

BIOGEOGRAPHY OF THE CENTRAL MESOREGION OF MARANHÃO (BRAZIL)

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ABSTRACT: The central mesoregion of Maranhão is composed of 42 cities located in the middle valley of the Mearim River and divided into three microregions. The region has a high density, however, concentrated in a rural zone where the practice of the subsistence agriculture is great. There are two types of climate considered: a sub-humid climate of C2 type and dry sub-humid climate of C1 type. This work aimed to characterize the central region of Maranhão in demographic, economic and natural resources aspects. Geologically, are found seven types of soils in the region, occurring with greater relevance the Yellow Latosols that even with high acidity, are handled and stand out for hosting large monocultures areas. Is worth highlighting the high Mearim, Grajaú, and Pindaré cities microregion, by the practice of rice cultivation in the lower and fertile areas and farming practices in the Cerrado domain. Livestock in this region is characterized extensively with the cattle (mixed race and Dutch zebu), specifically for slaughter and milk production. Currently, the region is suffering by the removal of natural vegetation and mainly the removal of babassu palm (*Orbignya phalerata*) for housing the agropastoral system that directly harmed the extraction of babassu almond and its derivatives generating great conflicts. The industry is concentrated in some cities, focusing on food production, woodworking and metallurgic. The main biome is Cerrado, which is being removed for several purposes, however, some natural areas are taken as reservation, highlighting the Conservation Unit Private Reserve of National Patrimony (PRNP), in Bacabal city that seeks the protection of remaining forests of cocais.

Key words: biogeography, Middle Mearim, Microregions of Maranhão State.

BIOGEOGRAFIA DA MESORREGIÃO CENTRO MARANHENSE (BRASIL)

RESUMO: A Mesorregião Centro Maranhense é formada por 42 municípios localizada no médio vale do rio Mearim e dividida em três microrregiões. A densidade da região é alta, porém concentrada na zona rural, onde a prática da agricultura de subsistência é grande. Há dois tipos de clima considerado: clima subúmido do tipo C2 e clima subúmido seco do tipo C1. Objetivou nesse trabalho caracterizar a região centro maranhense em aspectos demográficos, econômicos e recursos naturais. Geologicamente, são encontrados sete tipos de solos na região, ocorrendo com maior relevância os Latossolos amarelo que mesmo com acidez elevada, são manejados e destacam-se por abrigar grande áreas de monocultivos. Merece destaque a microrregião do Alto Mearim, Grajaú e município de Pindaré pela prática do cultivo de arroz nas áreas mais baixa e férteis e práticas agropecuárias no domínio de Cerrado. A pecuária nessa região caracteriza de forma extensiva com a criação de bovinos (raça mestiça e holandesa zebu), especificamente para corte e produção de leite. Atualmente a região vem sofrendo pela retirada da vegetação natural e principalmente retirada da palmeira de babaçu (*Orbignya phalerata*) para abrigar o sistema agropastoril que prejudicou diretamente a extração da amêndoa do babaçu e seus derivados gerando grandes conflitos. A indústria é concentrada em alguns municípios, com enfoque na produção alimentícia, madeireira e metalúrgica. O bioma principal é o Cerrado que vem sendo retirado para diversos fins, no entanto algumas áreas naturais são tidas como reserva, destacando a Unidade de Conservação Reserva Particular do Patrimônio Nacional (RPPN) no município de Bacabal que visa a proteção de remanescente de matas de cocais.

Palavras-chave: biogeografia, Médio Mearim, Microrregiões maranhenses.

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1. INTRODUCTION

1.1. Central Mesoregion of Maranhão

Identified in the middle Valley of Mearim River and its tributaries, is one of the oldest

populated areas of Maranhão inner, with elevated densities of the rural population, emphasizing an important area of agricultural economy (Figure 1).

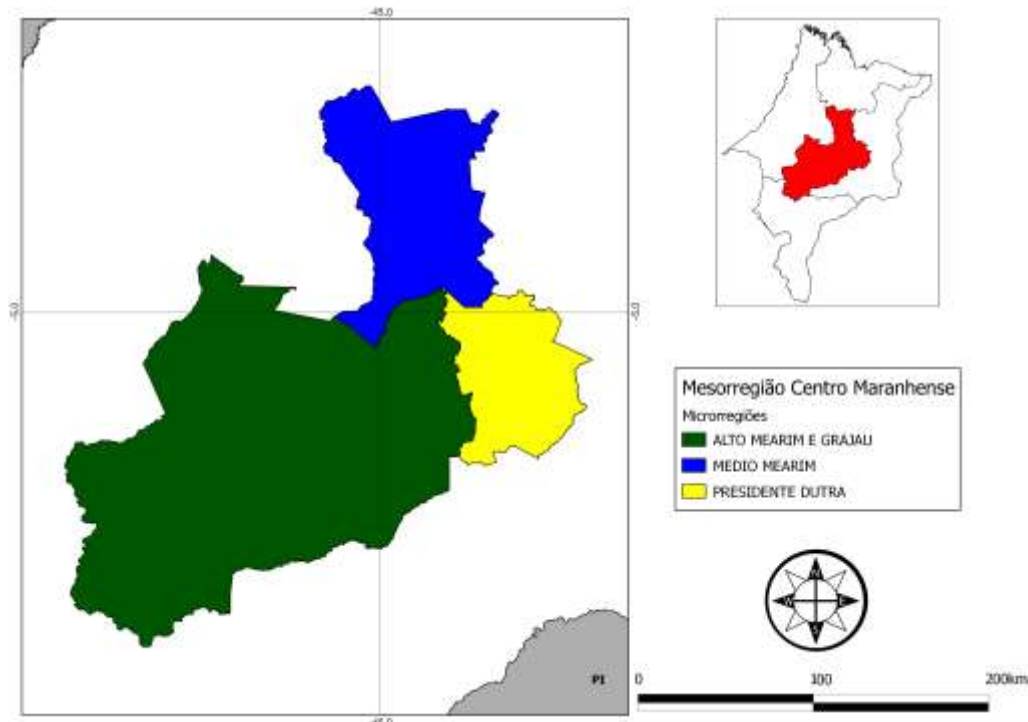


Figure 1. Image of the Central mesoregion of Maranhão and microregions: Alto Mearim e Grajaú, Médio Mearim and Presidente Dutra.

Central Mesoregion of Maranhão State (Brazil) - Population 848,790		
Microregion of Médio Mearim (Population 404,841)	Microregion of Alto Mearim e Grajaú (Population 266,581)	Microregion of Presidente Dutra (Total population 177,368)
Bacabal		
Bernardo do Mearim		
Bom Lugar		
Esperantinópolis		
Igarapé Grande		
Lago do Junco		
Lago dos Rodrigues		
Lago Verde		
Lima Campos		
Olho d'Água das Cunhãs		
Pedreiras		
Pio XII		
Poção de Pedras		
Santo Antônio dos Lopes		
São Luís Gonzaga do Maranhão		
São Mateus do Maranhão		
São Raimundo do Doca Bezerra		
São Roberto		
Satubinha		
Trizidela do Vale		
	Arame	Fortuna
	Barra do Corda	Dom Pedro
	Fernando Falcão	Gonçalves Dias
	Formosa da Serra Negra	Governador Archer
	Grajaú	Governador Eugênio Barros
	Itaipava do Grajaú	Governador Luiz Rocha
	Jenipapo dos Vieiras	Graça Aranha
	Joselândia	Presidente Dutra
	Santa Filomena do Maranhão	São Domingos do Maranhão
	Sítio Novo	São José dos Basílios
	Tuntum	Senador Alexandre Costa

Figure 2. Central Mesoregion of Maranhão State (Brazil), and the three Microregions are shown with their municipalities.

The Central mesoregion of Maranhão is one of the five mesoregions of the State of Maranhão. Is formed by the linkage of 42 cities grouped into three microregions (Figure 2).

In the past, this mesoregion was occupied by small producers proceeding from other northeastern areas, which were directed to the agricultural activity, such as planting of food crops, mainly the rice, making it a traditional agricultural activity of this mesoregion space, followed by other cultures such as beans and maize.

2. CLIMATE/TEMPERATURE

Figure 3 shows the characterization of the climate for Maranhão carried out based on the weather classification described by Thornthwaite (1948).

This way, four climatic types were identified in the state, which ranges from a dry sub-moist climate that prevails in the Southeast, until the moist, which prevails in the extreme northwest. Are described below the two main weather patterns that occur in the central mesoregion of Maranhão:

- **Sub-moist climate of the type (C2)**, with moderate water deficiency in the winter, during the months of June to September, mega thermic (A'), in other words, the monthly average temperature always above 18 ° C, being the sum of the potential evapotranspiration in the three warmer months of the year is lower than 48% in relation to the annual potential evapotranspiration (a');
- **Dry sub-moist climate of the type (C1)**, with little or no excess water, mega thermic (A'), in other words, the monthly average

temperature always higher than 18 ° C, being the sum of the potential evapotranspiration in the three warmer months of the year is lower than 48% in relation to annual potential evapotranspiration (a').



Figure 3. Map of Maranhão climate classification, 1971-1990. The influence zones of climate influence over-designed using as a basis data from IBGE, 2001, NUGEO, 2011.

3. SOILS

According to Araújo et al. (2011), the main soil classes found in Maranhão state that express greater importance, the socio-economic point of view are:

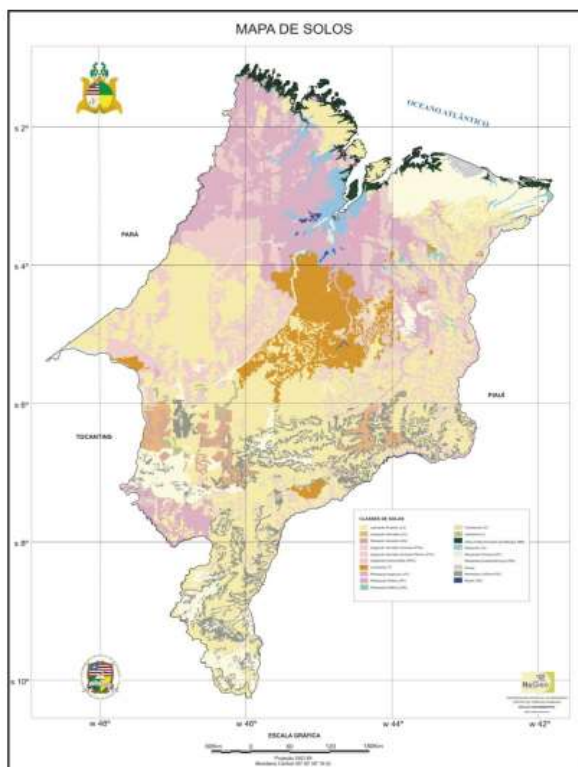
- Yellow Latosol (33.87%),
- Argiluvic Plinthosol (13.67%),
- Red Yellow Argisol (9.54%),
- Petroplintic Red Yellow Argisol (9.22%),
- Quartzarenic Neosols (8.84%),

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- Litholic Neosols (6.98%), and
- Chromic Luvisol (6.70%)

The seven classes listed above correspond to 88.82% of the state. The soil classes with lower cartographic expression are: Gleysols (1.89%); Indiscriminate Soils of Mangrove (1.85%); Red Nitosol (1.38%); Red Latosol (1.20%); Neossolos Flúvicos (1.07%); Petric Plintisol (0.94%); Wind Neosols - Dunes (0.38%); Vertisols (0.34%); Natric Planosol (0.27%); A Grey Argisol (0.20%); and Cambisol (0.07%). These classes correspond to about 10% of the state (Araújo et al., 2011).

Figure 4 shows the soil classification map.



Fonte: IBGE (2001); NUGEO (2011).

Figure 4. Maps of soil occurrence in Maranhão.

Yellow latosols are the most relevant soils, by representing about 33.87% of all Maranhão territory, occupying about 112,404.48 km². Highlights the occurrence of this type of soil in the Cerrado from Maranhão, mainly in the central-south region

where has been verified a constant soybean monoculture advance, beyond the maize, beans, cassava and planted pasture.

4. RELIEF

4.1 Dissected plateau Gurupi-Grajaú

The Dissected Plateau Gurupi-Grajaú occupies the central-western sector of Maranhão state and is represented by a set of elevated tabular surfaces (Figure 5).



Figure 5. Relief dissected into tabular mounts in the front of the low dissected plateaus in the interfluvium between Mearim and Grajaú rivers; frequent laminar erosion. MA-245 Highway (Lago da Pedra – Rock lake).

This plateau is upgraded, irregularly, in different altimetric elevations, being rising from west to east, varying between 200 and 450 m. The dissected plateau stands out topographically of the flat or flattened reliefs of the Baixada Maranhense, of the Subcoastal surface of Bacabal and of the Planed surface of Maranhão Northwest, located at north and northeast, by a bustling front of dissected hills and mounts. Occurring in soils with textural gradient, well drained and deep (Yellow Argisols and Red-Yellow dystrophic (Araújo et al., 2013)).

5. HYDROGRAPHY

The basin of Mearim river has an area of approximately 99,058 km² (Table 1), if considered the Pindaré river, which drains at only 20 km from its mouth and Grajaú, which drains into the Mearim through Rigó channel, already in Golfão Maranhense. The Mearim River comes from the Menina mount, near to Fortaleza dos Nogueiras, at 650 m altitude, under the name of Ribeirão Água Boa.

The Grajaú River is the most extensive watercourse of Mearim basin. Comes with the Cinta mount, in the extreme southwest of the state and moves in a southwest-northeast direction, draining the central portion of the basin Mearim (Rios, 2005).

Table 1. Mearim Basin data.

	Area (km ²)	% area Maranhão State	Population Total
Bacia hidrográfica do Rio Mearim	99,058.68	29.84	1,681.307

The seasonal fluvial variations of the Mearim River and its tributaries occur in more or less frequent pace. The floods usually happen in the same periods of the year. The Mearim has a simple hydrological regime, with two well-defined seasons: the maximum water - floods - that go from February to May and the minimum - dry or low waters - which extend from August to November. Toward to the lower course, occur small changes in these periods, with some delay of the rainy season (Rios, 2005).

6. AGRICULTURE IN CENTRAL MESOREGION OF MARANHÃO

According to Rios (2005), the microregion of Alto Mearim and Grajaú the rice farming is practiced in the moist and fertile areas, while the livestock is held in the Cerrado. For being an old occupation area and of traditional thin and of the unequal economy, the population is taken to focus mainly on the moister down. In this project, the agricultural combinations are characterized by a great predominance of rice and by primitive agriculture, located in the spontaneous populating zones, which recently started to produce in commercial form the Jaborandi.

In the microregion of the Middle Mearim, the rice production occurs with greater intensity in the microregions of Pindaré, Alto Mearim, and Grajaú, beyond Chapada do Alto Itapecuru, Presidente Dutra, Imperatriz, Caxias and Médio Mearim; the anioc, in the microregions of Baixada Maranhense, of Gurupi, of Baixo Parnaíba and of the North Coast. The bean crop is strong shy in the region when compared to the microregions of Maranhão as Pindaré, Alto Mearim, Grajaú and Baixo Parnaíba (Rios, 2005).

In the microregion of Presidente Dutra, the agricultural production is based on rice culture, practiced, in large part, by the occupants and tenants. Recently, it has been introduced, in this microregion, a modern agriculture, with fertilizer use, focused on the extractive production of babassu palm (*Orbignya phalerata*) that constitutes complementary activities. Babassu palm is traded outside the area. The city of Presidente Dutra, at the junction of highways of longitudinal and transverse traces, has

been benefiting, for its central location in relation to other cities (Rios, 2005).

7. LIVESTOCK IN CENTRAL MESOREGION OF MARANHÃO

In relation to the traditional nursery activities, this is carried out extensively in the Cerrado, where predominate the cattle raising of mixed race and the Dutch zebu, for beef and milk. It is a production of commercial nature, for the supply of urban centers of São Luís area. It is about the insertion, in this mesoregion, the main dairy basin of Maranhão, in the microregion of the Medio Mearim (Rios, 2005).

According to Rios (2005), livestock goes obtaining an important highlight in Maranhão economy; to reduce the rice cultivation and the introduction of dairy cattle on planted and fenced pastures. A livestock marked by modern technologies of management and genetic improvement is consolidated in the Médio Mearim region (city of Bacabal and adjacencies). The significant growth of the cattle herd puts Maranhão as the second largest producer in the Northeast, after Bahia, with more than 18% of the total regional herd. According to the agricultural census of the IBGE in 2000 to 2005, the cattle herd increased from 4 million heads to 6.5 million, grow of more than 60% in five years; today, there is more than 7 million head (FIEMA, 2009).

8. CONFLICTS BETWEEN MARANHÃO PEOPLE AND ENTREPRENEURS

A bibliographic survey, historical- economic carried out by Oliveira (2008) showed that in the 70s and 80s were intensified the conflicts between landowners and extractives because of Maranhão state government incentive policy for the raising cattle. Extensive forest areas belonging to natives were taken and gave way to open fields for the creation of buffaloes and cattle or planting of economically attractive species. Families who lived off subsistence crops have seen their way of life change dramatically.

The babassu coconut (*Orbignya phalerata*) that comprise the Cocais Forest became removed with the action of capitalist squatters, giving space for agropastoral expansion. In this period many organized groups asked with the state government charging providences. Many conflicts have marked this period (Oliveira, 2008; Brito et al 2013).

This reality, certainly, was much more felt in some parts of the state, such as the Médio Mearim. This microregion is dotted of an extensive area of babassu palm and marked by a significant number of conflicts involving coconut breakers and ranchers. This situation has generated discomfort to the families who lived off the extraction linked to the babassu coconut. These people from Maranhão lost their land to large landowners and to pursue in their culture of extraction and livestock subsistence, they had to ask permission to the farmers to extract the babassu coconut in the large properties (Rios, 2005; Oliveira, 2008).

9. INDUSTRY

According to Rios (2005), the center of Maranhão region presents an industrial

district in Bacabal and some types of industries as following below:

- The industry of food products - rice processing, bakery, oilseeds and agricultural products (Barra do Corda, Presidente Dutra, and Bacabal).
- Lumber Industry. Supply of wood for making furniture and paper. (Barra do Corda and Grajaú). Construction industry – (Bacabal); Metallurgical industry (Pedreiras), etc.

10. ENDANGERED BIOMES

10.1. Biome Cerrado

The Cerrado is traditionally used for extensive livestock farming, has been degraded for other purposes as: the exploitation of wood for processing into charcoal, replacement of traditional culture (rice, maize, etc.) by the recent soybean cultivation due to its economic value. In the Médio Mearim region the abundance of one representative of palm trees: the babassu coconut (*Orbignya phalerata*). This species forms a lush forest called Cocais Forest. That has been decimated by small producers and large farmers, making space for modern enterprises of Maranhão agribusiness (RIOS, 2005; OLIVEIRA, 2005).

10.2 Biome Amazon

The transition conditions between the super-moist climate of the northern region and the semi-arid climate of the Northeast region reflect, in large part, in forest cover in Maranhão. The forest from Maranhão presents high rates of deforestation and is

one of the most impacted by human action in Brazil. Together with the area of Cocais is the largest producer of rice of the State, also highlighting in the production of maize, beans, cassava and castor bean (RIOS, 2005; OLIVEIRA, 2008).

11. CONSERVATION AREAS

The central region of Maranhão has few areas of environmental conservation, as regards to areas for conservation of native species into natural reserves, even with fragile ecosystems that are impacted by inconsequential human actions. Among an example of the Conservation Unit, we can mention the Private Reserve of National Patrimony (PRNP) –SÃO FRANCISCO RESERVE. This unit belongs to the city of Bacabal. It presents 150 hectares and was founded on July 7, 1996, with the fragment protection purpose of Cocais Forest. Other areas of important environmental partner interest are indigenous reserves. In the cities of Grajaú and Barra do Corda, many indigenous peoples are found (Tab. 2).

Table 2. Indigenous areas contained in central Maranhão.

Indigenous ares	Cities
Bacurizinho	Grajaú
Geralda / Toco Preto	Grajaú
Lagoa Comprida	Grajaú
Morro Branco	Grajaú
Urucu / Juruá	Grajaú
Kanela – Buritivelho	Barra do Corda
Porquinhos – Aldeia Chinela	Barra do Corda
Rodeador	Barra do Corda
Cana Brava Guajajara	Barra do Corda e Grajaú

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Protected indigenous lands preserve the culture of these peoples and contribute to the preservation of numerous native species.

12. CONCLUSIONS

Maranhão center is an economically area highlighted by agriculture and the concentration of some industries that greatly contributes to the region's economy. Is in the constant economic expansion, however, this growth has been eliminating the native vegetation and causing extensive damage to subsistence agriculture and babassu coconut breakers.

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