POTENTIAL OF THE RAINWATER IN THE AREAS OF NORTHEAST OF THE BRAZIL

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ABSTRACT

The access to water is historical in Brazil, but the problem is more emblematic in the Semi-arid states. In general, the production that does not have access to water is higher in the North (33.3%) and Northeast (56.9%) of the country. The Brazilian Northeasten Region shows great climatic variability. In the Semi-arid region of Brazil, approximately, 10 million people live in an area of about 870 thousand square kilometers and that includes the north of the States of Espírito Santo and Minas Gerais, the entire of Alagoas, Bahia, Ceará, Paraíba, Pernambuco, Piauí, Rio Grande do Norte, Sergipe and southeastern part of Maranhão. The State of the Maranhão is located in the Northeastern Region of Brazil, between the coordinates 5° 10' S and 41° 46' 40" long. W. It includes an area of 329,355, 8 km²; defined by the north by the Atlantic Ocean, the east by Piauí, the south by São Luís, and the northwest by Pernambuco. This State is located in a humid transition area in the semi-arid climate of the interior of the northeast, the expected areas of the Araraucos are affected by the deflation ventilation coming of the Amazon (Open pasture) in the south. In the Forests You may camp in the center and the eastern part of the state. (Dona Reta Forest).

The main goal of this study is to evaluate the visibility of caption of rainwater in the Semi-arid state of Maranhão and evaluate which would be the best available water resources for this state. It used to be divided in periods of dry, normal and humid years; and analyzes of probability of the total annual precipitation. On these, the expected values of occurrence is inferred for years whose precipitations are considered normal (around the average) or droughts (below the average). The expected values are estimated using normal distribution of probability, by means of Quantiles.

The criteria for the normal distribution is based on the secular precipitation series. It shows a good test of this model, it denotes similar occurrences, probabilistic of humid years (above of the normal climatology) or dry years (below the normal climatology). Usually the frequencies to delimited humid or dry years are placed in the quantiles of 75% and 25%, respectively, of probability and vice versa. (Prob<0.75), being changeable Prec (annual average Precipitation), and = green value of annual total precipitation). Results show, that in most of the years, the climatic areas of the State scanty are 10% of area of real evapotranspiration. It is necessary try to solve the water problem so that it does not affect all the segments of the woody to the same parent areas in the same way.

Key words: rainwater, Semi-arid, Brazil. 15

INTRODUCTION

Water, the primary source of life for the human being, each year becomes more scarce. The problem of access to water is historic in Brazil, and in the Semi-arid states the problem is more emblematic. According to IBGE data, 2002, 40.12% of the children and adolescents who live in the Brazilian semi-arid, do not have access to the usual water networks, wells or springs at home or nearby. The national index is that 17.2% of children and adolescents have no access to water. The population that has no access to water is greater in the North (52.7%) and Northeast of the country (56.9%). These indices increased from the interest in 1993 to 2002, when the North had 31.7% and Northeast 50.2%.

The verification, in the National Water Registry on Basic Sanitation, emphasized by the

Regarding climatic conditions, the Brazilian Semi-arid is characterized by having a negative hypsometric regime, whose mean annual climatometric precipitations are equal or inferior to 800mm, excepting 2,500mm per year at the upper limit of the usual rainfall distributions, with occurrences of periodic droughts, all of which determine the favorable outcome of agriculture and cattle breeding and primarily, the survival of the families (Moura, et al, 2007). In Maranhão, there are 45 municipalities in an approximate area of 38,000 km² with a population of 1,100,000 inhabitants. Those municipalities have the arid index and are among the poorest cities of the state.

From the hydrographic point of view, only a small part of the Semi-arid region is known to have a mean annual pluviometric precipitation inferior to 400mm. In all the semi-arid, this average increases to 500mm over periods of years. In Maranhão, it is only a partial distribution of the rain in time and space. To the contrary of what has been thought in past years, it is not only droughts that are responsible for the drouth. It is also the distribution of water, but also the lack of good pastures and utilization of hypsometric resources. However, it is social mobilization in the Semi-arid states that has contributed to changing this situation.

In 2000, the Common Program was implemented and is being carried out in the Semi-arid and Cerrado, which implements the creation of the water banks by using diverse actions: hypsometric resources, appropriate production, contextualized education, management of naturally degraded areas, water use, etc. One of the principal programs is the INAPA Program for a Mission Country, developed by the Aquatic Semi-arid (ASA-Brazil) in the communities.

As the objective of this study is to evaluate the capillary rain water in the State of Maranhão in accordance with the mean annual precipitation and the frequency of occurrence.

MATERIAL AND METHODS

Study area:
The State of Maranhão, localized on the north coast of Brazil, is bound in the North by the Atlantic Ocean, in the Northeast by the Ceará State and in the South by State of Piauí and in the Southwest with the State of Bahia. It is a tropical climate.

Its relief presents two distinct regions, that include a coastal plain and a tabular high plain. The coastal plain is limited by the coast line and the tabular high plain is limited by the perpendicular line.

The coastal line is fairly formed by dunes, sands, and sandstones.

The State is the Brazil's State that most has an arid climate. The climate of the State is characterized by two distinct seasons: hot season from June to September and cold season from October to May. In the cold season, strong winds blow from the North (Nordeste) and from the South (Sudeste) and move across the State (Vale do Matosinhos).

MATERIAL used

In this work, data of historical precipitation series and georeferenced data bases were used, that were obtained from sources such as the Development Company of the Sãο Francisco Valley - CEED, the National Water Agency - ANA and the Federal University of Ceará, Ceará (UFCE). The georeferenced municipality and state bases were obtained from the National Institute of Geography and Statistics-Brazil.

Figure 1 shows the points and the names of the pluviometric stations used in this study.

RESULTS AND DISCUSSION

The annual precipitation, the expected values and occurrences of humid years are analyzed, using the normal probability of distribution, by means of Quantiles. The criterion for the choice of normal distribution was well def, due to the fact that the temporal series of precipitation shows a good adherence to this model, which denotes, probabilistically, similar occurrences, of humid years (above normal climatology) or dry years (below normal climatology), as highlighted, in Galvécio et al.,(2005,2006) and Moura et al. (2007).

It is considered, that in the majority of the years, the climatic areas of the State is scanty are 10% of area of real evapotranspiration. It is necessary to try to solve the water problem so that it does not affect all the segments of the wood to the same parent areas in the same way.

Figure 1 shows the points and the names of the pluviometric stations used in this study.

Conclusions

Precisely in dry years, the most critical areas of the State only need a 35 mm of roof collection. It is necessary to try to solve the problem so that water scarcity does not affect all the segments of society, that means, of course, the inhabitants who live in semi-barens regions.