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# RESEARCH ARTICLE

# STATISTICAL INVESTIGATION OF THE FREQUENCIES OF THE NUMBERS OF RAINY DAYS IN DSCHANG AND SURROUNDINGS WESTERN REGION OF CAMEROON PERIOD FROM 1976 TO 2015

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**ABSTRACT**

This study concerns the frequencies of monthly, yearly and seasonal numbers of rainy days in Dschang and surroundings for the period from 1976 to 2015 and their tendencies over this period. This investigation has revealed a slight time deterioration of these numbers accompanied by the reduction of the rainfall and pluviometry, particularly by the end of the considered period. This deterioration has been caused by the large scale destruction of the environment generated by the sudden augmentation of the populations of the city just after the creation of a classic university in Dschang. The proposed solution to this degradation is to give this area the green look she had before.



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# INTRODUCTION

One of the main problems terrifying farmers for already many years in most countries and particularly developing ones is the miss-management of the rainy seasons, mostly at their beginnings. This situation use to manifest itself as follows.  At the beginning of the rainy season it regularly rains for three weeks and sometimes a little more. During this period, farmers run to their fields for agricultural activities, particularly seeding as the land use to be already prepared. Water provided by these rainfalls makes plants start growing mostly to the stage of the biomasses formation. It is well known that at this stage the quantities of water needed by cultures are very high. Very often, by this time a dry season occurs suddenly for sometimes more than six weeks, putting plants under strong water stresses as its soil reserve is not yet sufficient to provide cultures needed quantities of water. Recall that we are under the tropics, near the equator, where the dry season use to be severe and we are still at the beginning of the rainy season when the soil water reserve is still at its lowest level. Moreover the populations in extreme poverty have no instruments for irrigation and the rivers are rare to enable inhabitants to drain water to their fields. This situation very negatively impacts the yields, quantitatively and qualitatively, leading to socio-economical catastrophic consequences. These situations are also encountered in Dschang, whence the importance of this investigation for the locality.

In front of this situation, reseeding the field after that sudden dry season is one of the remedies to overcome this problem. Unfortunately this seems to be complicated and even impossible as many countries, particularly developing ones, have no policy of preserving seeds obliging each farmer to manage as he can, usually without any help from special public services. Thus, after this sad event, farmers have no more available seeds when the real rainy season is back. So it is understandable why most developing countries are always under permanent international food assistance.  Today, developed countries help developing ones. A question a safety brain man could ask is to know for how long again this international help could run as the world economical situation is progressively getting tougher and tougher. Clear that these developing countries must urgently solve their problem of miss-management of the rainy season to avoid future hunger tragedy. Awarded of this tragedy, some researchers have started paying their attention to the rainfall regime, but poorly because of lack of data. The present article on the frequencies of the rainfalls in Dschang and surroundings could be considered as a real beginning of solution to this problem as done on the basis of accurate and substantial chronological data obtained by good qualified personal. Hopeful that sets of normal meteorological stations respecting the World Meteorological Organization prescriptions should be created in developing countries. They should provide different researchers a bank of accurate and long series of meteorological data to enable them to carry their work. This paper has five sections. The first and present one introduces the problematic of our study. The second section is on the data and methodology used. The results of data treatments and their analysis are in the third section, the conclusion and recommendations in the fourth section. The bibliography in alphabetic order is in the fifth section.

**Data and methodology**

**Data:** Data used in this work comes from the meteorological station of the agronomic research institute in Dschang, locality situated on the highlands in the western region of Cameroon, altitude about 1500 meters above the sea level. This locality on the mountains faces to the Atlantic Ocean away by approximately 350 kilometers. This institute is one of the most important agronomic research centers in the country. Thus, it is well-equipped with good instruments, high qualified multidisciplinary personals. Thus, the quality of used data should not suffer of any doubt. The data concerns daily rainfalls with pluviometry of at least 5 mm each during the period from 1976 to 2015, a total of 40 years. Monthly and yearly numbers of such daily rainfalls were determined and presented in tabular forms. Pluviometry of at least 5 mm was considered because the dry season used to be severe and at its end the soil water reserve should be at its lowest level to sustain normal development of cultures until this reserve reaches an acceptable level.

# METHODOLOGY

Monthly and yearly numbers of rainy days with corresponding standard deviations and mathematical means were calculated. Standard deviations enabled us to have an idea on the distribution of the numbers of rainy days around their corresponding mathematical means. Monthly probabilities enabled us to estimate the chance of occurrence of the fund monthly number of rainy days in the considered month. Obviously, this information should be very useful when planning agricultural activities, particularly seeding at the beginning of the rainy season. Modeling the time trend of the yearly numbers of rainy days was done using the least squares method. To facilitate computations an auxiliary variable t was introduced such that year 1995 corresponds to t = 0. To obtain these probabilities, the monthly numbers of rainy days N was divided by the corresponding total monthly number of days in the whole period multiplying 40 years by 31 for months with 31 days or 30 for months with 30 days and at last by 28 for February month; i.e. respectively 1240, 1200 and 1120 days. The last column $\Sigma_Y$ represents the yearly numbers of rainy days.

# RESULTS AND ANALYSIS

The data treatment led us to Table 3.1. In the last three rows of this table, N represents the monthly numbers of rainy days, s - their corresponding standard deviations and p – the probabilities of their occurrences during the whole period of study. Table 3.1 clearly indicates that the period covering November, December, January and February corresponds to the dry season in the locality despite the fact that some rainfalls were registered during this time. The remaining months correspond to the rainy season, particularly the period from April to October when it rained almost every three days. For the whole period, the rainiest year was 1982 with 131 rainy days and the less rainy year – 2011 with a total of only 75 rainy days. The less rainy month for the whole period was January with only 30 rainy days in 40 years and corresponding standard deviation and probability of occurrence respectively 1 day and 0.024. Within the same period the rainiest month was August with corresponding numerical characteristics respectively 678 days, 3 days and 0.565 chance of occurrence. All the standard deviations of the monthly numbers of rainy days were mostly of order 2 less than the corresponding main characteristics indicating that these monthly numbers were dispatched closer to their mathematical means. The probabilities of occurrence of rainy day were of order $10^{-2}$ during the dry season and $10^{-1}$ during the remaining period. These probabilities were around 0.350 in April-May and varied from 0.396 in July to 0.565 in September. Table 3.1 informs that at the beginning of the rainy season, April-May, rainfalls of pluviometry of at least 5 mm were registered mostly every three days and almost every two days the remaining time. Starting from year 2011 the monthly numbers of rainy days clearly started decreasing till the end of the period of study. Columns t and $\Sigma_Y$ of Table 3.1 led to Table 3.2 which enabled us to plot experimental points $N_Y(t)$ in a coordinate axes with t in the abscissa and $N_Y$, the yearly numbers of rainy days, in ordinates to investigate the time tendency of $N_Y$. The analysis of the configuration of the obtained cloud of points $N_Y(t)$, Figure 3.1, led to a conclusion of a linear relationship between t and $N_Y$. Applying the least squares method has permitted to obtain its analytic expression:

$$N_Y(t) = - 0.4t + 102. \quad (3.1)$$

Corresponding standard deviations, $s_Y$, of $N_Y$ and the average monthly numbers of rainy days, $n_Y$, were calculated. The results are presented in Table 3.2. Table 3.2 indicates that the standard deviations of the yearly numbers of rainy days were mostly of two orders less than their corresponding main parameters. This indicates that these yearly numbers of rainy days were scattered closer their mathematical mean value. Before 2001, $n_Y$ oscillating around 10 led to the conclusion that rainfall was registered in the area mostly after every three days in a month. $n_Y$ fell around 8 in the remaining years, increasing the interval between rainy days. The rainy season was established from March to October. Data treatment just for this period led to Table 3.3 where $N_S$, $s_S$ and $n_S$ are respectively the numbers, standard deviations and the average monthly numbers of rainy days. Table 3.3 indicates that $N_S$ was in the interval from 71 days in 1990, 2011 and 2012 to 122 days in 1982. The orders of the standard deviations and corresponding main parameters were respectively $10^0$ and $10^2$ indicating that experimental points $N_S$ were scattered closer to their mathematical mean. Moreover, variation of $n_S$ mostly around 12–13 rainy days per month till 2008 and around 9–10 the remaining years led to the conclusion that the time interval between rainy days was increasing by the end of the period of study, whence the conclusion of the degradation of the rainfall regime in the locality.
Archives revealed that the time degradation of $N_S$ was accompanied by the reduction of the precipitations and consequently, of the pluviometry. Most seasonal numbers of rainy days were situated in the interval 90–108 corresponding to about three rainy months in a year. Analysis of the configuration of the cloud of experimental points Ns(t) led to a linear relationship between variables t and $N_S$, Figure 3.2. The least squares method has permitted to obtain its analytical expression:

$$N_S(t) = - 0.4t + 95. \quad (3.2)$$

Results of modeling of N by formulas (3.1) and (3.2) are in Table 3.4. In Table 3.4 $N_Y$ and $N_S$, $N_{Y,th}$ and $N_{S,th}$, $\delta_Y$ and $\delta_S$ are respectively the experimental and theoretical values of N, and their corresponding degrees of fidelity. Both models gave decreasing linear functions of time t, confirming the degradation of the rainfall regime in the locality. Small coefficients of the regression lines of order $10^{-1}$ were the indicator of slowly time deterioration of that rainfall regime. As this phenomenon slowly occurs, it is still time to take adequate measures to prevent eventual future deep deteriorations because of their eventual catastrophic socio-economic consequences. The degree of fidelity of both models, Table 3.4, indicates that their values were mostly of 2 orders less than the corresponding values of N.

**Table 3.1. Monthly numbers of rainy days with at least 5 mm of pluviometry each**

| Years | t | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | $\Sigma_Y$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1976 | -19 | 0 | 5 | 8 | 12 | 13 | 13 | 16 | 14 | 17 | 17 | 7 | 0 | 122 |
| 1977 | -18 | 2 | 1 | 3 | 9 | 12 | 12 | 13 | 15 | 18 | 15 | 0 | 1 | 101 |
| 1978 | -17 | 1 | 1 | 7 | 12 | 9 | 17 | 9 | 17 | 19 | 15 | 2 | 0 | 109 |
| 1979 | -16 | 1 | 6 | 4 | 12 | 9 | 15 | 15 | 13 | 12 | 11 | 3 | 0 | 101 |
| 1980 | -15 | 1 | 2 | 5 | 7 | 12 | 13 | 11 | 18 | 18 | 19 | 4 | 0 | 110 |
| 1981 | -14 | 0 | 0 | 13 | 10 | 14 | 12 | 9 | 20 | 19 | 11 | 1 | 0 | 109 |
| 1982 | -13 | 3 | 5 | 7 | 11 | 12 | 18 | 19 | 19 | 19 | 17 | 1 | 0 | 131 |
| 1983 | -12 | 0 | 1 | 1 | 8 | 9 | 10 | 14 | 12 | 15 | 7 | 1 | 3 | 81 |
| 1984 | -11 | 0 | 1 | 9 | 10 | 9 | 14 | 10 | 15 | 20 | 11 | 1 | 0 | 100 |
| 1985 | -10 | 2 | 1 | 10 | 14 | 11 | 17 | 13 | 17 | 17 | 6 | 4 | 0 | 112 |
| 1986 | -9 | 1 | 2 | 11 | 13 | 11 | 11 | 12 | 19 | 19 | 10 | 3 | 0 | 112 |
| 1987 | -8 | 0 | 2 | 6 | 5 | 8 | 13 | 14 | 11 | 19 | 11 | 0 | 0 | 89 |
| 1988 | -7 | 0 | 3 | 4 | 11 | 8 | 5 | 13 | 12 | 18 | 15 | 1 | 2 | 92 |
| 1989 | -6 | 1 | 0 | 6 | 9 | 13 | 16 | 12 | 18 | 19 | 9 | 3 | 1 | 107 |
| 1990 | -5 | 0 | 0 | 0 | 12 | 13 | 9 | 12 | 20 | 14 | 17 | 4 | 3 | 104 |
| 1991 | -4 | 0 | 2 | 4 | 12 | 21 | 11 | 7 | 13 | 14 | 13 | 2 | 0 | 99 |
| 1992 | -3 | 1 | 0 | 6 | 12 | 16 | 9 | 11 | 15 | 20 | 15 | 2 | 0 | 101 |
| 1993 | -2 | 2 | 0 | 11 | 9 | 6 | 13 | 17 | 17 | 21 | 17 | 6 | 0 | 119 |
| 1994 | -1 | 2 | 0 | 5 | 13 | 12 | 14 | 11 | 13 | 18 | 15 | 1 | 0 | 104 |
| 1995 | 0 | 1 | 0 | 3 | 12 | 15 | 10 | 13 | 9 | 16 | 15 | 3 | 0 | 97 |
| 1996 | 1 | 0 | 3 | 11 | 10 | 11 | 15 | 10 | 11 | 14 | 10 | 0 | 0 | 95 |
| 1997 | 2 | 1 | 0 | 8 | 17 | 7 | 18 | 12 | 13 | 20 | 13 | 5 | 2 | 115 |
| 1998 | 3 | 0 | 2 | 2 | 12 | 10 | 13 | 13 | 12 | 17 | 15 | 1 | 0 | 97 |
| 1999 | 4 | 3 | 3 | 9 | 7 | 13 | 10 | 14 | 18 | 16 | 19 | 4 | 0 | 116 |
| 2000 | 5 | 0 | 1 | 1 | 12 | 14 | 17 | 13 | 12 | 22 | 13 | 2 | 0 | 107 |
| 2001 | 6 | 0 | 1 | 10 | 10 | 9 | 18 | 11 | 20 | 19 | 11 | 1 | 0 | 110 |
| 2002 | 7 | 0 | 1 | 6 | 9 | 5 | 19 | 14 | 17 | 9 | 7 | 2 | 0 | 89 |
| 2003 | 8 | 1 | 2 | 5 | 8 | 8 | 14 | 15 | 13 | 17 | 15 | 2 | 0 | 100 |
| 2004 | 9 | 1 | 1 | 5 | 16 | 9 | 14 | 9 | 18 | 16 | 10 | 8 | 0 | 107 |
| 2005 | 10 | 1 | 4 | 9 | 9 | 9 | 9 | 17 | 18 | 16 | 12 | 3 | 0 | 107 |
| 2006 | 11 | 1 | 4 | 12 | 4 | 16 | 10 | 14 | 14 | 19 | 8 | 2 | 0 | 104 |
| 2007 | 12 | 0 | 1 | 6 | 12 | 7 | 12 | 17 | 17 | 18 | 14 | 5 | 0 | 109 |
| 2008 | 13 | 1 | 0 | 9 | 13 | 12 | 13 | 10 | 11 | 17 | 7 | 3 | 1 | 97 |
| 2009 | 14 | 3 | 2 | 1 | 13 | 13 | 11 | 7 | 15 | 15 | 15 | 4 | 0 | 99 |
| 2010 | 15 | 0 | 5 | 5 | 9 | 12 | 9 | 10 | 8 | 15 | 17 | 4 | 0 | 99 |
| 2011 | 16 | 0 | 2 | 4 | 3 | 8 | 6 | 11 | 9 | 18 | 12 | 2 | 0 | 75 |
| 2012 | 17 | 0 | 4 | 0 | 7 | 9 | 8 | 12 | 12 | 10 | 13 | 4 | 0 | 79 |
| 2013 | 18 | 0 | 0 | 6 | 6 | 9 | 10 | 10 | 7 | 20 | 14 | 4 | 2 | 88 |
| 2014 | 19 | 0 | 1 | 9 | 12 | 9 | 7 | 11 | 14 | 14 | 17 | 9 | 0 | 103 |
| 2015 | 20 | 0 | 0 | 6 | 6 | 9 | 7 | 10 | 12 | 14 | 17 | 4 | 0 | 85 |
| Σ | 40 | | | | | | | | | | | | | 14280 |
| N | | 30 | 69 | 247 | 407 | 432 | 492 | 491 | 578 | 678 | 525 | 118 | 38 | 4082 |
| s | | 1 | 2 | 3 | 3 | 3 | 4 | 3 | 3 | 3 | 3 | 2 | 4 | 12 |
| p | | 0.024 | 0.062 | 0.199 | 0.339 | 0.348 | 0.410 | 0.396 | 0.466 | 0.565 | 0.423 | 0.098 | 0.031 | 0.286 |

**Table 3.2. Yearly numbers of rainy days, $N_Y$, corresponding standard deviations, $s_Y$, and average monthly numbers of rainy days, $n_Y$**

| Years | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $N_Y$ | 122 | 101 | 109 | 101 | 110 | 109 | 131 | 81 | 100 | 112 | 112 |
| $s_Y$ | 6 | 7 | 7 | 5 | 7 | 7 | 7 | 5 | 7 | 6 | 7 |
| $n_Y$ | 10 | 8 | 9 | 8 | 9 | 9 | 11 | 7 | 8 | 9 | 9 |

| 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 89 | 112 | 107 | 104 | 99 | 107 | 119 | 104 | 97 | 95 | 115 | 97 |
| 6 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 6 | 6 | 7 | 7 |
| 7 | 9 | 9 | 9 | 8 | 9 | 10 | 9 | 8 | 8 | 10 | 8 |

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 116 | 107 | 110 | 89 | 100 | 107 | 107 | 104 | 109 | 97 | 99 | 99 |
| 6 | 8 | 7 | 6 | 6 | 6 | 6 | 6 | 7 | 6 | 6 | 5 |
| 10 | 9 | 9 | 7 | 8 | 9 | 9 | 9 | 9 | 8 | 8 | 8 |

| 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|
| 75 | 79 | 88 | 103 | 85 |
| 6 | 5 | 6 | 6 | 6 |
| 6 | 7 | 8 | 9 | 7 |

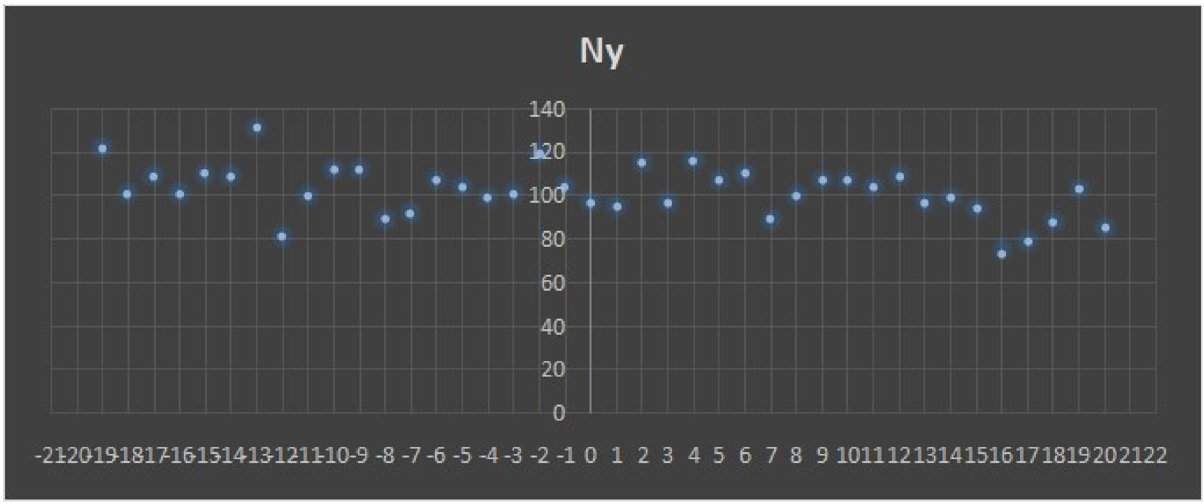


**Figure 3.1. Cloud of experimental points for determining the functional relationship $N_Y(t)$**

**Table 3.3. Rainy seasonal, $N_S$, corresponding standard deviations, $s_S$ and average monthly numbers, $n_S$ of rainy days**

| Years | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $N_S$ | 110 | 97 | 105 | 91 | 103 | 108 | 122 | 76 | 98 | 105 | 106 |
| $s_S$ | 3 | 5 | 4 | 4 | 5 | 4 | 5 | 4 | 4 | 4 | 4 |
| $n_S$ | 14 | 12 | 13 | 11 | 13 | 14 | 15 | 10 | 12 | 13 | 13 |

| 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 77 | 86 | 102 | 71 | 95 | 104 | 111 | 91 | 93 | 92 | 107 | 94 |
| 5 | 5 | 5 | 7 | 5 | 4 | 5 | 5 | 4 | 2 | 5 | 4 |
| 10 | 11 | 13 | 9 | 12 | 13 | 14 | 11 | 12 | 12 | 13 | 12 |

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 106 | 104 | 108 | 86 | 95 | 97 | 99 | 93 | 103 | 92 | 90 | 85 |
| 4 | 6 | 5 | 5 | 4 | 5 | 4 | 4 | 5 | 3 | 5 | 4 |
| 13 | 13 | 14 | 11 | 12 | 12 | 12 | 13 | 13 | 12 | 11 | 11 |

| 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|
| 71 | 71 | 82 | 93 | 81 |
| 5 | 4 | 5 | 3 | 4 |
| 9 | 9 | 10 | 12 | 10 |

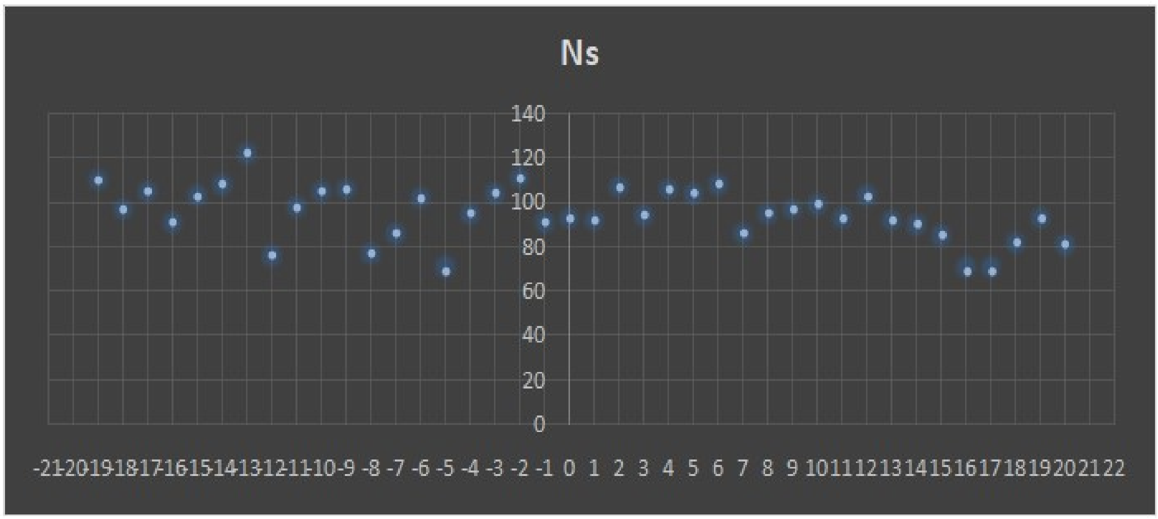


**Figure 3.2. Cloud of experimental points for determining the functional relationship $N_S(t)$**

Recalling the usual high time-spatial variability of precipitations, these low values of the degrees of fidelity should lead to the conclusion that used data and the established models were accurate to be implemented in operational works.

Between other causes, the ongoing degradation of the rainfall regime in Dschang could be explained as follows. Before 1993, Dschang was a very peaceful and green agricultural area with its National Advanced School of Agriculture.

**Table 3.4. Results of modeling of $N_Y$ and $N_S$ and corresponding degrees of fidelity $\delta_Y$, $\delta_S$**

| Formula (3.1) | | | | | | | Formula (3.2) | | |
|---|---|---|---|---|---|---|---|---|---|
| Years | t | $t^2$ | $N_Y$ | $N_{Y,th}$ | $\delta_Y$ | | $N_S$ | $N_{S,th}$ | $\delta_S$ |
| 1976 | -19 | | 122 | 110 | -12 | | 110 | 103 | -7 |
| 1977 | -18 | | 101 | 109 | 8 | | 97 | 102 | 5 |
| 1978 | -17 | | 109 | 109 | 0 | | 105 | 102 | -3 |
| 1979 | -16 | | 101 | 108 | 7 | | 91 | 101 | 10 |
| 1980 | -15 | | 110 | 108 | -2 | | 103 | 101 | -2 |
| 1981 | -14 | | 109 | 108 | -1 | | 108 | 101 | -7 |
| 1982 | -13 | | 131 | 107 | -24 | | 122 | 100 | -22 |
| 1983 | -12 | | 81 | 107 | 26 | | 76 | 100 | 24 |
| 1984 | -11 | | 100 | 106 | 6 | | 98 | 99 | 1 |
| 1985 | -10 | | 112 | 106 | -6 | | 105 | 99 | -6 |
| 1986 | -9 | | 112 | 106 | -6 | | 106 | 98 | -7 |
| 1987 | -8 | | 89 | 105 | 16 | | 77 | 98 | 21 |
| 1988 | -7 | | 92 | 105 | 13 | | 86 | 98 | 12 |
| 1989 | -6 | | 107 | 104 | -3 | | 102 | 97 | -5 |
| 1990 | -5 | | 104 | 104 | 0 | | 71 | 97 | 26 |
| 1991 | -4 | | 99 | 104 | 5 | | 95 | 97 | 2 |
| 1992 | -3 | | 101 | 103 | 2 | | 104 | 96 | -8 |
| 1993 | -2 | | 119 | 103 | -16 | | 111 | 96 | -15 |
| 1994 | -1 | | 104 | 102 | -2 | | 91 | 95 | 4 |
| 1995 | 0 | | 97 | 102 | 5 | | 93 | 95 | 2 |
| 1996 | 1 | | 95 | 102 | 7 | | 92 | 95 | 3 |
| 1997 | 2 | | 115 | 101 | -14 | | 107 | 94 | -13 |
| 1998 | 3 | | 97 | 101 | 4 | | 94 | 94 | 0 |
| 1999 | 4 | | 116 | 100 | -16 | | 106 | 93 | -13 |
| 2000 | 5 | | 107 | 100 | -7 | | 104 | 93 | -11 |
| 2001 | 6 | | 11O | 100 | -10 | | 108 | 93 | -15 |
| 2002 | 7 | | 89 | 99 | 10 | | 86 | 92 | 6 |
| 2003 | 8 | | 100 | 99 | -1 | | 95 | 92 | -3 |
| 2004 | 9 | | 107 | 98 | -9 | | 97 | 91 | -6 |
| 2005 | 10 | | 107 | 98 | -9 | | 99 | 91 | -8 |
| 2006 | 11 | | 104 | 98 | -6 | | 93 | 91 | -2 |
| 2007 | 12 | | 109 | 97 | -12 | | 103 | 90 | -13 |
| 2008 | 13 | | 97 | 97 | 0 | | 92 | 90 | -2 |
| 2009 | 14 | | 99 | 96 | -3 | | 90 | 89 | -1 |
| 2010 | 15 | | 94 | 96 | 2 | | 85 | 89 | 4 |
| 2011 | 16 | | 75 | 96 | 21 | | 71 | 89 | 18 |
| 2012 | 17 | | 79 | 95 | 16 | | 71 | 88 | 18 |
| 2013 | 18 | | 88 | 95 | 7 | | 82 | 88 | 6 |
| 2014 | 19 | | 103 | 94 | -9 | | 93 | 87 | -6 |
| 2015 | 20 | | 85 | 94 | 9 | | 81 | 87 | 6 |
| sums | 20 | 5340 | 4076 | | | | | | |

It had very few inhabitants and the institution had not many personals and students. In 1993 this school was transformed to a classic university with five faculties on campus and two out. Suddenly the number of inhabitants was increased by even more than five times. Many spaces, formerly occupied by trees or reserved to agricultural activities, were progressively destroyed for new buildings.

Moreover, no policy of planting new trees or preserving what was before was taken. Thus, inhabitants were in front of a progressing desert and the climate started degrading to what is going on today. Obviously that one of the main remedies to this situation is to make an effort bringing back the green town which was before. Also new constructions in the city should be under control of the urban council.

**Conclusion, recommendations and acknowledgment**

This study clearly confirms a slightly degradation of the rainfall regime in Dschang and surroundings. But the situation is not yet worse.

Therefore, city administrators and urban council rulers could still prevent the worse level of deterioration which should be catastrophic not only for the whole sub region, but also for the neighboring countries as many foods are permanently transporting from here to different directions. They should the former look the city had before. The authors cease this opportunity to thank everyone who has provided them help of any form.

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