UNIVERSITY OF CALIFORNIA, RIVERSIDE - UCR
Department of Economics
FEDERAL UNIVERSITY OF CEARÁ - UFC
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DESERTIFICATION OF DRYLANDS IN NORTHEAST OF BRAZIL

José de Jesus Sousa Lemos

Post-Doctoral Paper in Natural and Environmental Economics

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To Mummy in memorium

The Nature in its constructive quietness, in its slowly pace of creation and transformation, in its chlorophillian production, in the peace of the biological and chemical reactions which take centures, is an amazing example of equilibrium of movement sincronization, and of colors combination. The minerals, the vegetal societies and the animals, forming together the triangle of sustentation of the knowed cooperation with the climate in order to achieve the maximum of functional perfection, the sublime of beauty, and the highest pattern of utility.

In the collective life of the inferior and superior vegetation, in the adaptation of the various species of plants to the same soil, under the shadow protection that the species do to each other, in the symbiosis which actually is the cooperation among the vegetals, in the protection that the green cover provides to the fauna, we will find the greatest teaching of organized solidarity.

Guimarães Duque.

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All these studies have in common my preocupation with an equalitarian and sustainable development to my country and to my region, one of the poorest rdgions in the world. They also have in common the emphasis I gave to the Agricultural, Ecological, Environmental and Social problems facing by the underdeveloped countries, Brazil, and, of course, by Northeast of Brazil. My expectations is that all of these four studies can give some contributions for planning the sustainable, ethical and an even development to Brazil and to its Northeast.

To make these studies I had important support of some Institutions and of many people.

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To my Father Domingos Lemos, who is the person I have to give love and to take care, principally now when Mummy passed away, and leaft behind her a profound and painful felling of loosing in my heart and in my soul.

To all of you, thanks a lot. It was a very big challenge for me to make these jobs, having so many obstacles to transpose. But I did everything in my way with your help.

Riverside, Fall, 1995.

José de Jesus Sousa Lemos.

CHAPTER 1

CONSTRUCTING AN INDEX OF DESERTIFICATION

By surviving because of the rainfall, the land transfigures in a fantastic mutation in contrast with the previous desolation...
...Expand the horizons. The sky, without the intense blue color which is characteristic of deserts, becomes most profound, because of the revival of the land.
The backland becomes a fertile valley. It is a huge and without owner orchard.
Then, all of these things end, then come back the days of torture; [illegible] when the dry days extend for so long period of time without rainfall, comes the astonishing spasm of the droughts.
The Nature plays an antithesis game.

Euclides da Cunha: ***Os Sertões***

THE PROBLEM

The agricultural production in Northeastern of Brazil is hampered by difficulties associated with the agrarian structure, the climate conditions and the environmental degradation that has occurred due to the way agricultural activities are carried out both in the traditional and modern sector. The above quoted passage which was written in 1901 show de dimension of the natural problems facing in the Northeast of Brazil, the complexity and the fragility of its ecosystem.

In the Northeast of Brazil there is a very complex interaction of factors leading to the depletion of natural resources. As we understand, these factors could be listed as follows. First, the very high level of the land concentration in this region, maybe the greatest in all the world, induces overpopulation on the small farms, which causes an over exploitation of the land. This uneven access to the principal factor of the agricultural production, the land, in this region, contributes to increase the degradation of the natural resources in Northeast. The second factor which contributes to pressure the natural resources in the Northeast is the systematic occurrence of droughts. While the region receives little rainfall, this may not be the crucial problem, because we know that there are

suitable technologies (see Luebs, 1983; Unger, 1983; and Van Bavel & Hans, 1983) to make up for this deficiency. The irregular distribution of the rainfall from year to year, is the more crucial problem rather than the amount of rainfall itself.

The third factor that we list is the way that the agricultural production takes place in this region. On one side we observe the small owners or tenants intensively exploiting the land until it is exausted. This kind of exploitation of the land occurs due to the poverty of the small producers. Because their principal preocupation is survival, they are unable to afford techniques that would ensure the long term fertility of the soil. The low levels of natural fertility of the soil that prevail in most of the region, quickly desapears and is not replaced. In the modern sector of the agricultural production in the Northeast we observe the intensive use of capital, in its different forms such as, machinery, tractors, mechanical equipments, fertilizers, and pesticides. The intensive use of heavy machinery in this segment of the agricultural production of Northeast, which was supported by the official policies in Brazil begining in the sixties (see Campos & Lemos, 1988; Santos, 1988), leads to compactation of the soil, and the destruction of its superficial cover of humus. The intensive use of the chemical products, like fertilizers, and soil correctives, also induces soil degradation, because the Northeast soil, in general, does not have the physical and chemical capacities to absorb such a quantities of these chemical products (see Duque, 1980). The intensive use of pesticides, contributes to eliminating the natural enemies of the pests and expressive part of the natural fauna, resulting in, an imbalance in the naturally and fragile ecosystem.

The last though not the least factor in terms of importance is the cutting down of the natural vegetation. This is used as the principal source of energy in domestic households and in the small or even large industries in the rural areas. This puts very high pressure on the remaining natural forests. This is compounded by the fact that the rate of reforestation is lower than that of deforestation.

The net result of this complex interation of man with the fragile ecosystem of the Northeastern region, is the degradation of the natural resources, at a very high rate.

In this study we intend to identify the areas in the Northeast of Brazil that are facing more acute environmental degradation leading to a process of desertification. We intend to map these areas and group them by the level of actual and potential occurrence of desertification. We limit the study

to the Semi-Arid segment of the Northeast of Brazil, principally to that part identified as being more suspect to desertification process according to the results of the final relatory of the meeting *Impacts of Climatic Variations and Sustainable Development in Semi-Arid Regions* (ICID) which took place in Fortaleza, Ceará from January 27th to February 1st, 1992.

The objectives of the study are:

a - to identify the critical areas in the Semi-Arid of the Northeast of Brazil, at municipality level, which are facing or are subject to soil degradation leading to the desertification process;

b - to map these areas by the intensity of the occurrence in the Semi-Arid zone;

c - to map these areas by intensity of occurrence in each of the eight States of the Northeast which belong to the Semi-Arid zone.

Our study shall have two Chapters. In the first Chapter we construct an Index of desertification (ID) that we use to classify all the municipalities belonging to the Semi-Arid zone of Northeast by they actual stage of soil degradation leading to desertification. In this part we also group these municipalities according to their estimated ID. In the second part of the research we classify the top 25% of municipalities per State, which have the greatest problems of soil degradation leading to desertification.

BACKGROUND

In his magistral book, ***Os Sertões***, Euclides da Cunha, in the begining of this century, made refference to the "greatest drought of 1791 - 1792" which had as consequence the desertification of areas from Ceará to Bahia States. In that time the Governor of the Province wrote the called *Carta Regia* (Royal Letter) of March 17th 1796 in which the Governor designated a Magistrate to be responsable by the conservation of the forests, and wrote the *Carta Regia* of June 11th 1799, which prohibited people from Pernambuco and Bahia to cut *indiscrimately* trees of the forests (Cunha, 1963).

This record of Cunha shows that the preocupation with the formation of deserts anD with cutting down trees of forests has at least two centures in Northeast.

In this Century some previous studies have identified areas subject to degradation and even

desertification in the Northeast. Among the pioneering studies is one by Vasconcelos Sobrinho in 1978. This study pointed out the grave consequences of desertification on the population, flora and fauna of the region.

More recently, we can find two studies, which also represent tentatives of mapping the areas under desertification process in the Semi-Arid of the Northeast of Brazil. One was made by Scholars and Researchers of the Federal University of Ceará (UFC) and by Researchers of the FUNCEME (Ceará Foundation of Metheorology and Hydrological Resources). This study, which was released in 1992 in the ICID meeting, is restricted only to the Semi-Arid region of the Ceará State. To identify the areas of the Ceará State subjected to desertification, the authors used techniques of soil mapping, hydric balance and remoting censoring. They identified, in a macroanalysis, that there are at least 14% of the area of the Ceará subjected to the desertification process.

The second study, was released in 1994 at the *Latin American Conference of Desertification*, that took place in Fortaleza, Ceará from 7th to 11th of March. This study, which was done by Rodrigues *et al*, 1994, tried to map the areas subjected to the desertification process in all the Semi-Arid zone of the Northeast. In this study the author used, as units of observation, the Homogeneous Microregions, as defined by the IBGE, which are composed of municipalities[1]. As we can imagine, this is a very aggregated unit of observation. They used 19 indicators classified in ecological, economical, and social level. He collected information on the presence or absence of each indicator in the *available bibliography* (Rodrigues *et al*, 1994. p. 19 - 23). To construct his matrix of indicators of desertification, they gave a score of one in the presence of a specific indicator and zero in its absence. Then summed up the score for each microregion. Based on the total scores they classified the region into three categories of desertification: Very grave, grave and moderate (Rodrigues *et al*, op. cit. p. 30 - 35).

In this study, we will use the information at the more disaggregated level of municipality (the most disagregated information available in the Census of Brazil) and a more rigorous mathematical methodology to construct an *Index of Desertification* (ID) which will be used to identify the municipalities of the Semi-Arid of the Northeast which are experiencing the desertification process.

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[1] IBGE divides Brazil in Regions: North, Northeast, Southeast, South an Centrowest. The regions are subdivided in states. The states are subdivided in mesoregions. The mesoregions are compounded by microregions. The microregions included the municipalities.

Definitions.

Before presenting the methodology that we use to identify desertification, it is necessary that we have a definition of this process.

Desertification is not easy to define. We first will present a number of different ways that it has been defined and then use these to come up with a definition most appropriate for our present study. We begin the search to elucidate the concept of desertification by quoting a passage from Dregne, 1983. According to this author:

> **Desertification is a term that has been in use since at least 1949 when Abréville, a perceptive and well informed botanist and ecologist published a book on 'Climate, Forêts, et Désertification de l'Afrique Tropicale'. Abréville thought of desertification as a changing of productivity of land into a wasteland as the result of ruination by man-induced soil erosion. He associated it with the humid and subhumid tropics where he worked. The causes of land destruction were tree cutting, indiscriminate use of fire, and cultivation, which exposed the soil to water and wind erosion.** (Dregne, 1983. p. 4).

In this definition, we observe the importance which was given by this pioneer author to the role of man in the process of desertification. This is an important aspect to understand. Desertification does not occurs by chance or by itself. There is a fundamental and decisive role of mankind inducing the process.

In the same study, Dregne (op. cit p. 5) gives the definition that he used to identify desertification in some countries he had studied. He uses the definition:

> **Desertification is the impovereshment of terrestrial ecosystems under the impact of man. It is the process of deterioration in these ecosystems that can be measured by reduced productivity of desirable plants, undesirable alterations in the biomass and the diversity of the micro and macro fauna and flora, accelerated soil deterioration, and increased harzard for human occupancy.**

According to this definition, an important consequence of the desertification process is the modification of the natural biodiversity, and the impact it causes, like reducing the agricultural productivity and production, and inducing the appearance of undesirable species.

The United Nations Conference on Desertification (UNCOD) which took place in Nairobe in 1977, and had participants representing 94 countries affected by droughts and by desertification process, created the *Plan of Action to Combate Desertification* (PACD). In that document we find the following definition:

> **Desertification is the diminution or destruction of the biological potential of the land, and can lead ultimately to desert-like conditions. It is an aspect of the wide-spread deterioration of ecosystems and has destroyed or diminished the biological/potential, i.e., plant and animal production for multiple use purpose, at a time when increased productivity is needed to support growing populations in the quest of development.** (passage cited in Stiles, 1989, p. 92)

In addition to the above definition we find that Reining, 1978 recognises that a

> **precise definition of desertification is difficult because of differences in opinion about the impact of desertification. Desertification arises from the fragility of dryland ecosystems, which under excessive pressure of human use or changes in land use causes loss in productivity and the ability to recover. Stability and resilience are major factors in the viability of all systems - social and cultural as well as physical and biological...**
>
> **...Although desertification can develop from natural causes alone, and in any climate zone, the present international effort is concerned mainly with desertification that derives from the interaction of human use systems with natural ecosystems in the arid, smi-arid, and sub-humid lands.** (Reining, 1978. p. 1).

In this definition the author also gives emphasis to the role of man in the process of desertification, and calls attention to two important aspects associated with the occurrence of

desertification: stability and resilience of the ecosystem[2]. These two aspects are very important in the comprehension of desertification. The capacity to recover and the fall of the productivity of the desired products, are two aspects that we already found in the definition of Dregne. But there are a controversial point in this definition of Reining, when the author recognises that the desertification can develops in any climate zone. We will see later that the common thinking in the searched literature is that desertification is restricted to the arid, semi-arid and sub-humid zones.

For the FAO/UNEP (1983), desertification can be defined as:

> **a comprehensive expression of economic and social processes as well as these natural or induced ones which destroy the equilibrium of soil, vegetation, air and water, in the areas subject to edaphic and climatic aridity. Continued deterioration leads to a decrease in, or destruction of the biological potential of the land, deterioration of living conditions, and an increase of desert land-scapes.**

The important point in this definition is that it comes up with the role of economic and social processes in desertification.

According to this same study

> **desertification is a continuous process going through several stages before reaching the final one which is an irreversible change.** (FAO/UNEP, 1983 p. 5).

In this FAO/UNEP study we also find the important difference between soil degradation and desertification. The fundamental difference between these two concepts is that

> **the soil degradation is not continuous, it takes place over relatively short periods, and can be reversed. Also desertification, or the danger of it, is confined to the arid, semi-arid and sub-humid areas, whereas soil degradation can occur in all**

[2] we will explain more accurately these concepts later in this Chapter.

climates. (FAO/UNEP op. cit. p. 5).

In this explanation we would like to call attention to the fact that while soil degradation can occur anywhere, desertification is limited to arid, semi-arid and semi-humid zones.

Dixon (1988) also gives a very brief and general definition of desertification. For this author desertification

> **can be defined as climate dryness induced by human disturbances of the topsoil and natural plant communities.** (Dixon, 1988 p. 14)

Another definition of desertification is found in Nelson, 1990. According to this author:

> **Desertification is a process of sustained land (soil and vegetation) degradation in arid semi-arid and sub-humid areas, caused at least partly by man. It reduces both resilience and productivity potential to an extent which can neither be readily reversed by removing the cause nor easily reclaimed without substantial investment.**

This definitions incorporates all the definitions we have presented of desertification. It gives emphasis to the role of man in the process, it also gives emphasis to the fall in the resilience and productivity of the soil, and it says that we can not solve the problems caused by desertification without a substantial amount of investment. This last point is very important, because in the poor countries, in general, there are no financial resources available to regenerate areas under desertification. So the tasks in these countries should be, first to avoid desertification, and second, to detect in advance the potential areas that can be affected by the desertification process.

In our research we use the later definition given by Nelson, because we think that it incorporates all the definitions we presented, and gives emphasis to an important point, which is the costs associated with reclaiming land that has undergone desertification.

Measuring desertification.

Measuring desertification.

Desertification is a complex process that as we have seen is defined in many different ways. Though there are some commonalities in the definitions it is difficult to reach a consensus on what would be adequate indicators of desertification.

Maybe trying to identify the causes of desertification, would be helpful in determining what should be some indicators that can be used to measure desertification. Before we try to identify some suitable indicators for desertification, we would like to quote a passage encountered in the above cited document of FAO/UNEP which could be useful in the search of some measurable indicators. According to this passage *the inherent risk of desertification depends on the vulnerability of the landscape to desertification process, as well as on natural conditions (e.g. climate, physiography, soil erodibility, water quality and depth of ground water table).*

With this information we can identify some causes of desertification. Here we have another controversial point, as shown by this passage: *Causes* (of desertification) *are too often unhelpfully described as loss of trees, soil erosion, overgrazing etc. These are not causes, they are symptoms* (Nelson, op. cit. p. 18).

This passage clearly elucidates how one can confuse the causes of desertification, with its consequence. This is not an uncommon confusion that we can find in the literature.

Nelson (op. cit.), citing Stanford (1976), shows four main views on the causes of desertification:

i - the structural arguments, which lay the blame on social and economic structures;

ii - the natural event arguments, which lay the blame on uncontrollable climate events;

iii - the human falliabillity argument, which lay the blame on the short-sightedness of pastoralists, governments, donors, and others;

iv - the population argument, which lay the blame on human and animal population growth.

Nelson arguments that *about 70% of the problem can be attributed to natural events and population growth but that significant progress can still be made by working on the other 30%, particularly on social and economic structures and the lack of technologies which lies in Stanford's human falliability category* (Nelson, op. cit. p. 18).

In the PACD document from UNCOD we can also find that desertification indicators should be:

.Growth and encroachment of mobile dunes and aeolian sand sheets;

.deterioration of rangelands;

.degradation of rainfed croplands;

.water logging and salinization of irrigated lands;

.deforestation and destruction of woody vegetation;

.declining availability of quality of groundwater or surface water (Stiles, op. cit. p. 92).

BIE (1990) presents a synthesis of a group of indicators of dryland degradation which resulted from the meeting of the *Economic Comission for Asia and Pacific* that took place in September 1988 in Thailand. According to that document, the indicators of dryland degradation can be of two kinds:

i - single variables that have direct relation to resilence; and

ii - single variables that can indirectly reflect resilience (proxy variables).

Accordng to that document, the directly related variables should be:

a - change in vegetative cover;

b - change in species composition;

c - changing in the depth of topsoil;

d - change in yield of crops of fodder.

The indirectly related variables should be:

e - preciptation (amount, distribution, intensity);

f - radiation measured from satellite or aeroplane;

g - number of animals present; and

h - runoff from watershed.

The documens also says that there are others indirectly related variables reflecting the socio-economic phenomena:

i - price of agricultural commodities;

j - human migration;

k - human nutritional status; and

l - people's opinion.

Warren (1986) following Conway (1984) proposed three broad criteria for judging land degradation: Productivity and production; variability; and sustainability. Productivity and production are defined as mean values over a specific period of time. Produtivity being the rate of production.

According to Warren, *a decline in mean productivity would be the most obvious sign of desertification. It would not*, however, *be a sufficient sign on its own, because long-term mean productivity would remain stable even if desertification were occuring* (Warren, 1986. p 87-88).

According to Warren's study, stability and equality are separate, and yet are measured by a similar parameter: variability about a mean. In this context stability is a temporal measure of variability about a long-term average productivity or production. Following these ideas, *semi-arid areas are often thought to be particularly susceptible to instability, largely because a level of fluctuation that would be endurable elsewhere can take semi-arid economic system below a sustainable threshold. Instabity is therefore a spcially useful criterion for desertification* (Warren, op. cit. p. 90)

The third broad criteria for judging desertification, *sustainability* is defined as the ability of a natural system recover from a severe shock. According to Warren (op. cit. p. 91) *it is only a viable concept in the long-term and, usually only over large areas.* Its important to point out that these shocks could be caused by natural phenomena (such as droughts in the case of the Northeast of Brazil) or by some form of misuse or exploitation by people (Warren, op. cit).

It should become clear that the concept of resilience is more difficult to measure than the concept of productivity, so there is a problem in measuring accurately the indicators of land degradation leading to desertification.

Measuring productivity and resilience.

As we have seen productivity and resilience criteria are fundamental in the evaluation of the desertification process. By definition we can distinguish two kinds of productivities: crop productivity and animal productivity.

The crop productivity, as we discussed before, is the rate of production of a specific crop over a period of time. The animal productivity is defined as the carrying capacity of the pasture.

Conventionally the productivity of grazing lands is considered in terms of carrying capacity. Normally we define the carrying capacity as the number of livestock units (LU) that can graze an area in a sustainable way over indefinite time (Bie, op . cit). This is also an average term and varies from year to year.

Resilience is the ability of land under a given land use to return to its previous productivity, following a negative shock. So there is no difference between the concepts of resilience and sustainability presented by Warren. This implies that measuring resilience requires a time-scale, and that short-time resilience may be different from long-term resilience. The short-term resilience should covers a period of one to two years. A long-term resilience covers a period of five to thirty years. To measure resilience is to monitor productivity. This does not imply that land must return to its maximum productivity, but to a stable state (Bie, op. cit.)

Productivity and sustainability in Norheast of Brazil.

Recently we completed a study on the Northeast of Brazil in which we tried to measure the sustainability of agricultural production in that region. The study used data at a very aggretated level to all the Northeastern region. That study divided the agricultural production of the Northeast in two groups: food crops including rice, broadbean, bean, cassava and corn; and cash crops, including cotton (shrub and herb cotton), banana, cocoa, cashew nut, sugar cane, coconut, tobacco, orange, castor bean, and sisal. We measured sustainability by the evolution of the productivities of these crops. We used an annual series covering the period 1960-1989. We estimated, using a log-linear regression model, the annual rates of growth (decrease) of the productivity of land in these crops. The results are shown in Table 1.

Table 1: Rates of growth of the productivity of food crops and cash crops in Northeast of Brazil from 1960 to 1989.

PRODUCTS	Estimated Regression Coefficients	Estimated "t" Statistics
FOOD CROPS		
rice	-0.0089 (0.0956)	-2.0164
broadbean	-0.0224 (0.5438)	-5.9638
bean	-0.0307 (0.5882)	-6.5134
cassava	-0.0307 (0.5882)	-6.5134
corn	-0.0258 (0.3593)	-4.1550
CASH CROPS		
cotton (shrub and herb cotton)	-0.0189 (0.2108)	-2.9572
banana	-0.0183 (0.5505)	-6.0428
cocoa	0.0252 (0.5174)	5.6652
cashew nut	-0.0273 (0.4469)	-4.9425
sugar cane	0.0077 (0.8314)	12.0015
coconut	-0.0309 (0.6707)	-7.7496
tobacco	0.0085 (0.4720)	5.1892
orange	0.0082 (0.4065)	4.5671
castor bean	-0.0305 (0.3451)	-4.0347
sisal	-0.0173 (0.4366)	-4.8449

Source: Lemos, J.J.S., 1995. Sustentabilidade e Risco na Agricultura do Nordeste. *Revista de Economia Rura*l, Brasilia, DF. 1(1995): 73 - 87. Jan/Mar 1995.
Obs.: The values in brackets are the adjusted determination coefficients (Adj. R^2).
The expected absolute values for the "t" statistics for 28 degrees of freedom is 2.05 for 5% significancy level and 1.70 for 10% significancy level.

As one can observe from these results, in aggregated terms, the agricultural production of food crops and cash crops, in general, showed to be not sustainable. In the listed products (which represent over than 80% of the agriculture production in Northeast in terms of aggregated value and in terms of occupied areas), only cocoa, sugar cane, tobacco and orange showed statistically significant rates of growth in productivity in the studied period of 1960 to 1989. But if we examine carefully the magnitude of these rates of growth we will find, with the exception of productivity of cocoa, that they are practically equal to zero.

This study led us to believe that if we disaggregated the data we should find out what are the critical areas or municipalities of the Northeast, that are subject to the desertification process. We

should note that the period covered by this research included at least three periods of droughts in the Northeast: in 1970, 1976 and from 1979 to 1983 (see SUDENE, 1981; and Carvalho, 1988). So these crops, in aggregated terms showed no resilience or sustainability, which induces to think that we are experiencing preoccupant problems of desertification in considerable areas of Northeast.

THE AREA OF STUDY THE DEFINITION OF VARIABLES AND THE SOURCES OF THE DATA.

According to the IBGE (Brazilian Institute of Geography and Statistics), the Northeast of Brazil presents an area of 1,644 thousands square kilometers, covering nine States: Maranhão, Piaui, Ceará, Rio Grande do Norte, Paraiba, Pernambuco, Alagoas, Sergipe and Bahia. The SUDENE (Superintendency of the Northeast Development), which is the regional institution responsible for its development, also includes the north part of Minas Gerais State as belonging to the Northeast.

The official area of the Northeast covers aproximately 1/5 of the total area of Brazil and had in 1991 a population of 37.6 million of people, which represented aproximately 30% of the Brazilian population (IBGE, Demographic Census of 1991).

In this region we find the totality of the Brazilian Semi-Arid zone in Brazil, covering an area of 950 thousands square kilometers. This represents 58% of the area of the region (Andrade, 1977; Carvalho, 1988; and Nogueira *et al*, 1994). This area is spread over eight states of the region (excluding Maranhão State), and the northern part of Minas Gerais State.

In this study we examine only the part of the Semi-Arid zone which is found in the eight states of Northeast, as defined by IBGE. From these states we extract the municipalities which belong to the Semi-Arid zone, based on the map of susceptibility to desertification in the Northeast found in the Relatory of the ICID-1992. Based on that relatory, we can identify the microregions of each state which are most susceptible to the desertification process in the Northeast of Brazil. We present these microregions by state in Table 2.

Table 2: Microregions Suscetible to the Desertification Process in the Northeast of Brazil.

STATE	MICROREGIONS
Piaui (PI)	.Baixo Parnaiba Piauiense
	.Campo Maior
	.Teresina
	.Valença do Piaui
	.Floriano
	.Baixões Agricolas Piauienses
	.Médio Gurguéia
	.Altos Piaui e Canindé
	.Chapadas do Extremo Sul
Ceará (CE)	.Uruburetama
	.Litoral de Pacajus
	.Baixo Jaguaribe
	.Ibiapaba
	.Sobral
	.Ibiapaba Meridional
	.Sertões de Crateús
	.Sertões de Senador Pompeu
	.Médio Jaguaribe
	.Serra do Pereiro
	.Sertões dos Inhamuns
	.Iguatu
	.Sertão do Salgado
	.Serrana de Caririaçu
	.Cariri
Rio Grande do Norte (RN)	.Salineira Norteriograndense
	.Litoral de São Bento do Norte
	.Açu e Apodi
	.Sertão de Angicos
	.Serra Verde
	.Serrana Riograndense
	.Seridó
	.Borborema Potiguar

Continue.

STATES	MICROREGIONS
Paraiba (PB)	. Seridó Paraibano
	.Curimatau
	.Sertão de Cajazeiras
	.Depressão do Alto Piranhas
	.Cariris Velhos
	.Agreste da Borborema
	.Serra do Teixeira
Pernambuco (PE)	.Araripina
	.Salgueiro
	.Sertão Pernambucano do S. Francisco
	.Alto Pajeú
	.Sertão de Moxotó
	.Arcoverde
	.Agreste Setentrional Pernambucano
	.Vale do Ipojuca
	.Agreste Meriodional Pernambucano
Alagoas (AL)	.Sertão Alagoano
	.Batalha
	.Palmeira dos Indios
	.Arapiraca
Sergipe (SE)	.Sertão Sergipano do São Francisco
	.Sertão do Rio Real
Bahia (BA)	.Chapada do Alto Rio Grande
	.Baixo Médio São Francisco
	.Médio São Francisco
	.Chapada Diamantina Setentrional
	.Chapada Diamantina Meridional
	.Serra Geral da Bahia
	.Senhor do Bonfim
	.Piemonte da Diamantina
	.Corredeira de São Francisco
	.Sertão de Canudos
	.Serrinha
	.Feira de Santana
	.Planalto da Conquista
	.Pastoril de Itapetinga
	.Sertão de Paulo Afonso
	.Agreste de Alagoinhas

Source: Relatory of ICID, 1992.

From these microregions we selected all the municipalities which had available information on the indicators of desertification, that we discuss later, in both the Agricultural Census of 1975 and 1985. It is intesresting to say that only one municipality (Dario Meira placed in Bahia State) did not have available information on all the indicators we used in this research. The total numbers of the studied municipalities by state are as follows:

Piaui (PI): 97 municipalities;

Ceará (CE): 130 municipalities;

Rio Grande do Norte (RN): 111 municipalities;

Paraiba (PB): 128 municipalities;

Pernambuco (PE): 118 municipalities;

Alagoas (AL): 48 municipalities;

Sergipe (SE): 10 municipalities;

Bahia (BA): 197 municipalities.

In total we studied 839 municipalities of the Northeast of Brazil.

Choice of the Indicators.

As we have discussed in the previous section of this study, productivity, resilience or sustainability and vegetal cover are important indicators of the presence of the desertification process. To measure productivity and resilience, it was necessary to choose agricultural products that were represented in all the eight studied states, and for which there is available information for all the 839 studied municipalities. It should be clear that this final criteria (availability of information in all municipalities) prevailed in our choice of bean, corn and cattle to be the products in which we measure the productivity and resilience which help to identify the municipalities facing desertification process.

Because productivity and resilience, applied to measure desertification, are dynamic concepts, we estimated the rate of growth (or decrease) of the productivities of bean, corn and of the carrying capacity of the pastures (natural and planted) by municipalitiy. The percentage of vegetal cover, that we use in this research as an indicator of desertification, is measured by the existing relationship

between the sum of the area with permanent crops plus temporary crops plus natural forest plus planted forests, and the total area of the municipality. We estimate the rate of growth (decrease) of this variable in the studied period (10 years). We also use the static value of the vegetal cover in 1985. This is done because, a high positive rate of growth of this variable by itself, may cause misunderstanding, if the initial point of observation is very low or close to zero, and the vegetal cover itself is an indicator of desertification.

The sources of the data are the Censos Agropecuários (Agricultural Census) of each state for 1975 and 1985. 1985 is the last year for which agricultural information at the municipality level is available in Brazil. We also collected information from the Demographic Census of Brazil of 1991.

Another point that we would like to call attention to is the fact that there was a very intense drought in Northeast in the period 1979-83. So the estimated rates of growth (or decrease of productivity of bean, corn and cattle) capture the capacity of the soil of each municipality recover their initial level of productivity, which means that we are estimating the resilience or sustainability associated with each municipality.

METHODOLOGY

To evaluate desertification observed in each of the 839 studied municipalities we construct an index of desertification (ID). To do this we use factor analysis. This is another application of a methodology that we have created and applied simultanously to construct two other indices. The first measures the relative rural level of development of all the municipalities of the Northeast, we called it Index of Relative Rural Development (IRRD), and another one which we constructed to measure the level of development achieved by less developed countries. That index we called IRD (Index of Relative Development).

We develop this section in four parts. In the first part we overview factor analysis and examine in which way it is relevant to our study. In the second part we describe the way we constructed the index of desertification (ID). In the third part we show how we group the municipalities according to their estimated ID. In the fourth part we show how we construct the variables we use in the study.

An overview of the Factor Analysis Method.

We develop the ID using factor analysis method. The advantage of this method is that the weights come from the intercorrelation among the variables used, thus allowing the estimation of more than one factor to construct ID. Actually we estimate the associated factor scores to the factor estimated through the information matrix. Basically the factor analyisis method consists of reducing the large number of variables into a few orthogonal factors.

In general we can represent a factor analysis model in the following way:

$$\mathbf{X} = \mu + \alpha\mathbf{F} + \epsilon\ ; \qquad (1)$$

where $\mathbf{X} = (X_1, X_2, \ldots, X_p)^T$ is a vector of observed random variables; $\mathbf{f} = (f_1, f_2, \ldots, f_r)^T$ is a vector $\mathbf{r < p}$ of unobserved or latent variables called factors; α is a **(p x r)** matrix of fixed coefficients (loadings); and $\epsilon = (\epsilon_1, \epsilon_2, \ldots, \epsilon_p)^T$ is a vector of random error terms. Usually $\mathbf{E(\epsilon) = E(f) = 0}$. One additional property associated to the factors is that they are orthogonals.

In general the initial structure produced by the estimated loadings is not definitive. To confirm or reject this structure, the factor analysis method provides a rotation of the initial structure of the loadings. We can make oblique or orthogonal rotation in this structure. In the specific case of this study where we use the property of orthogonality associated with the factor scores to generate the ID, we make orthogonal rotation by the *varimax* method. Interested readers should find more details about rotation methods in Dillon & Goldstein, 1984; Johnson & Wichern, 1988; and Basilevsk, 1994.

By definition, the associated factor score to a factor will situate each observation in the space of the common factors. So for each factor $\mathbf{f_i}$ the i-th factor score that we can extract is defined by $\mathbf{F_i}$ and can be expressed by the following equation:

$$\mathbf{F_i = B_1X_{i1} + B_2\,X_{i2} + \ldots + B_pX_{ip}\ ;\ i = 1, \ldots, n\ ;\ j = 1, \ldots, p\ ;} \qquad (2)$$

Where $B_1, B_2, \ldots, B_p$ are regression coefficients; $X_{i1}, X_{i2}, \ldots, X_{ip}$ are **p** observed variables. We can not observe **F**, but we can estimate it through the existing techniques of factor analysis, using the observed matrix of variables **X**.

We can rewrite equation (2) in compact form by using the matrix notation, in the following way:

$$\mathbf{F}_{(n \times q)} = \mathbf{X}_{(n \times p)} \cdot \mathbf{B}_{(p \times q)} \qquad (3)$$

In equations (2) and (3), the factor scores will be affected both by the magnitude and by the units we have used to measure the variables **(X)**. To avoid these kind of problems we normalize the variables, replacing the **X** variables by the normalized **Z** variables, where:

$$Z_{ij} = [(X_{i.} - \mu_{xi.})/\sigma_{xi.}] \; ;$$

where $\mu_{xi.}$ is the mean of $X_{i.}$ and $\sigma_{xi.}$ is its standard deviation. So we can modify the equation (3) to obtain:

$$\mathbf{F}_{(n \times q)} = \mathbf{Z}_{(n \times p)} \cdot \beta_{(p \times q)} \; . \qquad (4)$$

In equation (4) β substitutes the coefficient **B**, because we are using normalized variables on both sides of the equation.

Now we can pre-multiply both sides of the equation (4) by the value $(1/n)\mathbf{Z}^T$, where **n** is the number of observations, and $\mathbf{Z}^T$ is the transposed matrix of **Z**. So we obtain:

$$(1/n)\mathbf{Z}^T\mathbf{F} = (1/n)\mathbf{Z}^T\mathbf{Z}\beta \qquad (5)$$

The matrix $(1/n)\mathbf{Z}^T\mathbf{Z}$ is the correlation matrix among the terms of the matriz **X**. We will call this matrix **R**. The matrix $(1/n)\mathbf{Z}^T\mathbf{F}$ represents the correlation among the factor scores and the factors

themselves, and we will call it Λ. We can now rewrite the equation (5) as:

$$\Lambda = \mathbf{R}.\beta \qquad (6)$$

If we assume that **R** is a non-singular matrix we can pre-multiply both sides of the equation (6) by the inverse of the matrix **R** ($\mathbf{R}^{-1}$). We will obtain the following result:

$$\beta = \mathbf{R}^{-1}.\Lambda \qquad (7)$$

Once we have estimated the β coefficients, we can substitute them in equation (4) in order to obtain the factor scores for each observation. Here the observations will be the municipalities of the Semi-Arid zone belonging to the Northeastern Region of Brazil.

The Construction of ID.

To construct the ID we use the property of orthogonality associated with the estimated factors and factor scores. It should be clear at this point that the orthogonality associated with the factors does not necessarily implies orthogonality to the factor scores. To verify if the factor scores are orthogonals we have to estimate the matrix of variance-covariance associated with the esimated factor scores. If this matrix is an identity matrix, the factor scores will be orthogonals. The index will be calculated by the following equation:

$$\mathbf{ID_i} = (\mathbf{F_{i1}}^2 + \mathbf{F_{i2}}^2 + \ldots + \mathbf{F_{in}}^2)^{0.5}. \qquad (8)$$

In this equation, ID_i is the index of desertification associated with the i-th municipality in the Semi-Arid zone of the Northeastern Region of Brazil. We then transform the base of the index by making the highest index estimated equal to 100.

We expect that the relevant factor score coefficients are all positive. We also expect that the factor scores have a symetrical distribution around the zero mean. So half of the factor scores have

negative signals, and the other half have positive signals. The municipalities which present low level of desertification (considering the variables we included in the analysis to be discussed later) relative to the others, have negative factor scores. To avoid that high negative factor scores associated with the municpalities in the best position pushing up the ID of these municipalities, because we are using the square of these scores, we have to bring all these scores to the first quadrant, in order to make all of them non negatives. To do this we use a procedure which keep the same relative distances among the values of the factor scores. This is made using the following transformation of their values:

$$F_{ij} = (F - F_{min})/(F_{max} - F_{min}) ; \qquad (9)$$

where F_{max} and F_{min} are the values maximum and minimum observed for the factor score. This is done prior to applying equation (8).

In summary we construct the ID in four steps. In the first step we have to estimate the correlation matrix of the observed random variables, assuming that all the correlation coefficients are positive. In the second step we estimate the loadings associated with the rotated factors (in this study using the varimax orthogonal method). In the third step we estimate the matrix of factor score coefficients based on the loadings estimated in the previous step. With these coefficients we generate the factor score associated with each municipality. We will have as many factor scores for each municipality as there are number of estimated factors. In the last step we use the orthogonal property of the factor scores to build the ID.

Once we have constructed the ID for each municipality we will rank all of them in descending order. So the municipalities which present the highest levels of desertification according to the variables we are using, will have the highests ID. We also group the municipalities according to their level of desertification as measured by the estimated ID in the following five groups:

Group one (G_1) that we identify as having a very intense level of desertification includes the municipalities in which the values of ID falls in the following interval:

$$G_1 \geq (\mu_{ID} + 2\sigma_{ID}).$$

Group two (G_2) that we identify as having an intense level of desertification includes those

municipalities in which the ID falls in the following interval:

$$(\mu_{ID} + 2\sigma_{ID}) \geq G_2 \geq (\mu_{ID} + \sigma_{ID}).$$

In Group three (G_3) we include the municipalities that we identify as having moderate level of desertification, and which estimated ID values fall in the interval:

$$(\mu_{ID} + \sigma_{ID}) \geq G_3 \geq \mu_{ID}.$$

The fourth Group (G_4) we identify as having a slight level of desertification, and includes the municipalities in which the ID falls in the interval:

$$\mu_{ID} \geq G_4 \geq (\mu_{ID} - \sigma_{ID}).$$

In the fifth group (G_5) we identify those that do not have signals of desertification process and includes all the remaining municipalities.

In the above expressions μ_{ID} and σ_{ID} are the mean and the standard deviation of ID_i.

Definition of the Variables.

In this research we use the following variables:

. Yearly rate of growth (decrease) of the relative vegetal cover in the period 1975 - 1985;

. yerarly rate of growth (decreas) of the productivity of bean in the period 1975 - 1985;

. yearly rate of growth (decrease) of the productivity of corn in the period 1975 - 1985;

. yearly rate of growth (decrease) of the carrying capacity of the pasture (natural and planted) in the period 1970 - 1985;

. relative vegetal cover in 1985.

Because we have only two points in time (1975 and 1985) we calculate the rates of growth (or decrease) of the variables by using the following equation:

$$V_n = V_0(1 + r)^T ; \; V_0 > 0 ; \qquad (10)$$

where V_n is the value of the variable in year 1985; V_0 is its value in 1975; **r** is the rate of growth (if positive) or of decrease (if negative) of the variable; and **T = 10** is the time span of the analysis.

If we observe the values which come from these indicators we will observe that the lower are the values of **r**, the more problems of desertification we will observe. Because we are interested in constructing an index of desertification in which the greatest values represent the municipalities with highest levels of desertification, we make modifications in the rates of growth and construct the following variables which are used in this research:

$Y_{i1} = 1 - RGCOVER_i ;$

$Y_{i2} = 1 - RGPBEAN_i ;$

$Y_{i3} = 1 - RGPCORN_i ;$

$Y_{i4} = 1 - RGPCATT_i ;$

$Y_{i5} = 1 - RECOVER_i ;$

where:

$RGCOVER_i$ is the rate of growth (or decrease) of the vegetal cover in the i-th municipality;

$RGPBEAN_i$ is the rate of growth (or decrease) of the productivity of bean in the i-th municipality;

$RGPCORN_i$ is the rate of growth (or decrease) of the productivity of corn in the i-th municipality;

$RGPCATT_i$ is the rate of growth (or decrease) of the carrying capacity of the pasture in the i-th municipality;

$RECOVER_i$ is the relative vegetal cover in 1985 in the i-th municipality.

RESULTS

As discussed before we create the ID based on the orthogonality property associated with the factor scores. The factor scores are non observed variables which must be estimated using the factor analysis techniques. We estimated the factor loadings using the principal component (PC) technique. We tried to use the maximum likelihood (ML) technique, but because we have only 5 variables and there are 3 relevant factors to be estimated, we do not have sufficient degrees of freedom to use the ML technique (See DILLON & GOLDSTEIN, 1984). By using the PC technique

we reduced the five original variables in three orthogonal factors. Before presenting the estimated loadings should be interesting to have a look at the correlation matrix among the variables used in the study. This is presented in the Table 2.

Table 2: Correlation Matrix Among the Variables Used to Estimate the Factor Loadings and the Factor Scores to Construct an Index of Desertification (ID).

VARIABLES	Y_{i1}	Y_{i2}	Y_{i3}	Y_{i4}	Y_{i5}
Y_{i1}	1.00000				
Y_{i2}	0.02792	1.00000			
Y_{i3}	0.05965	0.31221	1.00000		
Y_{i4}	0.38081	0.01691	0.00876	1.00000	
Y_{i5}	0.26176	0.01683	0.02971	0.17299	1.00000

Sources: Censos Agropecuários of the States of the Northeast.

It is important to observe that all the included variables are positively correlated, as we expected.

In Table 3 we show the factor loadings that we have estimated. As one can observe, the five original variables have been reduced to three orthogonal factors. The statistical characteristics of the factors, like communalities, eigenvalues and percentage of explained variance also can be seen in this Table.

Table 3: Estimated Factor Structure to the Construction of the Index of Desertification (ID)

VARIABLES	FACTOR 1	FACTOR 2	FACTOR 3	COMMUNALITIES
Y_{i1}	0.78968	-0.11044	-0.15279	0.65913
Y_{i2}	0.16128	0.79498	-0.09127	0.66633
Y_{i3}	0.21451	0.77963	0.12508	0.66949
Y_{i4}	0.72673	-0.16112	-0.47277	0.76893
Y_{i5}	0.59219	-0.15555	0.75867	0.95047
Eigenvalues	1.56576	1.30217	0.84641	
% of Explained Variance	31.3	28.0	16.9	
Cummulative (%) explanation = 74.3				

Sources: Censos Agropecuários of the States of the Northeast.

We know that to estimate the matrix of the factorscore coefficients, we have to make a rotation of the factor matrix presented above. This rotation has been done in order to confirm or reject the original factor structure of the loadings. The factor score coefficient matrix is estimated from this rotated structure. In this study we use the varimax technique to rotate the factor matrix. This rotated factor matrix is presented in the Table 4.

Table 4: Matrix of the Estimated Rotated (Varimax) Structure to the Construction of the Index of Desertification (ID).

VARIABLES	FACTOR 1	FACTOR 2	FACTOR 3
Y_{i1}	0.76392	0.05653	0.26900
Y_{i2}	0.04747	0.80803	-0.10568
Y_{i3}	-0.01433	0.81081	0.10891
Y_{i4}	0.87607	-0.01716	-0.03383
Y_{i5}	0.14356	-0.00284	0.96429

Sources: Censos Agropecuários of the States of the Northeast.

By looking at this final structure we can observe that the Factor 1 is more correlated (presents the greatest absolute loading values) with the variables Y_{i1} (1 - RGCOVER) and with Y_{i4} (1 - RGPCATT). The Factor 2 is more correlated with the variables Y_{i2} (1 - RGPBEAN) and Y_{i3} (1 - RGPCORN). The Factor 3 is correlated with the variable Y_{i5} (1 - RECOVER). We can also observe that the 3 estimated factors explain 74.3% of the variance and covariance of the included 5 variables (see Tables 3 and 4).

In these results one can observe that we estimated some negative loadings, but we can also observe that they are not the relevant ones in the definition of the composition of the factors, because their magnitudes (or their absolute values) are smaller than the magnitudes of the loading which actually define the factors (see Table 4). This is more clearly seen in the following Table, where we show the estimated matrix of factor score coefficients associated to the rotated matrix of factor.

Table 5 : Matrix of the Factorscore Coefficients Used to Construct the Index of Desertification (ID)

VARIABLES	FACTOR 1	FACTOR 2	FACTOR3
Y_{i1}	0.53226	0.01971	-0.10220
Y_{i2}	0.03791	0.61495	-0.12389
Y_{i3}	-0.06062	0.61826	0.11467
Y_{i4}	0.69284	0.03887	-0.24007
Y_{i5}	-0.11318	-0.00929	0.97357

Sources: Censos Agropecuários of the States of the Northeast.

We note that the relevant factor score coefficients are positive and have the greatest absolute values. This confirms what we observed before. The correlations between the three factor scores are all zero, and the variances of all the 3 estimated factor scores is one. This means that the three estimated factor score coefficients are orthogonals. Based on this property of orthogonality we estimate the factor scores associated with each municipality. As we have three estimated factors, we will have three factor score to eacha municipality. Based on these three factor scores we estimate the index of desertification (ID), after we have brought all the factor scores to the first quadrant, to make all of them non negatives and keeping their relative original distances. The ID in this case is calculated by the following transformation of the equation (8):

$$ID_i = (F_{i1}^2 + F_{i2}^2 + F_{i3}^2)^{0.5} .$$

Applying this equation to all the 839 studied municipality we observe that the municipality which presents the greatest ID is Cristino Castro (PI), with a value of 1.4583. The municipality which presents the lowest ID is Tacaratu (PE), with a value of 0.52529. The mean of ID is 0.90 and its standard deviation is 0.14. Transforming these indices so that the highest equals to 100, the index of Cristino de Castro becomes 100 and the index or Tacaratu becomes 36.02. In the Table 1A in the annex we show all the estimated ID in a descending order. In this Table we also present the estimated values of the rates of growth of vegetal cover, productivity of bean, productivity of corn, and of the carrying capacity of cattle. We complete this table presenting in the last column the relative vegetal cover observed in each municipality. Table 1A also shows the constitution of the 5 Groups in which we have classified the municipalities according to their level of desertification as measured by the

estimated ID. It should be clear at this point that in the neighbourhoods of the groups it is difficulty to precise the difference in the patterns of the indicators of desertification.

Following this classification we find that there are 16 municipalities in the Northeast that can be classified (according to the previous criteria) as having a very intense degree of desertification. In this group, 4 municipalities belong to Piaui (Cristino de Castro, Palmeira do Piaui, Socorro do Piaui e Parnaguá). Ceará has one municipality in this group (Jaguaretama). Paraiba also has one municipality belonging to this group (S. Mamede). Alagoas has 2 municipalities included among the ones which presente very intense degree of desertification (Campo Grande and Olho D'Agua Grande). Sergipe has one municipality in this group (Tobias Barreto). Bahia has the remaining 7 municipalities belonging to this group: Itambé, Caatiba, Andarai, Formosa do Rio Preto, Santanopolis, Macarani, and Castro Alves. We can observe that the commom characteristics of these municipalities are to have high negative rates of growth (exception to Socorro do Piaui) of the studied variables. They also have very reduced areas with vegetal covers. Socorro do Piaui which presents positive rates of growth in the productivities of bean, corn and cattle, present a very negative rate of growth of its vegetal cover (-0.19% per year). It also presents a very low rate of covered area with forests, permanents and temporary crops (7%) (see Table 1A).

In the following group negative rates of growth in the studied variables also prevail. In this group, in general, there are small increases in the rate of relative areas with vegetal covers in relation to the previous group, but the situation is still bad.

In the third group (moderate degree of desertification) we can observe that there are negative rates of growth in the indicators, but the vegetal covers increase a litle bit in relation to the previous groups. In this group we also can observe that there are more municipalities presenting positive rates of growth in the indicators of productivity.

In the fourth group we observe that there are few, but consistent, presence of the symptoms of desertification. The majority of the municipalities included in this group have negative rates of growth in the productivity of bean, corn and cattle. The rates of increase in the vegetal covers are, in general, greater than those observed in the previous groups, but the municipalities belonging to this group have to be monitored in order to avoid their situation becoming worse in terms of desertification

In the last group we observe that in many municipalities there is the presence of negative rates of growth in some of the indicators, but these negative rates are compensated by some positive rates in other indicators. Those municipalities, in general, present a moderate to high rate of vegetal cover, and seems that they are not experiencing desertification process at present.

CONCLUSIONS

In general we observe that the natural and planted vegetal cover of the Semi-Arid of Northeast of Brazil is desapearing at a very fast rate. We observe that this region presents a grave problem of sustainability or resilience in the production of bean, corn and cattle. A previous study, Lemos (1995a) has showed that in aggregated terms, the agricultural production of the Northeast is not sustainable. When we disaggregate the data at municipality level we have an exact dimension of the problem and of its localization.

Because of their characteristics, most of the municipalities situated in the Semi-Arid zone of this region show some level of desertification. As we have seen, desertification is caused in part by the behavior of man. The behavior of man can also stop the process, by using the natural resources in a sustainable way. This implies in a strong change in the way agricultural activities are practiced in this region.

We have shown in previous study (see Lemos, 1995b) that this region has a great vocation to produce fruits. The rational utilization of the land, must be by using a planned diversified exploitation, because monoculture is dangerous to biodiversity and can induce a very high level of economic risk (see Horowite, 1988). The plantation of these kind of trees and a planned reforestation with native species could give to the soil the natural protection against the direct incidence of the sunlight, and it can also protect the soil against the erosion caused by the storms which occurs in the rainfall season (Dixon, 1988). This could help to bring back the native fauna which is disapearing because the chart we just showed in this research.

In the next chapter of this research we will show how the desertification process have affected the areas and the population of the States and of the Northeast itself.

CHAPTER 2

MAPPING THE STATES OF THE NORTHEAST BY THE THEIR CRITIC LEVELS OF DESERTIFICATION

INTRODUCTION

In the previous Chapter of this study we showed the situation of the municipalities of the Semi-Arid zone of the Northeast of Brazil in a very large spectrum. We observed that there is a large number of municipalities in this region where the process of desertification is taking place in a very fast way. Even in the municipalities where the indicators that we have used to measure desertification showed small magnitudes, the situation has to be seen as delicate. So all the Semi-Arid zone of the Northeast of Brazil has to be rethinked, in terms of the way the agricultural activities and the exploitation of the natural resources in this zone are taking place, because of the very high level of fragility of the ecosystem in this complex and poor zone.

In this second Chapter we turn our attention to the situation observed in each of the eight states of Northeast which belong to the Semi-Arid zone. We observe that the effects of desertification reveal themselves in different ways in each State. We know that the agricultural production continues to have a very important role in the formation of the income and in the generation of employments in all the Northeastern region of Brazil and in its Semi-Arid zone. The degeneration of the land which is bad to the ecosystem and to the landscape of the region, causes profound, and sometimes irreversible, problems to the *nordestinos* (the natives of Northeast), who must be the first priority and the principal preocupation of any economic and social policy which intend to be ethical and just to this region.

We have seen in previous study (Lemos, 1995b) that the patterns of the land concentration is one of the principal causes of the poverty in Northeast of Brazil, and it is one of the principal causes of the land degeneration in this region. So one important step to revert both the level of poverty and the degradation of the soil in Northeast is to reverse this uneven situation related to the use of land.

So in this Chapter we identify, at the States level, which are the municipalities with the worst problems of desertification, the areas and the population which are affected by the desertification process. In this Chapter is our intention to fulfil the objectives **c** and **d** presented in the previous Chapter.

METHODOLOGY

To identify the municipalities by state where the desertification process takes place most intensively, we use the rank obtained in the first Chapter, and the estimated values of the index of desertification (ID). In the present case we classify the municipalities, in descending order according to the magnitude of the ID, by State. We select the 25% municipalities of each State (with the exception of Sergipe, where this percentage is increased because of the smaller number of municipalities of this State included in the Semi-Arid zone), where the estimated levels of desertification are either: very intense, intense or moderate.

In this part of the study we calculate the areas of the States which are most affected by the desertification process. We estimate the relative participation of these areas over the total areas of the States. We also estimate the population affected by the process of desertification, and the relative participation of this affected population over the total population of the states. Concluding this part of the research, we estimate the total area of Northeast affected by very intense, intense and moderate (in the top 25% municipalities most affected by State) levels of desertification. We also estimate the total affected population, the total affected area, the percentage of this population in relation to the total population, and the percentage of the affected area in relation to the total area of the Northeast of Brazil.

RESULTS

First of all we present the results by state, and in the final we present the situation observed in Northeast.

Piaui

In Table 2B of Annex we present the results obtained for Piaui. In this State we selected 24 municipalities (25% of the total municipalities of this State included in the Semi-Arid zone and more susceptible to the occurrency of desertification according to the ICID relatory of 1992), in which the stage of the desertification process is most advanced. In the listed municipalities we can observe a very high rate of decrease of the vegetal cover (area with permanent crops + area with temporary crops + area with natural forests + area with planted forests). There are three municipalities in Piaui where the areas with vegetal cover is pratically zero. These municipalities are: Cristino de Castro (as we can observe in Table 1A, Cristino de Castro has the highest estimated index of desertification in all the Semi-Arid zone of the Northeast of Brazil), Socorro do Piaui and Paes Landim.

In the other municipalities the rates of vegetal cover are very small (see Table 2B). We also observe that the rates of decrease of the productivities of bean, corn and cattle are very high (see Table 1A).

The municipalities most affected by desertification in Piaui are: Cristino de Castro, Palmeiras do Piaui, Socorro do Piaui, Parnaguá and Prata do Piaui (Table 2B).

The total area affected by high levels of desertification in Piaui amounts 2,767,765 hectares. This represents 23% of the total area of the State. The population which is directly or indirecly affected by this process of desertification in Piaui is 376,197 people. This represents 15% of the total population of Piaui according to the Demographic Census of 1991 (see Table 1B).

Ceará

Ceará has the highest relative area under the high levels of desertification (31%). The total area affected by desertification in the top 25% municipalities in terms of the estimated ID is 3,435,445 hectares. The total population suffering directly or indirectly the effects of the desertification process in Ceará is 862,368 people. This represents 14% of the total population of this State (Table 1B).

Table 3B shows the situation of the 32 most affected municipalities of Ceará by the desertification. We can observe that the municipalities in the worst situation are Jaguaretama, Jaguaribara, Pedra Branca, Jaguaribe, Apuiarés and Caridade. We also observe that there are some

municipalities in this state, where the areas with forests are practicaly zero. Pedra Branca, Martinopole, Jaguaribara, Ibiapina and Uruoca, are the municipalities where the areas with forests (natural and planted) are dissapearing (see Table 3B). In Ceará the municipalities which are most affected by the desertification process and present the highest areas with vegetal cover are Monsenhor Tabosa, Tamboril and Baixio. Tamboril and Monsenhor Tabosa also have the greatest areas with forests in this group (Table 3B).

Rio Grande do Norte

In Rio Grande do Norte we selected 28 municipalities experiencing high levels of desertification (very intense, intense or moderate, according to our classification).

In these municipalities we observe very high rates of decrease of the productivities of bean, corn and cattle (Table 1A). There are some municipalities, in this selected group of the top 25% more affected by the desertification process, in where the vegetation cover are relatively high. São Bento do Trairi, Felipe Guerra and Santa Cruz, have the highest level of vegetal cover among those most affected municipalities. Felipe Guerra and São Bento do Trairi also have the highest relative areas with forests (see Table 4B).

The municipalities most affected by the desertification process in Rio Grande do Norte are: Açu, Santana do Matos, Carnauba dos Dantas, Caiçara do Rio dos Ventos and Lajes Pintadas (See Table 4B).

The total amount of area affected by these high levels of desertification is 1,123,553 hectares. This represents 26% of the area of this State. The total population affected by these level of desertification in Rio Grande do Norte amounts 281,467 people, which represents 12% of the population of the State (Table 1B).

Paraiba

For Paraiba we selected 32 municipalities in which the levels of desertification are the highest. In this State, in general, and in these municipalities in particular, we need to call attention to the high

rate of depletion of the forests. There are 23 municipalities in this group of 32, where the relative areas under forests are not higher than 6%, many of them having 0% of their areas with forests (Table 5B). There are also very high rates of decrease of the productivities of bean, corn, and cattle (see Table 1A).

The municipalities most affected by the desertification process in Paraiba are: São Mamede, Frei Martinho, Santa Cruz, São Sebastião do Umbuzeiro and Congo (See Table 5B).

The total area affected by this high level of desertification in Paraiba is 1,236,811 hectares, which represents 25% of the total area of the State. The total population affected by this level of desertification in Paraiba is 411,102 people. This represents 13% of the total population of this state (see Table 1B).

Pernambuco

From Pernambuco, the 25% municipalities which have the high levels of desertification amount to a total of 30. Of these 30 municipalities, only two municipalities have areas with forests, which represent at least 10% of the area of the municipality. They are Itaiba with 13% and Pedra with 11%. In this State we also observe a very intense rate of depletion of the vegetal cover (see Table 6B). The rate of decrease of the productivities of bean, corn and cattle have very high values (Table 1A).

Among the municipalities belonging to this group in Pernambuco we observe that Feira Nova, though having a negative rate of growth in its relative area with vegetal cover, has a high rate of vegetal cover for this group (47%). São Bento do Una shows a positive rate of growth of the area with vegetal cover, and also has a relatively high rate of area with vegetal cover (41%) (See Tables 1A and 6B).

In Pernambuco, the municipalities most affected by desertification are: Correntes, Cachoeirinha, Feira Nova, Bom Conselho and Saire (See Table 6B).

The total area affected by the high levels of desertification in Pernambuco is 1,041,216 hectares, which represents 16% of the total area of this state. The total population affected by these high levels of desertification in Pernambuco amounts 865,860 people. This represents 12% of the

population of the State (See Table 1B).

Alagoas

Alagoas is another State in which we observe a very high rate of depletion of the natural resources. We selected 12 municipalities (the top 25% in terms of desertification). Of these municipalities, we observe that in eleven the areas with forests have less than 10% of the total area of the municipality. In this group, only Maravilha has more than 10% of its area with forests. Its observed value is 14%. We also observe very high rates of decrease of the relative areas with vegetal cover (Table 7B).

As a common characteristic of the municipalities of all States included among the ones with the highest levels of desertification, the municipalities of Alagoas belonging to this group, also have high rates of decrease of their productivities of bean, corn and cattle (see Table 1A).

In Alagoas, the municipalities most affected by the desertification process are: Campo Grande, Olho D'Agua Grande, Mar Vermelho, Paulo Jacinto and Maribondo (Table 7B)

The total area affected by the high levels of desertification in Alagoas is 217,943 hectares, which represents 9% of the total area of this state. The affected population is 178,101 people, which represents 7% of the population of Alagoas (Table 1B).

Sergipe

Sergipe had only 10 municipalities included in this study. From these 10 municipalities we selected 8 municipalities which are included in the group where the levels of desertification are the highest. In these selected municipalities we observe an intense rate of depletion of the forests, and a high rate of loss of the areas with vegetal cover (see Table 8B). In Sergipe we also observe high rates of decrease of the productivities of bean corn, and cattle (Table 1A).

The most affected municipalities by the desertification process in Sergipe are: Tobias Barreto, Tomar Geru, Cristanopolis, Gararu, and Monte Alegre de Sergipe (Table 8B).

The total area of Sergipe affected by these highest levels of desertification process represents 23% of the total area of the state and amounts to 432,387 hectares. The affected population by desertification in its highest levels in Sergipe represents 9% of the population of the State. This rate is associated with a population of 141,140 people (Table 1B).

Bahia

In Bahia we selected 49 municipalities which present the highest levels of desertification. In these municipalities, we observe high rates of decrease in the productivities of bean, corn and cattle, which prevail in the majority of the municipalities included in this group (Table 1A).

In Bahia the rate of depletion of the forests also is very intense. There are 28 municipalities situated in this critical group belonging to Bahia, where the areas with forests represent less than 10% of the areas of the municipalities. We observe also that in three municipalities (Santanopolis, Santa Barbara and Anguera) the rate of the areas with forests is zero (see Table 9B). The areas with vegetal cover, in general, also is a very low rate in relation to the total area of the municipalities.

In Bahia the municipalities most affected by high levels of desertification are: Itambé, Caatiba, Andarai, Formosa do Rio Preto and Santatanopolis (see Table 9B).

The total area affected by these levels of desertification in Bahia amounts to 5,702,614 hectares, which is 17% of the total area of thie state. The total population affected by these levels of desertification in Bahia is 878,429 people. This represents 17% of the total population of the State (see Table 1B).

Norheast

The Northeast of Brazil as a whole we observe that the affected area by the highest levels of desertification amounts to 15,957,734 hectares. This represents 17% of the total area of the region. The affected population by the highest levels of desertification represents 11% of the total population of this region. The total population affected amounts to 3, 994, 664 people (see Table 1B).

SUMMARY, GENERAL CONCLUSIONS AND IMPLICATIONS

In this research we have estimated an Index of desertification (ID) to measure the levels of desertification observed in all the municipalities situated in the critical and susceptible Semi-Arid zone of the Northeast of Brazil. To construct this index we used the dynamic concepts of the time evolution of the productivities of bean and corn, and of the evolution of the carrying capacity of the pasture in this zone. We also used the dynamic concept of evolution of the rate of growth of the vegetal cover and its static value in 1985, the last year that we have available agricultural information for Brazil at the municipality level.

The first three indicators are used to measure productivity and resilience or sustainability, two basic concepts in the definition and in the determination of the desertification process. The vegetal cover, which included the total areas occupied with permanent crops, temporary crops, natural and planted forests, stands as the indicator for soil protection against the intensity of the sunlight in this tropical area, and against the storms which cause its erosion, during the rainy seasons. We observed from the literature that the rate of vegetal cover and its evolution in time are important indicators of the degradation of the land and of the occurrence of the desertification process.

In the studied period (1975 - 1985), we observed that there was at least the occurrence of a rigorous period of drought in Northeast from 1979 to 1983. So the estimated rates of growth of the productivity of bean, corn and of the carrying capacity of the pasture (which is an indicator of its productivity), capture the resilience or sustainability of the land in the studied municipalities (Bie, op. cit.). We use factor analysis to create the ID, based on the mathematical property of orthogonality associated with the factor scores. We used this ID to rank in descending order of desertification all the 839 studied municipalities of the Semi-Arid zone of Northeast of Brazil.

The results showed that, in general, the fragile ecosystem of the Semi-Arid Zone of the Northeast has a very low capacity to restore its productivity capacity after the occurrence of a shock in the system. We include this, because we observe that the majority of the municipalities that we have studied, presented negative rates of growth in at least one indicator of productivity.

One could say that the fall in productivity occurred because the agricultural prices of these crops fell. There are at least two arguments against such a statement. First of all, corn and bean are

subsistence products for most farmers in the Northeast, and in general, the primary preocupation of these farmers is to produce to feed their families. So the market prices or their expected values have little importance in the decision of planting these two food crops. Otherwise, in previous study (Lemos, 1995a) we have shown that in aggregate terms, at least, the real prices of all the food products produced in the Northeast, including bean and corn, had positive rates of growth in their prices for the period 1960/1989. In the case of bean, for example this estimated rate was 2.8% per year. In the case of corn the rate was 1.2% per year. So the fall of the real prices of these two food crops, is not an adequate argument to explain their fall in productivity.

Cattle is, in general, produced for the market, but we observe that in the Northeast there are a great number of small farmers breeding cattle, where the information about its price or even the price of milk never come. But we have to recognize that the fall in the price of cattle can induce a fallen in the carrying capacity of the pasture. But if we look at the data we observe that, at the same time that the rate of vegetal cover decreased in Northeast and in the Semi-Arid zone, there was an increase in the rate of the land with pasture. Under the lens of neoclassical theory, this would be seen as irrational behavior on the part of the farmers, in increasing the land with pasture while the cattle prices were falling. So it seems that the cause of this fall in productivity of the pasture, can be greately atributed to the degradation of the land in the Semi-Arid zone.

These problems are consequences of the occurrency of natural phenomena like droughts, by the afluence of cristaline rocks, by the low physical and chemical quality of the soil, and also the consequences of the actions of man (Duque op cith; and Nelson, op. cit.). They are caused by the way that the agricultural production takes place in this area, by the intensive cutting of trees and shrubs for use as the principal source of energy and, most importantly, by the way the land is distributed in all the Northeast of Brazil. This interaction between the fragility of the natural ecosystem, and man use of natural resources for food and energy on very small farms, in addition to the use of heavy machinery, tractors, and chemical products on the modern agricultural sector, accelerated the degeneration of the soil and of the ecosystem of this region.

We have already pointed out that man has a fundamental role in causing desertification. But man also has the solution to this problem. The solution will be less complicated and costly, the less advanced is the stage of the desertification process. In many areas of the Semi-Arid zone we can

observe from the results of this research, that there are signals that the desertification process has already reached a very high degree of intensity. Even in those areas where the signals of desertification process are not critical, solutions to the problem must be found before the process becomes worse.

What must be done immediately in the Northeast, in general, and in the Semi-Arid zone in special, is to rethink the way that the natural resources of these very complicated and fragile areas are exploted. The observed rates of depletion of the forests in this zone are cause of concern, principally because in many municipalities the forests already disapeared or are disapearing. The vegetal cover of permanent and temporary crops also showed negative rates of growth in most municipalities. They are being substituted by pasture or are becoming innappropriate for agricultural production, because of the degradation of the land.

To rethink the exploitation of the natural resources in the Semi-Arid zone of Northeast in a sustainable and economic way, implies a profound modification in the human behavior, and principally in the modification of the priorities of the agricultural and economic policies in this area. We point out that the first step is to promote a profound land reform, which would allow the actual landless, tenants or small owners enough land to exploit and produce subsistence what is necessary for their survival. We would like to point out that Northeast of Brazil, according to the *Map of Hunger* produced by IPEA (Institute of Applied Research in Economics) in 1993, there are at least 7 million people living under the absolute poverty line. The majority of them living in the rural areas. Remember also that the Semi-Arid represents 58% of the total area of this region. Immediately creating conditions under which these people can obtain access to food is an important social and ethic objective, of any social and economic policy. This is only possible by giving them the conditions to produce, which means, giving them access to the principal factor of production in agriculture: the land. This has as a natural consequence the protection of the land, because having areas big enough to produce for food and the market with a small number of family members in the farms, will diminish the pressure on the land. In addition secure titles will promote the more careful use of land.. This will also reduce the existing practice of ***agricultura intinerante*** (intinerant agriculture), that the farmers do when the capacity of the land to produce diminishes.

Another point that must be given emphasis and that must be approached simultaneously with

land reform is the implementation of very different policies of rural credit in all phases of agricultural production: from the preparation of the land to the harvest and the comercialization of the crops. In the comercialization phase the Government, at a Federal level, must implement a policy of minimum price, principally for the food crops. We do not believe in the power of the *free market* to solve the problems of this kind of production, when we know that there are a few number of intermediaries who purchase the agricultural products imposing the prices that they want to do, because of their oligopsonic or even monopsonic position in the market in these areas.

We have to implement a policy of public technical assistance and rural extension for the small farmers and for their families. This includes services of education, sanitation, health. These are necessary for the creation of applied techonologies to exploit the natural resources of the Semi-Arid in a sustainable and economic way.

We have to begin zonning the areas by their natural vocation. In this respect we have demonstrated that the Northeast has a great natural vocation to produce fruits (Lemos, 1995b). These kind of products have the advantage of being better vegetal cover to the soil, and, of course, produce products of high income elasticity. To do this we have to plan the production in a very diversified way. We know that the large monoculture exploitation brings at least three kinds of problems. Economic risk, associated with a fall in the price of the product, and the farmer will not have economic alternatives. Risk of occurrence of pests and diseases. If we have extensive areas with the same crop, it becomes easier for the pests and diseases to disseminate in all the cultivated area. This is dangerous for the ecosystem equilibrium, because we know that the diversity of the vegetal cover stimulates the growing of the natural fauna.

Another point that must be addressed immediately in this region is stopping the official incentives to increase the areas with pasture. We observe that there is a great rate of substitution of the areas with forests and with the permanent and temporary crops by areas with pasture. This has been done greatly through the use of public financial resources. The substitution of the natural forests by pastures causes profound, and sometimes irreversibles, damage to the natural ecosystem, affecting the biodiversity, reducing the natural reservoir of water, because the evaporation of the water becomes most intensive without the protection of the trees. It also causes the reduction of available wood to be used by families as a source of energy to cook food.

The desertification process in the Semi-Arid of Northeast already affects, in a high way, at least one area of 15,957,734 hectares in Northeast, which represents 17% of its total area. The affected population, directely or indirectely, amounts a total of 3,994,664 people, which represents 11% of the population of the Northeast.

In relative terms, the Ceará is the most affected state of Northeast, having at least 31% of its area suffering of high rates of desertification.

The general conclusion of this research is that to modify the situation we just described, there is a long track to walk, but we have to start immediately, because the costs of recuperation of the degrated areas increases at a very high rate. The later we start the planning of exploitation of the natural resources of the Semi-Arid zone of Northeast in a sustainable and economic way, the more we will have to pay in financial terms, and in the reduction of the quality of life in these affected areas and in the urban areas, because people from rural area, without the minimum conditions to survive, will leave their original places and migrate to the big cities of the Northeast. These cities do not have conditions to absorb this amount of people. So the consequences are: increase of homeless, people living under the bridges or in shanytown, the increase of unemployment in the urban area, which cause fallen in wages, the deterioration of the environment both in the urban and in the rural areas. This picture is already very common in all the big cities of Northeast, principally in the state capitals.

As one can observe, this study has a characteristic in being exploratory. The next steps to be followed could be to actualize the data base at municipality level. If the rates of growth (decrease) of the vegetal cover, the productivities of bean, corn and carrying capacity keept being at the same level from 1985 to 1995, as they are in the previous decade, then the situation of the municipalities affected by desertification process has became worsen.

Another step could be to improve the construction of the map of the areas affected by the desertification process, and their characteristics. That could be done by making a field research in those more affected municipalities. We could also use remoting sensoring techniques to help to confirm and to map the areas of municipalities where the situation is worse in terms of desertification. We used disagreggated data at municipality level. This is a political concept. Maybe all the area of a specific municipality will not be totally affected by desertification. So with the field research and with the remoting sensoring, we could say exactly where are, in each municipality, the areas affected

by desertification.

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Table 1B: Total Area, Total Population, Affected Area, Affected Population by Preoccupant Levels of Desertification Process per State of the Semi-Arid Zone of the Northeast of Brazil.

STATE	Total Area (ha) (1)	Affected Area (ha) (2)	Relative Affected Area (2)/(1)	Total Population (3)	Affected Population (4)	Relative Affected Population (4)/(3)
Piaui	11828027	2767765	0.23	2582137	376197	0.15
Ceará	11009164	3435445	0.31	6366647	862368	0.14
R.G.Norte	4383019	1123553	0.26	2415567	281467	0.12
Paraiba	4872094	1236811	0.25	3201114	411102	0.13
Pernambuco	6699920	1041216	0.16	7127855	865860	0.12
Alagoas	2363772	217943	0.09	2514100	178101	0.07
Sergipe	1918510	432387	0.23	1491876	141140	0.09
Bahia	33431403	5702614	0.17	11867991	878429	0.07
Northeast	92054182	15957734	0.17	37567287	3994664	0.11

Sources: Censos Agropecuários of all States of Northeast and Censo Demográfico do Brasil.

Table 1A: Ranking of the Municipalities of the Semi-Arid of Northeast
According to the *Index of Desertification (ID)*.

Group One: Very Intense

Number of Munic.	Rank	Municipality	State	ID	ID base 100	RGCOVER	RGPBEAN	RGPCORN	RGPCATT	RECOVER
2074	001	Cristino de Castro	PI	1.46	100.00	-.32	.01	.00	-.11	.01
8009	002	Tobias Barreto	SE	1.33	91.19	-.14	-.02	-.06	-.05	.04
5067	003	S.Mamede	PB	1.31	89.57	-.04	-.12	-.12	-.05	.25
9171	004	Itambe	BA	1.26	86.60	-.04	-.04	-.08	-.03	.09
9162	005	Caatiba	BA	1.26	86.24	-.02	-.07	-.11	-.04	.18
9041	006	Andarai	BA	1.25	85.92	-.01	-.11	-.14	.02	.40
7037	007	Campo Grande	AL	1.25	85.54	-.01	-.11	-.07	-.01	.12
9008	008	Formosa do Rio Preto	BA	1.24	84.93	-.14	-.01	-.01	-.15	.11
9153	009	Santanopolis	BA	1.22	83.50	-.05	-.06	-.06	-.02	.12
2075	010	Palmeira do Piaui	PI	1.21	83.17	-.11	-.07	-.03	.01	.13
7044	011	Olho D'Agua Grande	AL	1.21	82.80	-.03	-.10	-.03	-.01	.10
9174	012	Macarani	BA	1.20	82.17	-.02	-.02	-.05	.00	.06
3063	013	Jaguaretama	CE	1.20	82.04	-.03	-.08	-.08	.00	.21
9142	014	Castro Alves	BA	1.19	81.69	-.05	-.04	-.06	-.02	.14
2089	015	Socorro do Piaui	PI	1.19	81.46	-.19	.13	.08	.07	.07
2097	016	Parnagua	PI	1.18	81.21	-.17	-.01	.06	-.14	.13

Group 2: Intense

Number of Munic.		Municipality	State	ID	ID base 100	RGCOVER	RGPBEAN	RGPCORN	RGPCATT	RECOVER
5010	017	Frei Martins	PB	1.17	80.31	.01	-.05	-.07	-.02	.14
5059	018	Sta. Cruz	PB	1.17	80.17	-.06	-.04	-.08	-.06	.25
9182	019	Acajutiba	BA	1.17	80.08	-.02	-.10	-.07	-.04	.26
9013	020	Barra	BA	1.17	80.03	-.06	-.10	-.07	.02	.31
6101	021	Correntes	PE	1.17	79.93	-.04	-.06	-.04	.03	.14
9143	022	Coracao de Maria	BA	1.16	79.81	.02	-.07	-.08	.03	.19
9152	023	Sta.Barbara	BA	1.16	79.70	.00	-.04	-.03	.03	.07
5086	024	S.Sebastiao do Umbuzeiro	PB	1.16	79.67	-.05	-.03	-.02	-.01	.08
5075	025	Congo	PB	1.16	79.60	-.01	-.04	-.04	.06	.10
9020	026	Sento Se	BA	1.16	79.51	-.07	-.10	-.06	-.11	.38
5001	027	Belem do Brejo do Cruz	PB	1.16	79.25	-.01	-.07	-.07	.01	.21
4009	028	Acu	RN	1.15	79.05	-.07	-.04	-.04	-.09	.22
6077	029	Cachoeirinha	PE	1.15	78.97	-.01	-.06	-.09	.02	.26
9052	030	Iramaia	BA	1.15	78.78	-.05	-.06	-.06	-.02	.24
2029	031	Prata do Piaui	PI	1.15	78.73	-.05	-.06	-.03	.05	.15
3064	032	Jaguaribara	CE	1.15	78.53	-.06	-.03	-.03	-.06	.16
5018	033	Boa Jesus	PB	1.14	78.38	-.07	-.04	-.06	-.01	.26
4047	034	Santana do Matos	RN	1.14	78.35	-.09	-.02	-.03	-.03	.17
5107	035	Tacima	PB	1.14	78.24	-.06	-.03	-.05	.00	.20
5090	036	Taperoa	PB	1.14	78.19	-.05	-.10	-.05	-.07	.30
7029	037	Mar Vermelho	AL	1.14	77.94	-.03	-.06	.00	.02	.09
6057	038	Feira Nova	PE	1.14	77.85	.00	-.15	-.08	.00	.47
5074	039	Camalau	PB	1.14	77.84	-.06	-.04	-.01	.01	.12
6094	040	Bom Conselho	PE	1.13	77.78	-.01	-.07	-.06	.00	.21
9150	041	Ouricangas	BA	1.13	77.28	.00	.06	-.09	.01	.16
9161	042	Boa Nova	BA	1.12	76.97	-.05	.00	-.04	-.01	.17
9140	043	Anguera	BA	1.12	76.92	-.08	.00	.04	-.04	.07
9175	044	Maiquinique	BA	1.12	76.79	.00	-.05	-.02	-.01	.10

2084	045	Paes Landim	PI	1.12	76.68	-.12	.04	.06	.04	.07
9166	046	Nova Canaa	BA	1.12	76.66	-.07	.01	-.01	-.02	.12
9059	047	Mucuge	BA	1.12	76.63	-.03	-.03	-.04	-.12	.21
2093	048	Cristalandia do Piaui	PI	1.12	76.55	-.10	-.01	-.01	-.08	.19
4024	049	Carnauba dos Dantas	RN	1.12	76.53	-.03	-.04	-.03	.02	.16
2096	050	Monte Alegre do Piaui	PI	1.12	76.52	-.04	-.07	-.04	-.05	.24
5053	051	Patos	PB	1.11	76.25	.01	-.07	-.09	.02	.33
6114	052	Saire	PE	1.11	76.13	-.03	-.01	-.07	.01	.24
5088	053	Soledade	PB	1.11	76.11	.00	-.06	-.03	-.05	.16
5038	054	Cacimba de Areia	PB	1.11	76.00	-.03	-.04	-.06	-.02	.26
7032	055	Paulo Jacinto	AL	1.11	75.95	-.04	-.06	.02	-.01	.09
6105	056	Ibirajuba	PE	1.11	75.94	-.01	-.07	-.08	.01	.31
2012	057	Batalha	PI	1.11	75.90	-.03	-.05	.00	.04	.12
3059	058	Pedra Branca	CE	1.11	75.85	-.03	-.08	-.02	.00	.17
2053	059	Demerval Lobao	PI	1.11	75.85	-.04	-.09	-.03	-.01	.24
4049	060	Caicara do Rio dos Ventos	RN	1.11	75.81	-.06	-.05	-.04	-.06	.27
2021	061	S.Joao da Serra	PI	1.10	75.74	-.04	-.01	-.01	.05	.13
9117	062	Tapiramuta	BA	1.10	75.72	.02	-.04	-.11	-.03	.34
9157	063	Tanquinho	BA	1.10	75.52	-.01	.01	.02	-.01	.03
9172	064	Itapetinga	BA	1.10	75.46	.00	.04	-.02	.00	.07
7028	065	Maribondo	AL	1.10	75.33	-.02	-.05	-.01	.03	.14
6091	066	Altinho	PE	1.10	75.17	-.02	-.05	-.05	-.01	.24
9084	067	Malhada de Pedras	BA	1.10	75.13	.06	-.05	-.07	.00	.19
4065	068	Lajes Pintada	RN	1.10	75.13	-.02	-.10	-.10	-.04	.52
9158	069	Anaje	BA	1.09	75.04	.00	-.03	-.10	.00	.34
5064	070	S.Jose de Espinheiro	PB	1.09	74.98	-.06	.01	-.02	.24	.21
2059	071	Bertolina	PI	1.09	74.83	-.04	-.01	.03	.02	.08
3065	072	Jaguaribe	CE	1.09	74.81	-.03	-.07	-.02	.00	.20
6071	073	Toritama	PE	1.09	74.81	.00	-.09	-.08	.04	.37
9070	074	Aracatu	BA	1.09	74.80	.05	-.05	-.06	-.01	.19
5097	075	Pilar	PB	1.09	74.62	-.04	-.05	-.02	.05	.20
3012	076	Apuiares	CE	1.08	74.36	-.02	-.04	-.09	-.01	.37
9129	077	Candeal	BA	1.08	74.31	.02	.00	.00	-.01	.06
2088	078	Simplicio Mendes	PI	1.08	74.26	-.11	.02	.05	.00	.13
5065	079	S.Jose do Bonfim	PB	1.08	74.22	-.01	-.07	-.08	.04	.37
5027	080	Monte Horebe	PB	1.08	74.11	-.07	-.04	-.02	-.01	.22
5068	081	Sousa	PB	1.08	74.09	-.04	-.03	-.06	-.02	.28
5096	082	Mogeiro	PB	1.08	73.85	.01	-.09	-.04	.03	.24
4019	083	S.Rafael	RN	1.08	73.81	-.08	.01	-.01	.02	.20
4003	084	Carnaubais	RN	1.08	73.81	-.09	-.01	-.03	-.08	.29
5092	085	Caldas Brandao	PB	1.07	73.70	-.05	-.04	-.02	-.02	.21
5042	086	Desterro de Malta	PB	1.07	73.62	-.04	-.03	-.05	.03	.26
8010	087	Tomar Geru	SE	1.07	73.60	-.02	.01	.00	-.04	.11
3023	088	Caridade	CE	1.07	73.51	-.06	-.02	-.05	-.13	.35
2030	089	S.Felix do Piaui	PI	1.07	73.50	-.03	.01	-.01	.07	.15
9115	090	Ruy Barbosa	BA	1.07	73.47	.00	-.04	-.04	-.01	.21
5082	091	Prata	PB	1.07	73.39	-.07	.00	.00	.08	.17
6056	092	Cumaru	PE	1.07	73.35	.01	-.06	-.07	.01	.31
9077	093	Dom Basilio	BA	1.07	73.34	-.01	-.06	-.03	-.05	.23
5084	094	S.Joao do Tigre	PB	1.07	73.33	.02	.01	.00	.00	.08
6086	095	Sta.Cruz do Capibaribe	PE	1.06	72.83	.00	-.09	-.01	-.03	.19
2013	096	Campo Maior	PI	1.06	72.82	-.01	-.04	-.04	.00	.23
9071	097	Brumado	BA	1.06	72.82	.03	-.04	-.03	-.03	.15
9180	098	Pedro Alexandre	BA	1.06	72.81	-.06	-.06	.00	-.01	.22
3025	099	Hidrolandia	CE	1.06	72.77	-.03	-.02	-.04	.03	.23
9101	100	Saude	BA	1.06	72.73	-.03	.01	.00	.00	.14
6096	101	Brejao	PE	1.06	72.68	.05	-.06	-.08	.04	.31
5047	102	Lastro	PB	1.06	72.64	-.02	-.03	-.06	.02	.30
9118	103	Varzea do Poco	BA	1.06	72.63	.00	.00	-.04	-.03	.18
3109	104	Ubajara	CE	1.06	72.54	-.04	-.03	-.04	.03	.25

2055	105	Miguel Alves	PI	1.06	72.47	-.01	-.04	-.08	.38	.46
9025	106	Paratinga	BA	1.06	72.45	-.05	-.04	-.05	.00	.33
9026	107	Barra do Mendes	BA	1.06	72.44	-.05	-.01	-.01	-.03	.19
9012	108	Tabocas do Brejo Velho	BA	1.06	72.43	-.03	-.05	-.01	-.04	.20
5120	109	Fagundes	PB	1.06	72.40	.02	-.07	-.07	-.01	.35
4099	110	Riacho do Cruz	RN	1.06	72.36	-.02	-.08	-.08	.01	.45
9154	111	Sta.Teresinha	BA	1.06	72.36	.01	.03	.01	-.02	.09
9106	112	Ibiquera	BA	1.05	72.26	.00	.05	-.07	-.02	.23
6111	113	Palmerina	PE	1.05	72.24	-.03	-.03	.00	.02	.17
5005	114	Catole do Rocha	PB	1.05	72.12	-.02	-.07	-.06	-.03	.39
5033	115	Serra Grande	PB	1.05	72.03	-.07	-.05	.01	.01	.21
7025	116	Belem	AL	1.05	71.80	.04	-.10	-.02	.03	.22
5049	117	Nazarezinho	PB	1.05	71.77	-.02	-.05	-.07	-.07	.40
9151	118	Pedrao	BA	1.05	71.76	.00	.07	-.02	.01	.13
9110	119	Macajuba	BA	1.05	71.73	.04	.00	-.05	-.02	.19
2017	120	Domingos Mourao	PI	1.04	71.65	.00	-.03	-.01	.09	.17
9111	121	Mairi	BA	1.04	71.64	.01	.02	-.03	-.03	.17
9075	122	Condeuba	BA	1.04	71.60	.01	-.04	-.04	-.07	.25
9185	123	Apora	BA	1.04	71.49	-.01	.00	-.02	-.01	.17
2073	124	Bom Jesus	PI	1.04	71.48	-.03	-.03	-.01	.01	.20
8007	125	Cristanopolis	SE	1.04	71.38	.00	.01	-.05	-.03	.23
6083	126	Pocao	PE	1.04	71.32	-.03	.00	-.02	.02	.20
6090	127	Agrestina	PE	1.04	71.31	-.02	-.02	-.02	.03	.21
4060	128	Campo Redondo	RN	1.04	71.30	.01	-.08	-.09	.06	.46
6069	129	Surubim	PE	1.04	71.23	-.02	-.08	-.03	.00	.32
5083	130	S.Joao do Cariri	PB	1.04	71.20	.07	-.03	-.02	.03	.13
9134	131	Riachao do Jucuipe	BA	1.04	71.13	-.06	.03	.00	-.03	.20

Group Three: Moderate

Number of Munic.	Rank	Municipality	State	ID	ID base 100	RGCOVER	RGPBEAN	RGPCORN	RGPCATT	RECOVER
9099	132	Mirangaba	BA	1.03	70.94	.02	-.07	-.05	-.05	.38
2056	133	Monsenhor Gil	PI	1.03	70.93	-.01	-.05	.00	.07	.19
6050	134	Itaiba	PE	1.03	70.71	.06	-.12	-.06	.05	.41
3007	135	Martinopole	CE	1.03	70.66	.00	-.09	-.02	-.03	.30
9113	136	Mundo Novo	BA	1.03	70.65	.00	-.01	-.04	-.01	.24
4048	137	Bento Fernandes	RN	1.03	70.61	-.03	-.07	-.04	-.01	.35
5087	138	Serra Branca	PB	1.03	70.60	.07	-.05	-.05	.05	.23
9042	139	Barra da Estiva	BA	1.03	70.59	-.01	-.03	-.06	.06	.32
2026	140	Inhuma	PI	1.03	70.47	-.03	-.05	-.04	-.19	.57
2011	141	Barras	PI	1.03	70.41	-.03	-.04	.00	.08	.21
9007	142	Cristopolis	BA	1.03	70.34	-.04	-.02	.01	-.07	.21
3055	143	Itatira	CE	1.03	70.33	-.03	-.11	-.02	-.06	.40
2092	144	Corrente	PI	1.03	70.31	-.06	-.06	.01	-.09	.31
6051	145	Pedra	PE	1.02	70.23	-.05	-.05	.00	.00	.26
6102	146	Cupira	PE	1.02	70.20	-.02	-.04	-.04	.01	.31
9132	147	Lamarao	BA	1.02	70.12	.01	.00	.01	-.01	.13
5089	148	Sume	PB	1.02	70.07	.02	-.03	-.01	.02	.17
4053	149	Lajes	RN	1.02	70.05	-.02	-.04	-.06	.05	.36
9076	150	Cordeiros	BA	1.02	70.04	-.02	-.03	-.04	-.02	.29
9149	151	Irara	BA	1.02	69.95	-.02	-.01	-.03	.01	.25
9127	152	Araci	BA	1.02	69.78	-.07	-.01	-.01	-.05	.31
6070	153	Taquaritinga do Norte	PE	1.02	69.75	-.01	-.10	-.01	.02	.30
7034	154	Taque D'Arca	AL	1.02	69.71	-.02	-.07	-.02	.03	.29
6115	155	Saloa	PE	1.02	69.63	.04	-.08	-.05	.02	.34
6104	156	Iati	PE	1.02	69.62	.02	-.09	-.05	.00	.37
6092	157	Angelim	PE	1.02	69.62	-.03	.00	-.01	.00	.21

9112	158	Miguel Calmon	BA	1.01	69.58	.01	-.03	-.03	-.04	.25
9156	159	Serra Preta	BA	1.01	69.54	.07	.00	.00	-.02	.10
2091	160	Barreiras do Piaui	PI	1.01	69.54	-.05	-.04	.00	-.03	.28
2022	161	S.Miguel do Tapuio	PI	1.01	69.53	.01	-.02	.00	-.02	.17
7015	162	Maravilha	AL	1.01	69.40	-.05	-.06	-.03	-.05	.43
9105	163	Caem	BA	1.01	69.25	.00	.00	-.02	-.04	.22
4038	164	S.Fernando	RN	1.01	69.23	.05	-.02	-.04	.02	.21
3013	165	Irauçuba	CE	1.01	69.14	-.01	-.03	-.03	.05	.26
5104	166	Cuite	PB	1.01	69.13	-.05	-.04	-.05	-.05	.43
6081	167	Jataúba	PE	1.01	69.10	-.02	-.05	.00	.01	.23
4104	168	Tabuleiro Grande	RN	1.01	69.02	-.01	-.04	-.05	.04	.33
6084	169	Riacho das Almas	PE	1.01	69.00	-.01	-.08	-.02	.01	.31
2077	170	Staluz	PI	1.01	68.95	-.02	-.04	.02	.04	.18
2004	171	Luis Correia	PI	1.00	68.88	.03	-.05	-.05	.17	.34
6047	172	Aguas Belas	PE	1.00	68.85	.03	-.09	-.05	.04	.37
9103	173	Baixa Grande	BA	1.00	68.78	.01	.02	-.02	-.03	.19
9169	174	Vitoria da Conquista	BA	1.00	68.76	.00	-.04	-.03	.03	.27
3019	175	S.Luis do Curu	CE	1.00	68.68	-.02	.01	-.05	.05	.30
6087	176	S.Bento do Una	PE	1.00	68.65	.01	-.06	-.07	.07	.41
6118	177	Teresinha	PE	1.00	68.63	.00	-.06	.00	.00	.23
9063	178	Piata	BA	1.00	68.59	.00	.01	-.02	-.07	.24
6082	179	Pesqueira	PE	1.00	68.56	.00	-.06	-.02	.03	.28
5062	180	Sta.Teresinha	PB	1.00	68.34	.00	-.05	-.05	.03	.36
3029	181	Nova Russas	CE	1.00	68.31	.07	-.05	-.07	.03	.33
7046	182	S.Sebastiao	AL	1.00	68.26	.03	-.07	-.05	.03	.35
9093	183	Tremedal	BA	1.00	68.25	.00	-.04	-.03	.00	.29
5021	184	Cajazeiras	PB	1.00	68.25	-.07	-.02	-.01	-.02	.32
7013	185	Jaramataia	AL	.99	68.21	-.03	-.06	.02	.03	.21
3124	186	Altaneira	CE	.99	68.20	.01	-.06	.00	-.20	.36
3116	187	Ipu	CE	.99	68.18	.02	-.07	-.06	.34	.47
9148	188	Ipira	BA	.99	68.17	.06	.00	.00	-.02	.14
9131	189	Ichu	BA	.99	68.10	.04	.01	.01	-.01	.13
6064	190	Passira	PE	.99	68.08	.01	-.09	-.01	.01	.31
9170	191	Encruzilhada	BA	.99	68.08	.01	.00	-.04	.02	.27
9138	192	Valente	BA	.99	68.07	-.03	-.04	-.04	-.02	.39
4051	193	Jardim Angicos	RN	.99	68.01	-.02	-.06	-.05	-.10	.56
9173	194	Itarantim	BA	.99	68.00	.08	.01	-.03	-.02	.17
5019	195	Bonito de Sta.Fe	PB	.99	67.89	-.08	-.04	.02	.03	.27
5034	196	Triunfo	PB	.99	67.89	-.03	-.04	-.03	.02	.35
5009	197	Cubati	PB	.99	67.88	.01	-.06	-.06	-.01	.44
9054	198	Itaete	BA	.99	67.88	.05	-.04	-.03	.00	.24
7045	199	S.Bras	AL	.99	67.87	-.01	-.07	.03	-.04	.20
9197	200	Rio Real	BA	.99	67.78	-.02	.01	-.04	-.02	.30
5004	201	Brejo dos Santos	PB	.99	67.74	-.02	-.06	-.04	.00	.43
3110	202	Vicosa do Ceara	CE	.99	67.73	.05	-.03	-.05	.13	.31
5057	203	Qixaba	PB	.99	67.69	-.04	-.11	.01	-.06	.39
9019	204	Remanso	BA	.99	67.69	-.03	-.04	-.02	-.01	.32
2015	205	Castelo do Piaui	PI	.99	67.60	.07	-.05	-.01	.00	.19
4032	206	Jardim do Serido	RN	.99	67.60	.04	-.04	-.03	.04	.27
6079	207	Caruaru	PE	.99	67.58	.01	-.06	-.04	.03	.36
2052	208	Beneditinos	PI	.99	67.58	-.01	.01	.03	.02	.16
9141	209	Antonio Cardoso	BA	.99	67.55	.05	.02	.03	-.01	.09
4064	210	Lagoa de Velhos	RN	.98	67.52	-.07	-.04	-.01	.10	.33
6075	211	Bezerros	PE	.98	67.49	.01	-.06	-.02	.03	.30
4027	212	Currais Novos	RN	.98	67.46	.00	-.06	-.05	.00	.42
3106	213	Ibiapina	CE	.98	67.46	.03	-.03	-.04	.04	.29
3011	214	Uruoca	CE	.98	67.43	.00	-.04	-.04	-.01	.36
5029	215	Sta.Helena	PB	.98	67.41	-.05	.01	-.03	-.05	.35
5063	216	S.Jose da Lagoa Tapeda	PB	.98	67.41	-.04	-.02	-.03	.00	.33
5051	217	Olho D'Agua	PB	.98	67.40	-.05	-.03	-.02	-.12	.46

5101	218	Araruna	PB	.98	67.38	-.02	-.03	-.04	.03	.35
5081	219	Ouro Velho	PB	.98	67.37	.03	-.07	.00	.07	.24
5003	220	Brejo do Cruz	PB	.98	67.35	.02	-.05	-.07	.05	.41
9091	221	Rio do Antonio	BA	.98	67.30	.04	-.09	-.01	-.03	.29
9137	222	Teofilandia	BA	.98	67.25	-.04	-.02	-.01	-.04	.31
9130	223	Conceicao do Coite	BA	.98	67.23	-.04	-.03	-.01	-.03	.34
5007	224	Riacho dos Cavalos	PB	.98	67.20	-.02	.00	-.04	-.03	.34
7031	225	Palmeira dos Indios	AL	.98	67.16	.00	-.08	-.02	.01	.33
7003	226	Delmiro Gouveia	AL	.98	67.15	.03	-.04	-.05	-.09	.36
9089	227	Presidente Janio Quadros	BA	.98	67.13	-.04	-.07	-.01	-.06	.41
6072	228	Vertentes	PE	.98	67.12	-.01	-.07	-.02	.01	.35
9146	229	Iacu	BA	.98	67.10	.12	-.04	-.04	.07	.22
9006	230	Cotegipe	BA	.98	67.07	-.03	-.04	-.01	-.01	.32
5112	231	Mae D'Agua	PB	.98	67.06	-.05	-.05	.01	.01	.29
7040	232	Girau do Ponciano	AL	.98	67.01	.00	-.05	.00	.00	.27
9048	233	Ibicoara	BA	.98	66.92	.02	-.02	-.05	-.01	.33
5012	234	Nova Palmeira	PB	.98	66.90	.11	-.09	-.08	.03	.46
5060	235	Sta.Luzia	PB	.98	66.90	-.03	-.03	-.04	-.03	.40
9037	236	Souto Soares	BA	.98	66.89	-.03	-.04	.02	.01	.24
3079	237	Baixio	CE	.98	66.89	-.04	-.08	-.03	.00	.46
5015	238	Serido	PB	.97	66.78	.07	-.10	-.08	.07	.52
5122	239	Massaranduba	PB	.97	66.77	.01	-.02	-.05	.01	.34
9145	240	Feira de Santana	BA	.97	66.58	.06	.00	.01	.01	.15
5077	241	Livramento	PB	.97	66.55	-.02	-.05	-.02	-.01	.37
8002	242	Gararu	SE	.97	66.53	-.01	-.08	.01	.02	.27
7026	243	Cacimbinhas	AL	.97	66.47	.00	-.07	.01	.01	.26
6067	244	Sta.Maria	PE	.97	66.46	-.01	-.09	-.05	.00	.56
4066	245	Monte das Gameleiras	RN	.97	66.35	.03	-.06	-.07	.10	.46
5093	246	Itabaiana	PB	.97	66.33	.00	-.05	.01	.01	.24
5066	247	S.Jose do Sabugi	PB	.97	66.32	.00	-.03	-.06	-.07	.49
7007	248	Piranhas	AL	.97	66.30	.02	-.03	-.03	-.04	.32
3073	249	Taua	CE	.97	66.27	-.01	-.05	-.01	.07	.30
6054	250	Belo Jardim	PE	.97	66.23	.00	-.07	-.05	.01	.46
4109	251	Pedra Grande	RN	.97	66.21	-.05	-.01	-.03	.07	.36
9104	252	Boa Vista do Tupim	BA	.97	66.20	-.03	.01	-.02	.00	.31
3081	253	Ico	CE	.97	66.20	-.03	-.02	-.04	.00	.38
4011	254	Augusto Severo	RN	.97	66.19	-.01	-.08	-.04	.04	.45
9159	255	Barra do Choca	BA	.96	66.16	.04	-.05	-.09	.03	.51
2002	256	Esperantina	PI	.96	66.12	-.01	-.06	.00	.05	.29
6117	257	S.Joaquim do Monte	PE	.96	66.12	.00	-.03	.00	.02	.25
2010	258	Alto Longa	PI	.96	66.03	.03	.01	.00	.05	.20
2076	259	Redencao do Gurgueia	PI	.96	65.97	-.03	-.01	-.03	-.01	.35
3062	260	Solonopole	CE	.96	65.97	-.01	-.09	-.02	.04	.39
2083	261	Isaias Coelho	PI	.96	65.97	-.05	-.01	.00	.08	.29
2095	262	Gilbues	PI	.96	65.93	-.04	-.01	.00	.00	.30
6058	263	Frei Miguelino	PE	.96	65.92	.00	-.07	-.01	.01	.33
5035	264	Uiraruna	PB	.96	65.92	-.03	-.02	-.04	.01	.37
6078	265	Capoeiras	PE	.96	65.88	.02	-.08	-.03	.00	.38
4071	266	S.Tome	RN	.96	65.84	.01	-.07	-.07	.05	.52
9073	267	Caetite	BA	.96	65.76	-.01	-.03	-.02	-.04	.34
9167	268	Planalto	BA	.96	65.68	.04	-.01	-.01	-.01	.22
5045	269	Junco do Serido	PB	.96	65.67	-.02	-.02	-.03	-.04	.37
2003	270	Joaquim Pires	PI	.96	65.67	.06	-.05	.00	.09	.21
9094	271	Urandi	BA	.96	65.62	.05	-.03	-.04	-.01	.30
4082	272	Francisco Dantas	RN	.96	65.60	-.01	-.05	-.04	.04	.42
9109	273	Lajedinho	BA	.96	65.52	.03	.03	-.06	.03	.31
3056	274	Quixada	CE	.96	65.52	-.01	-.10	-.04	.02	.51
3028	275	Ipueiras	CE	.96	65.51	.01	-.06	-.02	.03	.35
3040	276	Beberibe	CE	.95	65.47	-.03	-.03	-.05	-.05	.50
2064	277	Itaueira	PI	.95	65.46	.01	.00	-.02	-.03	.27

3076	278	Iguatu	CE	.95	65.45	-.01	-.11	-.03	.02	.53
3112	279	Carire	CE	.95	65.44	-.03	-.04	-.02	.02	.38
6076	280	Brejo da Madre Deus	PE	.95	65.41	-.01	-.05	-.01	.01	.31
8003	281	Monte Alegre de Sergipe	SE	.95	65.40	-.06	-.05	.05	-.01	.25
3035	282	Tamboril	CE	.95	65.38	.03	-.07	-.06	.01	.46
9155	283	Sto.Estevao	BA	.95	65.37	.04	.00	.00	.00	.21
9087	284	Pindai	BA	.95	65.33	-.02	-.04	-.01	.00	.34
4059	285	Barcelona	RN	.95	65.27	-.01	-.05	-.08	.00	.62
7030	286	Minador do Negrao	AL	.95	65.25	.03	-.05	-.03	.02	.32
9003	287	Barreiras	BA	.95	65.24	.00	.03	.01	-.11	.25
2050	288	Simoes	PI	.95	65.23	-.01	-.05	.01	-.17	.49
2071	289	S.Francisco do Piaui	PI	.95	65.21	.03	-.07	-.05	.05	.43
9005	290	Catolandia	BA	.95	65.19	.16	-.04	.00	.00	.10
4069	291	S.Bento do Trairi	RN	.95	65.17	.04	-.08	-.10	.08	.75
4006	292	Macau	RN	.95	65.17	-.06	-.02	.01	.01	.33
2066	293	Landri Sales	PI	.95	65.14	.16	-.05	-.01	.12	.18
5078	294	Monteiro	PB	.95	65.12	-.01	-.03	-.01	.03	.30
9189	295	Crisopolis	BA	.95	65.11	.02	-.01	-.03	.01	.31
9096	296	Caldeirao Grande	BA	.95	65.03	-.02	-.01	.01	.02	.26
5014	297	Picui	PB	.95	65.00	-.01	-.05	-.06	-.04	.56
5032	298	S.Jose de Piranhas	PB	.95	64.99	-.06	-.01	.01	-.02	.34
5079	299	Natuba	PB	.95	64.96	.02	-.01	-.03	-.01	.30
3033	300	Monsenhor Tabosa	CE	.95	64.95	.09	-.09	-.07	.04	.48
3043	301	Alto Santo	CE	.95	64.90	-.05	-.01	-.01	-.02	.38
6103	302	Garanhuns	PE	.95	64.85	.02	-.04	-.02	.01	.31
3094	303	Araripe	CE	.95	64.85	-.02	-.05	.03	.08	.25
9060	304	Oliveira dos Brejinhos	BA	.95	64.83	.03	-.05	-.05	-.09	.47
3022	305	Caninde	CE	.94	64.77	-.03	-.03	-.04	-.01	.43
5058	306	Salgadinho	PB	.94	64.73	.01	-.01	.00	-.08	.28
6048	307	Arcoverde	PE	.94	64.68	.01	-.04	-.04	-.04	.41
2054	308	Jose de Freitas	PI	.94	64.67	.12	-.03	-.04	.12	.27
9114	309	Piritiba	BA	.94	64.55	.02	.00	.00	-.01	.24
4068	310	Sta.Cruz	RN	.94	64.51	-.02	-.04	-.06	-.01	.57
6049	311	Buique	PE	.94	64.48	-.03	-.05	.00	.01	.37
6074	312	Belo Jardim	PE	.94	64.45	-.01	-.03	-.01	.04	.32
4013	313	Felipe Guerra	RN	.94	64.42	.03	-.07	-.09	.02	.67
2058	314	Antonio Almeida	PI	.94	64.31	.11	-.03	-.02	.08	.24
9047	315	Contendas do Sincora	BA	.94	64.28	-.01	.00	-.02	-.04	.34
3027	316	Sta.Quiteria	CE	.94	64.28	.01	-.04	-.05	.06	.41
6089	317	Tacaimbo	PE	.94	64.27	-.02	-.01	.00	-.01	.30
7027	318	Igaci	AL	.94	64.17	.00	-.06	-.01	-.01	.38
9004	319	Brejolandia	BA	.94	64.16	-.03	-.08	.00	-.04	.49
8005	320	Poco Redondo	SE	.94	64.13	.06	-.02	.01	.06	.19
4030	321	Ipueira	RN	.94	64.12	.03	-.03	-.07	.03	.46
3054	322	Boa Viagem	CE	.93	64.07	-.01	-.09	-.02	.01	.46
3107	323	S.Benedito	CE	.93	64.04	.02	-.06	-.06	.08	.49
5011	324	Juazeirinho	PB	.93	64.02	.03	-.06	-.04	.08	.39
3032	325	Independencia	CE	.93	63.98	.04	-.06	-.01	.03	.32
5128	326	Solanea	PB	.93	63.97	-.01	-.04	-.05	.01	.46
3083	327	Lavra da Mangabeira	CE	.93	63.97	-.02	-.02	-.03	.03	.39
9139	328	Agua Fria	BA	.93	63.93	.01	-.03	-.02	-.01	.34
3052	329	S.Joao do Jaguaribe	CE	.93	63.92	-.01	.01	-.04	-.07	.42
4044	330	Afonso Bezerra	RN	.93	63.92	-.04	.00	-.01	.11	.33
2014	331	Capitao de Campos	PI	.93	63.92	-.01	-.04	-.01	.00	.35
7016	332	Monteiropolis	AL	.93	63.87	.00	-.01	.01	-.01	.26
9147	333	Ipecaeta	BA	.93	63.87	.08	.02	.00	.00	.17
9136	334	Serrinha	BA	.93	63.87	.00	-.01	-.03	-.01	.36
9163	335	Candido Sales	BA	.93	63.81	.01	.01	-.03	.04	.31
9168	336	Pocoes	BA	.93	63.79	.10	.01	-.05	.01	.29
3086	337	Aurora	CE	.93	63.76	-.02	-.04	.00	-.04	.37

6003	338	Exu	PE	.93	63.75	.06	-.04	-.02	.09	.29
2020	339	Piripiri	PI	.93	63.73	.07	-.04	-.01	.05	.26
2032	340	Varzea Grande	PI	.93	63.73	-.01	-.01	.00	.02	.30
3048	341	Morada Nova	CE	.93	63.70	-.02	-.01	-.06	.05	.48
5020	342	Cachoeira dos Indios	PB	.93	63.64	-.05	-.03	.01	-.06	.39
3119	343	Moraujo	CE	.93	63.62	.03	.00	-.01	.15	.28
6085	344	Sanharo	PE	.93	63.58	.04	-.08	-.03	.02	.42
6027	345	Brejinho	PE	.93	63.51	-.01	-.11	.00	-.03	.52
3061	346	Senador Pompeu	CE	.93	63.46	.02	-.09	-.01	.02	.40
2001	347	Buriti dos Lopes	PI	.93	63.45	-.01	-.03	.00	.02	.32
8008	348	Poco Verde	SE	.92	63.42	-.02	-.01	-.01	-.02	.35
4041	349	S.Vicente	RN	.92	63.40	.02	-.08	-.05	.05	.51
7039	350	Feira Grande	AL	.92	63.39	.01	-.09	.00	-.02	.39
9021	351	Xique-Xique	BA	.92	63.37	-.05	-.04	.04	-.09	.38
4033	352	Jucurutu	RN	.92	63.37	.07	-.05	-.02	.11	.32
9001	353	Angical	BA	.92	63.32	-.03	-.02	.00	-.03	.37
2039	354	Jaicos	PI	.92	63.32	.01	-.02	.01	-.10	.34
3031	355	Crateus	CE	.92	63.29	.03	-.07	-.02	.04	.39
4073	356	Sitio Novo	RN	.92	63.29	-.02	-.05	-.04	-.04	.57
3072	357	Saboeiro	CE	.92	63.29	-.02	-.04	.00	.02	.37
5069	358	Varzea	PB	.92	63.25	.12	-.04	-.04	.03	.27
6108	359	Lagoa do Ouro	PE	.92	63.24	.01	-.04	-.01	.03	.33
6080	360	Gravata	PE	.92	63.22	.01	-.05	-.02	.03	.37
9030	361	Gentil do Ouro	BA	.92	63.21	.01	-.04	-.03	.00	.42
9124	362	Quijingue	BA	.92	63.19	.03	.03	.02	.04	.21
8004	363	Nossa Senhora da Gloria	SE	.92	63.17	-.03	-.07	.05	.00	.29
5024	364	Curral Velho	PB	.92	63.13	-.06	-.02	.03	-.05	.37
9179	365	Paulo Afonso	BA	.92	63.11	-.03	-.02	.04	-.13	.37
9022	366	Bom Jesus da Lapa	BA	.92	63.10	-.03	-.02	-.03	-.03	.46
9090	367	Riacho de Santana	BA	.92	63.07	-.03	.01	.00	.02	.32
3037	368	Caucaia	CE	.92	63.05	-.01	-.04	-.03	.00	.45
3078	369	Oros	CE	.92	62.92	-.01	-.03	-.03	-.04	.46
3018	370	S.Goncalo do Amarante	CE	.92	62.91	-.01	-.03	-.04	.03	.46
9068	371	Utinga	BA	.92	62.91	.08	-.04	-.06	-.14	.59
6052	372	Tupanatinga	PE	.92	62.89	-.03	-.05	.00	-.03	.42
9074	373	Candiba	BA	.92	62.85	.02	.01	-.06	.00	.41
7033	374	Quebrangulo	AL	.92	62.83	.06	-.10	.02	.02	.26
2049	375	S.Juliano	PI	.92	62.82	-.03	-.03	.00	-.05	.42
6030	376	Flores	PE	.92	62.80	-.01	-.06	-.02	-.02	.45
2019	377	Piracuruca	PI	.92	62.80	.12	-.04	-.01	.05	.23
6106	378	Jupi	PE	.92	62.80	-.01	-.02	-.05	.00	.48
4101	379	Rodolfo Fernando	RN	.92	62.76	-.02	-.01	.02	-.01	.28
9198	380	Satiro Dias	BA	.91	62.73	.03	-.04	-.03	-.06	.42
5111	381	Juru	PB	.91	62.72	-.01	-.06	.02	.05	.31
6110	382	Lajedo	PE	.91	62.71	.00	-.03	-.03	.02	.43
3127	383	Caririacu	CE	.91	62.67	.00	-.06	.00	.11	.34
9186	384	Aramari	BA	.91	62.59	.09	.07	-.08	-.01	.33
9069	385	Wagner	BA	.91	62.44	-.02	.01	-.03	-.03	.42
5108	386	Agua Branca	PB	.91	62.42	.00	-.09	.01	.05	.35
4072	387	Serra de S.Bento	RN	.91	62.41	.02	-.02	-.03	.08	.37
7023	388	Santana do Ipanema	AL	.91	62.41	-.03	-.01	-.02	.01	.39
9144	389	Elisio Medrado	BA	.91	62.39	.01	.06	.07	.03	.17
9121	390	Itiuba	BA	.91	62.37	-.03	.01	.00	-.05	.39
4054	391	Parazinho	RN	.91	62.35	-.02	-.07	-.04	.06	.53
9057	392	Lencois	BA	.91	62.30	.01	.01	-.05	.10	.39
3098	393	Santana do Cariri	CE	.91	62.27	-.01	-.07	.00	.08	.38
2090	394	Avelino Lopes	PI	.91	62.25	-.06	-.01	.04	.03	.31
3015	395	Itapipoca	CE	.91	62.24	.01	-.04	-.04	.02	.46
9194	396	Piripiranga	BA	.91	62.23	.03	.02	-.02	-.03	.30
4037	397	Santana do Serido	RN	.91	62.22	.02	-.07	-.05	.01	.58

5080	398	Olivedos	PB	.91	62.20	.10	-.06	-.04	.01	.36
3105	399	Guaraciaba do Norte	CE	.91	62.20	.00	-.03	-.02	.05	.39
9108	400	Jacobina	BA	.91	62.13	.01	-.03	-.01	.00	.35
5040	401	Condado	PB	.91	62.13	-.02	-.03	.01	-.06	.39
3123	402	Sobral	CE	.91	62.13	-.01	-.01	-.02	.03	.39
3008	403	Morrinhos	CE	.91	62.09	-.01	-.04	-.07	.07	.59
5043	404	Emas	PB	.90	62.05	.01	-.02	-.03	-.02	.41
3120	405	Mocambo	CE	.90	62.01	.00	-.06	-.05	.02	.56
9017	406	Morpara	BA	.90	61.97	.00	-.04	-.01	-.12	.36
3057	407	Quixeramobim	CE	.90	61.97	.00	-.11	.00	.02	.49
3080	408	Cedro	CE	.90	61.96	-.02	-.02	-.01	-.03	.43
3014	409	Itapage	CE	.90	61.89	-.01	-.02	-.03	.02	.42
5076	410	Gurjao	PB	.90	61.88	.04	-.04	.01	.04	.28
9191	411	Itapicuru	BA	.90	61.82	.05	-.06	-.04	-.06	.49
4058	412	Taipu	RN	.90	61.80	-.04	.02	.00	.05	.35
4061	413	Coronel Ezequiel	RN	.90	61.80	-.01	-.03	-.05	-.07	.63
3066	414	Iracema	CE	.90	61.77	.00	-.06	-.02	-.02	.49
4039	415	S.Joao do Sabugi	RN	.90	61.76	.06	-.04	-.05	.07	.42
3125	416	Antonina do Norte	CE	.90	61.73	-.04	-.07	.06	-.02	.34
3024	417	General Sampaio	CE	.90	61.73	-.01	-.04	-.05	.04	.56
2068	418	Marcos Parente	PI	.90	61.66	.14	-.04	-.01	.03	.22
7024	419	S.Jose da Tapera	AL	.90	61.66	-.02	-.02	-.02	.02	.42
9085	420	Mortugaba	BA	.90	61.63	-.02	-.04	.01	-.01	.37
3004	421	Chaval	CE	.90	61.60	-.04	-.02	-.01	-.06	.51
3087	422	Barro	CE	.90	61.56	-.02	-.04	-.01	.03	.41
9107	423	Itaberaba	BA	.90	61.51	.01	.00	-.01	.01	.35
9116	424	Serrolandia	BA	.90	61.51	.07	.01	-.01	.00	.26
9176	425	Coronel Joao Sa	BA	.90	61.49	.00	.03	.01	-.03	.29
9080	426	Igapora	BA	.90	61.43	.00	.01	.03	-.01	.28
3049	427	Palhano	CE	.90	61.42	.00	-.06	-.05	-.02	.63
4056	428	Poco Branco	RN	.90	61.41	.02	-.04	-.03	.03	.43

Group Four: Slight

Number of Munic.	Rank	Municipality	State	ID	ID base 100	RGCOVER	RGPBEAN	RGPCONR	RGPCATT	RECOVER
3038	429	Maranguape	CE	.89	61.33	-.01	-.03	-.03	.01	.45
7038	430	Coite do Noia	AL	.89	61.29	.02	-.08	-.02	.01	.45
2005	431	Luzilandia	PI	.89	61.29	.00	-.05	-.02	.13	.41
4043	432	Tibau da dos Batistas	RN	.89	61.27	.16	-.01	-.06	.14	.35
4012	433	Caraubas	RN	.89	61.24	.00	-.05	-.05	.03	.56
5041	434	Coremas	PB	.89	61.24	-.05	-.02	.00	.00	.43
9100	435	Pindobacu	BA	.89	61.24	.03	.02	-.01	-.02	.29
3101	436	Jardim	CE	.89	61.21	-.01	-.16	.04	.01	.51
3074	437	Acopiara	CE	.89	61.15	-.01	-.09	-.01	.07	.47
9009	438	Riachao das Neves	BA	.89	61.14	.02	-.03	-.01	.00	.36
9196	439	Ribeira do Pombal	BA	.89	61.13	.02	-.03	-.02	-.04	.44
9039	440	Abaira	BA	.89	61.10	-.01	.00	-.03	-.06	.49
9081	441	Jaraci	BA	.89	61.08	.00	-.04	-.02	-.01	.43
9088	442	Piripa	BA	.89	61.07	.01	-.02	-.01	-.04	.38
3017	443	Pentecoste	CE	.89	61.06	.02	-.06	-.05	.01	.57
3026	444	Paramoti	CE	.89	61.02	.02	-.03	-.05	-.03	.56
5031	445	S.Jose de Caiana	PB	.89	60.95	.01	-.04	.03	.10	.28
3102	446	Juazeiro do Norte	CE	.89	60.81	-.01	-.03	-.01	-.02	.44
9079	447	Ibiassuce	BA	.89	60.78	.01	-.07	.04	-.05	.35
6007	448	Sitio dos Moreiras	PE	.89	60.71	.06	-.04	.03	.08	.24
2007	449	Nossa Senhora dos Remedios	PI	.89	60.69	.00	-.02	-.02	.04	.40
9067	450	Tanhacu	BA	.88	60.68	-.01	.00	.00	-.01	.38

9078	451	Guanambi	BA	.88	60.67	.01	.01	.01	-.01	.32
7004	452	Inhapi	AL	.88	60.64	-.01	-.03	-.03	.02	.48
2025	453	Francinopoles	PI	.88	60.64	-.01	-.01	.02	.06	.31
4070	454	S.Jose do Campestre	RN	.88	60.57	.01	-.01	-.04	.03	.43
9165	455	Manuel Vitorino	BA	.88	60.57	.05	.07	.01	-.05	.23
9102	456	Senhor do Bonfim	BA	.88	60.51	-.01	.01	.01	-.02	.34
5085	457	S.Jose dos Cordeiros	PB	.88	60.48	.04	-.01	.01	.03	.28
9097	458	Campo Formoso	BA	.88	60.48	.02	-.05	-.04	-.02	.56
4021	459	Upanema	RN	.88	60.45	.04	-.04	-.02	.00	.40
9095	460	Antonio Goncalves	BA	.88	60.43	.00	.07	.05	-.05	.25
5118	461	Campina Grande	PB	.88	60.42	.02	-.02	-.01	-.03	.38
9035	462	Morro do Chapeu	BA	.88	60.40	.01	.02	.01	-.03	.32
3058	463	Mombaca	CE	.88	60.39	.02	-.09	.01	-.02	.42
6100	464	Canhotinho	PE	.88	60.36	.00	.01	-.01	.04	.35
9184	465	Antas	BA	.88	60.34	-.02	.02	.04	-.03	.30
4081	466	Encanto	RN	.88	60.34	-.04	.03	-.02	.02	.43
2018	467	Pedro II	PI	.88	60.33	.05	-.04	.00	.05	.31
6088	468	S.Caitano	PE	.88	60.32	.01	-.06	-.01	.01	.45
3034	469	Novo Oriente	CE	.88	60.19	.00	-.07	.00	.08	.42
5094	470	Jupiranga	PB	.88	60.18	.02	-.06	.00	-.04	.44
2037	471	Ipiranga do Piaui	PI	.88	60.12	.00	-.07	-.02	-.06	.70
3021	472	Uruburetama	CE	.88	60.07	-.02	-.01	-.04	.04	.50
7020	473	Palestina	AL	.88	60.07	.01	-.04	.03	-.03	.33
4029	474	Florania	RN	.88	60.06	-.01	-.05	.00	-.01	.47
4010	475	Apodi	RN	.87	59.99	.01	-.03	-.05	-.01	.58
5039	476	Catingueira	PB	.87	59.97	-.02	-.05	-.02	-.02	.59
6033	477	Itapetim	PE	.87	59.94	-.02	-.06	.02	-.04	.48
9002	478	Baianopolis	BA	.87	59.94	.16	-.05	-.02	.03	.29
4055	479	Pedra Preta	RN	.87	59.91	-.01	-.06	-.06	.13	.67
5052	480	Passagem	PB	.87	59.81	-.03	-.02	.00	.04	.43
6099	481	Camocim de S.Felix	PE	.87	59.71	-.03	.01	.04	-.02	.33
5110	482	Imaculada	PB	.87	59.71	.00	-.06	.01	-.01	.45
6066	483	Salgadinho	PE	.87	59.69	.01	-.04	.02	.05	.35
5037	484	Boqueirao dos Cochos	PB	.87	59.69	-.03	-.02	.01	.03	.39
4023	485	Caico	RN	.87	59.69	.05	-.01	-.02	.05	.35
3122	486	Reriutaba	CE	.87	59.66	.01	-.01	-.06	.02	.53
3118	487	Meruoca	CE	.87	59.61	-.01	-.03	-.01	.18	.41
9016	488	Ibotirama	BA	.87	59.54	.00	-.01	-.03	-.01	.46
2046	489	Sto.Antonio Lisboa	PI	.87	59.54	.04	-.02	-.04	-.06	.52
5016	490	Antenor Navarro	PB	.87	59.53	-.01	.01	-.02	.05	.43
5054	491	Paulista	PB	.87	59.52	.00	-.01	.00	.02	.39
5103	492	Cacimba de Dentro	PB	.87	59.52	-.01	-.01	-.03	.00	.47
3115	493	Groairas	CE	.87	59.50	-.01	.00	-.01	.10	.39
3006	494	Marco	CE	.87	59.49	.00	.00	.00	.00	.37
3108	495	Tiangua	CE	.87	59.40	.04	-.03	-.04	.02	.48
3113	496	Coreau	CE	.87	59.39	.05	-.03	-.01	.10	.36
3070	497	Catarina	CE	.86	59.29	.03	-.05	-.01	-.05	.47
4017	498	Janduis	RN	.86	59.29	.00	-.02	-.04	.01	.54
5002	499	Bom Sucesso	PB	.86	59.28	.00	-.01	-.01	-.02	.41
4014	500	Gov.Dix-sept Rosado	RN	.86	59.24	.03	-.03	-.07	.01	.62
9072	501	Cacule	BA	.86	59.24	.00	-.01	.02	-.04	.38
4074	502	Tangara	RN	.86	59.17	.01	.00	-.07	.04	.56
9123	503	Queimadas	BA	.86	59.17	.01	.01	.01	-.02	.33
4004	504	Grossos	RN	.86	59.15	-.04	.01	-.03	-.01	.53
4089	505	Martins	RN	.86	59.15	.00	.00	.02	.05	.33
5105	506	Dona Ines	PB	.86	59.12	.01	-.02	-.02	.04	.43
9160	507	Belo Campo	BA	.86	59.12	.06	.01	-.04	.01	.38
6073	508	Alagoinha	PE	.86	59.10	.02	-.05	-.01	.05	.42
2067	509	Manuel Emidio	PI	.86	59.08	.02	-.02	.14	.08	.13
7001	510	Agua Branca	AL	.86	59.08	-.01	.00	-.02	.01	.44

3117	511	Massape	CE	.86	59.07	-.02	.01	-.02	.07	.42
3026	512	Ibiara	PB	.86	59.06	-.03	-.03	.01	-.01	.44
2008	513	Parnaiba	PI	.86	59.04	.03	-.05	-.02	.10	.43
9043	514	Boninal	BA	.86	58.96	.00	.05	.04	-.06	.31
9178	515	Jeremoabo	BA	.86	58.96	.02	-.03	.01	-.04	.39
5098	516	Salgado de S.Felix	PB	.86	58.94	.05	-.06	.00	.06	.37
7048	517	Traipu	AL	.86	58.93	.01	-.05	.03	.04	.35
6059	518	Gloria do Goita	PE	.86	58.93	.01	-.06	-.04	.03	.60
6035	519	S.Jose do Egito	PE	.86	58.90	-.02	-.08	.03	-.03	.48
6043	520	Ibimirim	PE	.86	58.84	.04	-.07	-.01	-.07	.57
3050	521	Quixere	CE	.86	58.80	-.01	-.05	-.01	-.07	.74
5056	522	Pombal	PB	.86	58.78	.02	-.03	-.03	.03	.47
6053	523	Venturosa	PE	.86	58.74	.03	-.09	.02	-.01	.43
2024	524	Elesbao Veloso	PI	.86	58.65	.02	-.01	.01	.02	.34
3045	525	Italcaba	CE	.86	58.64	.02	-.02	-.06	.06	.54
9128	526	Biritinga	BA	.85	58.61	-.01	.02	-.01	.00	.43
5127	527	Remigio	PB	.85	58.61	.05	-.02	-.05	.04	.48
4075	528	Agua Nova	RN	.85	58.58	-.03	.00	-.01	-.04	.53
7022	529	Poco das Trincheiras	AL	.85	58.56	.00	.00	-.02	.03	.45
4046	530	Pedro Avelino	RN	.85	58.41	-.02	.01	-.04	.02	.53
6098	531	Calcado	PE	.85	58.37	.00	-.02	-.03	.00	.53
3041	532	Cascavel	CE	.85	58.36	.01	-.02	-.07	.04	.68
6112	533	Panelas	PE	.85	58.24	.01	-.02	-.03	.06	.48
9055	534	Ituacu	BA	.85	58.20	.04	.00	-.02	-.03	.43
6113	535	Paranatama	PE	.85	58.15	.02	-.04	-.02	-.01	.50
4098	536	Rafael Godeiro	RN	.85	58.11	-.01	-.02	-.04	.08	.52
4062	537	Jacana	RN	.85	58.11	.01	-.03	-.02	-.09	.75
4005	538	Guamare	RN	.85	58.10	-.04	.04	.03	-.06	.44
2009	539	Porto	PI	.85	58.05	.02	-.05	-.02	.12	.47
4025	540	Cerro Cora	RN	.84	57.94	.03	-.06	-.05	.07	.63
9011	541	S.Desiderio	BA	.84	57.91	.07	-.02	.00	-.16	.48
3126	542	Assare	CE	.84	57.90	-.01	-.03	.02	.01	.41
3097	543	Potengi	CE	.84	57.89	.03	-.05	.05	-.05	.32
9092	544	Sebastiao Laranjeiras	BA	.84	57.86	.03	.00	-.04	.01	.48
5048	545	Malta	PB	.84	57.82	-.01	-.02	-.01	.04	.48
3090	546	Mauriti	CE	.84	57.82	.01	-.06	-.01	.04	.50
4015	547	Ipanguacu	RN	.84	57.80	-.01	.02	-.04	.04	.49
9045	548	Botupora	BA	.84	57.80	.03	.00	-.02	-.05	.47
4008	549	Pendencias	RN	.84	57.78	-.03	.01	.00	.04	.43
2057	550	Uniao	PI	.84	57.74	.02	-.01	-.01	.03	.41
6031	551	Iguaraci	PE	.84	57.74	-.01	-.07	.03	.01	.43
7018	552	Olivenca	AL	.84	57.63	-.02	.00	-.01	.03	.46
5050	553	Nova Olinda	PB	.84	57.61	-.01	-.07	-.01	.02	.64
4020	554	Severiano Melo	RN	.84	57.56	.04	-.06	-.05	.08	.66
7036	555	Arapiraca	AL	.84	57.53	.02	-.06	-.02	.04	.56
9050	556	Ibitiara	BA	.84	57.51	.04	.02	.00	-.01	.35
3088	557	Brejo Santo	CE	.84	57.50	-.02	-.01	.01	-.03	.47
3003	558	Camocim	CE	.84	57.50	.07	-.05	-.05	-.02	.57
4031	559	Jardim de Pira	RN	.84	57.47	.05	-.04	-.03	.07	.46
3082	560	Ipaumirim	CE	.84	57.47	-.01	-.05	.00	-.01	.56
3075	561	Carius	CE	.84	57.42	.05	-.07	.00	.09	.43
7017	562	Olho D'Agua das Flores	AL	.84	57.41	.01	-.01	-.02	.06	.43
3010	563	Senador Sa	CE	.84	57.37	.03	-.06	.00	-.07	.51
4100	564	Riacho de Santana	RN	.84	57.37	-.04	.03	.00	-.01	.47
4035	565	Ouro Branco	RN	.84	57.29	.08	-.05	-.06	.09	.56
7005	566	Mata Grande	AL	.83	57.24	.02	-.04	-.01	.03	.46
6041	567	Betania	PE	.83	57.15	-.01	-.04	.00	-.01	.53
4007	568	Mossoro	RN	.83	57.12	-.02	.01	-.05	-.02	.63
9195	569	Ribeira do Amparo	BA	.83	57.07	.01	-.02	.00	-.02	.45
3084	570	Umari	CE	.83	57.03	-.04	.00	.05	.01	.37

6039	571	Triunfo	PE	.83	57.01	.01	-.06	.01	-.06	.62
2051	572	Altos	PI	.83	57.01	.06	-.02	.01	.09	.33
4079	573	Coronel Joao Pessoa	RN	.83	56.97	.00	.00	-.05	.03	.57
3053	574	Tabuleiro do Norte	CE	.83	56.93	-.02	.03	-.03	-.04	.58
6116	575	S.Joao	PE	.83	56.91	.02	-.01	-.03	.02	.49
4067	576	Ruy Barbosa	RN	.83	56.82	.01	-.09	-.04	.17	.74
7010	577	Carneiros	AL	.83	56.80	.00	.01	-.01	.00	.45
5070	578	Aroeiras	PB	.83	56.79	.03	-.01	-.01	.03	.43
6107	579	Jurema	PE	.83	56.76	.00	-.01	-.04	.02	.59
3051	580	Russas	CE	.83	56.71	-.02	.00	-.02	.00	.55
3114	581	Frecheirinha	CE	.83	56.65	-.01	-.05	.00	.03	.52
4045	582	Angicos	RN	.83	56.65	-.01	.00	-.03	.01	.56
8006	583	Porto da Folha	SE	.83	56.64	.01	-.02	.05	.01	.34
6042	584	Custodia	PE	.83	56.62	-.02	-.05	.02	.03	.47
3096	585	Nova Olinda	CE	.83	56.61	.01	-.05	.02	.01	.44
3069	586	Arneiroz	CE	.83	56.61	.02	-.05	-.03	.07	.54
3046	587	Jaguaruana	CE	.83	56.59	.01	-.04	-.04	-.01	.78
6036	588	Serra Talhada	PE	.83	56.57	.00	-.05	.01	-.01	.51
3047	589	Limoeiro do Norte	CE	.82	56.56	-.01	-.01	-.02	-.07	.76
6005	590	Ipubi	PE	.82	56.52	.08	-.04	-.01	.02	.39
3060	591	Piquet Carneiro	CE	.82	56.52	.03	-.07	.02	.12	.41
2048	592	S.Jose do Piaui	PI	.82	56.45	.01	-.06	-.02	-.01	.77
3130	593	Varzea Alegre	CE	.82	56.39	.00	-.04	.01	-.02	.53
9046	594	Brotas de Macauba	BA	.82	56.37	.03	.00	.00	-.07	.45
9051	595	Ipupiara	BA	.82	56.35	.03	.00	.00	-.07	.45
6061	596	Limoeiro	PE	.82	56.35	.00	-.05	.04	.01	.39
4042	597	Serra Negra do Norte	RN	.82	56.33	.08	-.01	-.05	.05	.47
7002	598	Canapi	AL	.82	56.32	.02	-.04	-.02	.02	.53
3129	599	Granjeiro	CE	.82	56.30	.03	-.09	.03	-.05	.55
6065	600	Pombos	PE	.82	56.29	-.02	-.05	.04	-.03	.51
4093	601	Patu	RN	.82	56.25	.02	-.01	-.02	.03	.48
4095	602	Piloes	RN	.82	56.23	-.02	.01	-.03	.00	.57
5126	603	Queimadas	PB	.82	56.22	.04	-.01	-.02	.03	.45
2063	604	Guadalupe	PI	.82	56.20	.11	.03	.06	.13	.21
9056	605	Jussiape	BA	.82	56.19	.04	.06	.04	-.10	.33
6034	606	Sta.Teresinha	PE	.82	56.09	.00	-.11	.03	.00	.56
9049	607	Ibipitanga	BA	.82	56.03	.01	.08	.02	-.06	.39
7011	608	Dois Riachos	AL	.82	56.00	.00	-.01	.00	.01	.46
3020	609	Trairi	CE	.82	55.95	.01	.01	-.04	-.01	.55
9064	610	Rio de Contas	BA	.82	55.90	-.01	.06	.02	-.04	.41
6004	611	Granito	PE	.81	55.86	.06	-.05	.01	.15	.39
2027	612	Novo Oriente do Piaui	PI	.81	55.81	.01	-.02	.01	.06	.43
6026	613	Afogados da Ingazeira	PE	.81	55.77	-.01	-.08	.01	.01	.62
3100	614	Crato	CE	.81	55.74	.01	-.02	-.01	.07	.47
4106	615	Umarizal	RN	.81	55.69	.00	-.03	-.01	.13	.50
9083	616	Livramento do Brumado	BA	.81	55.62	.00	.00	.01	.00	.46
4105	617	Tenente Ananias	RN	.81	55.60	-.01	-.01	-.01	-.02	.55
5116	618	Teixeira	PB	.81	55.55	.00	-.08	.03	.01	.55
6060	619	Joao Alfredo	PE	.81	55.41	.00	-.03	.00	.01	.54
3009	620	Santana do Acarau	CE	.81	55.39	.04	-.01	-.03	.08	.49
5121	621	Lagoa Seca	PB	.81	55.37	-.01	.04	-.05	-.05	.64
6062	622	Machados	PE	.81	55.37	.00	-.07	.00	-.01	.78
4078	623	Antonio Martins	RN	.81	55.33	-.01	.00	-.02	.04	.53
3092	624	Pena Forte	CE	.81	55.31	-.01	-.02	-.01	.02	.54
9034	625	Jussara	BA	.81	55.27	-.01	-.04	.01	-.05	.80
5109	626	Desterro	PB	.81	55.27	.01	-.07	.01	-.01	.62
5044	627	Itaporanga	PB	.81	55.26	-.01	-.02	.01	-.04	.56
2016	628	Cocal	PI	.81	55.21	.06	-.03	.01	.07	.40
3121	629	Pacuja	CE	.80	55.20	.08	-.08	-.04	.17	.65
9177	630	Gloria	BA	.80	55.15	-.01	-.02	.01	-.05	.59

9098	631	Jaguarari	BA	.80	55.04	.04	-.02	-.02	.00	.50
9135	632	Staluz	BA	.80	54.99	.05	.02	.00	-.05	.40
5055	633	Pianco	PB	.80	54.99	-.02	-.02	.01	.00	.53
6097	634	Caetes	PE	.80	54.94	.01	-.03	-.01	.00	.57
6045	635	Sertania	PE	.80	54.87	.05	-.05	.02	-.01	.44
9058	636	Macaubas	BA	.80	54.86	.02	.01	-.01	-.02	.47
4102	637	S.Francisco do Oeste	RN	.80	54.85	.00	.00	.00	.03	.47
7021	638	Pao de Acucar	AL	.80	54.80	-.01	.02	.02	.04	.41
6109	639	Lagoa dos Gatos	PE	.80	54.78	.02	-.02	-.02	.01	.56
9187	640	Cicero Dantas	BA	.80	54.72	.06	-.02	.00	-.02	.43
3002	641	Bela Cruz	CE	.80	54.69	-.02	-.02	.01	-.04	.61
2028	642	Pimenteiras	PI	.80	54.64	.03	-.02	.00	.03	.46
2047	643	Sto.Inacio do Piaui	PI	.80	54.62	.02	-.05	.05	-.11	.56
9027	644	Catarina	BA	.79	54.51	.07	-.02	-.01	-.01	.46
9193	645	Olindina	BA	.79	54.51	.01	.01	.01	.00	.46
3103	646	Missao Velha	CE	.79	54.47	-.01	.00	.01	.04	.48
7019	647	Ouro Branco	AL	.79	54.43	.01	-.01	.00	.05	.49
2006	648	Matias Olimpio	PI	.79	54.42	.05	-.04	-.03	.14	.52
6093	649	Barra de Guabiraba	PE	.79	54.41	-.02	.08	.07	.04	.34
5072	650	Boqueirao	PB	.79	54.23	.02	-.01	.01	.02	.45
2065	651	Jerumenha	PI	.79	54.15	.17	.01	.01	.12	.27
3111	652	Alcantaras	CE	.79	54.13	.02	-.02	-.04	.25	.61
3095	653	Campos Sales	CE	.79	54.12	.04	-.06	.03	.03	.40
6001	654	Araripina	PE	.79	54.05	.08	-.04	.00	.09	.41
3091	655	Milagres	CE	.79	54.03	.00	-.01	-.01	.05	.52
5102	656	Barra de Sta.Rosa	PB	.79	54.02	.03	-.03	-.03	.06	.60
4084	657	Joao Dias	RN	.79	53.95	.00	.00	-.02	.01	.60
3085	658	Abaiara	CE	.79	53.94	-.01	-.01	.00	.04	.53
5036	659	Aguiar	PB	.79	53.88	.01	-.04	.00	-.02	.65
2079	660	Campinas do Piaui	PI	.79	53.87	-.03	.03	.06	.08	.36
3104	661	Carnaubal	CE	.79	53.86	.28	-.06	-.05	.08	.46
2041	662	Ceiras	PI	.79	53.84	-.05	.01	.02	.01	.54
5046	663	Lagoa	PB	.78	53.83	.00	.02	.01	.02	.45
9018	664	Pilao Arcado	BA	.78	53.81	.01	-.02	-.02	.01	.67
3039	665	Pacatuba	CE	.78	53.81	.00	-.02	-.02	.08	.56
9010	666	Sta.Rita de Cassia	BA	.78	53.71	.01	.01	.04	.08	.36
4076	667	Alexandria	RN	.78	53.67	-.01	.03	.00	.01	.49
4002	668	Areia Branca	RN	.78	53.67	-.02	.03	.00	-.05	.59
3077	669	Jucas	CE	.78	53.63	.07	-.08	.00	.01	.58
3067	670	Pereiro	CE	.78	53.60	-.02	-.01	.03	-.01	.49
4028	671	Equador	RN	.78	53.59	.05	-.05	-.03	.07	.62
6040	672	Tuparetama	PE	.78	53.55	.04	-.09	.02	.02	.56
4090	673	Messias Targino	RN	.78	53.49	.02	.00	.02	.06	.40
6037	674	Solidao	PE	.78	53.41	.02	-.08	.05	.00	.47
3005	675	Granja	CE	.78	53.41	.02	.04	.03	.05	.38
3044	676	Aracati	CE	.78	53.40	.01	-.04	-.03	.06	.71
3093	677	Porteiras	CE	.78	53.38	-.01	-.01	.00	.02	.55
5091	678	Umbuzeiro	PB	.78	53.27	.04	.00	-.01	.05	.47
5025	679	Diamante	PB	.78	53.22	-.02	-.06	.05	.05	.47
2082	680	Conceicao do Caninde	PI	.78	53.19	.04	.07	.12	.15	.25
6028	681	Calumbi	PE	.77	53.14	-.01	-.02	.02	-.03	.59
9040	682	Agua Quente	BA	.77	53.08	.00	.00	.01	-.01	.51
6055	683	Cha Grande	PE	.77	53.03	.02	-.02	-.01	-.01	.61
3016	684	Paracuru	CE	.77	53.00	.01	.00	-.02	.06	.56
6032	685	Ingazeira	PE	.77	52.93	.02	-.10	.03	.05	.57
4083	686	Frutuoso Gomes????	RN	.77	52.93	.00	.02	.01	.00	.50
4110	687	S.Bento do Norte	RN	.77	52.92	-.03	.06	.06	.20	.38
3128	688	Farias Brito	CE	.77	52.88	.04	-.06	.02	.04	.50
6095	689	Bonito	PE	.77	52.86	-.01	.01	.01	.01	.49
6029	690	Carnaiba	PE	.77	52.85	.01	-.06	.01	.06	.59

5119	691	Esperanca	PB	.77	52.85	.03	.01	-.04	.07	.55
3071	692	Parambu	CE	.77	52.80	.04	-.03	.00	.08	.51
5124	693	Pocinhos	PB	.77	52.76	.03	-.03	-.05	.08	.75
6063	694	Orobo	PE	.77	52.74	-.01	-.01	.04	.01	.45
5030	695	Santana de Mangueira	PB	.77	52.72	.03	-.06	.01	.01	.63
5095	696	Mari	PB	.77	52.69	.05	.01	-.05	.04	.59
9044	697	Boqueira	BA	.77	52.64	.01	.01	.02	-.06	.53
9038	698	Uibai	BA	.77	52.63	.01	.00	.02	-.02	.50
4091	699	Olho D'Agua dos Borges	RN	.77	52.59	.04	-.01	-.01	.07	.50
2033	700	Bocaina	PI	.77	52.56	.04	-.04	-.02	.02	.67
3068	701	Aiuaba	CE	.76	52.41	.12	-.03	-.02	.02	.45
9082	702	Licinio de Almeida	BA	.76	52.34	.05	-.04	.04	-.02	.42
7006	703	Olho D'Água do Casado	AL	.76	52.33	.02	-.02	.01	.02	.50
2094	704	Curimata	PI	.76	52.30	.00	-.03	.02	-.01	.58
2081	705	Caracol	PI	.76	52.30	.06	-.02	.01	.04	.44
5106	706	Nova Floresta	PB	.76	52.29	.01	-.02	-.03	.03	.77
4085	707	Jose da Penha	RN	.76	52.27	-.02	.04	.02	.01	.49
4088	708	Marcelino Vieira	RN	.76	52.18	.00	.00	-.01	.09	.54
9188	709	Cipo	BA	.76	52.16	.02	-.03	.01	-.03	.60
4094	710	Pau dos Ferros	RN	.76	52.05	.06	.02	-.03	.10	.48
2069	711	Nazare do Piaui	PI	.76	51.99	.18	-.04	.00	.13	.37
7008	712	Batalha	AL	.76	51.95	-.01	.02	.10	-.07	.44
2035	713	Francisco Santos	PI	.76	51.86	.05	.01	-.04	-.05	.76
7035	714	Anadia	AL	.76	51.81	.07	-.03	.00	.01	.47
4022	715	Acari	RN	.76	51.80	.02	.02	.03	.01	.44

Group 5: No strong evidences of desertification

Number of Munic.	Rank	Municipality	State	ID	ID base 100	RGCOVER	RGPBEAN	RGPCORN	RGPCATT	RECOVER
4097	716	Rafael Fernandes	RN	.75	51.75	.00	.03	-.01	.12	.49
4001	717	Alto Rodrigues	RN	.75	51.73	-.01	.03	.00	.14	.49
6044	718	Inaja	PE	.75	51.66	.06	-.06	.00	.08	.56
5099	719	S.Miguel de Taipu	PB	.75	51.63	-.01	.14	.08	.08	.38
9192	720	Nova Soure	BA	.75	51.53	.00	.00	.01	-.02	.61
9014	721	Campo Alegre de Lourdes	BA	.75	51.48	.00	.01	.02	-.07	.79
6002	722	Bodoco	PE	.75	51.46	.08	-.05	.01	.11	.45
6038	723	Tabira	PE	.75	51.38	.01	-.09	.03	.06	.62
5117	724	Areial	PB	.75	51.35	.00	.03	-.03	-.01	.67
5125	725	Puxinana	PB	.75	51.30	.00	.04	-.04	.01	.67
9086	726	Palmas de Monte Alto	BA	.75	51.26	.01	.02	.02	.00	.50
7042	727	Lagoa da Canoa	AL	.75	51.15	.01	.01	-.02	.05	.61
8001	728	Caninde do S.Francisco	SE	.75	51.12	.17	.01	.04	.09	.27
9024	729	Malhada	BA	.74	50.98	.00	.05	.04	.02	.43
7041	730	Junqueiro	AL	.74	50.97	.07	06	.00	.02	.6.
4036	731	Parelhas	RN	.74	50.96	.04	-.02	-.02	.05	.59
4052	732	Joao Camara	RN	.74	50.95	.00	-.03	.00	.08	.59
2043	733	Picos	PI	.74	50.90	.04	-.03	.00	.02	.57
2036	734	Fronteiras	PI	.74	50.86	.01	-.05	.01	.09	.58
9023	735	Carinhanha	BA	.74	50.81	.01	-.01	.06	.01	.44
5028	736	Pedra Branca	PB	.74	50.61	-.02	-.04	.05	-.02	.67
5123	737	Montadas	PB	.74	50.56	-.01	.04	-.02	.01	.67
4077	738	Almino Afonso	RN	.74	50.49	.01	.01	.00	.07	.53
9183	739	Alagoinhas	BA	.74	50.48	.03	.00	.07	.00	.39
5113	740	Manira	PB	.74	50.47	.04	-.04	.04	.03	.48
5114	741	Princesa Izabel	PB	.74	50.46	.04	-.04	.02	.07	.51
3099	742	Barbalha	CE	.74	50.45	.03	-.03	.00	.08	.58
2080	743	Canto do Buriti	PI	.74	50.44	.08	.01	.01	.10	.40

9126	744	Usua	BA	.74	50.42	.13	-.02	.01	-.03	.41
6025	745	Sta.Maria da Boa Vista	PE	.73	50.32	.23	-.01	.02	.14	.32
9062	746	Paramirim	BA	.73	50.29	.02	.01	.01	-.01	.54
9065	747	Rio do Pires	BA	.73	50.18	.01	.05	.02	-.04	.53
9066	748	Seabra	BA	.73	50.06	.07	.00	.01	.00	.46
9119	749	Cansacao	BA	.73	50.00	.00	.02	.02	-.02	.60
6021	750	Itacuruba	PE	.73	49.97	.21	.00	-.01	.24	.45
4092	751	Parana	RN	.73	49.91	-.01	.03	.04	.03	.50
9032	752	Ibitita	BA	.73	49.89	.03	-.03	-.02	.04	.74
2087	753	S.Raimundo Nonato	PI	.72	49.54	.08	.03	.04	-.04	.39
7009	754	Belo Monte	AL	.72	49.50	.06	-.01	.03	.01	.46
5115	755	Tavares	PB	.72	49.44	.01	-.06	.02	.06	.68
4026	756	Cruzeta	RN	.72	49.42	.03	-.02	.00	.07	.58
5023	757	Conceicao	PB	.72	49.42	.01	-.04	.05	-.01	.55
2062	758	Floriano	PI	.72	49.41	.18	.01	-.04	.09	.46
6018	759	Belem do S.Francisco	PE	.72	49.41	.07	.04	-.02	-.03	.53
4111	760	Touros	RN	.72	49.37	-.01	.00	-.02	.06	.70
2085	761	Paulistana	PI	.72	49.32	.01	-.04	.04	.00	.60
9033	762	Irece	BA	.72	49.26	.00	.00	.00	.01	.70
5061	763	Santana dos Garrotes	PB	.72	49.10	.02	-.03	.01	.01	.74
4057	764	Pureza	RN	.71	49.01	.02	.01	-.03	.08	.69
4016	765	Itau	RN	.71	48.86	.10	-.04	-.04	.12	.70
5017	766	Boa Ventura	PB	.71	48.84	.01	-.04	.03	.07	.59
7043	767	Limoeiro de Anadia	AL	.71	48.82	.07	-.05	.00	.05	.60
3089	768	Jati	CE	.71	48.80	.02	-.02	.01	.07	.56
9190	769	Inhambupe	BA	.71	48.78	.17	-.02	-.02	.02	.45
9015	770	Casa Nova	BA	.71	48.77	-.01	.02	.05	-.04	.57
2031	771	Valenca do Piaui	PI	.71	48.69	.04	-.03	.00	.05	.63
4063	772	Japi	RN	.71	48.56	.04	-.02	-.06	.18	.82
7014	773	Major Isidoro	AL	.71	48.56	.07	-.01	.02	.02	.49
5013	774	Pedra Lavrada	PB	.71	48.52	.08	-.03	-.02	.05	.63
5006	775	Jerico	PB	.71	48.49	.04	.01	-.04	.05	.70
4103	776	S.Miguel	RN	.70	48.21	.03	.00	-.01	.04	.61
4087	777	Luis Gomes	RN	.70	48.19	.00	.04	.03	.04	.51
9028	778	Canarana	BA	.70	48.03	.02	-.01	.01	.07	.61
5022	779	Carrapateira	PB	.70	47.83	.02	.03	.02	-.05	.65
4080	780	Doutor Severiano	RN	.70	47.78	.03	.01	.00	.05	.61
4107	781	Vicosa	RN	.69	47.56	.02	-.01	-.03	.16	.72
2023	782	Aroazes	PI	.69	47.52	.05	-.02	.01	.14	.54
6011	783	Parnamirim	PE	.69	47.48	.15	-.02	.02	.09	.41
2086	784	S.Joao do Piaui	PI	.69	47.06	.03	.00	.04	.05	.52
6022	785	Oroco	PE	.68	46.94	.17	.01	-.03	.10	.49
2072	786	S.Jose do Peixe	PI	.68	46.71	.03	.01	.03	.03	.56
6068	787	S.Vicente Ferrer	PE	.68	46.70	.02	-.03	.01	.05	.76
3036	788	Aquiraz	CE	.68	46.66	.00	.03	.01	.07	.61
2042	789	Padre Marcos	PI	.68	46.53	.03	.00	.03	.05	.54
9036	790	Presidente Dutra	BA	.68	46.45	.01	-.03	.02	.05	.75
2044	791	Pio IX	PI	.68	46.43	.05	.01	.01	-.03	.65
9125	792	Tucano	BA	.67	46.10	.10	.00	.00	-.02	.63
9031	793	Ibipeba	BA	.67	45.94	.03	.00	.02	.00	.70
6010	794	Mirandiba	PE	.66	45.57	.04	-.02	.02	.07	.61
2061	795	Flores do Piaui	PI	.66	45.55	.15	-.01	.00	.13	.48
5008	796	S.Bento	PB	.66	45.52	.06	.03	-.03	.09	.64
4040	797	S.Jose do Serido	RN	.66	45.50	.05	-.01	.01	.07	.64
6023	798	Petrolandia	PE	.66	45.28	.10	.02	-.03	.11	.59
4086	799	Lucrecia	RN	.66	45.27	.03	.01	.03	.07	.56
7012	800	Jacare dos Homens	AL	.66	45.23	.09	-.02	.06	.12	.41
9061	801	Palmeiras	BA	.66	45.10	.15	.04	.06	.03	.33
4050	802	Jandaira	RN	.66	45.07	.02	-.04	.02	.18	.64
2070	803	Rio Grande do Piaui	PI	.66	44.94	.19	.02	.03	.11	.37

9122	804	Monte Santo	BA	.65	44.89	.07	.02	.03	-.01	.53
2045	805	Sta.Cruz do Piaui	PI	.65	44.87	.02	-.02	.02	.06	.72
6017	806	Afranio	PE	.65	44.81	.11	-.06	.01	.09	.66
6013	807	S.Jose do Belmonte	PE	.65	44.66	.04	-.02	.02	.12	.61
3030	808	Poranga	CE	.65	44.51	.03	.00	.03	.06	.60
9133	809	Retirolandia	BA	.65	44.47	.00	-.02	.16	-.03	.54
9053	810	Iraquara	BA	.65	44.31	.05	.00	.07	.00	.50
5100	811	Sape	PB	.63	43.41	.03	.06	.00	.04	.65
4018	812	Parau	RN	.63	43.14	.05	.00	-.05	.27	.90
4096	813	Poralegre	RN	.62	42.84	.03	.01	.02	.10	.63
9029	814	Central	BA	.62	42.54	.04	-.02	.04	.03	.83
5073	815	Cabaceiras	PB	.62	42.24	.22	-.01	-.02	.04	.55
7047	816	Taquarana	AL	.62	42.21	.06	-.06	.10	.05	.49
4034	817	Lagoa Nova	RN	.61	42.14	.22	-.05	-.02	.08	.70
6014	818	Serrita	PE	.61	42.13	.14	-.02	.03	.11	.49
6008	819	Trindade	PE	.61	42.05	.08	-.04	.03	.16	.62
3042	820	Pacajus	CE	.61	41.89	.01	-.04	.03	.15	.75
2040	821	Monsenhor Hipolito	PI	.61	41.88	.03	.02	-.01	.09	.80
9120	822	Euclides da Cunha	BA	.61	41.74	.17	-.01	.01	.06	.50
6006	823	Ouricuri	PE	.61	41.70	.13	-.04	.02	.13	.58
3001	824	Acarau	CE	.60	41.42	.00	-.01	.10	.05	.59
6016	825	Verdejante	PE	.60	41.27	.13	-.02	.02	.13	.57
5071	826	Barra de S.Miguel	PB	.60	41.22	.19	-.03	-.02	.13	.68
2034	827	D. Expedito Lopes	PI	.59	40.79	.04	.01	.04	.03	.71
6009	828	Cedro	PE	.59	40.64	.07	-.01	.03	.07	.67
2038	829	Itainopolis	PI	.58	39.96	.04	-.03	.04	.09	.78
2060	830	Eliseu Martins	PI	.58	39.76	.27	.02	.05	.10	.35
6020	831	Floresta	PE	.58	39.57	.25	-.05	-.01	.15	.72
6012	832	Salgueiro	PE	.57	39.38	.20	-.05	.02	.12	.57
9181	833	Sta.Brigida	BA	.56	38.51	.13	.01	.08	-.04	.51
6015	834	Terra Nova	PE	.56	38.25	.17	.02	.03	.09	.50
2078	835	Anisio de Abreu	PI	.55	37.86	.13	.02	.07	-.08	.70
4108	836	Galinhos	RN	.55	37.37	.07	.05	-.02	.13	.79
6019	837	Cabrobro	PE	.54	36.79	.19	.02	.04	.08	.50
6024	838	Petrolina	PE	.54	36.70	.20	-.02	.01	.11	.63
6046	839	Tacaratu	PE	.53	36.02	.14	-.02	.01	.15	.77

Sources: Censos Agropecuarios of Piaui, Ceara, Rio Grande do Norte, Paraiba, Pernambuco, Alagoas, Sergipe and Bahia.

ble 2B: Index of Desertification, Total Area in 1985, Relative Participation of Areas with Forests (Natural and Planted), Relative Vegetal Cover, and Population in the 25% More Affected Municipalities by the Desertification Process in Piaui.

mber of nic.	Municipality	ID	ID base 100	Area in 85	Vegetal cover 75	Vegetal cover 85	Relative area with forest 85	Population
074	Cristino Castro	1.46	100.00	278249	.67	.01	.00	11041
075	Palmeiras do Piaui	1.21	83.17	61023	.42	.13	.10	4445
089	Socorro do Piaui	1.19	81.46	45314	.63	.07	.00	5266
097	Parnagua	1.18	81.21	327464	.81	.13	.11	12666
029	Prata do Piaui	1.15	78.73	9407	.26	.15	.12	2710
084	Paes Landin	1.12	76.68	45926	.23	.07	.00	5436
093	Cristalandia do Piaui	1.12	76.55	54503	.56	.19	.14	5963
096	Monte Alegre do Piaui	1.12	76.52	91231	.35	.24	.20	9446
012	Batalha	1.11	75.90	111725	.17	.12	.06	22332
053	Demerval Lobao	1.11	75.85	27714	.34	.24	.17	12218
021	S.Joao da Serra	1.10	75.74	60169	.20	.13	.10	7288
059	Bertolina	1.09	74.83	162181	.11	.08	.05	8758
088	Simplicio Mendes	1.08	74.26	123578	.44	.13	.06	13451
030	S.Felix do Piaui	1.07	73.50	42343	.19	.15	.11	5537
013	Campo Maior	1.06	72.82	242569	.25	.23	.17	72258
055	Miguel Alves	1.06	72.47	110637	.50	.46	.40	27679
017	Domingos Mourao	1.04	71.65	19493	.17	.17	.09	4273
073	Bom Jesus	1.04	71.48	166332	.28	.20	.18	18126
056	Monsenhor Gil	1.03	70.93	47005	.21	.19	.08	10986
026	Inhuma	1.03	70.47	29643	.77	.57	.33	13174
071	Barras	1.03	70.41	151798	.30	.21	.12	50151
092	Correntes	1.03	70.31	200017	.59	.31	.28	24964
091	Barreiras do Piaui	1.01	69.54	44952	.49	.28	.26	4052
022	S.Miguel do Tapuio	1.01	69.53	314492	.15	.17	.11	24829
otals				2767765				376197

urces: Table 1A and Censos Agropecuarios of Piaui.

ble 3B: Index of Desertification, Total Area in 1985, Relative Participation of Areas with Forests (Natural and Planted), Relative Vegetal Cover, and Population in the 25% More Affected Municipalities by the Desertification Process in Ceara.

mber of mic.	Municipality	ID	ID base 100	Area in 85	Vegetal cover 75	Vegetal cover 85	Relative area with forest 85	Population
3063	Jaguretama	1.20	82.04	154795	.27	.21	.11	17580
3064	Jaguaribara	1.15	78.53	69969	.31	.16	.04	7718
3059	Pedra Branca	1.11	75.85	132843	.23	.17	.01	38800
3065	Jaguaribe	1.09	74.81	205458	.27	.20	.09	32340
3012	Apuiares	1.08	74.36	47011	.47	.37	.17	9516
3023	Caridade	1.07	73.51	58881	.63	.35	.24	12432
3025	Hidrolandia	1.06	72.77	81284	.30	.23	.13	17900
3109	Ubajara	1.06	72.54	45028	.36	.25	.07	23374
3007	Martinopole	1.03	70.66	10982	.31	.30	.01	6447
3055	Itatira	1.03	70.33	66860	.53	.40	.17	13853
3013	Iraucuba	1.01	69.14	110936	.28	.26	.15	17155
3019	S.Luis do Curu	1.00	68.68	12423	.37	.30	.13	10609
3029	Nova Russas	1.00	68.31	148946	.18	.33	.17	37832
3124	Altaneira	.99	68.20	5249	.33	.36	.12	4806
3116	Ipu	.99	68.18	63510	.40	.47	.20	35689
3110	Vicosa do Ceara	.99	67.73	94869	.19	.31	.16	40865
3106	Ibiapina	.98	67.46	25424	.21	.29	.05	20031
3011	Uruoca	.98	67.43	30593	.36	.36	.08	10220
3079	Baixio	.98	66.89	13494	.68	.46	.15	5412
3073	Taua	.97	66.27	345125	.33	.30	.20	51339
3081	Ico	.97	66.20	114678	.52	.38	.14	60466
3062	Solonopole	.96	65.97	187755	.42	.39	.24	15831
3056	Quixada	.96	65.52	402994	.56	.51	.27	72224
3028	Ipueiras	.96	65.51	85252	.33	.35	.19	35099
3040	Beberibe	.95	65.47	70276	.71	.50	.25	36801
3076	Iguatu	.95	65.45	103902	.58	.53	.21	75649
3112	Carire	.95	65.44	67740	.51	.38	.29	17747
3035	Tamboril	.95	65.38	159621	.34	.46	.37	26260
3033	Monsenhor Tabosa	.95	64.95	80756	.20	.48	.32	15527
3043	Alto Santo	.95	64.90	109612	.66	.38	.16	13610
3094	Araripe	.95	64.85	88570	.32	.25	.12	17409
3022	Caninde	.94	64.77	240609	.59	.43	.27	61827
otals				3435445				862368

urces: Table 1A and Censos Agropecuarios of Ceara.

ble 4B: Index of Desertification, Total Area in 1985, Relative Participation of Areas with Forests (Natural and Planted), Relative Vegetal Cover, and Population in the 25% More Affected Municipalities by the Desertification Process in Rio Grande do Norte

ber of ic.	Municipality	ID	ID base 100	Area in 85	Vegetal cover 75	Vegetal cover 85	Relative area with forest 85	Population
009	Acu	1.15	79.05	96517	.48	.22	.03	43591
147	Santana do Matos	1.14	78.35	151096	.43	.17	.04	17188
024	Carnauba dos Dantas	1.12	76.53	14852	.22	.16	.02	5608
149	Caicara do Rio dos Ventos	1.11	75.81	21815	.51	.27	.18	2616
165	Lajes Pintadas	1.10	75.13	11990	.62	.52	.13	4459
119	S.Rafael	1.08	73.81	24816	.47	.20	.14	7843
103	Carnaubais	1.08	73.81	83956	.76	.29	.02	10461
099	Riacho do Cruz	1.06	72.36	11869	.55	.45	.31	2558
160	Campo Redondo	1.04	71.30	18902	.40	.46	.14	9349
148	Bento Fernandes	1.03	70.61	24077	.48	.35	.22	4463
053	Lajes	1.02	70.05	57296	.46	.36	.17	8587
038	S.Fernando	1.01	69.23	38112	.13	.21	.14	3504
164	Taboleiro Grande	1.01	69.02	11908	.37	.33	.20	2071
051	Jardim de Angicos	.99	68.01	28919	.70	.56	.40	2439
032	Jardim de Serido	.99	67.60	34228	.19	.27	.12	11840
064	Lagoa de Velhos	.98	67.52	18094	.67	.33	.20	1968
027	Currais Novos	.98	67.46	83985	.43	.42	.30	40227
066	Monte das Gameleiras	.97	66.35	4276	.33	.46	.09	2761
109	Pedra Grande	.97	66.21	18700	.60	.36	.06	3489
011	Augusto Severo	.97	66.19	107961	.49	.45	.33	12437
031	S.Tome	.96	65.84	68400	.48	.52	.21	11465
082	Francisco Dantas	.96	65.60	19224	.49	.42	.23	3267
059	Barcelona	.95	65.27	18456	.65	.62	.24	3655
069	S.Bento do Trairi	.95	65.17	17371	.50	.75	.47	3239
006	Macau	.95	65.17	28629	.62	.33	.16	25985
068	Sta.Cruz	.94	64.51	68081	.72	.57	.27	28654
013	Felipe Guerra	.94	64.42	27877	.49	.67	.57	6042
030	Ipueira	.94	64.12	12146	.32	.46	.38	1701
otals				1123553				281467

urces: Table 1A and Censos Agropecurarios of Rio Grande do Norte.

ble 5B: Index of Desertification, Total Area in 1985, Relative Participation of Areas with Forests (Natural and Planted), Relative Vegetal Cover, and Population in the 25% More Affected Municipalities by the Desertification Process in Paraiba

ber of nic.	Municipality	ID	ID base 100	Area in 85	Vegetal cover 75	Vegetal cover 85	Relative area with forest 85	Population
067	S.Mamede	1.31	89.57	63887	.37	.25	.09	8521
010	Frei Martinho	1.17	80.31	17319	.13	.14	.06	2684
059	Sta.Cruz	1.17	80.17	25862	.47	.25	.00	7410
086	S.Sebastiao do Umbuzeiro	1.16	79.67	50788	.14	.08	.01	4448
075	Congo	1.16	79.60	27923	.12	.10	.00	4367
101	Belem do Brejo do Cruz	1.16	79.25	52475	.23	.21	.10	8141
118	Bom Jesus	1.14	78.38	3995	.56	.26	.00	1735
007	Tacima	1.14	78.24	22430	.37	.20	.01	10407
090	Taperoa	1.14	78.19	64498	.48	.30	.03	15197
074	Camalau	1.14	77.84	33134	.22	.12	.02	5549
053	Patos	1.11	76.25	51575	.30	.33	.17	81298
088	Soledade	1.11	76.11	65186	.16	.16	.03	11175
038	Cacimba de Areia	1.11	76.00	19512	.37	.26	.11	2906
064	S.Jose de Espinheiro	1.09	74.98	64604	.40	.21	.04	5998
097	Pilar	1.09	74.62	24778	.29	.20	.01	13773
065	S.Jose do Bonfim	1.08	74.22	12245	.42	.37	.14	2808
027	Monte Horebe	1.08	74.11	10299	.44	.22	.08	4053
068	Sousa	1.08	74.09	116906	.42	.28	.06	79135
096	Mogerio	1.08	73.85	18305	.22	.24	.05	13298
092	Caldas Brandao	1.07	73.70	2969	.34	.21	.01	4522
042	Desterro de Malta	1.07	73.62	5400	.40	.26	.00	3052
082	Prata	1.07	73.39	12383	.34	.17	.00	3311
084	S.Joao do Tigre	1.07	73.33	38829	.07	.08	.01	4146
047	Lastro	1.06	72.64	11869	.37	.30	.01	3278
120	Fagundes	1.06	72.40	15527	.30	.35	.09	13195
005	Catole do Rocha	1.05	72.12	53987	.47	.39	.21	25220
033	Serra Grande	1.05	72.03	6863	.44	.21	.00	2598
049	Nazarezinho	1.05	71.77	20848	.49	.40	.01	7420
083	S.Joao do Cariri	1.04	71.20	93701	.06	.13	.05	7537
087	Serra Branca	1.03	70.60	76940	.12	.23	.08	13595
089	Sume	1.02	70.07	86820	.13	.17	.05	17230
104	Cuite	1.01	69.13	62954	.71	.43	.06	23153
otals				1236811				411102

urces: Table 1A and Censos Agropecuarios of Paraiba.

Table 5B: Index of Desertification, Total Area in 1985, Relative Participation of Areas with Forests (Natural and Planted), Relative Vegetal Cover, and Population in the 25% More Affected Municipalities by the Desertification Process in Paraiba

mber of mic.	Municipality	ID	ID base 100	Area in 85	Vegetal cover 75	Vegetal cover 85	Relative area with forest 85	Population
067	S.Mamede	1.31	89.57	63887	.37	.25	.09	8521
010	Frei Martinho	1.17	80.31	17319	.13	.14	.06	2684
059	Sta.Cruz	1.17	80.17	25862	.47	.25	.00	7410
086	S.Sebastiao do Umbuzeiro	1.16	79.67	50788	.14	.08	.01	4448
075	Congo	1.16	79.60	27923	.12	.10	.00	4367
001	Belem do Brejo do Cruz	1.16	79.25	52475	.23	.21	.10	8141
018	Bom Jesus	1.14	78.38	3995	.56	.26	.00	1735
107	Tacima	1.14	78.24	22430	.37	.20	.01	10407
090	Taperoa	1.14	78.19	64498	.48	.30	.03	15197
074	Camalau	1.14	77.84	33134	.22	.12	.02	5549
053	Patos	1.11	76.25	51575	.30	.33	.17	81298
088	Soledade	1.11	76.11	65186	.16	.16	.03	11175
038	Cacimba de Areia	1.11	76.00	19512	.37	.26	.11	2906
064	S.Jose de Espinheiro	1.09	74.98	64604	.40	.21	.04	5998
097	Pilar	1.09	74.62	24778	.29	.20	.01	13773
065	S.Jose do Bonfim	1.08	74.22	12245	.42	.37	.14	2808
027	Monte Horebe	1.08	74.11	10299	.44	.22	.08	4053
068	Sousa	1.08	74.09	116906	.42	.28	.06	79135
096	Mogerio	1.08	73.85	18305	.22	.24	.05	13298
092	Caldas Brandao	1.07	73.70	2969	.34	.21	.01	4522
042	Desterro de Malta	1.07	73.62	5400	.40	.26	.00	3052
082	Prata	1.07	73.39	12383	.34	.17	.00	3311
084	S.Joao do Tigre	1.07	73.33	38829	.07	.08	.01	4146
047	Lastro	1.06	72.64	11869	.37	.30	.01	3278
120	Fagundes	1.06	72.40	15527	.30	.35	.09	13195
005	Catole do Rocha	1.05	72.12	53987	.47	.39	.21	25220
033	Serra Grande	1.05	72.03	6863	.44	.21	.00	2598
049	Nazarezinho	1.05	71.77	20848	.49	.40	.01	7420
083	S.Joao do Cariri	1.04	71.20	93701	.06	.13	.05	7537
087	Serra Branca	1.03	70.60	76940	.12	.23	.08	13595
089	Sume	1.02	70.07	86820	.13	.17	.05	17230
104	Cuite	1.01	69.13	62954	.71	.43	.06	23153
otals				1236811				411102

urces: Table 1A and Censos Agropecuarios of Paraiba.

Table 68: Index of Desertification, Total Area in 1985, Relative Participation of Areas with Forests (Natural and Planted), Relative Vegetal cover, and Poulation in the 25% More Affected Municipalities by the Desertification Process in Pernambuco.

Number of Munic.	Municipality	ID	ID base 100	Area in 85	Vegetal cover 75	Vegetal cover 85	Relative area with forest 85	Population
6101	Correntes	1.17	79.93	30149	.22	.14	.03	16218
6077	Cachoeirinha	1.15	78.97	16405	.28	.26	.02	15852
6057	Feira Nova	1.14	77.85	10249	.49	.47	.01	18526
6094	Bom Conselho	1.13	77.78	76442	.25	.21	.04	41177
6114	Saire	1.11	76.13	20381	.35	.24	.02	11113
6105	Ibirajuba	1.11	75.94	16785	.34	.31	.04	7548
6091	Altinho	1.10	75.17	41536	.31	.24	.01	23144
6071	Toritama	1.09	74.81	1981	.36	.37	.04	14907
6056	Cumaru	1.07	73.35	23114	.27	.31	.01	18004
6086	Sta.Cruz do Capibaribe	1.06	72.83	26941	.19	.19	.00	38332
6096	Brejao	1.06	72.68	14565	.19	.31	.03	8707
6111	Palmerina	1.05	72.24	16602	.23	.17	.04	8311
6083	Pocao	1.04	71.32	16628	.26	.20	.06	9584
6090	Agrestina	1.04	71.31	18151	.25	.21	.01	17993
6069	Surubim	1.04	71.23	34017	.39	.32	.01	67572
6050	Itaiba	1.03	70.71	93639	.22	.41	.13	27142
6051	Pedra	1.02	70.23	78619	.43	.26	.11	19614
6102	Cupira	1.02	70.20	9262	.38	.31	.01	22701
6070	Taquaritinga do Norte	1.02	69.75	37566	.34	.30	.09	17093
6115	Saloa	1.02	69.63	25524	.24	.34	.04	14837
6104	Iati	1.02	69.62	48698	.30	.37	.07	18526
6092	Angelim	1.02	69.62	11641	.27	.21	.01	8734
6081	Jataubа	1.01	69.10	41999	.27	.23	.07	14450
6084	Riacho das Almas	1.01	69.00	30435	.36	.31	.01	17941
6047	Aguas Belas	1.00	68.85	71109	.27	.37	.06	38355
6087	S.Bento do Una	1.00	68.65	55176	.37	.41	.05	42236
6118	Teresinha	1.00	68.63	12016	.22	.23	.02	6789
6082	Pesqueira	1.00	68.56	73818	.28	.28	.10	57622
6064	Passira	.99	68.08	23183	.29	.31	.00	29135
6079	Caruaru	.99	67.58	64585	.33	.36	.06	213697
Totals				1041216				865860

Sources: Table 1A and Censos Agropecuarios of Pernambuco.

Table 7B: Index of Desertification, Total Area in 1985, Relative Participation of Areas with Forests (Natural and Planted), Relative Vegetal Cover, and Population in the 25% More Affected Municipalities by the Desertification Process in Alagoas.

Number of Munic.	Municipality	ID	ID base 100	Area in 85	Vegetal cover 75	Vegetal cover 85	Relative area with forest 85	Population
7037	Campo Grande	1.25	85.54	17216	.14	.12	.02	10041
7044	Olho D'Agua Grande	1.21	82.80	15966	.14	.10	.02	4413
7029	Mar Vermelho	1.14	77.94	9860	.13	.09	.01	3965
7032	Paulo Jacinto	1.11	75.95	11213	.12	.09	.00	7117
7028	Maribondo	1.10	75.33	15469	.18	.14	.01	14966
7025	Belem	1.05	71.80	7007	.15	.22	.00	5919
7034	Tanque D'Arca	1.02	69.71	10781	.37	.29	.01	7715
7015	Maravilha	1.01	69.40	29838	.75	.43	.14	11380
7046	S.Sebastiao	1.00	68.26	26134	.27	.35	.01	24696
7013	Jaramataia	.99	68.21	9749	.29	.21	.04	4372
7045	S.Bras	.99	67.87	14391	.23	.20	.08	6313
7031	Palmeiras dos Indios	.98	67.16	50319	.33	.33	.03	77204
Totals				217943				178204

Sources: Table 1A and Censos Agropecuarios of Alagoas.

ble 88: Index of Desertification, Total Area in 1985, Relative Participation of Areas with Forests (Natural and Planted), Relative Vegetal Cover, and Population in the More Affected Municipalities by the Desertification Process in Sergipe.

mber of nic.	Municipality	ID	ID base 100	Area in 85	Vegetal cover 75	Vegetal cover 85	Relative area with forest 85	Population
009	Tobias Barreto	1.33	91.19	75333	.20	.04	.02	37577
010	Tomar Geru	1.07	73.60	30642	.13	.11	.01	11278
007	Cristanopolis	1.04	71.38	22991	.24	.23	.06	10932
002	Gararu	.97	66.53	64451	.28	.27	.12	10465
003	Monte Alegre de Sergipe	.95	65.40	34060	.46	.25	.08	9589
005	Poco Redondo	.94	64.13	91046	.11	.19	.10	20155
008	Poco Verde	.92	63.42	35536	.41	.35	.10	17666
004	Nossa Senhora da Gloria	.92	63.17	78328	.41	.29	.09	23478
otals		432387			141140			

urces: Table 1A and Censos Agropecuarios of Sergipe.

Table 98: Index of Desertification, Total Area in 1985, Relative Participation of Areas with Forests (Natural and Planted), Relative Vegetal Cover and Population in the 25% More Affected Municipalities by the Desertification Proces in Bahia.

Number of Munic.	Municipality	ID	ID base 100	Area in 85	Vegetal cover 75	Vetetal cover 85	Relative area with forest 85	Population
9171	Itambe	1.26	86.60	155430	.13	.09	.07	23901
9162	Caatiba	1.26	86.24	65140	.21	.18	.08	9907
9041	Andarai	1.25	85.92	145684	.46	.40	.33	14285
9008	Formosa do Rio Preto	1.24	84.93	1102702	.46	.06	.06	15418
9153	Santanopolis	1.22	83.50	22351	.19	.12	.00	72587
9174	Macarani	1.20	82.17	123113	.07	.06	.05	14057
9142	Castro Alves	1.19	81.69	155017	.24	.14	.06	26773
9182	Acajutiba	1.17	80.08	20624	.32	.26	.14	12894
9013	Barra	1.17	80.03	570855	.55	.31	.25	39806
9143	Coracao de Maria	1.16	79.81	35794	.15	.19	.04	21937
9152	Sta.Barbara	1.16	79.70	33764	.07	.07	.00	16768
9020	Sento Se	1.16	79.51	90662	.76	.38	.21	28387
9052	Iramaia	1.15	78.78	153651	.40	.24	.20	17199
9150	Curicangas	1.13	77.28	11001	.15	.16	.07	7042
9161	Boa Nova	1.12	76.97	135371	.29	.17	.09	13505
9140	Anguera	1.12	76.92	14061	.17	.07	.00	7859
9175	Maiquinique	1.12	76.79	50277	.09	.10	.05	7833
9166	Nova Canaa	1.12	76.66	59574	.24	.12	.07	13815
9059	Mucuge	1.12	76.63	69029	.30	.21	.12	10334
9117	Tapiramuta	1.10	75.72	55032	.28	.34	.20	13691
9157	Tanquinho	1.10	75.52	23752	.04	.03	.02	10280
9172	Itapetinga	1.10	75.46	169138	.07	.07	.07	53476
9084	Malhada de Pedras	1.10	75.13	40836	.11	.19	.01	7279
9158	Anaje	1.09	75.04	111920	.34	.34	.22	41544
9070	Aracatu	1.09	74.80	107733	.12	.19	.08	15464
9129	Candeal	1.08	74.31	41793	.05	.06	.02	10728
9115	Ruy Barbosa	1.07	73.47	196973	.20	.21	.16	30052
9077	Dom Basilio	1.07	73.34	32043	.25	.23	.07	9730
9071	Brumado	1.06	72.82	131906	.11	.15	.02	57176
9180	Pedro Alexandre	1.06	72.81	88189	.43	.22	.12	14801
9101	Saude	1.06	72.73	37179	.18	.14	.07	11389
9118	Varzea do Poco	1.06	72.63	25097	.18	.18	.05	9633
9025	Paratinga	1.06	72.45	100604	.56	.33	.20	24181
9026	Barra do Mendes	1.06	72.44	157916	.31	.19	.14	14469
9012	Tabocas do Brejo Velho	1.06	72.43	69532	.27	.20	.15	11281
9154	Sta.Teresinha	1.06	72.36	102381	.08	.09	.03	8860
9106	Ibiquera	1.05	72.26	115109	.24	.23	.21	5838
9151	Pedrao	1.05	71.76	15668	.13	.13	.04	6813
9110	Macajuba	1.05	71.73	57976	.13	.19	.16	10479
9111	Mairi	1.04	71.64	129440	.15	.17	.08	20769
9075	Condeuba	1.04	71.60	139247	.23	.25	.13	17898
9185	Apora	1.04	71.49	35702	.18	.17	.08	15742
9134	Riachao do Jacuipe	1.04	71.13	273662	.36	.20	.04	37610
9099	Mirangaba	1.03	70.94	92205	.47	.38	.21	14651
9113	Mundo Novo	1.03	70.65	142559	.24	.24	.19	30854
9042	Barra da Estiva	1.03	70.59	71372	.37	.32	.17	17246
9007	Cristopolis	1.03	70.34	64298	.33	.21	.17	16778
9132	Lamarao	1.02	70.12	23147	.12	.13	.01	10275
9076	Cordeiros	1.02	70.04	36114	.36	.29	.16	10664
Totals				5702614				878429

Sources: Table 1A en Censo Agropecuarios of Bahia.