

CHARACTERIZATION OF THE DRY PERIOD AND HIS IMPACT ON THE CHANGE OF LANDSCAPE STEPPIQUE

(case of Aflou ALGERIA)

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ABSTRACT:

For many years, steppe, a semi arid region pass by episodes of drought, characterized by weak rains and the elevated temperatures that have devastating consequences on vegetation. The climatic conditions are part of the factors acting on the pastoral space state. In our country, the crucial problem is the vegetation degradation. For this effect, it appears necessary to follow these zones regularly in order to fear this problem. The deterioration of the middle steppique is a crisis. The reasons of this crisis must be sought-after in all aspects, to know the physical environment (climate, soil, vegetation etc...). The drought is one of the considerable reasons of the deterioration of the courses steppiques. And according to several authors (Daget, Djellouli, Le-Houerou...), the drought raged on this region during the years 1980. Such that aims for this work that aims to determine the periods showing a deficit during the considered period and the survey of the irregularity during and inter year of the precipitations to establish their impact on the changes of landscape. The remote sensing is an adequate means that permits us to follow this change appropriately in the year and between the years, while using some pictures at different dates.

Key Words : Steppe, dryness, deterioration of the courses, dry periods, remote sensing.

PARTIE I : climatic survey

Introduction:

One of the major reasons of the deterioration of the courses steppiques is the drought. it is characterized by the weak precipitations and the strong temperatures causing a strong evaporation and little water infiltration thus in soil. The consequences are known, they appear by a deterioration of the plant table setting, and to the sterilization of soils long-term.

In the Algerian steppe and according to several authors (Daget, Djellouli, The Houerou...), the drought has raged during the years 1980.

This survey is about characterizing the variation of the temperatures and precipitations on the period going from 1970 to 1995 while trying to put in evidence the evolution of the dry period during those years.

One of the most characteristic methods of this type of survey is the method of Bagnouls and Gaussen by the realization of the curves ombrothermiques, that permit to fix the beginning and the end of one dry period in the intersections of the curves of the monthly middle values of the temperatures and precipitations.

ROLE OF THE PRECIPITATIONS AND TEMPERATURES:

The precipitations characterize the climatic balance of a region. By their intensity, their frequency and their irregularity, rains have an enormous influence on the model of the landscape.

The season of rain is characterized by dry periods and the rainy periods. Indeed, a good distribution of these dry and humid periods can give a good plant recovery.

The rainy period during the vegetative cycle encourages the plant table setting and The dry period is indispensable in the growth of the plants during the vegetative phase.

The temperature is used in phytoclimatologie, the balance of the radiance has a direct effect on vegetation. It is a factor that affects the availability of the energy and it is thanks to the degree day that vegetation shows its biologic rhythm.

THE USED DATA:

In order to search for the climatic reasons, the surrounding station data have been used, due to a lack of meteorological data availability on the zone of Aflou. It is about the station of Djelfa, El-bayadh and of Tiaret (chosen example like reference of regular situations)

To summarize the climatic features of every region, the averages of the sets of homogeneous data are used for one appropriate period.

The survey of the precipitation requires the choice of a long common period, that permits to distinguish the temporal and spatial differences. Indeed the survey of long sets precipitation puts in evidence the existence of alternation, that is to say of the excess periods and the periods showing a deficit. The two factors of characterization of the climate for our survey are in direct relation with the model of landscape. A floor bioclimatique semi arid characterized by a flora and a fauna that adapt to this middle.

MULTI-YEAR DROUGHTS

For a station having a long set of precipitation data, a dry year is located below the average of the values of the set. Thus, in Djelfa on 25 years, the distribution is nearly equal in relation to the average (339 mm) with 12 years to the over (whose 5 to more of 400 mm) and 13 below (whose 4 to less of 200 mm): the dry years are accentuated more than the humid years. In El Bayadh on the same period, 13 years are over to the average (254 mm) whose 4 to more of 300 mm and 12 below (whose 5 to less of 200 mm), on the other hand in Tiaret on 24 years, only 7 years are over to the average (420,2 mm) whose 5 to more of 600 mm and 17 are below (whose 2 to less of 300 mm).

Inter - yearly variation of the precipitations:

The yearly precipitation variation put in evidence that the decade of the years 1980 appeared less rainy in this region what confirms the deficit in water and the display of the dry period. we know very well that the normal middle precipitation in the regions semi arid is of 400 mm, However we can notice that during this decade the yearly totals don't exceed the 400 mm for all stations with the exception of the year 1982. Example of the Djelfa station Fig I

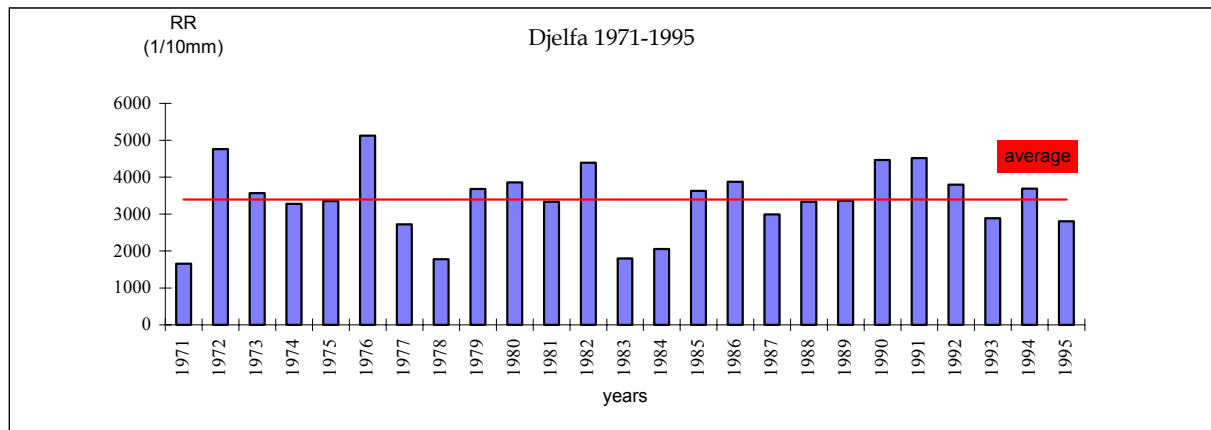


Fig. I: inter - yearly variation of the precipitations in Djelfa

DROUGHT TO THE COURSE OF THE YEAR

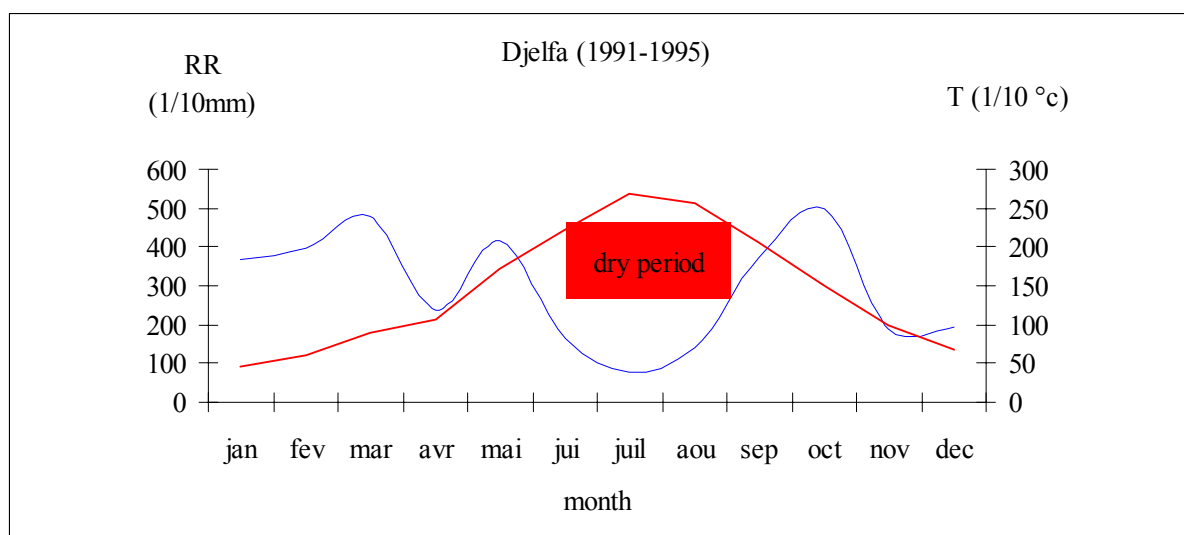
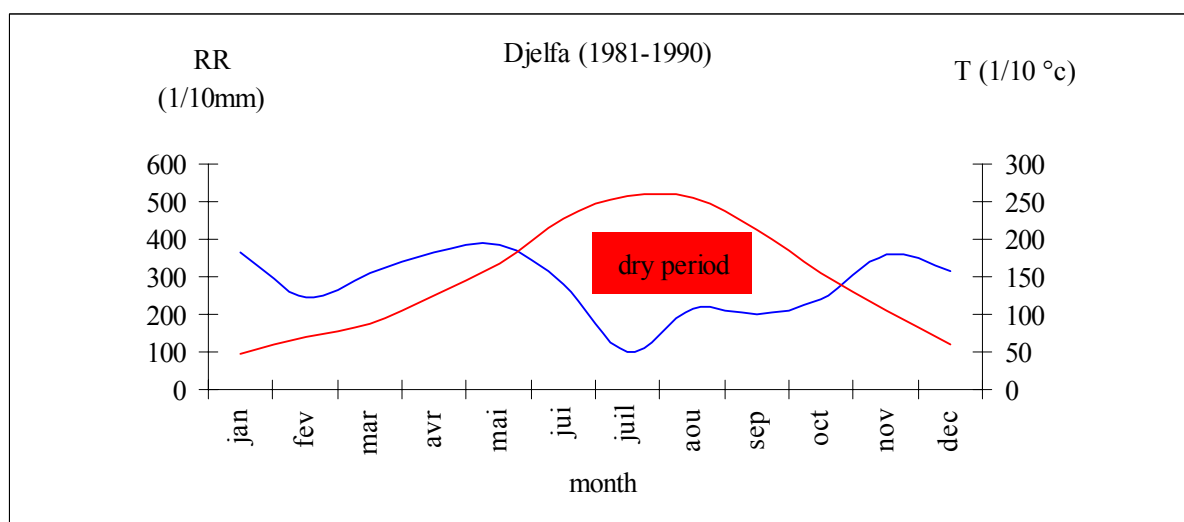
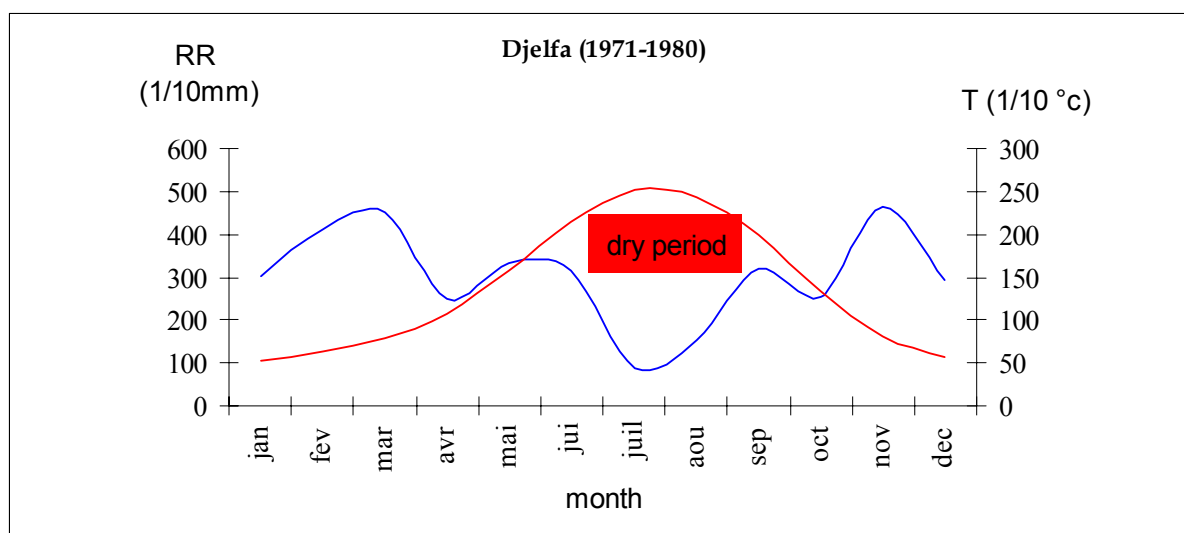
The drought during the year is at a time a permanent data of the climate (the dry season) and a risk of deterioration, insofar as its length, its amplitude and its spatial extension vary to the scale of the decades. The arid region planning and semi - arid must hold account of two reasons of possible water shortages during the year: the length of the dry season and the risks of shortage to the court of the vegetative period.

Analysis of the diagrams ombrothermiques:

we note according to these diagrams that in Djelfa the dry period begins from the end of May and go until the mid - October during the period 1971-1980. it spreads during the second period 1981-1990 of the mid - May at the end of the month of October to decrease during the period 1991-1995 while going from the June beginning at the end of September. Example Fig II.

In El Bayadh the dry period begins in the beginning of the month of May and end at the end of October between 1971-1980, its length to increased for the period 1981-1990 while spreading of the April beginning until end of October. On the other hand, shrank during the length going from 1991 to 1995 (mid - April at end September).

In Tiaret in which the zone is watered more, the dry period is shorter during the years 1970 (beginning of June at end of September). A clean extension of this period occurred between 1981-1990 since it spreads of the mid - May at the end of October. It informs us that the drought of the years 1980 didn't touch the steppe solely.



— nthly average temperatures. — Monthly average precipitations.

Fig. II: Diagram ombrothermique of Djelfa

Intra - yearly variations:

The diagrams show us that the monthly precipitation varies in an uncertain manner during the year. On the other hand the temperature normally varies during the year, weak in winter and elevated in summer. July is the hottest month and coldest January for all stations.

Djelfa and El Bayadhs are more or less at the same latitude with Aflou, rains are middle to weak (active of 20mm to 50 mm) in winter and during the 2 periods (1971-1980) and (1991-1995). In Tiaret that is located more at the north rains are stronger (they pass the 50 mm); we are recorded a pick of 120 mm in the month of March during the period (1970-1980). On the other hand in the decade (1981-1990), the three stations showed a deficit in water and especially in El Bayadh in which rain doesn't exceed the 30 mm. The month of March appeared the rainiest for all stations.

EVOLUTION OF RAINS DURING THE YEARS 1976, 1986 AND 1995:

After the survey of the evolution of the dry periods and the analysis of the precipitations inter and intra yearly, we are interested in the reasons capable to explain the changes observed in the satellite's pictures of the years 1976, 1986, 1995. These last showed us that an important deterioration operated itself during the year 1986 in relation to the year 1976 even though the year 1995 knew a relative ascent. For it, we considered the agricultural seasons 1975-1976, 1985-1986 and 1994-1995 in order to search for if in fact the reason of this deterioration was of climatic origin?

While considering the distribution of the precipitations of the vegetative period of most plants steppiques, active of September to May; one notices according to the faces 7, 8 and 9 that rain varies uncertainly of one month to the other. This distribution is bimodale with two maximas situated at the fall and at the end of the winter for the slice 1975-1976, what gave a good enough distribution during this year. A clean shift of these maximas occurred toward the season of the spring for the two other periods of 1985-1986 and 1994-1995, what gave a middle distribution during those years. But we notice that the year 1994 starts with a good quantity of rain in the month of September. The temperatures undergo a normal variation during this period, that is to say decrease from September to January grow until May.

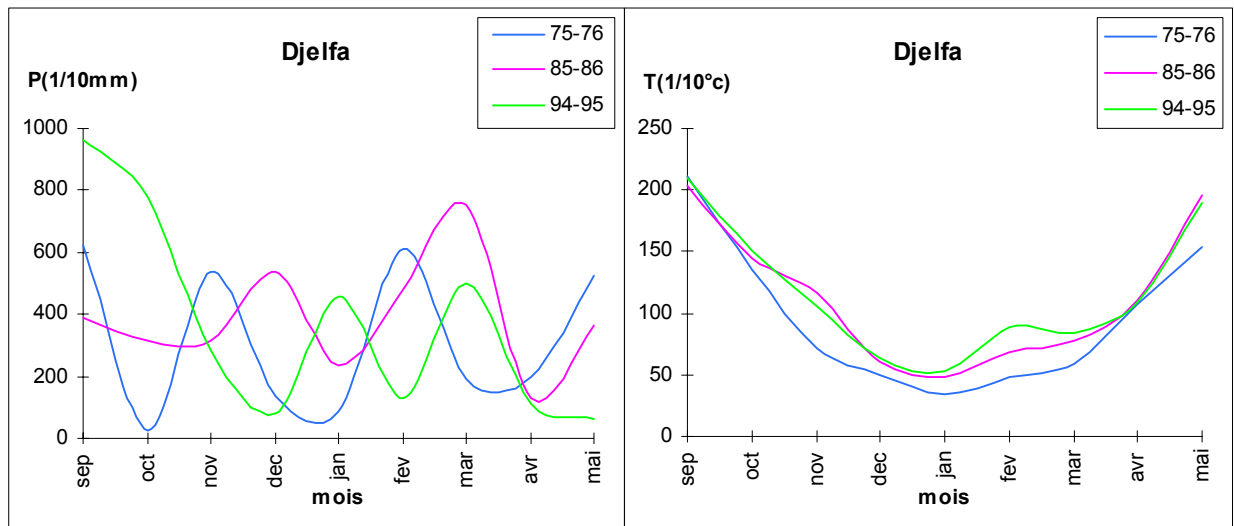


Fig. III: monthly variation of precipitation and temperature of September to May.

Seen on the heaps of the precipitations:

The distribution of the heap of the precipitations of the same period (75-76, 85-86 and 94-95) for the three stations makes little variation during this phase of the year and show the lack of quantity of water fallen in relation to the normal that is of 400 mm. Example: Djelfa and El Bayadh respectively:

294 mm, 278 mm between 1975-1976,

351 mm, 330 mm between 1985-1986,

336 mm, 246 mm between 1994-1995.

Example IV fig of Djelfa

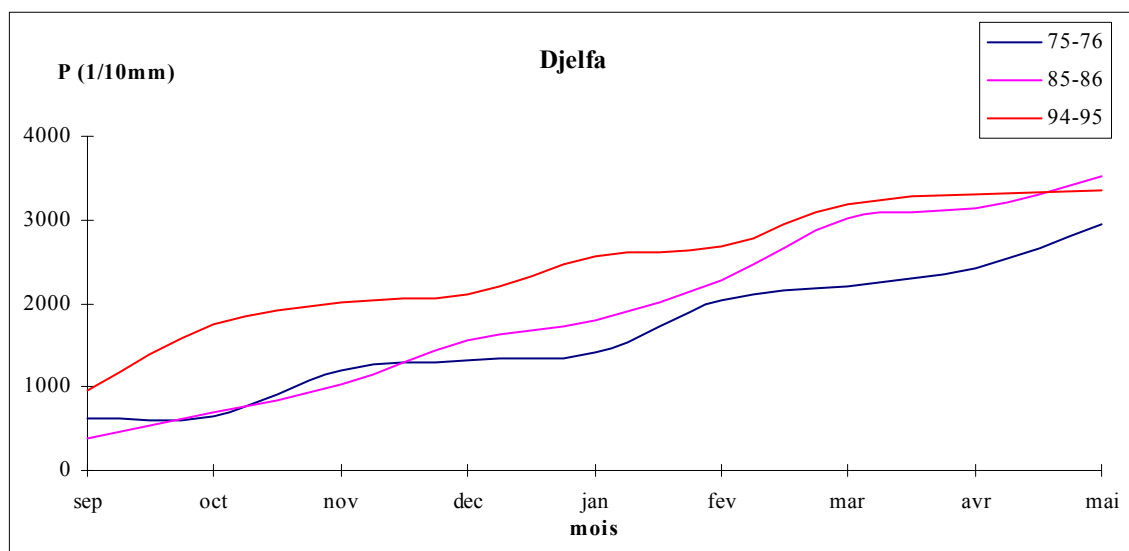


Fig. IV heap the precipitations of September to May

PARTIE II : Remote sensing

To strengthen our survey, the tool remote sensing has been used in order to know the state of change of the landscape of the region in question. For it three pictures satellite multispectrales and multitudes have been selected, it is about the stages suivantes :

- LANDSAT stage MSS 211/36 of June 02, 1976;
- LANDSAT stage TM 196/36 of May 17, 1986;
- LANDSAT stage TM 196/36 of April 08, 1995.

The MSS pictures were rééchantillonné to be able to superimpose them with those of landsat, a radiometric and geometric correction of the TM pictures and MSS has been made. The Method of the indications of vegetations is adopted to know the state of change of the course.

He/it has been applied on every stage the indication of vegetation normalized classic of TUCKER of 1979 given by the formulas suivantes :

$$I_v = \frac{TM4 - TM3}{TM4 + TM3} \quad \text{et} \quad I_v = \frac{MSS7 - MSS5}{MSS7 + MSS5}$$

The development of the cards of changes has been made while superimposing the pictures of the indications of vegetations two to two while affecting them has color each.

This approach consists has achieve year additive synthesis that informs one the state of the changes, the dominance of one of the colors (red however green) translates the abundance of vegetation heart the corresponding year to this color; the apparition of the yellow color (red + green) however black indicates the non change.

The interpretation of the pictures, watch that the method of the indications of vegetations presents have considerable advantage in relation to the visual aspect concerning the changes. Goal she/it is limited, since she/it only permits the localization of the changes.

The picture of the changes between the year 1986 and 1995 (fig: V) show the changes that present themselves in the red and green color. The zones whose color is red are zones provided before of vegetation, one the other hand the zones indicated by the green color are the zones presenting has good plantation recovery gold has biologic ascent.

Therefore one can say that the uses of the imagery satellites is year adequate means that informs one the state of changes of the landscape.

IMAGE OF CHANGE 1986-1995

indice of vegetation

1986 : red

1995 : green

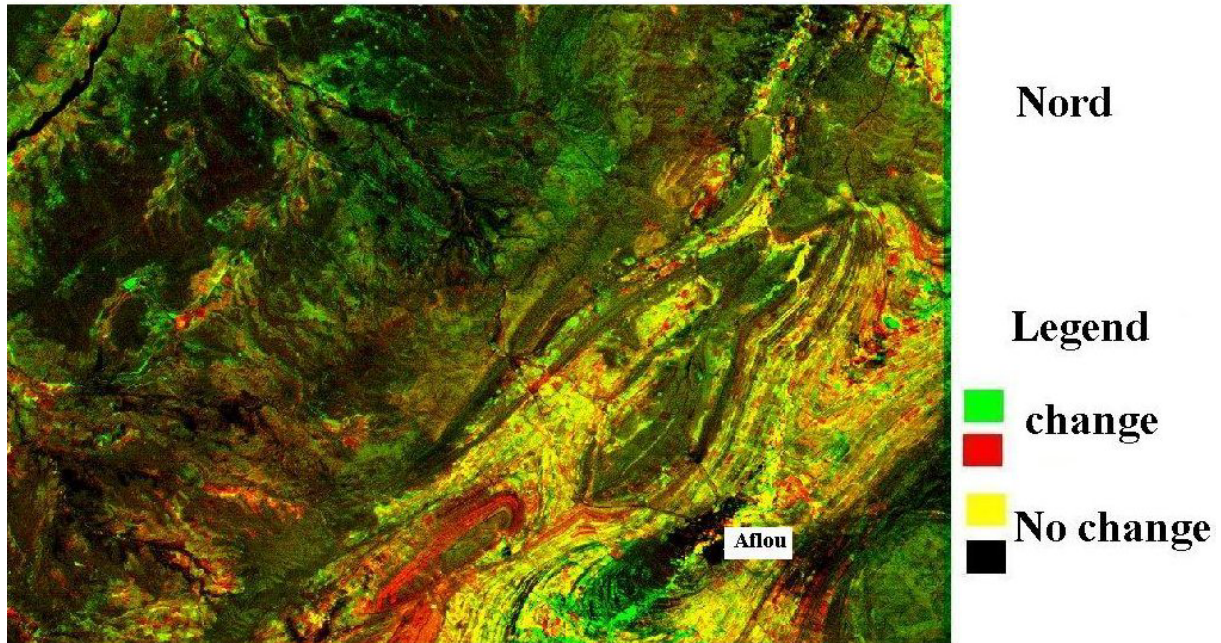


Fig V: IMAGE OF CHANGE 1986-1995

CONCLUSION:

The analysis of the evolution of the climatic data made itself in two phases:

- A general analysis on the variation of the precipitation and the period of drought intra and inter yearly.
- A prompt analysis on the years of acquirement of the satellitale's data for the research of the reasons of the variations in the occupation of the soil of 1976, 1986 and 1995.

1- the analysis of the meteorological data of this region showed us that the precipitations vary an uncertain manner during the year, on the other hand the variation of the temperatures is normal. The survey confirmed in fact the lack of water during the decade 1981-1990. It has been illustrated by the display of the periods of drought in all stations during this decade.

This survey put in evidence the distribution irregular of the precipitations during the vegetative period. But one cannot conclude that the deterioration of the courses is owed to the climate solely. To this stage of the analysis, one can only say that the climate presents of long dry periods, and the precipitations are irregular. Vegetation is weakly watered what doesn't allow it a good development on the one hand. And on the other hand the load exercised by the more and more important livestock hardly permits sound maintains.

The climatic reasons as the drought and the aridity in the domain semi arid have an effect limiting for the good development of the courses certainly, but fortunately those on the maghreb never pass three or five years (The Houerou, 1996).

2 - the analysis of the climatic data wich correspond at the dates of holds of views of the satellitale's data used didn't reveal a particular fall in the quantity of rain for the year of strong deterioration (1986) in relation to the other years. On the other hand this state of deterioration could be explained by the irregularity and the bad distribution of rains during the year.

The climatic survey showed has display of the dry period between 1980 and 1990, the results gotten through the pictures come to reinforce this survey to show that in fact the big changes got in evidence one the picture taken in 1986. Thesis two studies haggard just was able to in evidence the deterioration of the runs during the years 1980-1990.

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