have início starting from 1973, with the arrival of the south-river-grandness, intense the local economy, however provoking some social and environmental problems.

Among so many environmental problems, they stand out the harmful effects of this activity type for the soil that, for being failed to protect of the superficial drainage in the period of the rains, it suffers intense erosive processes that you/they model the landscape of the area. Besides the human activities, the atmosphere suffers the action of other forces that you/they aid in the process of structuring of the landscape.

The objective of this study is to analyze the erosive processes of the located municipal district of Rafts in Maranhão, accomplishing like this the paper of the geomorphology as science that is of projecting, in the space and in the time, the behavior of the processes and the forms of relief resultants.

## **METHODOLOGY**

According to Ross (2000; p. 32), for the application certain methodology it is necessary, on one side, to dominate the theoretical and conceptual content and, for other, to

have ability of the instrumental support technician's handling, and not to confuse, as habitually happens in the research activities.

Among the methods used in the present study, it is pointed out Phenomenal, based on the perception and existence of the studied object (TUAN, 1980). In the Geography, the approach phenomenal is developed by two thought currents: the Geography of the Perception and the Conduct Geography.

In the work the orientation of the two thought currents was adopted guided for the perception of the local landscape, and the analysis of the behavior of the agents modeller of the landscape that is being used for the agriculture.

For the accomplishment of the present study the following activities were developed:

- Rising and analysis of the bibliography related with the theme and the area object of the research, through visits and consultations in libraries of institutions as IBGE, EMBRAPA, FAPCEN, sites of the internet, Central Library of the State University of Maranhão, Central Library of the Federal University of Maranhão, Library of the Nucleus of Documentation, Researches and Geographical Extension of the Department of Geosciences of UFMA;

- Geographical location and delimitation of the municipal district of Rafts, demonstrating their limits and geographical situation;

- Selection of four among the main farms in the rural area of Rafts that you/they develop the cultivation of the soy for the accomplishment of studies of the environmental alterations;

- Geographical characterization of the area and of the selected farms, considering the physical aspects and the human activities related with the space organization of the agricultural activities;

- Accomplishment of field activities understanding observation and evaluation of the environmental impacts related with to the agrarian activities;

- I register photographic of the areas with more impacts for erosive processes and deposition, especially ravines, inside of the farms producing of the grain;

- Interpretation and analysis of the results of the obtained in the last ten years;

- Comparison of the current data with produced them during the first decade of implantation of the activity;

- Preliminary composition and formulation of the preliminary conclusions;

- Elaboration of the final report of the work.

## LOCATION AND GEOGRAPHICAL CHARACTERIZATION

The municipal district of Rafts is located in the south portion of the State of Maranhão, being limited to the north with the municipal districts of New Hills, Fortaleza of the Walnuts and São Raimundo of Mangabeiras; to the south, with High Parnaíba; to east, with the municipal districts of Sambaíba and Tasso Fragoso and to west with Riachão and the State of Tocantins

The municipal district of Rafts is of domain florist of Biomass of the Savannah. Second BRAZIL (1991; p.42), the Savannah is characterized by trees and bushes with twisted trunks and branches short, crooked and covered by a thick peel, that it is distributed in three gradients denominated Closed Field, Savannah and Cerradão.

The Closed Field or Cerradinho concentrates on areas with deficiency of water. Essentially it is rural with trees and dispersed bushes, presenting scattered arboreal covering, of only one species, is very used economically for pastures of the cattle. The Savannah is a formation a little dense, bioextract, where the low is extract and the arboreal possesses irregular ramifications and hardened big leaves. In Cerradão, the trees are of small to medium load and the dominant herbaceous extract.

The regional model understands a geological structure of sedimentary base of the sedimentary basin of Parnaíba, in whose top of sandstones, siltitos and argilitos prevail. The relief is composed by having plated and plains with tops tabulate and sub tabulates whose altitude varies between 300 and 500 m, presenting strong dissection index.

The soils of the area are of the following types: podzólico red-yellow concessionary, sands quartzosas, yellow latossolo and litólicos, what checks the following characteristics: sandy, very drained, erosive, with low fertility natural, low humidity retention associated to the acidity and high porosities presenting fragility erosive varying of medium strong á.

In agreement with Atlas of Maranhão (2002; p. 17) the geological formation of Rafts understands: Covering Detrítica (quaternary), Formation Sardinha (Cretaceous), Formation Pedra of the Fire (Permiano), Formation Piauí (Carboniferous). being the first of the period two Cenozóico and the one of the last of the Palaeozoic.

According to the weather forecast (2003; p. 36) the average regional pluvial is from 1.400 mm a year. The climate is of the hot and humid tropical type. The regime of rains extends from September to April, with larger intensity the months of November and December. The drought period has beginning in the month of May and it finishes in August, tends larger intensity the months of June and July. The annual medium temperature oscillates

around 26th C, with maxims of even of 36°C and minimum averages of 22nd C, however in the month of July, the temperature can fall arriving to reach indexes around 12°C to 14°C.

In agreement with Cabral (1992. p. 59), the occupation of the south of Maranhão, where the municipal district of Rafts is inserted, she had beging with the pastoral front expansion originating from of the valley of San Francisco, for the interior of the State, starting from 1730, installing great number of farms in the interiors of Good Pastures, as well as the area was known.

In the second half of the century XVIII, ahead of cowboys it advances settling in the valleys of the rivers Rafts, Neves and Macapá continually. In the proportion in that it increased the number of farms, the ownership of the earth went if turning more and more difficult transforming the area in dispute stage between the cowboys and the Indians. Of the indigenous tribes that inhabited the area, they remained little, concentrated in the center-south portion of the State, they are them: Kricati, Bacurizinho, Channels, Porcs and part of Guajajaras.

Due to so many problems, to the activity cattle farmer it began to suffer with the decadence process. With the decrease of the bovine creation the population was forced to develop other activities to aid the survival, she was then that she had beging the subsistence agriculture. Starting from 1973, this activity began to be intensified through the cultivation of the rice and of the soy for the south-river-grandness's that migrated for the area of Rafts, due the attractive low price of the hectare of earth and of the incentives offered by the state government.

Due to the adaptation difficulties of the soy varieties to the climatic conditions of the area and the infrastructure lack for storage and drainage of the production, only starting from 1992 the agriculture the soy became lucrative, through the pioneering farmers' initiatives and of administrations of the regional political leaderships, the Federal and State governments, that they improved the conditions of infrastructure of financing of the production, storage and of drainage to the ports through the railroads North-south and Carajás.

## **RESULTS AND DISCUSSIONS**

With the constant growth of the population the need appeared of increasing the nutritious production. Ever since the agriculture comes if developing in search of larger production and profitability.

In Brazil, the reflexes of that tendency have been noticed in several ways, as the introduction of new victuals in the national cookery, in the case of the soy, and of the

agribusiness that has if expanded occupying not only the areas south and southeast, but if expanded for the areas of domain of the savannah, in States as: Mato Grosso of the South, Goiás, Mato Grosso, Tocantins and Maranhão. The main product of the Brazilian agribusiness is the soy, for being an export grain and his market value to be quoted in dollar.

Along his process of economical development, the municipal district of Rafts tried relative complacency in what refers to the productive activities, until the phase of implantation of the culture of the soy, which also needed time and resources to reach the current phase of stability.

The lack of studies thatthey make possible the knowledge of the local environmental parameters is reflected in serious environmental problems that understand the degradation of cultivation areas, pollution and degradation of the natural resources.

The soil of the savannah is very poor and, to become arable, he needs some cares. The farmers deforest the area removing the woody material and they leave for the correction of the soil, doing mainly for the addition of the match and limestone. In the most sophisticated farms, the deforestation is made with the use of two linked tractors by a current moving parallel, making a sweeping in the lands to pull the trees, that method is called chain.

Second Magalhães (1992, p. 20), the soils that dominate the savannah areas are acid, constituting like this a problem for the agriculture, because they are just for the temporary cultures needing punishments through the addition of limestone and manuring.

The soy grain has larger market value that the rice, however, his production has larger negative effect for the soil, leaving him poor and without any use in smaller space of time that the cultivation of the rice. It is necessary there to be a series of cares for the use and conservation of the soil in this culture type.

Most of the farmings of Rafts works through the direct planting, a system for which the residues of the previous culture providing less expenses with chemical products. Therefore, it spends less time preparing the earth, less money and he/she obtains larger productivity. After the crop of the soy, the soil is occupied by an alternative farming that promotes the " rest " of the soil. Among the cultivations more used initially, they stood out the corn, the banana and the pineapple, however, in Agrobalsas 2003, Sorgo was presented as better option for the rest, which, ever since it is in adaptation phase. According to the agronomists' of EMBRAPA researches, Sorgo returns part of the nutrients to the soil and it is also profitable, because in the area there are many cattle farmers and the vegetable serves as food for the animals as bovine, equine and bovid.

With the elimination of the native vegetation, besides poor the soil is unprotected and subject to the agents intemperance's. She is dry, leached and sterile, with direct reflexes in the balance of the atmosphere.

The pluviosidade in the area of the headquarters of the municipal district of Rafts (Table 1) according to NUGEO (2004), it happens with more intensity in the month of December, coinciding with the increase of the number and of the magnitude of the erosive processes in the area.

Month	Average pluvial
January	190,8 mm
February	116,4 mm
March	241,2 mm
April	131,8 mm
May	38,1 mm
June	7,0 mm
July	0,1 mm
August	5,1 mm
September	20,6 mm
October	77,7 mm
November	147,9 mm
December	195,5 mm
Total	1.172,0 mm

Source: NUGEO (2004)

Tabela1. Distribution of rains in the municipal district of Rafts.

Second Carvalho (1994. p. 25), the erosion of the useful earth is what more worries, therefore the soil is constituted in a layer of just some meters under the constant erosive action. In the case of the agriculture, the fertile part is still smaller, of little thickness, representing a serious problem when it happens his wear and tear.

Lobardini and Moldenhauer apud Carvalho (1994. p. 37), they developed a relationship that allows to use the values of annual and monthly medium precipitation, to know the monthly average of the erosion index:

$$EcI = 6,886 \left( \frac{Pm}{P} \right)^{0,85}$$

Being;

EcI = monthly Average of the erosion index

Pm = monthly medium precipitation (mm)

P = annual medium precipitation (mm)

Applying the formula the reality of the municipal district of Rafts, be obtained the following result:

$$EcI = 6,886 \left( \frac{97,6^2}{1.172} \right)^{0,85}$$

$$EcI = 6,88 (8,12)^{0,85}$$

$$EcI = 8,532 \times 6,886$$

$$EcI = 58,75$$

The obtained value demonstrates that the soils of the area research object reach medium fragility degree. Ally the that natural fragility, is the weak protection degree given to the soil by the vegetable covering, in the case agriculture of short cycle (rice, corn, soy), face to the action of the pluvial waters. Starting from what it was affirmed, it is possible to determine a attendance type trying to recover what was already damaged, and to avoid that that problem type continues happening in the municipal district in an intensive way.

#### **FINAL CONSIDERATIONS.**

The export agriculture brought dynamism to the economy of Rafts, but it is provoking serious problems of environmental character, that space besides the erosion of the soil. It removed of Rafts the air of city of the interior, it collaborated with the idea of formation of a new State, " Maranhão of the South ", being, Rafts, fort runs for office the capital.

The municipal district has great tourist potential, fortunately little explored, but it already begins to receive tourists mainly the months of June and July, interested in Santo



Antonio's feasts, in the rodeos, in the waterfalls, in the walk for the river Rafts and in the exhibition technology agriculture.

The city has been winning national projection as a new agricultural border in the middle of the development and the reflexes of that agricultural pole can be observed even when she are arriving to Rafts, for terrestrial transport, from the margins of the highways it is seen erosive processes due to the exhibition of the soil for vegetation lack, the savannah is practically inexistent if compared the immense extensions of cut farmings by the highway.

The intensification of the production and the rejection of the population to the products transgenic, suggests the modification of the local agriculture. The ecologic agriculture has been a lot accepts at the market due to the search of the world population for better life quality. That measured is not adopted still for the soy, however it is a good alternative to minimize the effects of environmental degradation that they would be softened considerably mainly by the decrease of pesticides that you/they would be being used in the farmings.

Several techniques have been applied to avoid the harmful effects of the soy cultivation, among which she stands out the development of the systems agroecológicos that they have been demonstrating to be possible to produce propitiating the natural possibility of renewal of the soil, it facilitates the recycling of nutrients of the soil, it uses the natural resources rationally and it maintains the biodiversity, that is very important for the formation of the soil. However this method still has not been applied in the soy production in the south of Maranhão.

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