ANALYSES FAILURE REASONS OF THE DEVELOPMENT SCHEMES OF THE STEPPE AND ROLE OF TETRACLINIS ARTICULATA VAHL MASTER IN ITS ECO-DEVELOPMENT

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The steppe in Algeria is a strategic space that opposes the desert extension; it covers more 20 millions of hectares and is actually exposed to an important deterioration. The different programs aimed at the protection and rehabilitation of this space that have been implemented have failed, further more they generated an aggravation of this deterioration. An analysis of the reasons of this failure allowed us to propose a new approach centred on the introduction of a very rustic plant and whose ecological impact could save the steppe.

Keywords: steppe, deterioration, strategy, impact

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Introduction

The economical and social development of a region depends upon a rational management of its physical, biological and socio-economic environment. Enormous potentialities in terms of natural resources risk to be irreversibly compromised by the climate evolution and the socio-economic mutations in the steppe which remains the ultimate natural barrier against the desert extension. This space is seriously threatened by the desertification process [1].

Many specialists have insisted on the necessity of adopting urgent and adequate solutions to remedy to this situation.

Numerous works done in the last four decades reveal progressive degradation of the steppe vegetal cover and the soil. The aim of this work is the evaluation of the phyto-ecological impact of the implementation of a rustic vegetal specie; the *Tetraclinis articulata* which presents interesting characteristics such as the adaptation to the climate conditions, the soil and the social context of the area.

Theoretical analysis

Socio-economic and ecological generalities of the steppe

a. Geographical delimitation of the steppe

The Algerian Steppe constitutes a vast region that spreads from the South of the Atlas of the Sahara, (Fig. 1) forming a band of 1000 km length and 300 km large, and is reduced to less than 150 km in the East. It occupies a surface of 36 millions of hectares but counts 20 millions of hectares of course [2]. The Annual average rain precipitations in the northern limits are 400 mm while those of the south are 100 mm [3].

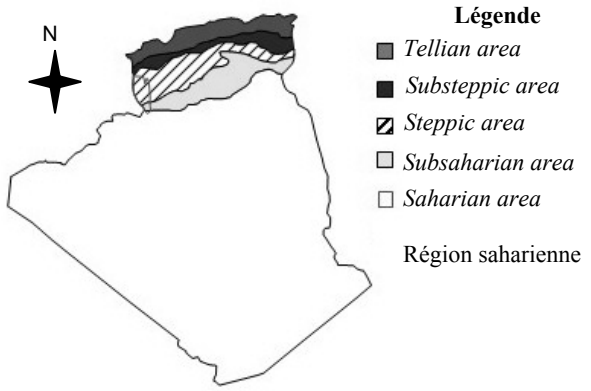

Fig. 1. *The card of situation of the steppe area [4], saharian area, subsaharian area, steppic area, tellian area*

b. Climate, vegetation and soil

The steppe is characterized by a semi-arid climate in the northern regions and an arid climate in the South. The average rain precipitations are comprised between 400 mm and 100 mm, which is not enough for an intensive agricultural usage. In dry years, the whole steppe receives less than 250 mm of rain; these isohyets spread up until the Tell.

The vegetation of the steppe is short and discontinuous, composed of herbaceous plants, generally in tufts. This vegetation varies by its floristic composition and its density and constitutes the fundamental stake of the pastor's life. It determines human displacements and his parking areas with his herds [5].

There are four zones in the Algerian steppe [6].

Zone 1: 700,000 to 1000,000 hectares; with an annual average of 400 mm of rain, it is mainly the domain of scrubs, the garrigues and the forests of the Saharian Atlas.

Zone 2: 3.5 to 4 thousands hectares, it receives 300 to 400 mm of rain. It is t the most favoured zone, situated on the South fringe of the tellian Atlas. It is the zone of the big tracts which is exposed to an important pastoral load (2 to 4 sheep in the hectare). It is occupied however by the profitable culture of cereals in rainy season.

Zone 3: 5 to 6 thousands hectares with an annual average of 200 to 300 mm of rain. It is la region of the high central and southern plains and the South side of the Atlas of the Sahara. The courses are of unequal quality and the pastoral load is there weaker (2 sheep to the maximum ha).

Zone 4: 10 thousands hectares, with an annual average rain fall of 100 mm to 200 mm. It is situated in the south of the Hodna and South of the Atlas. The pastoral load is very low (20 to 60 times less than that of zone 2).

The real potentialities of these regions represent, actually, half of their surface, because of the immense abandoned areas, due to a lack of points of water.

The Steppe is essentially composed of a varied herbaceous stratum of vivacious and ephemeral species. Generally there are thee dominant flora species: the esparto (*Stipa tenacissima L.*), the Artemisia (*Artemisia herba Alba L*) and the false esparto (*Lygeum spartum*), (Fig. 2 and 3) [7].

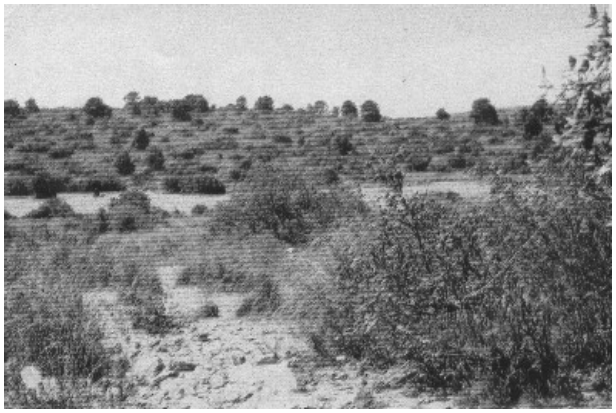

Fig. 2. *The forest deteriorate with the under wood of the Stipa*

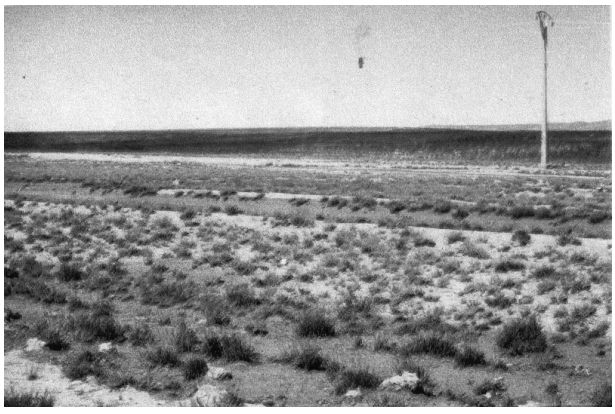

Fig. 3. *The ground of the Stipa deteriorate and association with the Artemisia*

More than thirty other species vegetate at different periods of the year. The esparto and the Artemisia occupy for their part almost 7,000,000 hectares while the *Lygeum* occupies 3,000,000 hectares. Generally, numerous halophytes species occupy the salty soils in the vicinity of the chotts [5].

The pastoral surfaces offer substantial food diversity considering the species diversity [8].

c. Entropic factors

The national ovine livestock is the first supplier of red meat, with 68,000 tons in 1983. It provided 75 % of the 2,996,000 produced quintals. Its contribution to national economy is important insofar as it represents a capital of more than 1000000000 dinars.

In 1985, on a national 15,500,000 heads, some 11,500,000 heads remained confined in the steppe. In 1996 the number of the ovine livestock rose to 17,301,000 heads of which 75 % concentrated in the steppe zone [9].

The steppe and its difficulties

An arid steppe is an environment which, by definition, offers extreme conditions for the establishment and the survival of perennial vegetation which plays a fundamental role in the structure and the functioning of the ecosystem. Despite all the national programs applied to it the steppe zone remains subjected to the degradations and very low rate of successful plantations. The consequences which ensue are alarming, and are characterised by the alteration of soils, the intense erosion and a diminution of its biological potential [10].

The natural vegetal cover is continuously subjected to a double impact: that of the soil and the climate on one side and the anthropogenic on the other side [11].

a. Chronicle of the applied strategies

The steppe has been the object of many development projects since 1962.

This period is characterised by too significant steps:

***** The First period 1962 to 1980: the state attempted to organize the pastoral populations by grouping them in cooperatives on much delimited territories, the objective was to organize these populations to allow a rational use of the courses. The number of created cooperatives was very low in relation to the autochthonous population, the delimited zones were not in adequacy with the habits of the breeders and the way of life of these inhabitants has been disturbed. It resulted in an abandonment of this politics and a pure and simple disappearance of these cooperatives.

This period is also characterised by the enactment of the charter carrying agrarian revolution notably the pastoral code. Its objective was the planning integration of the space and the radical transformation of the social behaviour and the system of production without a real knowledge their social system. This period distinguishes itself by three important facts but without positive effects on the steppe.

– The agrarian revolution: with a strategy based on the organization of the agro-pastors in cooperatives those impact on the behaviour of the breeders was negative. This phase did only concern 3 % of the breeders of the whole region and solely 5 % of the livestock of the steppe. The state also sustained the food of the ovine by importing barley those consequences were negative upon the traditional systems of breeding.

– The green dam: the primary objective of this project was to oppose the desertification by the timbering and reforestation on more of 3 millions hectares with the introduction of the rustic arboriculture and fodder species. All launched operations have been made beforehand without studies and the obtained results were not satisfactory. Among the main reasons of this failure it is necessary to note the bad choice of the plant specie and the techniques of plantation, the transformation of a space of course in forest zone, the absence of integration of the population in the project and the unsuitability of the vocation of the lands and the projected planning.

– The creation of the state Secretariat to the forests and to the reforestation in 1980 allowed some corrections by stopping reforestations which were most often improvised. A policy of lands classification and the elaboration of planed development in pilot zones, as well as the reconstitution of the degraded forest massifs were the principal action undertaken. Other actions were undertaken: the pastoral plantations, the fixing of the dunes, track initializations. These actions remained modest with regard to the importance of the steppe surface (20 millions hectares).

*****The second period: 1980-1996, it corresponds to a new orientation of the agricultural politics of the country with the enactment of four laws: the one carrying accession to the agricultural real property by an enhancement in 1983, the law carrying exploitation modes of the agricultural lands in 1987, the law carrying fundamental orientation in 1990 and the law carrying integration in the privet state domains of the pastoral lands in a special protective regulation, management and exploitation in accordance with the pastoral code. The creation of an organism in charge of the management of the steppe in 1985 constitutes another fact of this period; this institution had to control the environment was in charge of planning the steppe zone [10].

b. Analysis of the successive strategies failures

The traditional system of breeding and management of the steppe zone guaranteed a biologic balance with control of the size of the livestock which avoided over grazing.

The reproduction of the livestock remained traditional and the transhumance allowed the hope to regenerate, in doing so the biological equilibrium was respected with regard to the phenological cycle. The rule was to never remain too long in one place. The pressure on the environment was distributed therefore in the time and in the space, according to the rhythm of the seasons respecting precise rules adopted by all breeders.

The extent of the sedendarisation which resulted from the new villages implantations caused the end of the seasonal mobility of the herds. The mechanisation is one of the principal reasons of the sedentarisation with all the negative consequences on the steppe ecosystem: the surface clearing for cereals cultures, overgrazing, and the use of ligneous species for domestic purposes. The introduction of bovines and last but not the least the absence of regulations aimed at the protection of the esperato.

Experimental methods

Introduction impact of the Tetraclinis articulata Masters vahl

In order to evaluate the state of degradation and the impact of the introduction of *Tetraclinis articulata*, twenty observation stations were installed all over the steppe. The measures were performed in situ, the data collected by local technical services and the results of multiple analyses in laboratories allowed to appreciate the impact of *Tetraclinis articulata* on steppe.

At the level of the 20 stations measures of the total biomass and the number of species were undertaken in order to appreciate the induced dynamic by the *Tetraclinis articulata* (Table 1).

The *Stipa tenacissima* presents the most elevated indications. The mineral indication for the Sparta decreases 0.43 to most elevated mineral 0.35. L'indice corresponds to the station 2 that is a setting in defense and 0.35 correspond to the station 12 that is an abandoned fodder plantation.

The graph which follows gives an outline on the evolution, calculates it covering of the first dominant species, makes it possible to note that Lygeum spartum, is the species with a stronger covering (12 %), followed by Thymelia microphylla (6 %). it is about species which develops, on sandy, and sablo-muddy ground (Fig. 4, 5).

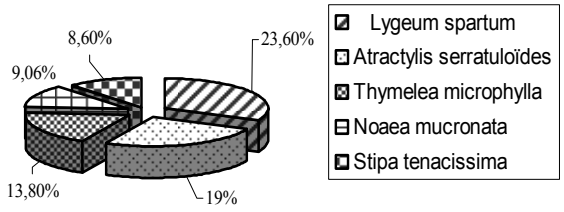

Fig. 4. *Specific contribution of the main cash [12]*

Five main species showed the strongest contribution, they represent to them only 74 % of the total of the specific contributions of the cash of the plant carpet. It is about *Lygeum spartum* with 23.6 %, *Atractylis serratuloïdes* with 19 % and *Thymelea microphylla* and *Noaea mucronata* respectively 13.8 and 9.06 %.

Table 1

Measures of phyto-mass and number of species the 20 stations [1]

Stations	Cash	Phyto-mass (Kg of M·S/ha)	
		initial	final
1	Stipa tenacissima	1254	1578
2	Lygeum spartum	1972	1895
3	Noaea mucronata	96	1002
4	Lygeum spartum	1048	4.29
5	Stipa tenacissima	471	2.11
6	Atractylis serratuloïdes	144	0.40
7	Salsola vermiculata	109	0.22
8	Lygeum spartum	581	2.15
9	Lygeum spartum	288	1.10
10	Thymelea microphylla	280	0.71
12	Lygeum spartum	1283	4.48
14	Atractylis serratuloïdes	164	0.42
15	Thymelea microphylla	86	0.25
16	Salsola vermiculata	195	0.53
17	Noaea mucronata	124	0.28
18	Lygeum spartum	69	0.30
19	Thymelea microphylla	91	0.29
20	Thymelea microphylla	222	0.76

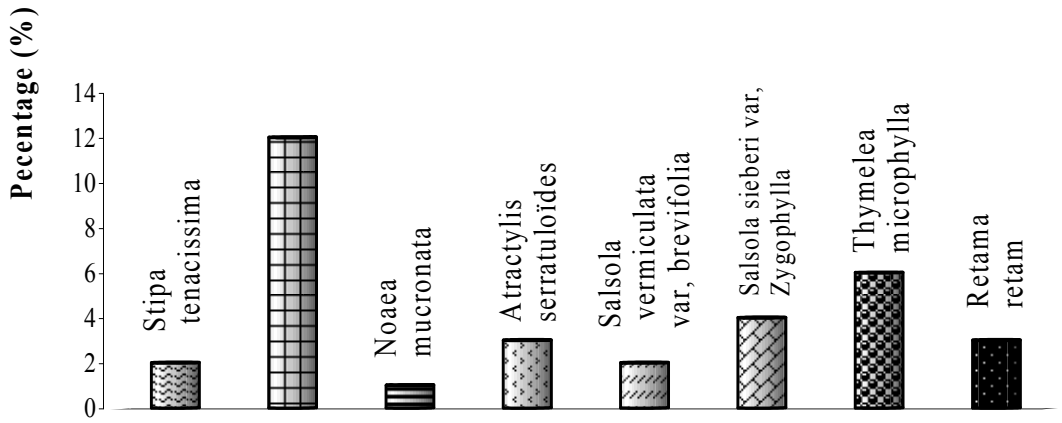

Fig. 5. *Recovery of the first dominant cash [12]*

Generalities of Tetraclinis articulata

All authors having studied this specie agree to say that *Tetraclinis articulata* has small exigencies with respect to the environment because of its faculty to adapt to different types of soils and bioclimatic (sub humid, semi arid and arid). The dry soils are more appropriate for its growth that the humid soils. It grows well on the fixed dunes which allow the fixing of the sand.

Tetraclinis articulata is a specie that showed a large capacity of adaptation and resistance and resists to the most difficult environmental conditions; it has an exceptional seeds r or suckers regeneration faculty, it grows under all bioclimatic lands of Algeria (from sub-humid to the arid) and on all types of the soils with the exception of the saline [13].

The Tetraclinis articulata resists to the drought and the heat as well as the cold weather. Well adapted to extreme conditions, it develops within a range of 250 to 30 mm yearly average rain, a yearly average temperature of 11.2 °C, an average temperature of the coldest month of 1 °C and the average temperature of the hottest month of 33.5 °C [14].

It is utilised in polishing white woods that is used for making furniture, its fibers could be used in the paper industry [15].

Methodology adopt

A test of assessment of the potentialities of this specie to grew in this expanse, through the evaluation of the it's germination rate and growth will allow us to estimate the ecological impact of this specie on the steppe.

The plant's seeds were harvested on 10 to 15 years aged trees of *Tetraclinis articulata* situated in Tessala area (Wilaya of Sidi Bel Abbès Fig. 6) and which is situated in the cold semi-arid level. All seeds were washed with distilled water, then planted and watered every week in order to help the germination and the raise.

A 20 weeks period of time was necessary before performing the first observations and measures. The quantified parameters are:

– The speed of germination.

– The germinative capacity [16].

Results and discussion

According to the results of the development test, we can state that *Tetraclinis articulata* found a favourable biotope in the steppe zones, with a rate of maximal germination of 80 % and a 10 weeks rate of germination which is remarkable compared to the results obtained in the Tell zone with the same seeds. (Tables 2-4).

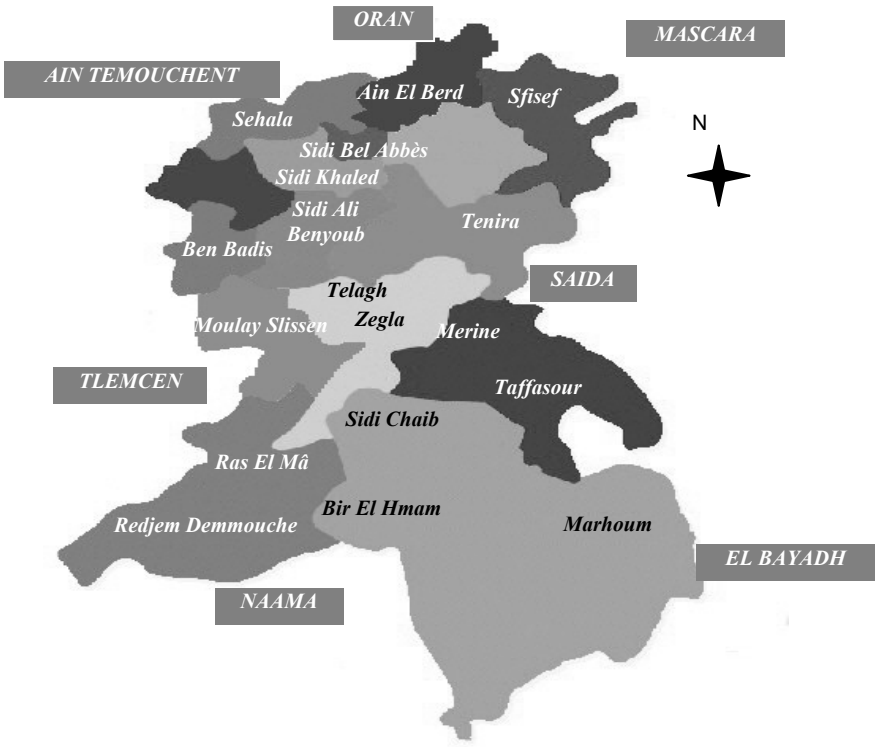

Fig. 6. *Localisation of the Wilaya of Sidi Bel Abbès*

Table 2

Number of the seed sprout according to the time

Num of week	4th	6th	8th	10th	12th	14th	16th	18th	20th
*NSS	08	20	30	40	50	55	60	70	80

**N: Number, *S: the seed, *S: Sprout.*

Table 3

The test of germination gives the results

Capacity of germination	80 %
Speed of germination	60 days
The forwardness	8 %
The latency time	35 days

Table 4

The average growth in cm

Number of the weeks	20	30	40	50	60
The average of the growing in height in cm	06	09	12.50	15.50	18.70

Tetraclinis articulata recorded a growth of 18.70 cm in height in a 60 weeks period. The average height growth is of 1.2 cm per month, which results in a 15 cm yearly growth. This is quite important for these areas.

Conclusion

This study showed the importance of the *Tetraclinis articulata* in the preservation of secluded areas through its generation in the damaged areas. It constitutes a prime factor in the struggle against the extension of the desert.

It is necessary to note also that the species has a power suckering very important and therefore even though the conditions of culture are un favorable provoking the drying up of the plant mother, the Thuya of Maghreb will give some dismissals quickly.

The desertification of the steppe zone is a reality. It has been measured scientifically on the basis of an ecological diagnosis. In the dynamics of deterioration of the plant table setting in some years, one passed on state 3 graminean steppe in *Stipa tenacissima*, stage 4 chamaephytic steppe to *Artemisia herba alba* (on slimy soils) or to *Artemisia campestris* (on sandy soils) to the stage 5 steppe to *Peganum harmala* and *Noaea mucronata,* it is unfortunately the ultimate stage of deterioration.

The climatic conditions constitute a factor of this regressive evolution. However, the factor anthropique is multilevel determinant:

To the level of the breeders, operators of the zone who have privileged the profit to the protective imperative of place. The mechanization and the motorization gave to these operators the means to attack the courses more and more greatly and on extents more and bigger.

To the level of the decision-makers that had resort to strategies that gave the proof of their limits extensively.

The main mistakes concern:

- The absence of integral global economic vision for the regional development.
- The predominance of the sartorial approach.
- The brutal change of operating system that provoked the disequilibrium

Procures/chapter.

The problems are known, however the identification of the problems constitutes a stage important of the analytic phase that could clear on a correct scheduling and the formulation of applicable projects.

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