RURAL DEVELOPMENT IN THE BRAZILIAN AMAZON: LEVELS AND DISTRIBUTION IN THE 2000-2010 DECADE[1]

MÁRIO SÉRGIO PEDROZA LOBÃO[2]
JEFFERSON ANDRONIO RAMUNDO STADUTO[3]

1. Introdução

The theme of Rural Development is associated to a broad discussion embracing various approaches ranging between two extremes: the (conservative) developmentalist approach and the (progressive) conservationist one. The former is marked by its economic basis whereby it seeks to achieve regional economic development. The latter, the conservationist view, seeks to place the environmental issue as a key element that should be a limiting factor for rural development (BECKER, 2007).

In addition to that debate there is the further discussion as to what is rural and what is urban, making rural development studies all the more complicated. There is no overriding consensus regarding the delimitation of, or theoretical approach to those two territories especially because of the incorporation of new elements over the years (MONTE-MOR, 2006).

It has become increasingly difficult to discern the geographic and conceptual limits where one ends and the other begins because the consolidation of a process of overlapping and dependence has occurred that is difficult to individualize. It should be stressed that the lines of the current Brazilian model follow those of a political-administrative model that makes the rural medium a residual territory insofar as the term rural environment merely refers to whatever is not urban (VEIGA, 2000; ABRAMOVAY, 2003).

Scholars like Abramovay (2000), Kageyama (2006; 2008), Monte-Mór (2006) and others have endeavored to analyze Brazilian rural development in the hopes of measuring and understanding it, and their efforts have concentrated mainly on deciphering the transformation processes and investigating in greater depth certain dimensions of rural community realities based on a mapping of their temporal and spatial distribution. The results of those studies have formed the basis for decision-making and public policy

implementation in the area, particularly insofar as they have emphasized the multi--dimensionality and the multi-functionality of the rural milieu.

Public administrators have conceived those policies on the basis of regional and local diagnoses and analysis of the main impact-producing factors. The instruments designed to capture the degree and intensity of rural development in the regions have proved to be good indicators and have provided the necessary support to the decision-making actors involved, as Abramovay (2000) and Favareto (2006) have shown.

Based on the appropriate presuppositions for the study of rural development in the Brazilian Amazon, Becker (2007) shows that there are two main moments that have marked development in the region. The first dates back to the period of military rule when developmentalist policies prevailed, introducing a new reality in the region and directed at economic exploitation and populating the region with the opening up of highways and provision of incentives for private capital mining and crop and livestock farming.

In their analysis of rural development policies in the 1970s and 1980s, Neumann, Fajardo and Marin (2017) show that the focus established the hegemony of agribusiness in the Brazilian rural space at large and it was no different for the Amazon region. As a result, farmers practicing small-scale, family-based agriculture had to try and maintain their space or find a space by forming organizations and struggling to survive in the midst of that diffusion of the capitalist mode of production imposed by the agricultural policy in force.

The second moment, unlike the first, emerged in the 1990s with the advent of national and international environmental pressures regarding the exploitation of the Amazon. The focus then changed from developmentalist policies to environmentalist ones (BECKER, 2007).

Against that background, this article sets out to contribute towards obtaining knowledge regarding the levels and distribution of rural development in the years 2000 to 2010 in the Amazonian context. The regional result that will be revealed stems from a historical accumulation of the most varied and diffuse governmental development policies put into practice in the region especially after the 1960s when the Amazon was effectively placed on the national political agenda.

Multivariate factor analysis of the statistics is used to construct a Rural Development Index (RDI) as a means to measure rural development in the Brazilian Amazon. The use of Factor analysis to produce an RDI is strongly scientifically validated by the recurrent reports of its use in the specialized literature and that validation extends to the present work.

Kageyama (2008) and Stege (2011) carried out similar work for Brazil as a whole. Kageyama (2008) addressed the question of the development of the Brazilian states and Stege (2011) studied Brazilian micro-regions. However, their work was directed mainly at territorial aggregations and they did not offer any detailed explanations for the rural development patterns in the municipalities; it is the latter aspect that the present study sets out to investigate. The intention is to acquire knowledge of the phenomenon of rural development at the local level of Amazonian reality and gain an understanding as to how the phenomenon has occurred and been disseminated throughout the region.

The study consists of a brief technical discussion of development as such and of the rural territory in the section following this introduction. The third section is dedicated to methodological procedures and the results and discussion of Rural Development in the Brazilian Amazon are set out in the fourth section. Lastly come the Final considerations summarizing all that has been described.

2. Development, the rural milieu and rural development

Development means the occurrence of qualitative changes in living conditions (FURTADO, 2000). Sen (2000) considers that development seeks to free people from their privations whether they be economic, social, political cultural or others. Development can be understood as a complex process involving changes of an economic and political order and above all of a human and social kind. Economic growth is an essential prerequisite for overcoming obstacles such as poverty and for constructing a decent standard of living (OLIVEIRA, 2002; FURTADO, 1976).

Sachs (2007) holds that the concept of development has undergone a process of evolution that essentially began with the creation of the United Nations Organization right after the Second World War. In that author's view "[…] development is the universal effectuation of the overall set of human rights ranging from civil and political rights, embracing economic, social and cultural rights and terminating with collective rights which include, for example, the right to a healthy environment" (SACHS, 2007, p. 22).

The idea of development is considered to include three basic dimensions: social inclusion, environmental sustainability and economic sustainability. The social inclusion dimension refers to social and ethical aspects of development whereby the intention is to seek egalitarian forms of social progress. The dimension involving sustainability of the environment refers to the concept of sustainable development whereby natural resources can be made use of but without jeopardizing their availability to future generations. The sustainable aspect of the economic dimension refers to the inclusive and sustainable improvement of families' living conditions, that is to say, it is of a permanent nature (SACHS, 2007).

Based on the understanding that the rural territory is an environment with its own specific functions and characteristics, there can be no doubt that it is capable of fostering its own development. The Rural ambit of today cannot be considered the same as it was before; it now has multiple sectors and is multi-functional (KAGEYAMA, 2004). It has evolved and transformed its social relations; the improvement in the living conditions of citizens living in such spaces is an outstanding example.

Menéndez (1985) portrays the need for a resignification of the term rural; one that goes beyond the classic vision of a poor backward place where the only activity is agriculture. That author considers that the resignification process involves three points: the incorporation of multidimensionality into the rural change process; the insertion of consumerist activities such as leisure and environmental conservation and new forms of circulation such as financial capital all of which enable the emergence of what has come to be called 'the new rurality'. Another key element, however is the high degree

of imbrication of the urban and rural spheres and they cannot be considered divergent or independent..

In that regard, Ploeg et al. (2000) underscore the importance of understanding that rural development involves more than the agricultural sector alone given that new objectives have been set based on incentives for the production of collective goods/assets; sustainable integration with local ecosystems, promoting economies of scope rather than of scale and the development of multiple activities by rural families. All of that has led to the emergence new products and services associated to the emerging markets that are needed to sustain them. The adoption of new cost-cutting technological trajectories, the understanding of agriculture as involving more than just rural establishments, integration at the regional level and the boosting of the rural economy as a whole are all notable features of those changes.

In view of what has been stated above, it can be understood that to foster and boost rural development a whole set of common elements that are conditions for it or favor it must be taken into account. They are set out in Chart 1 below.

Chart 1. Conditioning elements for promoting rural development

a) commercial integration with cities in the region: the economic dynamics of medium-sized cities, especially the creation of tertiary activities, favors the development of rural communities in adjacent rural areas.
b) the combination of consolidated family-based agriculture and a decentralized urbanization and industrialization process generating a local consumer market for diversified products and the supply of raw materials and labor for local industry.
c) the plurality of rural family activities enables the retention of the ´population and a reduction of the rural exodus.
d) diversity of income sources allows for a greater degree of autonomy (less exclusive dependence on agriculture) and reduces income instability.
e) employment-generating programs to improve living conditions, attenuating migration and isolation.
f) resources existing in the territory, making it feasible to produce for specific markets (wine, tourism, etc.) thereby internalizing positive externalities.

Source: Kageyama (2008, p.76).

The discussion on rural development in the Brazilian Amazon also embraces the respective debates in the national and international literature. It is a phenomenon that manifests itself in different ways in time and space insofar as, according to Kageyama (2008, p. 58) rural development "[…] is anchored in time (a long-term trajectory) and in space (the territory and its resources) and in the social structures present in each case". Consequently the expectation of capturing it in a given period and given demarcated territory and with its own structure refers to a singular situation.

3. Methodology

This exploratory and explanatory research study adopted a quantitative approach to investigate rural development in the Brazilian Amazon. The deductive research method was preferred to the option of assuming a general premise to understand a local reality, because it is well-known that rural development tends to diffuse itself in space and time in very different ways so the endeavor was focused on gaining an understanding of the phenomenon as it occurs in the Brazilian Amazon.

The results obtained from a Principal Components Factor Analysis formed the basis for calculating the Rural Development Index of the municipalities that lie in the studied territory. The use of that non-parametrical type of analysis is validated by the many reports in the specialized literature of its use to produce RDIs and further justified by its capacity to group the constructs stemming from a list of variables.

Authors like Melo (2006), Stege (2011) and Chioveto (2014) consider Principal Components Factor Analysis to be particularly suitable for analyzing rural development. In this case 29 variables were considered that had an impact on the rural development of municipalities in the Brazilian Amazon in the years 2000-2010. They were grouped into economic, environmental and socio-demographic sub-groups and are described below in Chart 2[4].

---

4. Based on Hoffmann and Kageyama (1985); Kageyama (2004; 2008); Melo and Parré (2007); Pereira et al. (2008); Stege and Parré (2008); Abreu (2014); Araújo (2014); Chioveto (2014) and Stege (2015).

Chart 2. Variables with an impact on rural development.

	Variable	Description	Source	Yr.	Dimension
X1	Rural population	Rural population/total municipal population			
X2	Rural demographic density	Number of rural inhabitants/ total area of the municipality			
X3	Rural longevity age 60 +	% of the rural population aged over 60	IBGE	2010	Demographic
X4	Rural electricity supply	Permanent private rural households with access to electricity/total number of permanent private rural households			
X5	Rural water supply and sanitation	% of permanent private rural households with inadequate water supply and sanitation			
X6	Rural sanitation	Nº of permanent private rural households with toilets/ total Nº of permanent private rural households			
X7	Rural water supply	Nº of permanent private rural households with piped water supply from general distribution network / total Nº of permanent private rural households			
X8	Occupation in the agricultural sector	Individuals aged 10 or over working in agriculture, livestock farming, fishing, forest production, aquiculture, or extractive activities/total Nª of individuals aged 10 or over working			
X9	Racial diversity	Nº of white residents in the rural zone /total Nº of residents in the rural zone			
X10	Rural literacy	Nº of literate individuals aged 10 or over living in rural households / total municipal population aged 10 or over.	IBGE	2010	Social and Well-being
X11	Rural labor force	Rural population of age for the labor force/ total rural population of the municipality			
X12	Rural child labor	Rural residents in the 10 to 13 age group working /total number of municipal residents in the 10 to 13 age group working			
X13	Rural school attendance	Persons from the rural zone in the 10 to 17 age group not attending school /total number of persons in the 10 to 17 age group in the municipality not attending school			
X14	Rural waste collection	Permanent private rural households with waste collection service/total number of permanent private rural households	IBGE	2010	
X15	Burning off practices	Crop and livestock farming establishments that practice burning off/ crop and livestock farming establishments in the municipality			
X16	Chemical fertilizer use	Crop and livestock farming establishments that use chemical fertilizers/ crop and livestock farming establishments in the municipality			
X17	Agricultural Pesticide use	Crop and livestock farming establishments using agricultural pesticides/ crop and livestock farming establishments in the municipality			
X18	Perm. Pres. and Legal Reserve area (km^2)	Area of permanent preservation and legal reserve /total area of crop and livestock farming establishments in the municipality			
X19	Crop and livestock farming area	Area occupied by temporary and permanent crops/total area of crop and livestock farming establishments			
X20	Water resource protection	Crop and livestock farming establishments with springs, streams, rivers, natural lakes or dam reservoirs protected by natural vegetation /total Nº of crop and livestock farming establishments with such water resources	Crop and livestock farming Census	2006	Environmental
X21	Area of pastureland	Area occupied by pastures /total area of crop and livestock farming establishments			

X22	Per capita income	Average value of nominal monthly rural household income per capita;			
X23	Poor rural households	Persons living in permanent private rural households / Total of household incomes of up to ¹/₂ official minimum salary per capita	IBGE	2010	
X24	Productivity of crop and livestock farm workers	Gross crop and livestock production value/ total number of persons working in agriculture and livestock farming	Censo Agro-pecuário	2006	
X25	Average per capita GDP for crop and livestock production	Gross crop and livestock production value (GPV) /total rural population	IPEA - IBGE	2010	
X26	Average production per esta-blishment	Total value of crop and livestock farming establishments' production/ total number of crop and livestock farming establishments in the municipality			
X27	Crop and Livestock turnovers	Total turnover/ total number of crop and livestock farming establish-ments in the municipality	Crop and livestock farming Census	2006	Economic
X28	Nº of tractors per establishment	Number of tractors// total number of crop and livestock farming estab-lishments in the municipality			
X29	Economic participation of crop and livestock farming	Ratio between gross value of crop and livestock production value and the Municipal GDP	IBGE	2010	

Source: elaborated by the authors, 2019.

As result of the factor analysis, seven latent factors were identified and they served as the basis for producing the RDI. The latent factors represented 72% of the total accumulated variance of the overall set of 28 variables considered and the results of the KMO test, 0.820 and of Bartlett's test with likelihood significant to 1% confirmed the statistical significance and the scientific validity of the results.

Once the factors had been formed, the next step was to obtain the Rural Development Index of the Brazilian Amazon municipalities first using Equation 1 below to rank the factor scores in an interval from 0 to 1:

$$F_{ij} = \frac{(F_i - F_{min})}{(F_{máx} - F_{min})} \tag{1}$$

where F_{ij} is the score of i-th municipality, F_i is the factor score of the i-th municipality, F_{min} is the lowest factor score obtained by the municipalities and $F_{máx}$ is the highest score of the municipalities used in the analysis of the i-th municipality.

Having standardized the factor weights it was possible to calculate the RDI for each municipality using expression 2.

$$IDR = \sum_{j=1}^{p} \left[\frac{\lambda_j}{\sum \lambda_j} \right] F_{ij} \tag{2}$$

where λ_j is the j-th characteristic root, p the number of factors used in the analysis of the i-th municipality and $\sum \lambda_j$ is the sum of the characteristic roots of the extracted p factors. It should be noted that the characteristic roots of the factors were considered after performing Varimax rotation.

Hierarchizing the municipalities was achieved using a classification based on the work of Parré (2007) and Stege (2011 which used the standard deviations from the mean and established the following classes of Rural Development: Very low (1 to 2 standard

deviations below the mean); Low (between the mean and one standard variation below the mean; Regular (between the mean and one standard deviation above the mean); High (1 to 2 standard deviations above the mean); and Very High (2 to 3 standard deviations above the mean). It is worth mentioning that there are other forms of classification such as division in percentiles or even quartiles as Kageyama (2004) did, but the option for using standard deviations was taken because it is less subjective and more appropriate to the case in hand.

The RDIs of 449 of the 450 Brazilian Amazon municipalities were calculated. The Brazilian geo-political region 'North' is composed of the states of Acre (AC), Amapá (AP), Amazonas (AM), Pará (PA), Rondônia (RO), Roraima (RR) and Tocantins (TO) and according to Loureiro (2015, p. 26-29) they compose what is referred to as the Brazilian Amazon. It is different from what is known as the Legal Amazon which in composed of considerable parts of the states of Mato Grosso and Maranhão in addition to the seven states mentioned above

The reason for not calculating the RDI of one of the municipalities, Mojuí dos Campos in the state of Pará, was that it was only created in 2013 and so there was no information available for the years 2000-2010

4. RURAL DEVELOPMENT IN THE BRAZILIAN AMAZON

Table 1 shows that the mean value of the regional RDI was 0.396. Of the 449 municipalities, 215 (47.88%) had RDIs equal to or higher than the regional mean. At state level, only two of the states, Pará and Rondônia, had RDIs higher than the regional mean.

Table1. RDI Descriptive statistics by states and by regions.

	Mean	Maximum	Minimum	Standard Deviation	Variance	Coefficient of Variation (%)
AC	0.300	0.588	0.096	0.128	0.016	42.73
AP	0.315	0.544	0.094	0.129	0.017	40.93
AM	0.279	0.721	0.030	0.145	0.021	51.90
PA	0.430	1.000	0.099	0.145	0.021	33.74
RO	0.586	0.814	0.110	0.132	0.017	22.54
RR	0.332	0.535	0.089	0.128	0.016	38.65
TO	0.374	0.797	0.000	0.144	0.021	38.46
REGION	**0.396**	**1.000**	**0.000**	**0.165**	**0.027**	**41.76**

Source: Research results, 2019.

The RDI analyzed here portrays the intra-regional situation. It can be seen that fewer than 50.00% of the municipalities have RDIs higher than the regional mean. Sege (2011) conducted a similar study encompassing Brazil as a whole at the level of micro-regions and found the Northern region was the one with the lowest level of rural development; that is consistent with the results of the present study which confirmed that low level.

In that regard it can be seen that, intra-regionally, even the states with the best RDIs like Rondônia and Pará failed to accompany the development of the rest of Brazil in the same proportion and the other northern states are in an even worse situation when the inter-regional context is analyzed. In general, 93.7% of the territory in the geo-political region 'North' showed a degree of rural development below the national mean value that Sege (2011) obtained in his research. The results obtained by the present study based on intra-regional observations show a very different pattern.

Within the Brazilian Amazon the levels of rural development among the municipalities are much closer to one another but that closeness dissipates when comparison is made with the national sphere. The level of the region as a whole is far from those of the other geo-political regions so in an overall comparison the North of Brazil is far behind in terms of the living conditions of its rural population.

The coefficient of variation of the RDA is an important indicator for the purpose of this analysis insofar as it indicates whether there is any dispersion/concentration process among the results obtained. The higher the value of the coefficient, the more heterogeneous the distribution of the RDI is in the territory under study and the lower it is, the more homogeneous the distribution is. The results therefore indicate the existence of a strong intra-regional heterogeneity in the composition of the RDI among the municipalities, with a value of 41.76%. It means that there are places in the Brazilian Amazon region with levels of development very different from one another indicating the inequality of the development process in the macro ambit.

Rondônia was the state with the most evenly distributed rural development with the lowest coefficient of variation (22.54%) and therefore the difference between the municipality with the lowest level of rural development in that state and the one with the highest one was not so great.

On the other hand, the state of Amazonas showed a very high degree of intra-state disparity. That represents a situation brought about by an unequal and conflictive rural development process within the state. The value of the variation coefficient (51.90%) was the highest among the states in the region and higher than the regional mean. The other states were in intermediate situations between those of Rondônia and Amazonas with RDI values close to the regional RDI value.

4.1 Rural development levels in the municipalities of the Brazilian Amazon

Table 2 displays the RDI classifications of the municipalities aggregated by states and by region together with the numbers of municipalities per classification category and their respective percentages. There is a notable predominance of municipalities in the rural development categories Regular and Low. Over 67% of the municipalities in the region 'North' were in those two stages of development.

Table 2. RDI classifications and respective percentages of Brazilian Amazon municipalities by states and region.

	VH	(%) VH	H	(%) H	R	(%) R	L	(%) L	VL	(%) VL	Mun.
AC	0	0.00	1	4.55	3	13.64	11	50.00	7	31.82	22
AP	0	0.00	0	0.00	3	18.75	9	56.25	4	25.00	16
AM	0	0.00	4	6.45	5	8.06	24	38.71	29	46.77	62
PA	4	2.80	20	13.99	56	39.16	55	38.46	8	5.59	143
RO	8	15.38	23	44.23	19	36.54	1	1.92	1	1.92	52
RR	0	0.00	0	0.00	4	26.67	6	40.00	5	33.33	15
TO	1	0.72	13	9.35	50	35.97	56	40.29	19	13.67	139
REGION	13	2.90	61	13.59	140	31.18	162	36.08	73	16.26	449

Source: Research results, 2019.

As a measure of comparison, in her study of rural development in the municipalities of the state of Paraná, Melo (2006) obtained similar results to those displayed above. Most of the state's 399 municipalities were at the regular or low stages of rural development. Only 63 (15.79%) attained a classification of extremely high, very high or high rural development levels. Those in the classification of regular rural development level represented 29.07 of the researched locations while those in the categories low, very low and extremely low levels of rural development made up 55.14% of the total.

Another research project conducted by Chioveto (2014) analyzed rural development in the state of Mato Grosso, according to biomes, and there the reality was somewhat different. Practically all of that state's municipalities have rural development levels classified as low or very low. According to that author and the classification criteria she adopted, 137 of the state's 141 municipalities, that is, 97% were at the stage of either low or very low levels of rural development. In the separate analyses made according to the biomes (Cerrado savannahs and Amazon/Pantanal) the levels of development appeared to be slightly better but, nevertheless, municipalities with low levels of rural development were predominant.

Thus different regions of Brazil with different economic, social and environmental realities have certain aspects in common. The rural development process has been highly differentiated and very small groups of municipalities stand out in stark contrast to the vast majority in which the level of rural development is low or very low; the situation is no different in the Brazilian Amazon.

A few poles of development have formed that concentrate and attract persons and resources to the detriment of most other municipalities which show a tendency for their situation to become increasingly distant from those of the poles, exacerbating their condition of rural underdevelopment. Accordingly, the state needs to act as an inductor of development by planning and implementing public rural development policies designed to establish equilibrium in the region or indeed in the state as a whole.

Observing the results obtained by the present analysis at the level of states, Pará, Rondônia and Tocantins consolidated themselves as having the best levels of rural development. They were the only states in which the levels of at least some municipalities were classified as very high; they represented 2.90% of the total number of municipalities. Those three states also concentrate the best social and economic indicators thereby explaining the better results obtained for rural development levels.

Specifically in the case of Pará, Santos (2005) found that the concentrations of better levels of rural development were in the Metropolitan Integration Regions (*Regiões de Integração Metropolitana*) of Guamá and Rio Capim. Those regions are located in the in the eastern and northeastern part of Pará and they are notable for their physical-spatial confluences which, the author says, may have influenced their improved performance; in other words, their proximity may have stimulated positive externalities.

The states of Amapá and Roraima had the lowest RDIs. All their municipalities were in one of the three lower development levels: very low, low and regular. In the case of Amapá, it could be seen that the conditions of rural settlements have contributed more than anything else to that low rating. According to Silva, Filocreão and Lomba (2012) the lands of rural settlements occupy a considerable part of the territory, 14.88% of the State's total area. They are all in precarious conditions and the 16,044 families occupying them in 2012 have been overlooked by government action.

Those authors show that the precariousness found in the settlement is of all kinds including the conditions of the physical infrastructure and especially due to the fact that most of such settlements have been formed spontaneously through the invasion of government lands. Another major obstacle has been the lack of land tenure regularization insofar as without tenure it is practically impossible to capture financial resources from entities dedicated to financing projects. In addition, the cultivation of cassava (manioc) in artisanal, subsistence agriculture conditions is practically the only economic activity carried out by the settlers and its products have low aggregated value.

In a similar way to Amapá, in Roraima, the low level of crop and livestock farming, the main rural activity in the state, helps to explain its poor Rural Development rating. According to the work of Silva and Silva (2004) that activity accounted for a mere 4.30% of the GDP in the year 2004, whereas the tertiary sector's participation was a massive 87.00% of the GDP. That was especially due to government administration which increased its participation from 27.50% of the GDP in 1995 to 53.70% in the year 2000; an example of the so-called 'pay slip economy'.

Another determinant for the low level of rural development in most of that state's municipalities is the high degree of concentration of resources and personnel in the state capital, Boa Vista. Staevie (2012, p. 151) reports that Boa Vista "[...] responds for over 70% of the state's GDP, concentrates 80.00% of all the trading establishments responsible for around 70.00% of private sector activities in the state […]".

The results for the state of Amazonas were also highly unsatisfactory. 46.77% of its municipalities obtained rural development ratings of 'very low', proportionally the greatest percentage for that category among all the states researched. The factors that justify those results are similar to those found for the state of Amapá, namely a strong

presence in the rural areas of archaic family-based and subsistence forms of agriculture associated to a low level of capitalization among rural producers and a lack of physical and social infrastructure.

On the other hand, the state of Rondônia stands out in the northern region for its agricultural and livestock production and its social indicators. The two have provided better living conditions for the rural inhabitant, especially in regard to enhanced income levels and improved social infrastructure all of which have generated wellbeing and a better quality of life. The rural development indexes obtained for that state's municipalities clearly reflect the above observation. As can be seen in Table 2, only two of the 52 municipalities are in situations of low or very low rural development, namely, Ji-Paraná and Guajará-Mirim respectively.

In general terms, the research identified two main rural development patterns in the region. The first was concentrated in north and west of the region consisting of the states of Acre, Amazonas, Amapá and Roraima. The second was found in the eastern and southern part of the Brazilian Amazon consisting of the states of Rondônia, Pará and Tocantins.

There was not one municipality in the states of Acre, Amapá, Amazonas or Roraima that was awarded a classification of very high rural development level, underscoring the regional deficit and highlighting the degree of regional heterogeneity. Only 5 municipalities registered a high level of rural development and those with low or very low levels, predominated.

Serious social and economic problem are concentrated in those four states. They are the states with the lowest incomes from crop and livestock production and the poorest access to basic social services. They are also notable for their low levels of rural settlement and rural economic exploitation with the correspondingly low demographic density figures.

Furthermore, many municipalities in those states are affected by questions of geographic isolation that jeopardize the possibilities of access to basic services such as health, education, infrastructure, security or even to markets that could absorb their production. Silva et al. (2012) cite the example of Acre where there are some municipalities that can only be accessed by plane or by navigating the rivers. That is the case with the municipalities of Santa Rosa do Purus, Jordão, Marechal Thaumaturgo and Porto Walter.

The second pattern, represented by the best levels of rural development, was identified in the eastern and southern part of the Brazilian Amazon, encompassing parts of the states of Pará, Rondônia and Tocantins. Those three states are directly linked to the Brazilian agricultural production frontier and the latter fact has attracted increasing numbers of people from other places, including other states in the region, all of them in search of better opportunities and endowed with better qualifications

Another important fact has been the advent of huge investments, first in livestock production, but more recently in the production of soy bean. The latter is a commodity with a vast internal and external consumer market that has been steadily growing in the last few years.

4.2 Rural development distribution among the municipalities of the Brazilian Amazon

Figure 1 enables a better understanding of the two patterns of rural development identified in Brazil's northern macro-region and also the distribution of rural development in the territory under study. It also facilitates the identification of the three major poles of rural development, one associated to the central-eastern region of Rondônia, another, to the northeastern/eastern part of Pará and the last to the southeast of Pará and embracing the northwest of Tocantins.

Figure 1. Rural development distribution among the municipalities of the Brazilian Amazon and the main agrarian complexes in the region
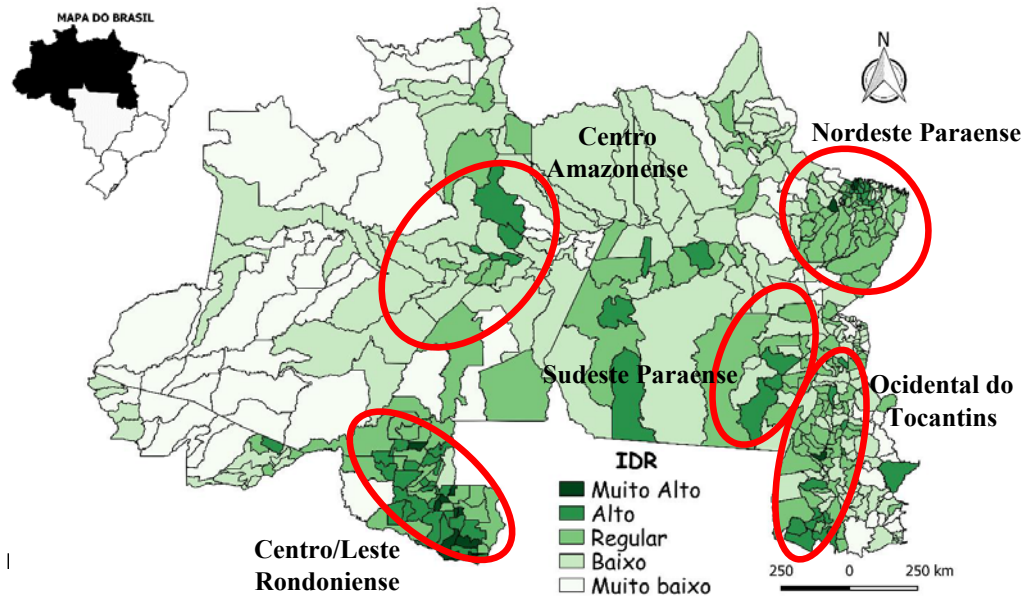
Source: Research results, 2019.

Legend

MAPA DO BRASIL	MAP OF BRAZIL
Centro Amazonense	Central region of the state of Amazonas
Nordeste Paraense	Northeast of the state of Pará
Sudeste Paraense	Southeast of the State of Pará
Ocidental do Tocantins	The west of Tocantins
Centro/ Leste Rondoniense	Center/ East of Rondônia

In their study of agrarian dynamics and sustainable development in the Amazon region   Costa (2008) and Costa and Fernandes (2016), obtained results for the main agrarian systems in the region similar to those obtained in this study. Places in the states of Pará and Rondônia and Tocantins with the most intense rural economic activities, that

is with the highest percentage participation in the Gross Production Value (GPV) were the explanation for the better levels of rural development of those states.

It can be seen that the concentrations of the best social infrastructure are in those states with the best economic returns stemming from intense demographic settlement and economic exploitation which in turn are associated to the presence of federal highways such as the BR-364 and the BR-152, the region's main access-ways. Those are the spaces in which the best health, education and leisure services are developed as well as the best infrastructure such as water and electricity supply and basic sanitation. Furthermore, in those same locations the main public administration services are installed, making the State's specific activities feasible. All the above aspects contribute towards explaining the present distribution of rural development in the Amazon.

A list drawn up by Costa (2008) and Costa and Fernandes (2016) places the meso--regions that have contributed most to the development of the rural economy in the North, in order of their importance: southeastern Pará (PA), eastern Rondônia (RO), central Amazonas (AM), western Tocantins (TO) and northeastern Pará (PA). Those five meso-regions are responsible for 59.40% of the GPV, 57.80% of the appropriated lands, 65.80% of the land in use and 58.00% of all the labor employed in the rural sector in the region as a whole.

The southeastern Para meso-region has the principal and most complex agrarian system in the region 'North' and in it beef cattle production activities run by employers of labor play the leading role. Those activities are concentrated in large scale projects that were financed by the Bureau for Amazon Development (*Superintendência de Desenvolvimento da Amazônia - SUDAM*) starting in the mid-'960s and that explains their predominance in the regional context (COSTA, 2008; COSTA; FERNANDES, 2016). Costa (2012) explains that the most extraordinary dynamics within the Brazilian Amazon region has been identified in that particular meso-region.

In the years from 2004 to 2006, the system was responsible for 55.00% of the mean Gross Rural Production Value (GRPV) and since then it has evolved even further. The southeastern Para meso-region alone concentrated 21.00% of the GPV of the entire Brazilian northern region and was responsible for 13.90% of all rural employment positions making it the most dynamic and complex meso-region in the entire northern region of Brazil (COSTA, 2008; COSTA; FERNANDES, 2016).

It is important to state that, historically, mining activities have always played an important role in the southeastern Para meso-region and they have contributed towards the accumulation of its capital. There was intense diamond mining there in the 1940s and 1950s (VELHO, 1972). In the 1970s there was tremendous gold rush at Serra Pelada and in the 1980s the Vale do Rio Doce Mining company (*Companhia Vale do Rio Doce- CVRD*), set up large scale iron ore mining operations, especially in the Carajas region.

The municipality of Marabá has consolidated itself as an important regional pole in the southeast of Para. Trindade Júnior (2012, p. 7) explains how it "[…] has become the locus for large-scale investments in the region, given its importance in terms of production, trade and services distribution and its political leadership in the southeast of Pará, all of

which have made it one of the most important cities in the economic ranking of the state of Pará as a whole[…]". The same author comments on the important concentration and conurbation of road networks and electricity supply in that eastern Amazonian city, based largely on crop and livestock production and the mining-metallurgy industries as well as on other plant and mineral extractive activities.

The eastern Rondônia meso-region has the second largest agrarian system in the North of Brazil. According to Costa (2008) and Costa and Fernandes (2016), unlike the preceding meso-region its activities are based on small-scale individual farmers engaged mainly in dairy cattle farming and fruit-tree cultivation.

The production of that agrarian system accounted for 59.00% of the mean value of meso-region's GRPV in the period 2004 to 2006. However, beef cattle production run by employers also played a considerable part, accounting for 30.00% of the total. The two activities together add up to almost 90.00 of the total GPV. Most of those results can be explained by the existence of Federal Highway BR-364 which has had the effect of being a veritable development corridor for the state of Rondônia as a whole.

The third agrarian system that Costa (2008) identified was the central Amazon region where smallholder farmers were predominant especially those adopting agro-forestry production systems. That sector was responsible for 35.00% of the GPV followed by dairy farming production with 33.00% participation and beef cattle farming with 23.00%. The outstanding municipalities were Careiro da Várzea, Iranduba, Presidente Figueiredo and Rio Preto da Erva all with high levels of rural development.

The western Tocantins meso-region is similar to the southeastern Para meso-region which it is close to and its predominant economic activity is beef cattle production run by employers. That production responded for a massive 77.00% of its GPV in the year 2006. However, the system employed a mere 5.00% of the labor force corresponding to 10.30% of the rural GPV (COSTA, 2008; COSTA; FERNANDES, 2016).

Just like the Central Amazon meso-region, as Costa (2008) and Costa and Fernandes (2016) have shown, the principal production system of the northeastern Pará meso-region is based on agro-forestry type agriculture which responds for 44.00% of the GPV while dairy farming and fruit tree cultivation responded for 24.00% of the meso--region's GPV in 2006. The majority are smallholder and small scale farmers and that type of production was responsible for 6.60% of the total GRPV for the Northern region as a whole and employed 14.50% of the region's rural workers.

Becker (2000) considers that the Amazon territory has three main macro-regions. The first, usually referred to as 'the crescent of fire' but which that author prefers to call the crescent of consolidated settlement, is concentrated in the states of Rondonia, the south and east of the state of Para in Mato Grosso and in Tocantins. Here the larger cities are to be found as well as the highest demographic densities, major roads and the heart of the economy. Unsurprisingly the best levels of rural development accompany that situation.

The second macro-region according to Becker (2005 is the Central Amazon and embraces the rest of the state of Para. She considers it to be currently the most vulnerable part of the Amazon. There are two localized fronts within in the region and there are roads and axes that place the region in the sights of economic exploiters.

The third and last region identified by that author is the most preserved. It has consolidated itself as a political frontier of great resistance to the destruction of the forest and the exploitation of natural resources with the single exception of the Manaus Free Zone and various other sporadic concentrations of settlements (BECKER, 2005). It should be stressed that the lowest levels of rural development were found in the western Amazon where the degree of economic exploitation was low and native forest and woods formations were predominant.

Given the evidence set out above, there is an obvious urgent need to promote localized public rural development policies especially for the municipalities in the western and northern parts of the Brazilian Amazon. They are depressed regions caught in a vicious cycle of underdevelopment and therefore lacking external interventions based on the principle of sustainability especially because, to date, they are the regions with the highest environmental quality in the country.

In the view of Patrício and Gomes (2012), the main factor to consider in order to achieve sustainability is the participation of the local community in the planning of rural development policies. The perspectives and actions to be delineated should stem from the local actors, because there is nobody better than they are in terms of knowledge of the real needs and of respect for nature

Oliveira and Carleal (2013) also stress the importance of fostering Amazonian development on the basis of a Macro-vision. The national and international integration of the Amazon region, ceasing to address the region solely in terms of its isolation and its differences, is an inexorable strategy.

5. Final considerations

The aim of this article has been to measure and analyze the level and the distribution of rural development in the municipalities of the Brazilian Amazon, in the decade that began in the year 2000. To that end, the study calculated the Rural Development Indexes of the municipalities in the region.

Once the RDIs had been calculated the mean regional value was found to be 0.396. 215 municipalities (47.88% of the total of 449) had Indexes equal to or higher than that mean value. Another fact that came to light was the great disparity among the municipalities as shown by the coefficients of variation which resulted in a high value of 41.76% among the 449 municipalities.

Thus there were places with very different rural development levels in the regional context with some showing very high levels and others very low ones. The regional distribution was therefore highly uneven and unequal; in other words the region is highly heterogeneous in terms of rural development levels and that is true both in the comparisons among the states and in comparison of municipalities within single states.

In the result obtained for the classification of rural development levels, the classes regular and low development were predominant. Together they represented more than 67.00% of the municipalities in the region; that is to say, in the overall context, the level of development in the Brazilian Amazon is low.

Pará, Rondônia and Tocantins were the only states where there were municipalities classified as having a very high level of rural development. The worst results were for Amapá and Roraima where the rural development levels of all their municipalities were classified as regular, low or very low. The state of Amazonas also brought in a very poor result given that the rural development of 46.00% of its municipalities was classified as very low.

Generally speaking there were two discernible rural development patterns in the region. One found more to the west and the north, with the lowest rural development levels involving the states of Acre, Amazonas, Amapá and Roraima and the other, the south and east of the Brazilian Amazon represented by the states of Rondônia, Pará and to a lesser extent, Tocantins, with better results. In addition to those patterns, 5 principal poles of rural development were identified: southeastern Para, central and eastern Rondônia, central Amazonas, western Tocantins, and northeastern Pará, in order of importance.

In view of all the above, there is a glaring need for efforts on the part of governments to disseminate rural development in the direction from the south and east of the region towards the west and north, especially through the implementation of rural public policies capable of fostering the development of depressed regions. Those regions are trapped in a vicious development circle and they need to be induced to overcome that condition.

Furthermore, there is a need to stimulate overflow from those municipalities that are already consolidated, as is the case with 5 principal poles identified. In the case of Rondônia for example, there is a certain spreading out toward the eastern part of Acre in course, following the axis of the BR-364 Federal Highway and that would suggest itself as a topic for future research, namely, an analysis of regional overflows and the dissemination of rural development in the territory under examination.

Thus, in the theoretical field, rural Amazon shows itself to be a territory in formation in which some rural development poles have already emerged and they should serve as the basis for stimulating the progress of the other regions. Once there has been a consolidation of a social capital network on the part of rural Amazonian society then it will be possible to achieve a more harmonious dissemination of development in the Brazilian Amazon.

References

ABRAMOVAY, R. **O futuro das regiões rurais**. Porto Alegre: Editora da UFRGS, 2003. 149 p.

BECKER, B. K. In: **Dilemas e desafios do desenvolvimento sustentável no Brasil**. Organizadores: Elimar Pinheiro do Nascimento e João Nildo Vianna. Rio de Janeiro: Garamond, 2007.

BECKER, B.K. Geopolítica da Amazônia. **Estudos Avançados**, v. 19, n. 53, pp. 71-86, jan./abr., 2005.

CHIOVETO, M. O. T. **Desenvolvimento rural no Mato Grosso e seus Biomas.** 2014. 245 f. Thesis (Ph.D. in Regional Development and Agribusiness) Universidade Estadual do Oeste do Paraná, Toledo, 2014.

COSTA, F. de A. **Decodificando economias locais:** análise da estrutura e dinâmica do Sudeste Paraense utilizando CS□. Brasília: IPEA, 2012. (Text for discussion nº 1723).

_____. **Dinâmica agrária e desenvolvimento sustentável na Amazônia:** diversidade, conhecimento, planejamento. Núcleos de Altos Estudos Amazônicos/UFPA. Research report, 2008.

COSTA, F. de A.; FERNANDES, D. A. Dinâmica agrária, instituições e governança territorial para o desenvolvimento sustentável na Amazônia. **Rev. Econ. Contemp.**,v. 20, n. 3, p. 517-552, set.-dez., 2016.

FURTADO, C. **Introdução ao desenvolvimento:** enfoque histórico-estrutural. 3. ed. Rio de Janeiro: Paz e Terra, 2000.

KAGEYAMA, A. A. Desenvolvimento rural: conceito e um exemplo de medida. Congresso da SOBER. **SOBER.** Cuiabá, 2004.

_____. **Desenvolvimento rural:** conceitos e aplicação ao caso brasileiro. Porto Alegre: Editora da UFRGS: Programa de Pós-Graduação em Desenvolvimento Rural, 2008.

LOMBA, R. M.; SILVA, I. C. da. O crédito rural na agricultura familiar no estado do Amapá-Brasil. **Informe GEPEC**, v. 18, n. 2, p. 20-36, jul./dez. 2014.

LOUREIRO, V. R. **Amazônia:** temas fundamentais sobre o meio ambiente. 1. ed. Belém: Cultural Brasil, 2015.

MELO, C. O.; PARRÉ, J. L. Índice de desenvolvimento rural dos municípios paranaenses: determinantes e hierarquização. **Revista de Economia e Sociologia Rural,** v. 45, n. 02, p. 329 – 365, abr./jun., 2007.

MELO, C. O. de. **Caracterização do desenvolvimento rural dos municípios paranaenses:** uma análise com base na estatística multivariada. 2006. 127 f. Dissertação (Programa de Mestrado em Economia) – Universidade Estadual de Maringá, Maringá, 2006.

MENÉNDEZ, L. S. Tendencias recientes en las zonas rurales: de la industrialización a los servicios? **Agricultura y Soc.** n. 36-37, julio/diciembre, p. 235-250, 1985.

MIRANDA, R. R. Interfaces do rural e do urbano em área de colonização antiga da Amazônia: estudo de colônias agrícolas em Igarapé-Açu e Castanhal (PA). **Campo-Território: Revista de Geografia Agrária**, v. 7, n. 14, p. 1-36, ago., 2012.

MONTE-MÓR, R. L. O que é o urbano, no mundo contemporâneo. **Revista Paranaense de Desenvolvimento** n.111, p.09-18, jul./dez. 2006.

NEUMANN, E.; FAJARDO, S.; MARIN, M. Z. As transformações recentes no Espaço rural brasileiro: Análises do papel do estado nas políticas de desenvolvimento rural das décadas de 1970 a 1990. **RA'E GA - O Espaço Geográfico em Análise,** vol. 40, pp.177-194, August, 2017.

OLIVEIRA, G. B. Uma discussão sobre o conceito de desenvolvimento. **Revista FAE**, v. 5, n. 2, pp. 37-48, maio/ago. 2002.

OLIVEIRA, R. Q.; CARLEIAL, L. M. F. Desenvolvimento amazônico: uma discussão das políticas públicas do Estado brasileiro. **Revista Eletrônica FAF**, v. 3, n. 1, 2013.

PATRÍCIO, P. C.; GOMES, J. C. C. Desenvolvimento rural sustentável, planejamento e participação. **Revista NERA**, ano 15, n. 21, jul./dez., 2012.

PLOEG, J. D. V. D et al. Rural development: from practices and policies towards theory. **Sociologia Ruralis**, v. 40, n. 4, October, 2000.

RODRIGUES, M.; SILVA, D. C. C. Crédito rural e produção agropecuária no Pará. **Revista de Administração e Negócios da Amazônia**, v. 1, n. 3, set./dez., 2015.

SACHS, I. In: **Dilemas e desafios do desenvolvimento sustentável no Brasil**. Organizadores: Elimar Pinheiro do Nascimento e João Nildo Vianna. Rio de Janeiro: Garamond, 2007.

SANTOS, N. C. A. dos. **Indicador de desenvolvimento rural para as Regiões de Integração do estado do Pará.** 2015. 140 f. Dissertation (Graduate Program in Economics) Universidade Federal da Bahia, 2015.

SEN, A. K. **Desenvolvimento como liberdade.** São Paulo: Companhia das Letras, 2000.

SILVA, I. C.; FILOCREÃO, A. S. M.; LOMBA, R.M. Assentamentos rurais no estado do Amapá: uma visão da realidade. In: **Anais do XXI Encontro Nacional de Geografia Agrária**. Uberlândia,

SILVA, I. D. B et al. Um estudo demográfico dos municípios do estado do Acre: determinístico x fuzzy. **Biomatemática**, v. 22, Campinas, p. 137-161, 2012.

SILVA, S. B. M.; SILVA, B.C.N. Roraima: problemas de desenvolvimento sustentável em uma região de fronteira. In: II Seminário Internacional sobre Desenvolvimento Regional, Santa Cruz do Sul, 2004. 7. **Anais eletrônicos.**

STAEVIE, P. M. Configuração urbana, racionalidades socioeconômicas e migrações em Boa Vista – RR: um debate sobre a urbanização de uma capital periférica da Amazônia brasileira. In: Congresso Histórico Internacional: as cidades na história: população, Guimarães/PT. 2012. **Anais eletrônicos.**

STEGE, A. L. **Desenvolvimento rural nas microrregiões do Brasil:** um estudo multidimensional. 2011. 137 f. Dissertação (Mestrado em Economia) Universidade Estadual de Maringá. Maringá. 2011.

TRINDADE JÚNIOR, S. C. C. A Amazônia Oriental brasileira: processos de territorialização e perspectivas de fragmentação política do espaço. In: XII Colóquio Internacional de Geocrítica, Barcelona, 2012. **Anais eletrônicos.**

VELHO, O. G. **Frentes de expansão e estrutura agrária.** Rio de Janeiro: Zahar, 1972.

RURAL DEVELOPMENT IN THE BRAZILIAN AMAZON: LEVELS AND DISTRIBUTION IN THE 2000-2010 DECADE

MÁRIO SÉRGIO PEDROZA LOBÃO
JEFFERSON ANDRONIO RAMUNDO STADUTO

RURAL DEVELOPMENT IN THE BRAZILIAN AMAZON: LEVELS AND REGIONAL DISTRIBUTION IN THE DECADE 2000-2010

Abstract: This paper analyzes the rural development of Brazilian Amazon municipalities in the decade 2000-2010 based on an analysis of the Rural Development Indexes (RDI) calculated for 449 municipalities. The index calculation takes into account demographic, social/welfare, environmental and economic dimensions. The results showed that only 47.88% of the municipalities had rural development levels superior to the regional average. The study identified a high degree of heterogeneity in the intraregional distribution of rural development whereby municipalities with high levels coexisted with others with very low levels. The distribution of rural development showed a clear pattern of a duality: the eastern and southern portions of the Brazilian Amazon in the states of Rondônia, Pará and Tocantins had the best levels of development and the western and northern portions in the states of Acre, Amapá, Amazonas and Roraima had the worst levels.

Keywords: Rural Development. Amazon. Northern Region of Brazil.

DESENVOLVIMENTO RURAL NA AMAZÔNIA BRASILEIRA: NÍVEIS E DISTRIBUIÇÃO REGIONAL NA DÉCADA 2000

Resumo: Buscou-se medir e analisar o desenvolvimento rural dos municípios da Amazônia brasileira na década 2000. Para tanto, foi calculado o Índice de Desenvolvimento Rural (IDR) para 449 municípios. Esse índice agrega quatro dimensões: demográfica, social e de bem-estar, ambiental e econômica. Verificou-se que apenas 47,88% dos municípios estavam acima da média regional. Além disto, ficou constatado alta heterogeneidade na distribuição intrarregional, em que coexistem municípios com alto nível de desenvolvimento rural e outros com baixos níveis. Esse resultado corroborou para a presença visível de uma dualidade na distribuição do desenvolvimento rural, em que, na porção Leste e Sul da Amazônia brasileira, figuraram os estados de Rondônia, Pará e Tocantins com os melhores níveis de desenvolvimento e no lado Oeste e Norte localizaram-se os piores níveis de desenvolvimento rural, com os estados do Acre, Amapá, Amazonas e Roraima.

DESARROLLO RURAL EN LA AMAZÓNIA BRASILERA: NIVELES Y DISTRIBUCIÓN REGIONAL EN LA DÉCADA 2000

Resumen: Se buscó analizar el desarrollo rural de los municipios de la Amazonia brasileña en la década 2000. Se calculó el Índice de Desarrollo Rural (IDR) para 449 municipios. Este índice agrega cuatro dimensiones: demográfica, social y de bienestar, ambiental y económica. Se verificó que sólo el 47,88% de los municipios estaban por encima de la media regional. Se constató alta heterogeneidad en la distribución intrarregional, en que coexisten municipios con alto nivel de desarrollo rural y otros con bajos niveles. Se encontró la presencia visible de una dualidad en la distribución del desarrollo rural, en que la parte oriental y sur de la Amazonia brasileña, figuraron los estados de Rondônia, Pará y Tocantins con los mejores niveles de desarrollo y en el lado Oeste y Norte localizaron los peores niveles de desarrollo rural, con los estados de Acre, Amapá, Amazonas y Roraima.