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CHARACTERIZATION OF THE MUNICIPALITIES OF AMAPÁ STATE, BRAZILIAN EASTERN AMAZON, REGARDING THE DIFFERENCES IN THE LEVELS OF DEVELOPMENT

CARACTERIZAÇÃO DOS MUNICÍPIOS DO ESTADO DO AMAPÁ, AMAZÔNIA ORIENTAL BRASILEIRA, QUANTO ÀS DIFERENÇAS NOS NÍVEIS DE DESENVOLVIMENTO

Janayna Santos de Sousa Costa¹

Wardsson Lustrino Borges²

Abstract

The present study was carried out considering the 16 municipalities of the state of Amapá, Eastern Amazon, and its objective was to comparatively analyze the level of development of the municipalities through the analysis of three groups of indicators, the conditioning factors, the characteristics, and the effects or consequences of the development process. Cluster analyses were performed to identify distances and rank the municipalities in Amapá State. We conclude that Macapá and Santana have the best indicators related to development conditions. Porto Grande stands out with the largest number of agricultural establishments in the indicators related to family agriculture. Macapá distances itself from the other municipalities in relation to health-related indicators and the vehicle fleet. The municipality of Serra do Navio has indicators that point to improvements in living conditions and schooling, while the municipalities of Laranjal do Jari and Santana point to higher income and poverty reduction. The municipality of Mazagão, presents the worst indicators related to improvements in living conditions and schooling. The cluster analysis allowed the simultaneous evaluation of a large number of indicators, and the results observed can help decision makers in important processes such as the elaboration, implementation, and evaluation and control of public policies, especially those with a territorial approach.

Keywords: Amapá. Regional Development. Indicators.

Resumo

O presente estudo foi realizado considerando os 16 municípios do estado do Amapá, Amazônia Oriental e, teve como objetivo analisar comparativamente o nível de desenvolvimento dos municípios, através da análise de três grupos de indicadores, os fatores condicionantes, as características e os efeitos ou consequências do processo de desenvolvimento. Foram realizadas

¹ Master in Regional Development (UNIFAP) Agricultural Extensionist at the Rural Development Institute of Amapá, Macapá – AP, Brazil. Email: naynareis@yahoo.com.br

² PhD in Soil Science (UFRRJ). Researcher at Embrapa Amapá. Permanent Professor of the Graduate Program in Regional Development at the Federal University of Amapá, Macapá – AP, Brazil. E-mail: wardsson.borges@embrapa.br

análises de agrupamento para identificar as distâncias e hierarquizar os municípios do Estado do Amapá. Conclui-se que Macapá e Santana possuem os melhores indicadores relacionados aos condicionantes do desenvolvimento. Porto Grande se destaca com o maior número de estabelecimentos agropecuários nos indicadores relacionados à agricultura familiar. Macapá se distancia dos demais municípios em relação aos indicadores relacionados à saúde e a frota de veículos. O município de Serra do Navio apresenta indicadores que sinalizam para melhorias das condições de vida e da escolaridade e os municípios de Laranjal do Jari e Santana, para elevação da renda e redução da pobreza. O município de Mazagão, apresenta os piores indicadores relacionados às melhorias das condições de vida e da escolaridade. A análise de agrupamento permitiu avaliar simultaneamente um elevado número de indicadores e os resultados observados podem auxiliar os tomadores de decisão em processos importantes como elaboração, implementação e avaliação e controle de políticas públicas, especialmente as políticas com abordagem territorial.

Palavras-chave: Amapá. Desenvolvimento Regional. Indicadores.

Introduction

The term development can have several meanings, and one of them is to be understood as a process of evolution, growth and/or change to steps or stages considered higher, of an object, person or situation. Development usually applies to a national economy or society, but extrapolations to larger spaces such as development of the Asian continent or smaller ones such as development of the Eastern Amazon region or rural development are also common. Development can also be applied to objective situations such as the development of a country or a city (OLIVEIRA, 2002).

Measuring only the economic growth of a region, that related to income or gross domestic product, does not contemplate the various dimensions of development that a place is capable of presenting, masking results that can be as negative as positive. According to Favareto (2007), when only economic growth occurs, there may be an increase in inequality between classes, since other dimensions of development are not necessarily contemplated. A country with a high gross national income (GNI) that has a high number of polluting industries and companies as high as its income, can cause numerous diseases to decrease the life expectancy of its residents, causing economic growth, but leading to a worsening in the quality of life of its inhabitants.

In recent years Brazil has undergone a process of simultaneous and unprecedented reduction of poverty and income inequality, but the advances in this direction have not been supported by forms of economic growth aimed at a lower use of energy and materials (ABRAMOVAY, 2010), which in the future may show us that growing only one side of the scale can unbalance the results.

Rodrigues (2018), in a study on social capital and regional development in Brazilian municipalities, pointed out that the development process has exactly direct connection with non-economic causes. Cabugueira (2000) emphasizes the importance of the participation of local actors, saying that they are fundamental in the development process, but that it is not enough to promote it, and that specialized professionals are needed for this to happen. Sachs (2004) differentiates development from economic growth, understanding that the objectives of development go beyond the multiplication of material wealth and states that “growth is a necessary but by no means sufficient condition, much less an objective in itself, for achieving the goal of a better, happier, and more complete life for all”.

Melo & Parré (2007) point out that measuring development is not a simple task, for it involves many transformations, making it necessary to raise a series of qualitative and quantitative indicators related to demographic, social, economic, and environmental factors that can help in the study of the process. Bresser-Pereira (2006) argues that the use of indicators alone is not enough to study development, pointing out that it is necessary to incorporate a study of the historical process of evolution of each location.

Approaches to Development

Nowadays various approaches to development are presented, such as sustainable development, human development, rural development, regional development, and territorial development. Sustainable development was conceptualized in the 1980s as the development model that seeks to meet the needs of current generations without compromising the ability of future generations to meet their own needs (NOSSO FUTURO COMUM/ RELATÓRIO BRUNTLAND, 1987). For Canepa (2007) sustainable development is characterized as a process of change, “in which the exploitation of resources, the management of technological investment, and institutional changes are made compatible with the present and the future”.

Another development approach that has been in evidence over the past three decades is Human Development, defined as a process of enlarging people's choices so that they have capabilities and opportunities to be what they want to be (SEN, 2000). The Human Development Index (HDI) created by the Pakistani economist Mahbub ul Haq, in collaboration with the Indian economist Amartya Sen, winner of the Nobel Prize in Economics in 1998, aims to be a counterpoint to development understood only through the gross domestic product per capita (GDP per capita).

Rural development is a set of actions that causes or intends to cause changes in the rural environment (BEGNINI; ALMEIDA, 2016). Kageyama (2008) defines rural development as the passage, for a given territorial space, from isolation to integration with the urban and other sectors of the economy, and from specialization to economic and social diversification. For this passage, or what would in fact be rural development to occur, the author understands that some factors are indispensable, such as less unequal access to land and education; presence of diversified agriculture and spatial concentrations of activities, combined with a dense and well distributed urban network and the presence of adequate institutional arrangements. Understanding rural development requires an ongoing dialogue with social science theories (CONTERATO; RADOMSKY; SCHNEIDER, 2014). Celso Furtado, Brazilian economist and Regional Development researcher, understood that development, even the regional one, had to be thought and planned as a whole, nationally and even internationally, bearing in mind that no region is alone or should be thought of in isolation (DINIZ, 2009).

An approach considered to be quite broad that takes into consideration conditioning factors, characteristics, and effects or consequences of the development process has been used in empirical analyses of the degree of development (KAGEYAMA, 2008). Factors conditioning the development process are those considered essential for development to occur. These characterize territorial differences in terms of demographic and economic base, the result of possible differences in the historical trajectories of the transformation processes of activities and population. Characteristics of the development process aggregate indicators related to the manner and/or options selected by the territory's population, regarding the activities and how to carry them out in the development process. Finally, the effects or consequences of the development process consist of the changes observed in the quality of life indicators of the population and the environment, assuming that the combination of the conditioning factors with the characteristics produces various economic, environmental, and social effects or consequences.

Amapá State

Located in the extreme north of Brazil, the state has an area of 142,828 km², representing 3.7% of the territory of the northern region and 1.67% of the Brazilian territory. It is bordered to the east by the Atlantic Ocean, to the north by French Guiana, to the south by the State of Pará, to the southeast by the Amazon River, and to the west by Pará and Suriname. The distance between the most extreme points of the state, to the North, in the municipality of Oiapoque, and to the South, Vitória do Jari, is 553 km as the crow flies, and between East and West is 560 km, going from the municipality of Amapá in the far East to the Serra do Tumucumaque in the municipality of Laranjal do Jari in the far West. Administratively the state is divided into sixteen municipalities. Of a total population of 750,912 (IBGE, 2015), 89.77% are concentrated in urban areas, and 74.2% are concentrated in only two cities: the capital Macapá (59.49%) and Santana, 16 km from the capital (14.72%).

Amapá is considered the most preserved state in Brazil, with approximately 72% of its territory set aside for conservation units. There are nineteen conservation units and five indigenous lands, forming the Amapá Biodiversity Corridor, occupying an area of more than nine million hectares. Despite presenting numerous potentialities from the point of view of natural resources, the gross domestic product (GDP) in 2015 reached only R\$13 billion, representing 0.2% of the national

GDP. The tertiary sector is the sector with the largest participation in the state GDP (85.8%). There is still no true industrial economy in the state, so that the secondary sector represents only 12.1% of the GDP and, the primary sector is the one with the smallest participation in the economy, representing 2.1% of the GDP (IBGE, 2015).

It is imagined that there are several possibilities for development in the state, and the greater the availability of information for the decision-makers, whether public or private, the more actions can be organized with the intention of developing the Amapá State municipalities. Having as hypothesis that the municipalities of Amapá State present marked differences in relation to the current development level, this study aimed at comparatively analyzing the development level of the sixteen municipalities of Amapá State considering different indicators, related to the conditioning factors, characteristics, and consequences of development.

Data Survey and Analysis Methodology

The analysis of the degree of development of the municipalities in Amapá State was carried out based on three categories of indicators. The conditioning factors of development included indicators of wealth endowment, isolation of the territory and its infrastructure, presence of family farming, demographic factors, and access to education. For the development characteristics, agricultural activity indicators, environmental preservation indicators, health indicators, and social indicator were used. Finally, for the observed impacts, the indicators of reduced rural exodus, increased income and poverty reduction, improved living conditions, and schooling were evaluated. We sought an indicator related to the road network (in km) per municipality, to be part of the analysis of the territory's isolation and its infrastructure, but it was not possible to obtain the data from the competent bodies.

The data and information were collected from official databases available in public agencies, as shown in Table 1. In possession of the data, the cluster analysis was performed, which aims to divide the elements of a sample, or population, into groups so that the elements belonging to the same group are similar with respect to the characteristics (indicators) that were measured in them, and the elements in different groups are heterogeneous with respect to these same characteristics (MINGOTI, 2007). For these analyses a Euclidean Distance index and Ward's clustering method (Ward's method), available in the PAST- Palaeontological Statistics program, were used. Based on the groupings formed for the different indicators, the municipalities were hierarchized, in order to allow an analysis about the differences between them in terms of development.

Table 1: Group of indicators (factors), indicators, source of information institutions, and year the data was obtained by each institution used to evaluate the degree of development of the municipalities in the state of Amapá.

Group of indicators	Indicator	Institutions source of information/Year
Conditioning factors: wealth endowment.	Gross domestic product (GDP), GDP per capita, and GDP by sector (primary, secondary, and tertiary).	* Instituto Brasileiro de Geografia e Estatística – IBGE. Year 2012.
	population living in the municipality. demographic density (number of inhabitants per km ²).	Instituto Brasileiro de Geografia e Estatística – IBGE. Year 2014.
Conditioning factors: isolation of the territory and its infrastructure.	number of vehicles per km ² .	Departamento Nacional de Trânsito. www.denatran.gov.br/frota2015.htm. Year 2015.
	number of internet access operators per municipality, number of operators with telephone service per municipality, percentage of the population in relation to the State.	Inteligência em Telecomunicações. www.teleco.com.br. Year 2014.
Conditioning factors: presence of family farming.	presence of the state rural extension agency in the municipalities.	Instituto de Desenvolvimento Rural do Amapá-RURAP. www.portal.ap.gov.br. Year 2014.
	average area of agricultural establishments (ha).	Instituto Brasileiro de Geografia e Estatística – IBGE. Year 2010.
	number of technicians of the rural extension agency per municipality. number of statements of aptitude to Pronaf (DAPs).	Instituto de Desenvolvimento Rural do Amapá-RURAP. www.portal.ap.gov.br. Year 2014.
Conditioning factors: demographic factors.	demographic dependency ratio, total, urban and rural.	Instituto Brasileiro de Geografia e Estatística – IBGE. Year 2014.
Conditioning factors: access to education.	number of people who attended undergraduate higher education. number of doctors, masters and graduates in the municipality.	Ministério da Educação-MEC. https://www.gov.br/mec/pt-br. Year 2010.
	existence of in-class and distance learning undergraduate courses. number of schools by education stage (infant, elementary, and high school), in rural, urban, and total areas.	Secretaria Estadual de Educação-SEED. Conselho Estadual de Educação. www.portal.ap.gov.br. Year 2010.
Characteristics of the development process: agricultural activity.	production value per ha (R\$). production value per occupied person (R\$).	Instituto Brasileiro de Geografia e Estatística – IBGE. Year 2006.
	relationship between area of crops and other uses. relationship between planted and natural pasture area. number of head of buffaloes.	
Characteristics of the development process: environmental preservation indicators.	km ² deforested in each municipality. forest area, percentage of forest area, percentage of deforestation in forest area.	Secretaria de Meio Ambiente – SEMA. Instituto de Meio Ambiente e Ordenamento Territorial do Estado do Amapá - IMAP. www.portal.ap.gov.br. Year 2014.
	presence of a municipal environmental office, municipal environmental legislation. landfills and dumpsites.	
Characteristics of the development process: health indicators.	** number of health facilities.	www.portal.ap.gov.br. Secretaria de Estado de Saúde. Year 2014.
Characteristics of the development process: social indicator.	detailed fleet of the municipalities, such as cars, motorcycles, scooters, buses, trucks, crawler and wheeled tractors, pickup trucks, and vans.	Departamento Nacional de Trânsito. www.denatran.gov.br/frota2015.htm. Year 2015.
Impacts: reduction of rural exodus.	rural population variation in the decade 2000-2010.	Instituto Brasileiro de Geografia e Estatística – IBGE. Year 2010.
Impacts: income increase and poverty reduction.	per capita household income in R\$. percentage of non-poor. percentage of extremely poor and poor. percentage of employees with a signed labor contract.	Instituto Brasileiro de Geografia e Estatística – IBGE. Year 2010
	HDI-M.	
Impacts: improved living conditions.	life expectancy at birth. mortality up to one year of age. percentage of households with piped water and toilet. electric energy. garbage collection in urban areas.	Instituto Brasileiro de Geografia e Estatística – IBGE. Year 2010.
	expectation of years of study.	
Impacts: schooling.	literacy rate. schooling rate. illiteracy rate.	Ministério da Educação-MEC. https://www.gov.br/mec/pt-br. Year 2010.

* Instituto Brasileiro de Geografia e Estatística – IBGE (IBGE Automatic Recovery System – SIDRA; IBGE/Cities@; IBGE/States@; IBGE/Census 2010; IBGE/ Municipal Agricultural Production; IBGE/ Agricultural Census 2006; Atlas of Human Development).

** Health establishments: Health Academy, Basic Health Unit, Health Center, Secretary of Health, Health Surveillance Unit, Mixed Unit, Mobile Ground Unit, State Central Office for Organ Procurement and Distribution Notification, Public Health Laboratory, Regulation Center, Specialized Clinic/Ambulatory, Diagnosis and Therapy Support

Service Unit, Mobile Unit for Pre-Hospital Urgency/Emergency Level, Indigenous Health Care Unit, General Emergency Room, Emergency Care, General Hospital, Specialized Hospital, Pharmacy, Cooperative, Practice, Psychosocial Care Center- CAPS, and Central Medical Regulation of Emergencies.

Evaluation of the Conditioning Factors, Characteristics and Effects of the Development models in the municipalities of Amapá State, Eastern Amazonia

Conditioning Factors - Wealth of the municipalities

It was observed that the municipalities were distributed into five groups (Table 2). In the first three, were grouped the three municipalities with the largest GDPs, ranging from R\$466,827,000.00 to R\$6,453,597,000.00, and in the last two were the other municipalities with GDPs ranging from R\$49,147,000.00 to R\$290,832,000.00. In group A was the capital Macapá, in B, Santana, and in C, Laranjal do Jari. The other municipalities were in groups D and E, and were separated according to the participation of the tertiary sector in the GDP, being in group D the municipalities with participation up to R\$ 99.699.000,00 and in group E from R\$ 110.757.000,00 to R\$ 219.267.000,00.

As can be seen, there was an intense influence of the gross domestic product figures on the formation of the groups. Based on the results presented, we noticed a strong concentration of the factors conditioning development in the capital Macapá and in the municipality of Santana. Services is the sector with the highest participation in all municipalities. In Macapá this sector represents 90% of the GDP and the participation of the primary sector in Macapá and Santana is extremely low, corresponding to 0.79 and 1%, respectively. In Laranjal do Jari and Vitória do Jari, the tertiary sector accounts for 89% and 86% of the GDP, respectively. Although these municipalities have industries in their territories, which should theoretically increase the participation of the transformation sector, in both cases the companies operate both in the State of Amapá and in the State of Pará.

Serra do Navio is the municipality with the lowest participation of the tertiary sector in the GDP (55%) and with the highest participation of the secondary sector (34%), followed by Pedra Branca do Amapari, Ferreira Gomes, Calçoene, and Santana. This can be explained by its history as a suitable location for manganese exploration, having been the stage in the recent past of "the first modern and large-scale mineral enterprise carried out in the Brazilian Amazon" (DRUMMOND & PEREIRA, 2007), referring to the establishment of ICOMI in the municipality for ore exploration, changing considerably the economy of the region. The construction of the Ferreira Gomes hydroelectric, the mineral exploration in Calçoene and Pedra Branca, as well as the presence of a port area and proximity to Macapá and Santana, are responsible for this greater participation of the secondary sector in the economy of these municipalities.

Conditioning Factors - Isolation of the territory

Three groups were formed (Table 2). In this case population size had a strong differentiating effect among the municipalities. In group A are Macapá and Santana, and in group B, Laranjal do Jari. The remaining municipalities were distributed in five subgroups of group C. We observed in group A a population density higher than 60 inhabitants per km², a number of cars higher than 14 cars per km², a total population higher than 100,000 inhabitants, and the presence of four telephone operators. In group B is the only municipality with a population between 40 and 100 thousand inhabitants. In group C are the municipalities with up to 24,000 inhabitants, with less than one car per km², and with the presence of up to two telephone operators.

Amapá State has no land connection with the rest of the country, so the isolation is a natural complication, and any entry of people or materials has to be done by air or river. With its almost "island" geographic location, the state ends up being hindered due to the high cost of transportation, which complicates agricultural production, for example, since the inputs arrive at high prices, making it difficult for the products produced here and the imported ones to compete.

The low demographic density of the municipalities has a strong influence on isolation, because the social fabrics need to be formed so that there is interaction among people and so that this interaction leads to the exchange of experiences and, consequently, to the exchange of products and commercialization. At this point, only group A has a high demographic density, when compared to the other municipalities (62 and 64 hab km⁻², respectively). Groups B and C vary from 0.5 to 5 inhabitants per km², making the population in these cities disperse, which makes it difficult to provide some services, whether private or public, such as health care and education, for example.

Conditioning Factors - Presence of family agriculture

In the dendrogram obtained by the indicators related to the presence of family farming (Table 2), it was possible to observe the formation of four distinct groups. In the first group (A) are the municipalities of Macapá and Porto Grande. In the latter, the number of agricultural establishments was above 400 units, and the average area of the agricultural establishments was between 170 and 300 hectares. In group B, made up of Cutias, the average area of the agricultural establishments is above 1,400 hectares, quite distinct from both group A and group C. In the municipalities that formed Group C, the size of the agricultural establishments varied between 300 and 500 hectares, and the number of technicians from the rural extension agency available to serve the farmers was between four and five people. In group D were grouped the municipalities that have agricultural establishments with an average area of less than 170 hectares, except Santana, which has an average area of 190 hectares, but differs from group A by its low number of agricultural establishments.

Conditioning Factors - Demographic factors

As for the demographic factors, the demographic dependency ratio was analyzed. The demographic dependency ratio shows the weight of the population considered inactive (0 to 14 years old and 65 years old and over) over the potentially active population (15 to 64 years old). High values indicate that the "productive" part of the local population needs to support a large proportion of dependents. Two groups, young and old, were analyzed separately, the total of these and separated by urban and rural areas.

Three groups were formed in the dendrogram of the demographic factors (Table 2). In group A, the municipalities with high rural dependency ratio, above 0.85, and medium urban dependency ratio, between 0.63 and 0.78, were grouped. Group B includes all municipalities with high rural and low urban dependency ratios, below 0.60. Group C is formed by municipalities with low rural and medium urban dependency ratios.

The total dependency ratio is quite varied among the Amapá municipalities, ranging from 0.52 and 0.57 in Macapá and Santana, respectively, to 0.86 in Pracuúba. It is worth noting that the lowest dependency ratios are in the two most populous municipalities with the largest shares in the state's GDP.

In all three groups, the dependency ratio of the young is much higher than that of the elderly, the proportion being, in all cases, more than 80% of young people over the elderly, which shows that although the overall concern is with the elderly, in the short term, public policies need to be aimed at the younger population in the municipalities of Amapá.

Conditioning Factors - Access to education

In the dendrogram concerning access to education (Table 2) only three groups were formed, evidencing, once again, a great distance between the capital Macapá and Santana, and the other municipalities of Amapá.

In group A, only the capital Macapá was left, with more than 20,000 graduates, more than 600 masters, and more than 200 PhDs. In group B is the only municipality that has from 3 to 20 thousand undergraduates, from 100 to 600 masters, and from 30 to 200 PhDs. As for the presence of colleges, the first two groups have both, in-class and distance learning, while group C only has one or the other option, except for Mazagão, which also offers both modalities to its population. In Group C are all the municipalities with fewer than 3,000 undergraduates, fewer than 100 masters, and fewer than 30 PhDs, and there is a subdivision into two groups: the first group, from Cutias do Araguari to Vitória do Jari, includes municipalities with fewer than 200 undergraduates and fewer than 200 graduates, and the second group, from Laranjal do Jari to Porto Grande, includes those with more than this number.

The number of schools followed the same line as the other results, with more schools in groups A and B, and fewer schools in group C. Gomes et al. (2019) in a study of the rural population in the municipality of Araçuaia, in the state of Minas Gerais, found that rural residents, when they have access to school, feel like an integral part of life in the city, associating this achievement with improvements in rural life.

In the item "higher education", only five municipalities have on-site colleges (Macapá, Santana, Mazagão, Laranjal do Jari and Oiapoque) and in only 50% of these it is possible to attend a higher education course in the distance modality, which makes the population 11 cities, who are interested in completing a third degree, are forced to travel to the capital to have access to it.

Table 2: Result of the grouping formed among the Amapá State municipalities in relation to the indicators of the factors that condition development I- endowment of wealth; II- isolation of the territory and its infrastructure; III- presence of family agriculture; IV- demographic factors; V- access to education.

Municipalities	Factors that condition development				
	I	II	III	IV	V
Macapá	A	A	A	B	A
Santana	B	A	D	B	B
Laranjal do Jari	C	B	D	B	C
Amapá	D	C	C	B	C
Calçoene	D	C	C	C	C
Itaubal	D	C	C	C	C
Pracuúba	D	C	C	A	C
Cutias	D	C	B	A	C
Ferreira Gomes	D	C	D	C	C
Serra do navio	D	C	D	B	C
Vitória do Jari	E	C	D	A	C
Mazagão	E	C	D	A	C
Pedra Branca	E	C	D	B	C
Oiapoque	E	C	D	B	C
Porto Grande	E	C	A	C	C
Tartarugalzinho	E	C	C	C	C

Development Characteristics - Agricultural activity

Three distinct groups were observed, based on the indicators related to the agricultural activity of the municipalities (Figure 1A). The first (A) was formed by the municipality of Laranjal do Jari, which had per-hectare production figures above R\$ 10,000.00; the second (B), formed by ten municipalities, which present production values per hectare below R\$ 200.00 and, the third group (C), formed by five municipalities that present production values per hectare between R\$ 200.00 and R\$ 2,000.00. All municipalities have a low value in the ratio between cropland and other uses, showing that cropland areas are still small in relation to natural and planted pastures, planted forests, and unused productive land. The data related to the number of cattle and buffalo herds per municipality show that in the municipality of Amapá the extensive practice is still dominant, where the largest herds predominate, the planted pastures do not necessarily predominate.

The primary sector has a small share in the GDP of Amapá State, although we know that agriculture is an activity with a strong indirect link to development, because according to Almeida, Silva, and Angelo (2013), despite the low value added to this sector, it provides subsidies for the development of the secondary and tertiary sectors and can thus raise the rates related both to economic growth and development in general. For Kageyama (2008), the idea of a diversified and productive agriculture can be observed in a simple way and serve as a basis for development analysis, through data related to productivity and crop diversification, such as the value of production per hectare, value of production per occupied person, ratio between areas of crops and areas of other uses, and ratio between areas of planted and natural pasture, indicators that will be used in this topic.

Development Characteristics - Environmental preservation

It was admitted in this work that the presence or absence of a municipal environmental office, municipal environmental legislation, controlled landfills, the percentage of forest area, and the percentage of deforestation in forest areas are characteristics of the development model related to

environmental protection. All the municipalities have an environmental secretary, but "Environmental Legislation", only seven municipalities have them: Calçoene, Cutias, Ferreira Gomes, Laranjal do Jari, Macapá, Oiapoque, and Porto Grande. In the "sanitary landfill" category, only the capital Macapá has one, the other municipalities only have garbage dumps. The dendrogram composed from these indicators showed the formation of six groups (Figure 1B).

The municipality of Cutias do Araguari was isolated in the first group, for presenting a percentage of forest area below 20% and a high number of bubalinos, above 70,000 heads. Group B was formed by municipalities with a slightly higher percentage of forest area than group A (30%) and with a lower number of buffalo, between 10,000 and 30,000 head. What united group C was the percentage of deforestation in forest areas, between 5 and 10%, and the number of cattle, between 30,000 and 70,000. In group D are the municipalities that have approximately 250 km² of deforested area and between 350 and 700 head of buffalo. In group E are all municipalities with more than 5,000 km² and less than 18,000 km² of forest area; and in the last group are the municipalities with a number of bubalinos from 600 to 6,000 and that have a forest area between 600 and 4,000 km².

The deforestation rate between 2014 and 2015 in Amapá was 4 km² of forest areas, according to the Amazon Institute of Man and Environment - Imazon, being considered a low result, ranking second only to the state of Tocantins. This result, according to environmentalist Almeida Júnior in an interview to G1 Amapá (2015), is more related to the existing conservation and indigenous areas, which do not allow the felling of trees, than to the environmental awareness of the population. In relation to the municipalities, the deforestation rate was below 15%, with 11 municipalities below 5%.

Developmental Characteristics - Health

The dendrogram formed showed five groups (Figure 1C). Group A is formed by the capital Macapá, which has more than 100 health units in total. The second group is formed by the municipality of Mazagão, which has more than 20 health centers. Groups C, D and E were made up of 5, 5 and 4 municipalities, respectively. In group C were the municipalities that have between 5 and 9 health posts and an average of approximately 12 health units in total. In group D were the municipalities that have from 0 to 3 health posts, but have a larger number of basic health units, from 1 to 6, with the exception of Pracuúba, which has three health posts for only one basic health unit, and with 6 to 10 total health establishments. And group E, were the municipalities that have between 16 and 48 health establishments in total, 6 to 14 basic health units, and an average of 2 health posts per municipality.

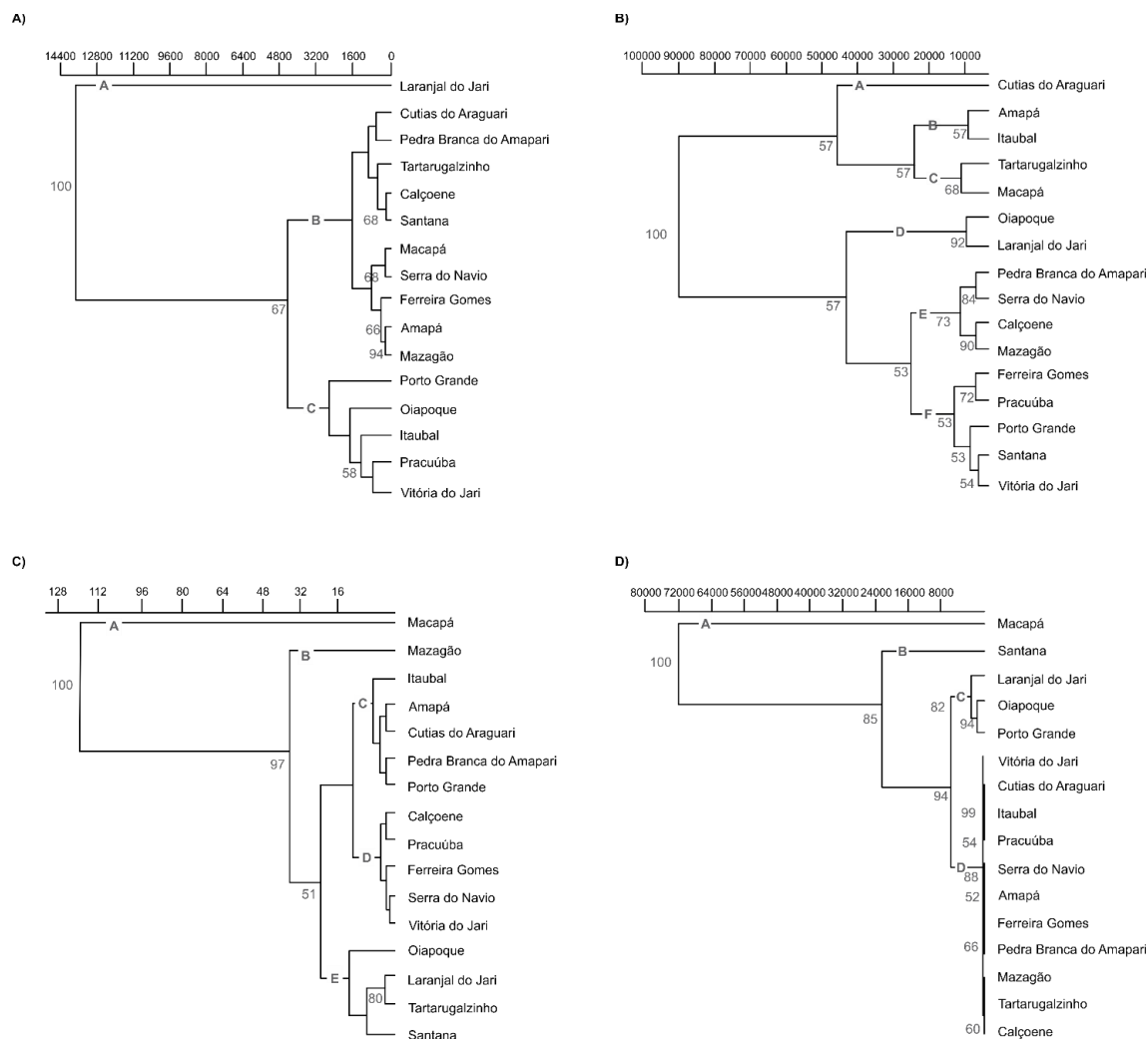
In the dendrogram formed in this research, the capital Macapá was in an isolated group, determined by its high number of BHU, health posts, specialized clinics, and for being the only municipality in the state to have a general emergency room and emergency care.

Development Characteristics - Vehicle fleet

The dendrogram formed showed four groups (Figure 1D). Only the municipality of Macapá, with more than 2,000 trucks, more than 40,000 motorcycles, more than 800 buses, and with the largest total number of vehicles, is in group A. In group B is the municipality of Santana, with the second highest total number of vehicles, more than 20,000 units, more than 7,000 motorcycles, more than 150 buses, and more than 70 tractors. In group C, Laranjal do Jari, Oiapoque and Porto Grande, with 40 to 100 trucks, 700 to 3,000 motorcycles, 14 to 20 buses and 0 to 5 tractors, and in the last group, group D, the rest of the municipalities, with less than a thousand vehicles each.

Gomes et al. (2019) report that motorized transportation, for residents of rural areas or isolated areas, is considered by them as an item of necessity because it reduces distances and isolation, bringing closer and bringing comfort to those who live far from large centers.

Figure 1: Clustering formed among the municipalities of Amapá State in relation to indicators of (A) agricultural activity; (B) environmental preservation; (C) health facilities and, (D) vehicle fleet. Bootstrap values above 50 are shown in the figure.



Effects of the Development Process - Raising income and reducing poverty

We observed the formation of six groups when we considered per capita household income, percentage of non-poor, percentage of employees with a signed work contract, percentage of extremely poor, and the percentage of poor (Table 3).

Group A includes the municipalities with per capita household income around R\$ 500.00 and a low percentage of non-poor, around 35%. In the second group (B) are the municipalities with per capita household incomes of around R\$ 400.00, with Vitória do Jari standing out, with an average number of 1,000 employees with a signed contract; in group C, the municipalities that present an average per capita domiciliary income of R\$ 300.00; in group D, was the capital Macapá, where we observe a per capita household income of R\$800.00; in Group E, Laranjal do Jari and Santana, with a per capita household income around R\$ 500.00, but with a "high" percentage of non-poor, around 65%, and the last group includes municipalities with per capita household income between R\$ 400.00 and R\$ 800.00, and an average percentage of non-poor of 50%.

The municipality of Macapá has a higher per capita income combined with a high number of formal jobs and the highest index of non-poor and the lowest index of extremely poor (5.89%) and poor (18.15%), when compared to the other municipalities of Amapá. On the other hand, Oiapoque has a high per capita household income, equivalent to that of Macapá, contrasting with a low percentage of employees with signed work papers and an average percentage of extremely poor people, as does the entire group E.

Table 3: Values of the indicators of the effects of the development process I - Household income per capita (R\$); II - Not poor (%); III - Employees with signed work card (%); IV - Extremely poor (%); V - Poor (%) and group, according to the grouping analysis, for the Amapá State municipalities.

Municipalities	I	II	III	IV	V	Group
Amapá	512.02	36.46	5.31	21.53	42.01	A
Calçoene	558.09	35.39	7.17	22.76	41.85	A
Cutias do Araguari	426.31	28.6	4.13	23.64	47.76	B
Mazagão	464.28	31.6	3.67	24.89	43.51	B
Vitoria do Jari	368.01	36.03	7.67	22.33	41.64	B
Itaubal	308.26	3.22	4.33	33.09	63.69	C
Pracuuba	319.43	6.53	2	37.72	55.75	C
Tartarugalzinho	339.61	6.52	3.86	36.87	56.61	C
Macapá	884.09	75.96	15	5.89	18.15	D
Laranjal do Jari	513.96	66.57	12.82	8.94	24.49	E
Santana	572.2	65.69	12.11	8.92	25.39	E
Ferreira Gomes	605.63	51.31	7.63	14.94	33.75	F
Oiapoque	828.81	47.45	6.97	21.31	31.24	F
Pedra Branca do Amapari	554.18	55.79	10.63	19.65	36.14	F
Porto grande	474.58	46.42	7.95	18	35.58	F
Serra do Navio	604.02	53.68	10.34	16.99	29.33	F

Effects of the Development Process - Rural exodus

The rural exodus was analyzed based on data regarding the rural population in the years 2000 to 2010. Three groups were formed. In group A, formed only by the capital Macapá, there was an increase in the rural population of more than 6,000 people; in group B, the municipalities where the increase in rural population varied between 1,500 and 2,000 people (Mazagão, Pedra Branca do Amapari, Oiapoque, Porto Grande, and Tartarugalzinho), and in group C, subdivided into 3 groups, municipalities where the increase was below 800 people, being in the first subgroup (Serra do Navio and Santana) framing the municipalities in the -2,500 to -100 range; in the second subgroup (Amapá, Pracuuba, Calçoene, and Ferreira Gomes), municipalities that went from -99 to 300, and in the third subgroup (Itaubal, Cutias do Araguari, Laranjal do Jari, and Vitória do Jari) the municipalities in the range 301 to 800 people.

Santana, Serra do Navio and Amapá stand out, where the number was negative, that is, there was a decrease in the rural population in these municipalities. Despite this, the rural exodus decreased in Amapá State as a whole in the decade from 2000 to 2010. The only municipalities where this effect is not noticeable are these three, with the first two having very expressive numbers, which may be caused by the mining companies established in the region, attracting labor from rural to urban areas.

Souza (2019), in a paper using rural development indicators, states that a satisfactory development process implies a reduction in rural emigration, among other positive outcomes. It is believed that the growth of the rural population in Amapá is not the result of pluriactivity in the rural environment, but rather, of the natural growth of rural areas, still focused exclusively on agriculture, different from the tendency that has existed since the 1990s in the rest of Brazil.

Effects of the Development Process - Improvements in living conditions

Group A was formed by the municipalities that present the highest percentages of population with access to bathroom and piped water, above 60% (Ferreira Gomes, Laranjal do Jari, Cutias do Araguari, Macapá, Santana, and Serra do Navio). In group B was the municipality of Mazagão, which has the lowest percentage of garbage collection (75%), the lowest percentage of population in homes with electricity (85%), and the lowest percentage of population in homes with a bathroom and piped water (29%). In group C are the municipalities with intermediate results (Pedra Branca do Amapari, Itaubal, and Oiapoque), with a percentage of the population living in households with a bathroom and running water of around 45%; and, finally, in group D are the municipalities with a low percentage of the population in households with a bathroom and piped water, less than 38%, but with

better results in other items, being above group B, regarding garbage collection and electricity (Tartarugalzinho, Amapá, Calçoene, Porto Grande, Pacuuba, and Vitória do Jari).

It is interesting to note that municipalities with a higher HDI than the others were placed in lower groups, such as Oiapoque, which, despite having an HDI of 0.658, was placed in group C, due to its high infant mortality rate, of 20 for every thousand live births, and Amapá, with an HDI of 0.642, in group D, due to the fact that only 35% of the population lived in households with a bathroom and running water.

Itaubal, despite having the lowest HDI in the state (0.576), presents high rates of garbage collection (index calculated only for the urban area), which makes it rise to the group C, of indicators with average results, the same as Pedra Branca do Amapari and Oiapoque. All indicators were analyzed in the years 1991, 2000 and 2010, which shows an increase (in years) in "Life expectancy at birth", which in 1991 was 63 years, going to 67 years in 2000 and reaching the average of 72 years in 2010.

Silveira, Silva & Carvalho (2008), calculated a relative quality of life index for the North Region (IRQV), based on the HDI and quality of life indicators, some of them also used in this work, such as life expectancy at birth, households with electricity, garbage collection, among others. The results point to a heterogeneity in the quality of life in the states of the Northern region, just as the dendrogram of the effects of the development process, relative to improvements in living conditions, points us to a heterogeneity among municipalities in the state of Amapá.

Effects of the Development Process - Schooling

The formation of six distinct groups was observed with regard to the education indicators. In group A were grouped the municipalities with the highest schooling rate, and with low illiteracy rates (between 2 and 5%) in the 10 to 15 year olds (Serra do Navio, Macapá and Santana). Group B grouped the municipalities with the highest illiteracy rates in the two age groups analyzed (15 and 27%, respectively) (Mazagão and Pedra Branca do Amapari). In group C are the municipalities with the lowest schooling rates, and illiteracy rates around 9% in the 10-15 age group (Pracuuba, Tartarugalzinho, Amapá, and Laranjal do Jari). In group D are the municipalities with a schooling rate of 14% and an average illiteracy rate of 10 to 15 years old of 7.6% (Calçoene, Itaubal and Vitória do Jari). In group E are the municipalities with an average schooling rate of 18.9% and a high illiteracy rate, in the 10-15 age group, averaging 11.6% (Cutias do Araguari and Oiapoque); finally, group F, with Ferreira Gomes and Porto Grande, grouped together because of their high schooling rates, around 28%, which would fit them in group A, if it weren't for their illiteracy rate (much higher than group A), an average of 9.6%, in the 10 to 15 year age brackets. With the exception of group B, all the groups have the average 18% illiteracy rate in the 15+ age group.

The municipalities with the best results in elementary school (ages 7 to 14) are Pracuúba, Ferreira Gomes, and Santana. In high school (ages 15 to 17), the municipalities of Macapá, Ferreira Gomes and Santana are the best performers.

Final considerations

We conclude that the municipalities of Macapá and Santana have the best indicators related to the development process, especially for the conditionings of development linked to income, isolation, dependency ratio, and education. Macapá stands out once again with regard to the characteristics of development, in the indicators related to health and the vehicle fleet.

The municipality of Porto Grande stands out with the largest number of agricultural establishments in the indicators related to family farming. In agriculture, Laranjal do Jari stands out with the highest production value per hectare. Itaubal presents the smallest deforested area in the environmental indicators and Porto Grande the largest. The municipality of Serra do Navio presents indicators that point to "improved living conditions" and "better education", and the municipalities of Laranjal do Jari and Santana, to "higher income and poverty reduction". The municipality of Mazagão, on the other hand, presents the worst indicators related to "improved living conditions" and "schooling".

As is the case among the Brazilian states, it was observed that the Amapá municipalities present different levels of development. This work did not intend to create an absolute model or elucidate all the reasons why these differences exist, but rather to collaborate with the understanding, from a perspective still little analyzed, of the reasons why a state with so much

potential, especially from the point of view of natural resources, presents itself so little exploited and its municipalities in such heterogeneous degrees of development.

The wealth of detailed information on the sixteen municipalities produced from this work can contribute to the construction of a future Integrated or Territorial Development Plan for the state, considering that Amapá has no such instrument. This plan can help create and manage public policies, public-private partnerships, and feed strategic plans from different institutions in order to increase effectiveness and efficiency in meeting the real needs of the population and with an effect on the degree of integration and development among the municipalities.

The results demonstrated the differences between the municipalities, which conditions allow development in certain municipalities, and what the consequences of this are for the population and for the physical environment, collaborating to identify what needs to be improved and what can serve as an example in one municipality for the others. On the one hand, the distance from the rest of the country; the low demographic density; the isolation of rural areas; the difficulty of access by road to the interior of the state; the difficulty of communication; The low GDP, HDI and RDI, and the small representation of the primary and secondary sectors in the GDP, are in opposition to the presence of natural resources; production factor Earth; ore availability; energy potential of waterways for hydroelectric construction and expanding agriculture and cattle-raising.

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