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Changes in land property and desertification in south Tunisia. The Menzel Habib case

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Résumé

La délégation de Menzel Habib, en Tunisie présaharienne, a connu un processus spectaculaire de désertification du milieu des années 1970 à la fin de la décennie 1980. L'origine anthropique du phénomène a été soulignée par de nombreuses études : pression démographique, progression des superficies cultivées, surpâturage et éradication des ligneux. L'analyse des données disponibles concernant la pluviométrie, la démographie, et les statuts fonciers permettent de mettre en relief le rôle important de la "course à la terre", déclenchée par la mise en œuvre d'une politique de privatisation des terres collectives à partir de 1971, dans le processus de désertification.

Located in the "lower arid" bioclimatic level in pre-saharan Tunisia, the Menzel Habib delegation has a low and irregular pluviometry (160 mm a year on average) and large areas of sandy soils exposed to wind erosion. The region has experienced a dramatic process of desertification as revealed by many studies [1, 2, 3], which concern a clearly limited period.

The direct factors of desertification are now identified¹: land clearing and increase of cereal and tree cultivation on former steppe grazing areas, overgrazing and eradication of ligneous plants. They partake of technical, economical and social changes and of settling process concerning seminomadic shepherds in the area. In this paper, we will take into account the rainfall, demographic and land property data, available during the last two decades. The analysis leads us to relativize the role of demographic and climatic factors, generally regarded as decisive in the desertification process, and to stress the importance of changes in land property.

Analysis of satellite images. Thinning of vegetation between 1977 and 1987.

Through the analysis of satellite images, the process of desertification can be assessed accurately by observing the changes in surface conditions over the period². We worked on a set of 12 MSS Landsat images covering the 1972-1993 period, as well as a SPOT XS image of 1996, partly covering the MSS area (cf. fig.1 to 5 : images of 1975, 81,87,93,96).

¹ In the 1970s, the zone (notably the Zougrata area) was the topic of thorough ecological research. For the last 20 years, the State has implemented important measures for the development and the rehabilitation of the environment in Menzel Habib. The region is at present an important reference as regards desertification in South Tunisia.

² In order to emphasise the process of desertification, the images have been geometrically corrected and radiometrically calibrated through measurements performed on objects of which the radiometric properties vary little.

Abstract

The Menzel Habib delegation, in pre-Saharan Tunisia, has experienced a dramatic desertification process from the mid-seventies to the end of the eighties. The anthropic cause of the phenomena has been emphasized by many studies: demographic pressure, increase of cultivated land, overgrazing and eradication of ligneous plants. The analysis of available rainfall, demography and land property data allow us to underline the importance of the "race for land", induced since 1971 by a policy of division of collective ownership lands, in the desertification process.

Colour changes in the images correspond to reflectance changes in land surfaces - i.e. the amount of electromagnetic energy reflected by objects against the amount of energy which they receive. Colour changes thus reveal corresponding changes in the environment.

The reflectances of the main plant species, as well as the reflectances of the main soil types have been measured in the field. Their study has provided us with a clue for the interpretation of the visible changes in the images : in Menzel Habib, natural vegetation and the low ligneous steppe show much lower reflectance than most ground surfaces composed of sandy and loamy materials and gypsum crust. A thinning of vegetation cover (hence an increase in soil surface) thus corresponds to an increase in ground reflectance- i.e. lighter images. This can be measured through a brightness index that will reduce the information contained in the image to a single value: the higher the value, the stronger the reflectance.

As far back as 1972, the image reveals light-coloured areas - a characteristic of thinned vegetation.

From 1977 to 1987, the increase in light-coloured areas corresponds to a severe degradation of the natural vegetation on predominantly sandy soils.

Between 1987 and 1993, the area covered with vegetation is nearly as large as in 1975.

The thinning of the vegetation is seemingly time limited - the 1977-1987 period corresponding to the maximum degradation phase.

It appears necessary to mention the intensity as well as the degree of irreversibility reached by the degradation process. It's possible indeed to observe a disappearance of the vegetation cover without the vital attributes being affected. The degradation might then be considered as low because of the vegetation being able to grow again without any major human intervention. On the 1993 image (fig.4), very bright zones are still visible though this image was acquired in spring, when vegetation is expected to be

denser. Such bright spots could thus be regarded as reflecting severe degradation. The 1996 image shows that part of these lands, which have been suspended from cultivation and grazing, are covered again with vegetation (fig.5). This means that these areas had not reached the ultimate stage of degradation.

Climatic data. The 1970s fairly rainy decade. The 1980s drought

From the 1970-93 data provided by the Gabès station (cf. fig.7), two main climatic trends can be emphasised :

-a wet trend with 8 consecutive fairly rainy to rainy years from 1971 to 1978 - 1975 and 1976 being actually rainy years; and

-a dry trend from 1979 to 1993, with a fairly dry year alternating with a fairly wet year till 1990, followed by 3 fairly dry years from 1991 to 1993.

Such a dry period (1979-1993) is not exceptional in the region [1]. It occurs during the process of degradation of ground surface states as shown by remote sensing (1977-1993) and persists afterwards. It is worth noting that when the drought seems to worsen (1991-1993), remote sensing images show much better land surface states.

Demographic data. Overall moderate growth - Variable growth rates.

The Menzel Habib delegation, in the Gabès governorate, corresponds to the northern part of the former territory of the Beni Zid tribe. At the end of the last century, the area was the grazing field of seminomads who reared cattle on pastures and occasionally grew cereals through dry-farming on the most suitable soils.

With an average growth rate of 0.8% a year between 1956 and 1994, and a density rising from 8.6 to 11.7 inhabitants per square kilometre, the growth can hardly be regarded as a population explosion. However, growth rates vary noticeably from one census to another (cf. fig.8).

Between 1966 and 1975, a fairly favourable pluviometry, together with the launching of the 'race for land' account for the increase in the growth rate - +2.8% - which is very high for a rural area.

From 1975 to 1984, owing to the early 1980s drought inducing an exodus to the El Hamma oasis, growth rates drop considerably (+0.7%).

Between 1984 and 1994, there is a fair rise in growth rates, probably induced by public intervention over that period.

The positive correlation between rainfall and demographic growth rates shows the significant role of farming - notably cereal growing - and cattle breeding in the economy of Menzel Habib, as well as their subordination to pluviometry, which, in turn, has an important regulating effect on population growth.. The legacy of nomadism is ever present.

Land property situation. The race for land: to plough for ownership.

In the early 1900s, more than 75% of the Beni Zid territory was collectively owned lands, the remaining 25% being privately owned and *habous*² lands. Until 1975, the statutes were unchanged, but from 1960s, land clearing and farming have been stretching out on grazing lands. Such private appropriations prefigure the legal divisions.

The policy of privatization of collective lands, implementing new procedures of land allocation (1971 laws amending the 1964 law and May 1973 memorandum), induced a swift change in the land tenure situation. As regards Menzel Habib, more than 40 000 ha of collective and *enzel* lands (formerly *habous*) were privatised between 1975 and 1980. Regional

statistics reveal that privately owned lands now stand for 70% of lands of Menzel Habib, while only 25% are still collective (cf. fig.6 and fig.9).

Starting from 1973, a beneficiary can obtain the equivalent of a title deed merely by 'developing' a piece of land and having his neighbours testify in his favour. Accordingly, the race for land gained impetus, with beneficiaries clearing large areas in order to appropriate lands, regardless of climatic or pedological conditions. Once the best lands - piedmonts and alluvial depressions - had been occupied, farming extended to the sandy plains exposed to wind erosion.

Although the 1993 image, taken quite early (spring), compels us to temper the density of the vegetation it reveals, a significant ecological improvement can be observed. This is surprising, especially as the rainfall conditions are rather unfavourable. It is thus observed that the *enzel* zones are covered with thick vegetation (fig.4). Such an improvement might be the result of the measures aiming at the protection and the rehabilitation of the environment, implemented in Menzel Habib, as well as changes in the land appropriation and productive strategies.

In 1985, a year of favourable pluviometry, only a small proportion of the cleared lands was planted with cereals. This trend, which is seemingly gaining impetus compared with the previous years, might imply that once land allocation has been achieved, beneficiaries no longer deem it necessary to farm a land for its ownership.

The race for land, started in the 1960s and intensified through the early 1970s, may be regarded as a key factor of desertification. It accounts for the population growth observed during the period as well as the dramatic increase of cultivated land related to the widespread use of tractors. The 1980s drought will further aggravate the degradation process.

The present analysis reveals the impact of social factors on desertification. While the privatization policy has failed to achieve the State's objective - i.e. more productive and rational land management - it has induced at first the degradation of natural resources in the specific social and ecological context of presaharan Tunisia.

The present work is a contribution from the DYPEN and CAMELEO research programs.

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² *habous*: institution of muslim law close to foundation

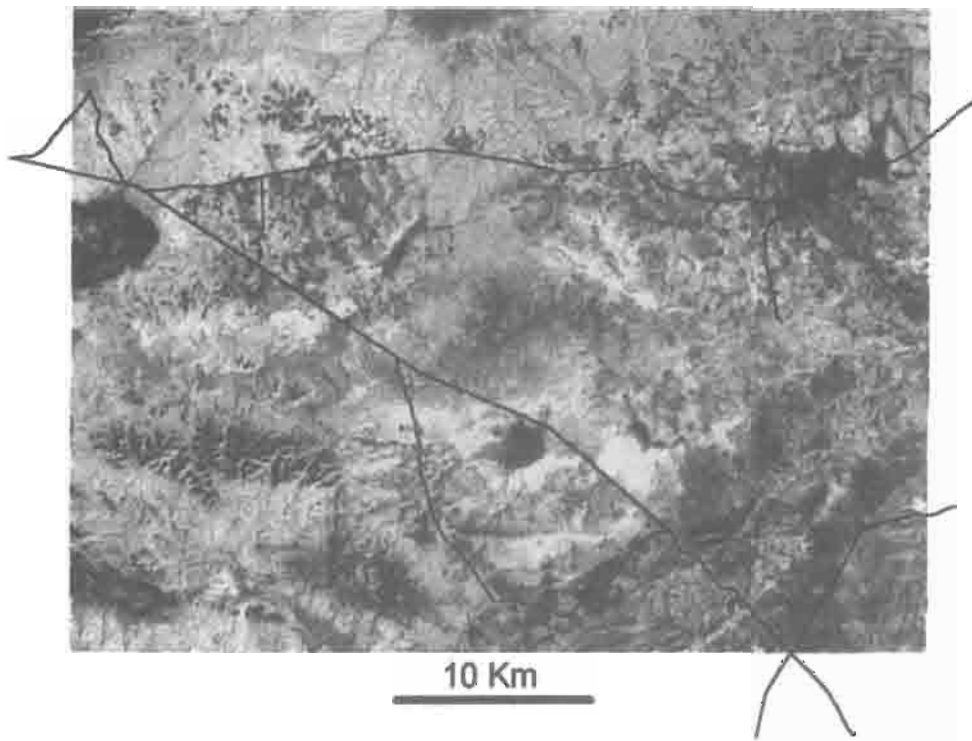


Fig.1 - Landsat MSS image of 30 november 1975

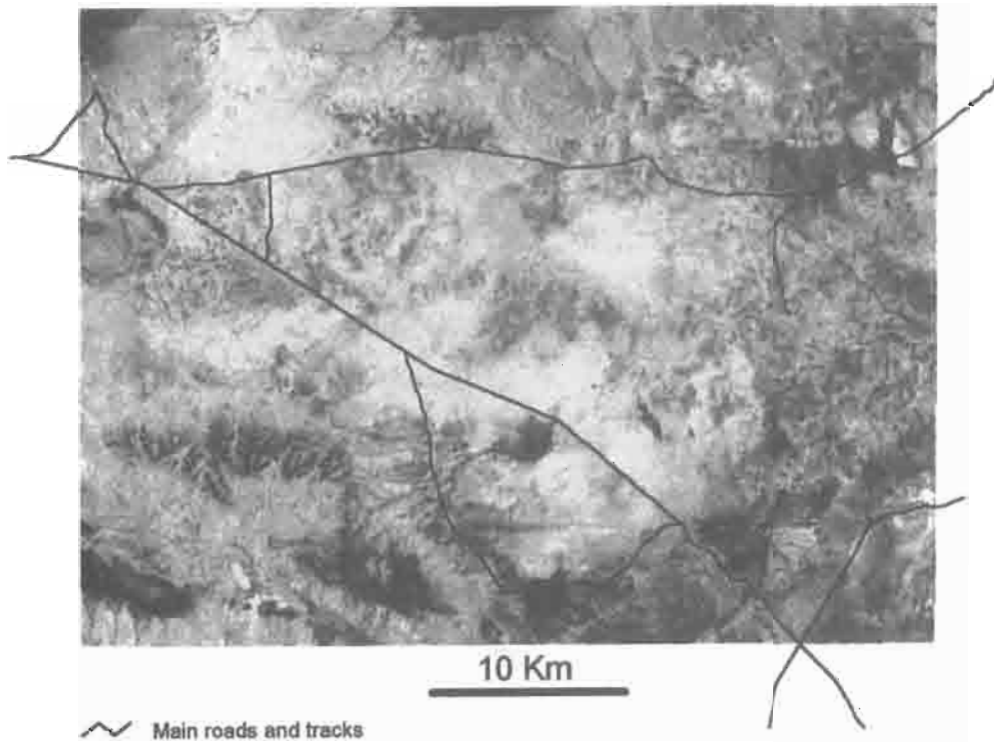


Fig.2 - Landsat MSS image of 20 may 1981

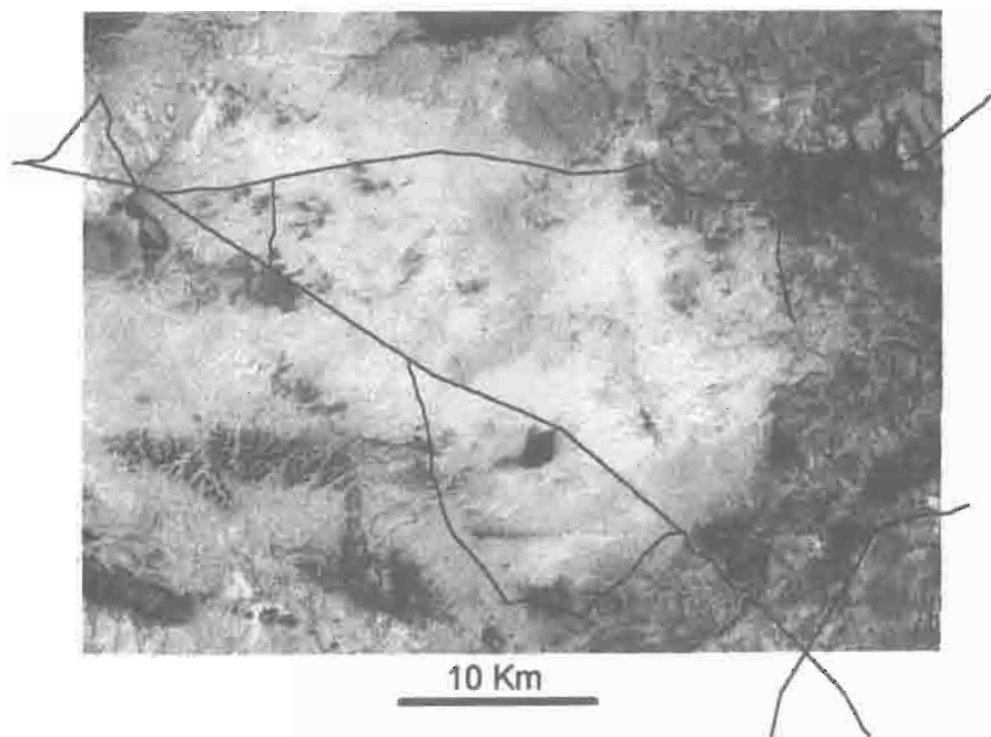


Fig.3 - Landsat MSS image of 22 september 1987

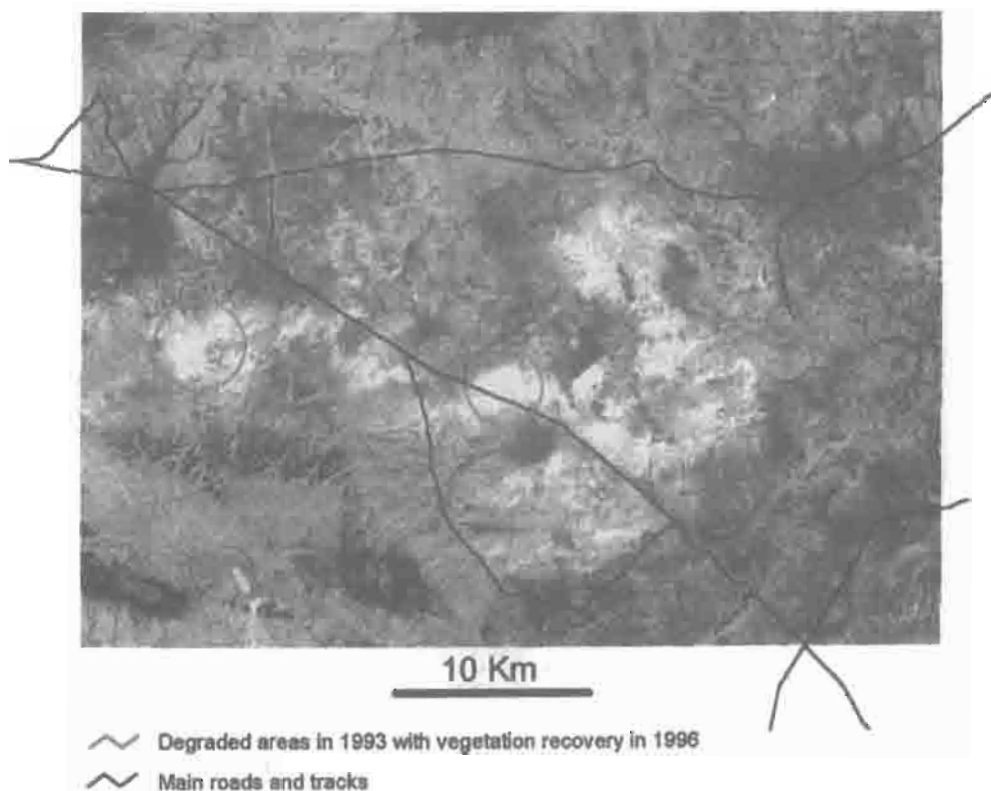


Fig.4 - Landsat MSS image of 30 march 1993

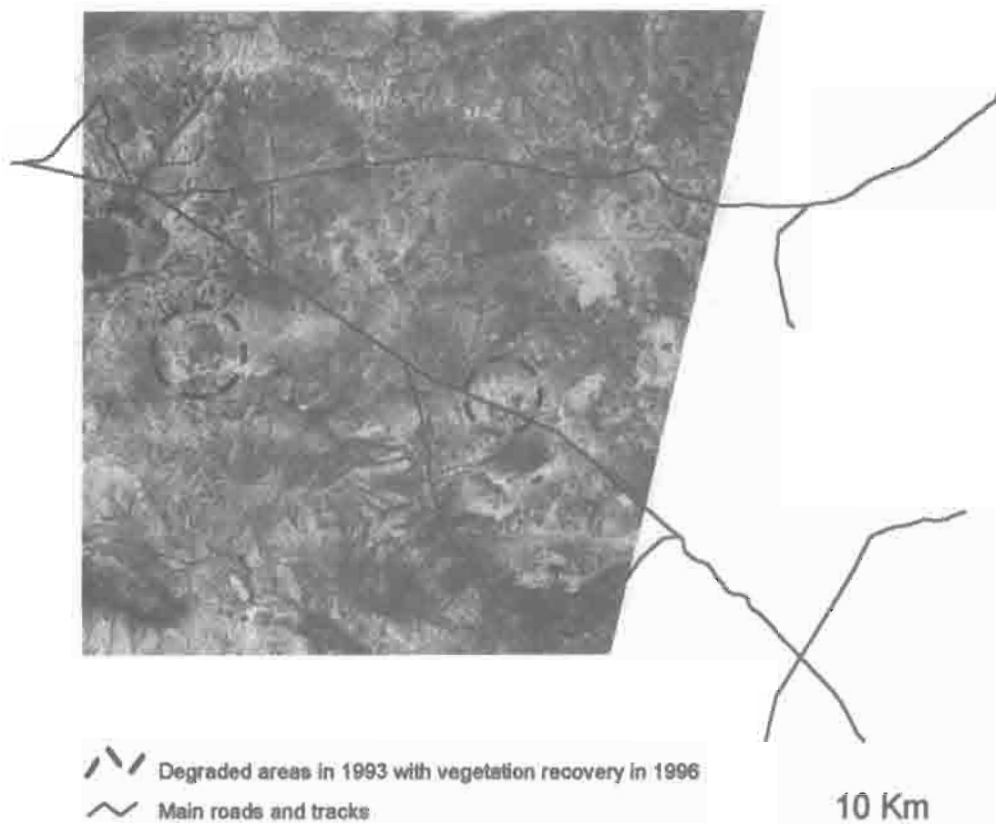


Fig.5 - SPOT image of 1 June 1996
(Partial covering of the MSS covered area)

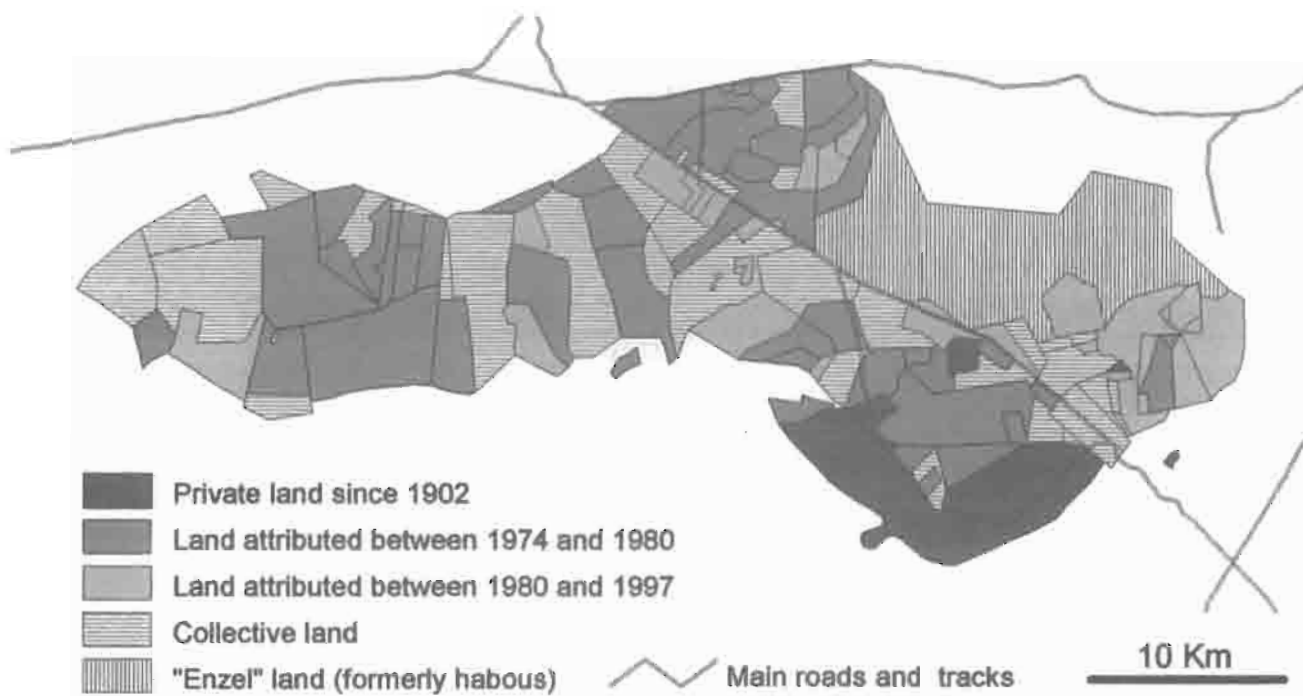


Fig.6 - Land ownership status in the Menzel Habib delegation
Land affairs department, Gabès, 1998

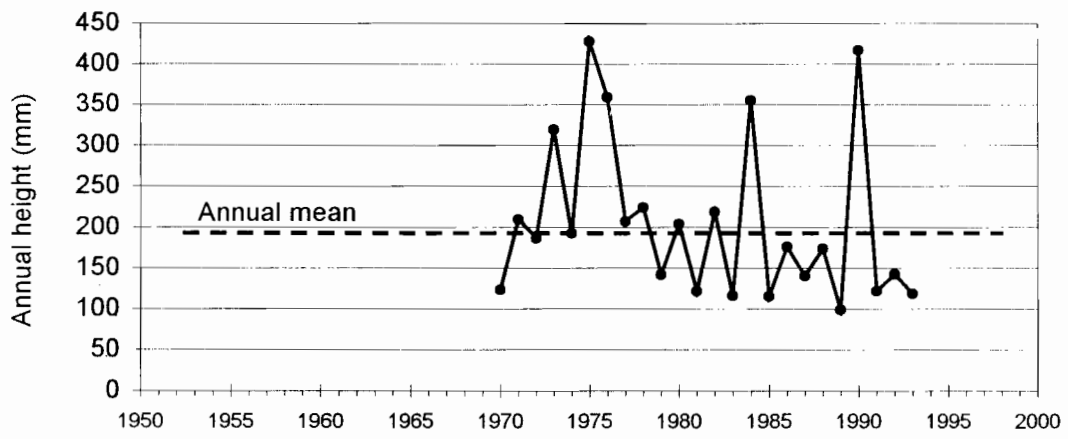


Fig.7 - Pluviometry in MenzelHabib

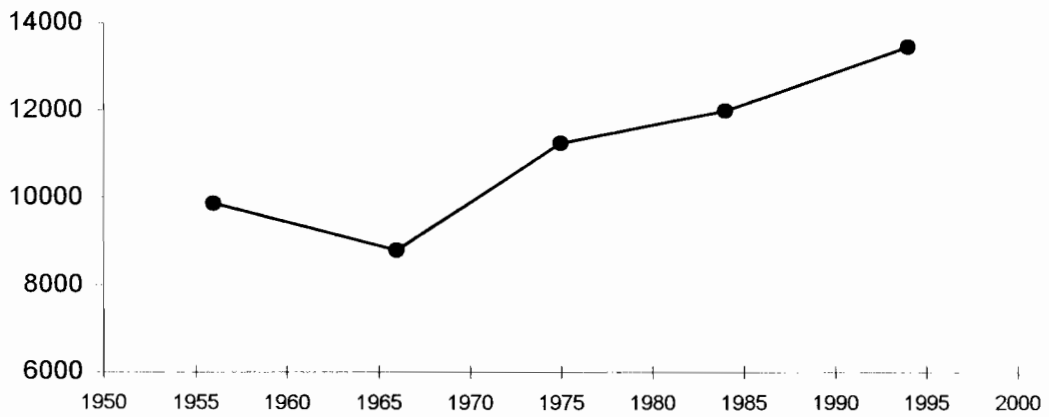


Fig.8 - Population in Menzel Habib

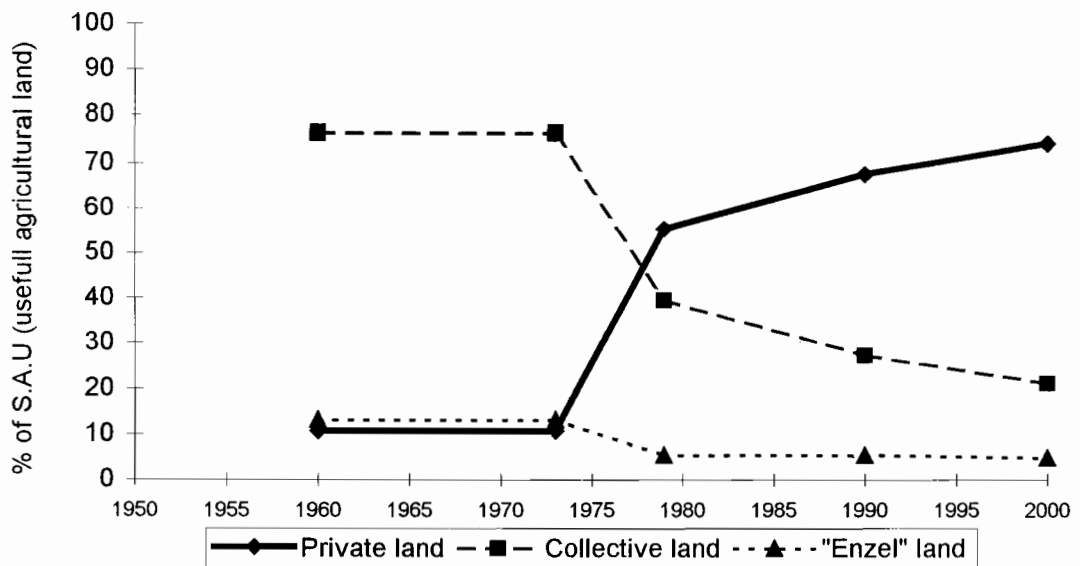


Fig.9 - Evolution of land ownership status in Menzel Habib

Auclair Laurent, Chaize-Auclair M., Delaitre Eric, Simonneaux Vincent. (1999).

Changes in land property and desertification in South Tunisia : the Menzel Habib case.

In : Planetary gardens : proceedings = Jardin planétaire : actes. Paris (FRA) ; Le Bourget du Lac : Prospective 2100 ; Savoie Technolac, p. 326-331.

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