

The phenomenon of desertification and its effects on Algerian economy

CHEMANI Wafa¹

Received :10/01/2019 Revised: 05/03/2019 Accepted: 30/06/2019

Abstract:

Desertification, whether natural or not, is a phenomenon which takes its origins from climatic variations and/or the consequences of human activities. This word describes a local aridification reflecting the degradation of lands which leads to biotic conditions of desert types. Algeria is one of the countries the most affected by this phenomenon. Desertification affects many regions, particularly the steppes which deteriorate under the influence of human and natural factors and their interferences. The human factor can be summarized in: deforestation, systems of culture, overexploitation of pastures, inadequate use of irrigation technologies, socioeconomic factors and specific policies. However, the natural factors include the low; say the inexistent rainfall, high heat and wind frequency. Techniques to combat against desertification have been the object of many researches and applications on lands. Unfortunately, there exists no ready-made practical solution to treat the problem from its roots. Thereby, the problem always remains and generates negative results influencing the economy. This requires the coordination of all political, economic and sociological aspects to face this phenomenon.

Key Word: Algeria, Steppes, Overgrazing, Wind and water erosion, Desertification

Jel Classification CodesQ5

المخلص:

تعد مخاطر التصحر أعمق من الظاهر بكثير، فالبشر يواجهون آثار التصحر من خلال تطوير استراتيجيات للبقاء، تعمل بدورها على زيادة مشكلة التصحر كونها تعتمد على الاستغلال الجائر للموارد الطبيعية. وفي الجزائر تمس هذه الظاهرة مناطق عديدة، السهبية منها على وجه الخصوص والتي تعاني من تدهور مستمر، تحت تأثير العوامل البشرية والطبيعية معا. يتلخص النشاط البشري في الاستغلال المكثف للأراضي الزراعية، الحرث العشوائي الذي يطال المراعي، المكننة غير العقلانية، الرعي المفرط الذي فاق قدرة الأراضي الرعوية. أما العوامل الطبيعية فتتمثل في تأثيرات مناخية تضافرت مع أنشطة بشرية، وقلة التساقط وشدة الرياح والحرارة المرتفعة التي أدت مجتمعة إلى تدهور أراضي وتصحر أخرى. وبالرغم من اتخاذ عدة إجراءات للحد من هذه الظاهرة، إلا أنه لم يعالج الإشكال من جذوره، حيث يجد سكان أي بقعة تعاني من التصحر أنفسهم عالقين في دائرة مغلقة تكون فيها محاولة التأقلم مع التصحر وإيجاد حلول للتصحر هي نفسها نتائج التصحر وهي نفسها أيضاً من الأسباب المؤدية إلى تفاقم ظاهرة التصحر، إضافة إلى انهيار التضامن في المجتمع ونشوب النزاعات بين الأفراد والجماعات. لذا لا يزال الوسط يعاني من التدهور المستمر مما أدى إلى نتائج سلبية تعود على الاقتصاد بالخسائر، وبالتالي وجب تضافر الجهود من جميع القطاعات للحد من هذه الظاهرة.

الكلمات المفتاحية : الجزائر، السهوب، الرعي المفرط، الانجراف الريحي والمائي، التصحر.

تصنيف JEL: Q5

¹Laboratory of economic studies on industrial areas under the new role of the University
- University of Mohamed El Bachir El Ibrahim

1 Introduction:

The various natural phenomena that affect the environment are of a different nature. They affect the global climate system. These phenomena are going through their effects on biodiversity, threatening the survival of the planet.

Desertification is one of the greatest challenges facing the global economy and concerns the researchers and authorities. This phenomenon occurs a little across or (everywhere) around the world. The fertile lands are deteriorating gradually and most of these lands become sterile where they are situated in the Arab and African countries. This desertification slows the economic, social and cultural momentum. Environmental disasters are increasing day by day and experts predict an imminent apocalypse if we do not remedy it in a short time. This brings us! First to draw up a report of the phenomenon of desertification in nearly to examine the consequences and finally to see how can we consider solutions to safeguard the well-being of future generations. At this level we can ask the following questions:

1. What does desertification mean?
2. If desertification is a quality, at what pace does it move forward? And subsidiary question: do we really have a problem of desertification in Algeria?
3. What are the potential indicators in order to measure its impact on the economy?
4. Can we avoid the economic aspects of desertification in Algeria?
5. What are the most effective ways to immediately reduce the lightning advance of sand?

These questions and others lead us to establish a hypothesis that we formulate as follows: This event has multiple causes, which arise from the will, acts of man and nature.

Thus, in order to comment or summarize this research, we should divide it into two parts: Part I: generalities or (general points) and current situation regarding the phenomenon of desertification in Algeria, and the second part: The impact of desertification on the national economy "case study of the municipality of EL-Euch Wilaya of BBA"

Part I: Generalities (background) and states concerning the phenomenon of desertification in Algeria:

Desertification is one of the major concerns in Algeria. It is a threat to the vast steppe band; known by the quality of its lands that of an agricultural and pastoral vocation. This phenomenon is even in the coast, where it is a threat to the whole environment. Facing this threat, international agreements were signed and several conferences were organized. The objective is to find solutions with lower costs.

I- the concept of desertification:

Nowadays, the problem of desertification is one of the major environmental problems that the world faces. It is a threat to food security in many countries, especially in Africa.

1- Desertification and its stages:

1. Definition: Desertification is the loss of production capacity in the soil. It could lead to the creation of semi-desert conditions. In other words, this is the total or partial loss of fertility of productive land (pasture, crops). Several definitions of desertification have been proposed by specialist organizations.

At the UN meeting on desertification that was held in Nairobi in 1977, desertification was defined as the lack in the biological capacity of the land, which leads to the appearance of semi-desert situations, and this following land degradation, water and other resources, under pressure from human natural activities. Subsequently, it turned out that this definition is not appropriate for a qualitative assessment of desertification.

At the Earth Summit "Rio 1992" Desertification has been defined as land degradation in arid and semi arid areas as a result of several factors related to environmental imbalances

and human activities. The fact that this topic is relatively new (the first appearance of scientific text by that name for 50 years and its implementation of the first card in 1977) this definition is in a continuous evolution.

The difference between the desert and desertification is that desert is an ecosystem, while desertification is a phenomenon that results from an imbalance between population and resources. This degradation is accelerated because of the vulnerability of these environments and the unsustainable exploitation of resources. Topographic and climatic factors may also exacerbate this phenomenon. The process of desertification leads to an absolute desert with an organic productivity equal to zero, thus we have left parts of the world by the factor of desertification.

2. Stages of desertification:

Depending on the nature of the relationship between environment and human activity; we can distinguish four levels of desertification:

1. Slight desertification: small deterioration in the canopy composition of the soil, without effects on the biological capacity of the environment.
2. Average desertification: early deterioration of vegetation covers in terms of its diversity and density, and reduced fertility of the soil due to wind, water and chemical pollution. Productivity loss in this step is estimated over 25% of capacity before deterioration. It is during this step that we must begin to apply the tools to fight against desertification effectively and economically.
3. Intense Desertification: it is an extension of all manifestations and causes of desertification, until it becomes difficult to remedy the growing degradation.
4. Very Intense desertification: this is the last step where the soil becomes barren and unproductive.

UNEP has established a number of indicators for desertification which are:

- Deterioration of agricultural land by the sand.
- Deterioration of agricultural land which count on the rain.
- Salinity or salinization of soil.
- Loss of forests.
- Decreased fertility of farmland.
- Increased sediment at dams and rivers with increasing amounts of dust into the atmosphere.

2- The causes of desertification

The causes of desertification are varied: they are originated by human and natural factors. These can be summarized as follows;

Natural causes: which are

- Decreased precipitation in the years of alternating drought.
- Higher temperatures accelerate the rate of evaporation and salt accumulation in agricultural soils
- Erosion: it is land degradation due to climatic factors: winds and waters. There are two types of erosion: wind and water erosion
- The sliding of sand dunes: a phenomenon known as "headway of desert"-the advancing of the desert-: it is the movement of dunes which causes the coating of agricultural grounds proximity.

Human causes: In addition to the climatic factors, human activities also contribute to this phenomenon

- Population pressures on the environment: the extension of agricultural land and increasing herds lead to the disappearance of forests.

- The mode of land use: the use of wood exceeds the rate of renewal of forests. On one side, the loss of forests contributes significantly to the deterioration of the environment. On the other side, other factors that increase the probability of occurrence of this phenomenon include:

1 - Methods for the preparation of agricultural land as deep plowing and unused levees that protect the soil from erosion and disuse barriers against the wind.

2 - Methods related to the choice of methods of harvesting and agricultural cycles.

3 - Methods related to the practice of farming itself as irrigation, drainage, fertilization, and harvesting

4 - Poor exploitation of natural resources. Depletion of subterranean resources exposes soil to salinity in addition to the degradation of its quality.

3- The fight against desertification

The phenomenon of desertification is not new in the world, but what is problematic is the quickness with which it spreads. As a result, several international summits and conferences have been organized. We name below the most important:

-In the month of August 1977 in Nairobi (Kenya), the United Nations has organized a summit to find a roadmap to fight against desertification, but because of exorbitant costs (\$ 4. 5 billion annually); this meeting did not achieve its objectives.

- In July 1985, a ministerial summit held in Dakar with the participation of 20 countries concerned by this phenomenon. A platform to work starts.

- In October 1985, at the fortieth meeting of the United Nations, the Senegalese president urged international opinion to be conscious of the threats of desertification for the poor countries.

-In November 1985, Senegal hosted the second ministerial meeting on desertification with the participation of five countries in West Africa, 29 projects were signed in the framework of bilateral cooperation.

-In December 1985, Algeria has participated in a ministerial meeting on environment that was held in Cairo under the auspices of UNEP.

- In the month of February 1986, a summit on the tree and forests was held in Paris.

- In June 1990, a conference was held in Paris. It was marked by the sentence of Jaque Brouchelli “. . . The reality is summed up in the south . . . the water scarcity, animal death, the disappearance of pastures, forests disappear, the exodus of people, the displacement which is not a culture but a curse. . .”

- Between 1985 and 1991, we noted the UNDP intervention in the municipality region between Sudan and Sahel

_ In November 1992, the Maghreb countries have achieved a charter for environmental protection and durable development

-In October 1994, an agreement on the fight against desertification in the Arab Maghreb

-First Celebration of the World Day to Combat against Desertification (17 June 1995)

-At the Arab Summit that was held in Cairo in 1996, desertification and implementation of green space was one major theme.

-Second Afro-Asian conference on the phenomenon of desertification in Niger (1997).

-First meeting of members of the agreement on the fight against desertification in Rome (1997)

II- Assessment of desertification around the world

More than 100 countries around the world suffer from desertification. The affected area is about 45 million km², or about one third of the mainland, where more than one billion people live. The most affected Continents by this phenomenon are: Africa, Asia and Latin America.

1- The problem of desertification around the world

It mostly affects countries in development. Dry lands cover more than 6150 ha which is about 47% of the total land area in the world, 62% of the total irrigated area in the world, 36% of the land in which the crop depends on rainfall, and 68% of pastures. It should be noted that too arid desert lands are not affected by desertification.

The problem of desertification affects in a dangerous and in a direct way the regions and populations. Over 15% of the world population lives in arid regions. The number of people threatened by desertification has reached 78. 5 million. Also the rate of land degradation in dry areas and semi-deserted is 5. 25% million ha / year with an annual loss of 42 million dollars. The potential benefit of improved lands is estimated at 895 million per year.

The fact that developing countries are dependent on developed countries in terms of food security and the threat of drought, almost 150 million inhabitants live in Africa, causing the death of 250,000 people two decades since. 30% of people were forced to leave their homes in search of food, and who found themselves in the camps of climatic refugees.

2- The problem of desertification in the Arab world

The phenomenon of desertification has experienced significant spread in the Arab world because of the irrational exploitation of natural resources, especially water resources and agricultural lands (pastures, forests and agricultural land) and this has been for several decades. The fragility of environmental systems, the prevalence of dry climate and water scarcity have amplified this phenomenon. To remedy this, several organizational and scientific programs as well as indicators were put to measure its amplex. This is the goal of Arab League for the development of agriculture to meet the challenge of food security for the growing population.

The most exposed regions to desertification in the Arab world are the natural pastoral lands which occupied extensive areas. Overgrazing has led to the disappearance of plants for grazing and replaced by plants less resistant to grazing. With continued heavy grazing and the exploitation of these plants which have a bad environmental quality, the grazing land became almost deserted.

Other factors have contributed to land degradation. These methods of plowing and clearing of shrubs, especially as plants, animals and humans are part of the ecosystem. They influence each other. To this effect, studies have showed that 50% of irrigated Arab lands are lost by salinization.

Table 1: Degraded and desertified grazing areas in some parts of the Arab world

Country	Desertified grazing areas km ²	% of area
Sudan	660,000	0.26
Somalia	425,000	7.83
Libya	380,000	0.21
Mauritania	343,000	3.34
Iraq	238,000	3.54
Algeria	230,000	7.9
Morocco	195,000	4.27
Jordan	109,000	9.58
Syria	59,000	0.36
Tunisia	15,000	5.16
Total	2,654,000	/

Source: Arab Organization for Agricultural Development, Arab Organization for Agricultural Development Efforts in Desertification, 1996, p. 45

The problems of desertification in the Arab world are generally due to climate change, and other human factors in addition to the deregulation of ecosystems.

3- States where desertification is found in Algeria:

Desertification is one of the major problems, now facing many countries worldwide, including those located in arid and semiarid regions. Like other countries, Algeria is one of the countries that are affected by this phenomenon. In Algeria, desertification had grown, there are at least two decades. It is especially worrisome in that its effects are growing in all sectors.

1. Natural resources and the problem of desertification:

Climate: Algeria contains a vast territory which has recorded at least three types of climates:

- A Mediterranean climate in the north, which characterizes relatively the countries, by a humid climate in the east and dry climate in the West.
- A continental climate in the interior region of the country (the highlands): Atlas Tellian has a storm climate while the Saharan Atlas is characterized by a dry climate.
- A dry tropical climate in the south with a large temperature difference by reporting climates mentioned above: a variation in precipitation, 1500 mm / year to the coast; 250mm/year in the highlands while it becomes scarce when one goes to the south.

Water resources: Algeria is a country where water constraint is largely marked: with a ratio of average consumption of about 1000m³/person / year.

Soils: arable area is 47. 2 million hectares of a total of 238 million hectares; the UAA is 8. 2 million hectares, equivalent to 3% of the total area. Pastoral areas are a big part of the total area of arable land with 32 million hectares. In this context, the importance of agricultural policy is to rationalize the exploitation to better meet the needs of the country in terms of agricultural products: milk, cereal, meat. . .

- **Flora:** Flora in Algeria is characterized by its intensity in the north east. Besides, it has released its measure when one goes to the south. The area of forest is 3. 9 million hectares. While the area of pastoral land is 32 million hectares, the land area covered by the Alfa is 13% Aleppo pine 60% and 16% for cork.

The area of degraded forests is about 60%. It was due:

- Fires, deforestation, overgrazing, insects and diseases insecticides;
- The pressure of the population;

- The management of the forest and its main consequences: the main goal of reforestation is to raise the forest coverage of 11% to 25% to make up for the lack recorded on wood with reforestation the degraded area, flora, in addition to fighting against desertification. However, the methods undertaken in the management of projects are expected goals which remain far from being realized.

2. Characteristics of the steppe zone:

Geographically the steppe zone lies south of the Tell Atlas in the southern plain. It covers an area of 38 million hectares or 14% of the total land area. It is positioned on a line of precipitation between 100mm and 400mm in the south to the north. It is subject to a climate which is characterized by a random precipitation, with high monthly and annual variation in climate; degrees of high temperature and dry winds. The distribution of land is dictated by geological structure of the region: the accumulation of limestone; a limited depth of arable land, a degree of sensitivity and high degradation. Under such conditions, the use of land in agricultural activities becomes impossible.

The natural and geographical characteristics of the steppe region:

The administrative organization distinguishes between Algerian steppe wilayas and para-steppe Wilayas. The latter are located near a steppe zone. The number of steppe wilayas is 8 which are: Laghouat, Biskra, Tebessa, Djelfa, M'sila Bayedh, Khanechla and Naama with an area of 264. 034 km², or about 12% of the country with a population of 3. 5 million.

The number of para- steppe pastoral farming Wilayas is 12 Wilayas: Ome-bouagui, Batna, Tiaret, Tlemcen, Setif, Saïda, Sidi-Bel-Abbes, Medea, Bordj BouArreridj, Souk Ahras, Tisimsilt and Ghardaïa that is the last to the south. It covers an area of 182,291 km² or 8% of national territory.

3. The Work on the fourth cycle (1999-2006) and its consequences:

A. Plowing and farming cereals:

In traditional societies, the practice of agriculture including cereal; fundamentally serves to meet the immediate food needs; and provide safety reserves for drought years. The operating scale; with the extension of agricultural lands was developed during the Roman period; henceforth, the interaction between man and his environment is beginning to influence the internal balance of traditional society.

Indeed, the degradation of the ecosystem in the upper palatal is not a recent phenomenon. It has grown since a century at least. Following soil depletion through increased mechanization of agriculture, among the most worrying consequences of this fact: the disastrous development of desertification. Studies that were conducted in this direction show that, if the grazing activity could lead to desertification within a few centuries of exploitation of land, increased mechanization in agriculture could amplify the problem in some decades of operation.

B. Deregulation of the grazing activity and the capitalization of the farming one:

The combination of two capitalization practices of stocks on the one hand, and the behavior of excessive exploitation has contributed in a magnifying way to degradation of flora. The latter phenomenon is considered as the main cause of desertification and deregulation of the ecosystem. Besides these elements, we can add other factors that are no less important in the development of the phenomenon which are as follows:

- The premature introduction of large numbers of herds, compared to the development of vegetation;
- The persistence of herds for a long time on grazing land with a current green, thereby disadvantaging the capacities of regeneration of the vegetation;

• The overloading in quantities of harvested plants, also disadvantage the ability to revival of vegetation.

In this sense, excessive grazing is a common practice in the region, and that is not a subject to any control which had contributed to the reduction of resources. (the need to a head of livestock have increased from 4 hectares in 1962 to 16 hectares today, or even 32 in some areas where desertification is most prominent).

This is further exacerbated by the mechanization and the use of telephony. They actually used the telephone to find better grazing lands and transfer the herds with the truck in case of a distance over 100 km.

C. Reducing grazing: several reasons have resulted in the reduction of grazing:

• The distance vis-a-vis the grazing areas, regarding the means of transport available to producers.

• The lack of water resources: a natural constraint, which is combined with the lack of investment in the pipeline and water distribution.

• Agglomeration of producers on the geographical perimeters reduced: for security reasons, and to take advantage of some cities or settlements. (eg school attendance).

D. The renovation (planning, development) and equipment: the most dominant trend in the field of development consists in the creation of new spaces of tree crops. This activity is largely profitable over the production of cattle feed.

4. The negative impact of administrative commitments

Degradation of steppe zones is due to several interventions that have dire consequences on the environment, as the grant of indifferent energy prices and electricity that caused the intensification of land use following the mechanization.

A. The subsidy of prices: in a review conducted by the Ministry of Agriculture on a subsidizing energy prices used in agriculture the following results can be seen:

B. Maintaining balance in the number of livestock:

Maintaining a fictional situation and imbalance in the number of livestock in comparison to the actual availability of hay, see a subsidizing of food products.

C. Lack of legal framework:

The exploitation of natural resources in the steppes (land, water) is governed by more traditional institutions by the new laws of the State, also by the rule of the strongest imposed by certain groups who monopolize and claim that they are the owners of lands: this had resulted in the delivery of cattle farmers to poor regions in terms of resources. The result of this approach engendered irregular irrational behavior in the exploitation of resources, an imbalance of ecosystems and accelerating consequences of desertification.

5. Social transformation and impoverishment of the population of the steppes:

The highland regions, unlike the rest of the country recorded a slow process of urbanization, low levels of schooling. Facing this situation develops intensified agriculture which is a new phenomenon. This latter will fundamentally transform the regions that constitute grazing areas in the middle of cultural overlap: the substitution of traditional lifestyle of a new mode of social organization leads to progressive population movements to urban areas in search of improving their living conditions

Part Two: The impact of desertification on the National Economy / Case Study of the municipality of El-Euch Wilaya BBA

With a strategic and attractive geographical situation, the province of BBA is represented as a link between east and west, together with a significant natural diversity that characterizes it. This Wilaya is living today a permanent risk of depletion in its natural resources. Indeed, the combination of an irrational action of man with the fragility of the environment inevitably leads to soil degradation and desertification.

I- Study of the phenomenon of desertification in the region of El-Euch.

Reasons that justify the choice of the region:

A steppe area which is located on a line of precipitation of 200-300 mm. The region's climate is characterized by irregular precipitation with unpredictable changes (monthly and annual) climate. The diversity of soil is also significant, as the construction of geological layers: the accumulation of limestone which reduces the cavity of agricultural land and increases the exposure of land degradation and desertification.

1- The natural relief and its effect on the degradation of environment.

The region of Bordj BouArreridj is situated at the high plateau region of the country, crossed by the line Algiers-Constantine, it shares borders with these four Wilayas: the north side with the province of Bejaia, east of Setif, The province of Bouira the west side and south by the province of M'sila. The area of the Wilaya is 3920. 42 km, equivalent to 1/600 of the country's total area.

Regarding the study area, (El-Euch) is located in the southern part of the wilaya. A mountainous area with an elevated level of degradation. The region is characterized by two main activities: grazing constitutes the bulk of the economic activity while agriculture is practiced in a random way for reasons such as drought.

2-Studies of climate data:

In this study, we will adapt the following indices: precipitation, temperature, humidity level and their consequences on the natural environment. Our goal is to delimit the main factors that influence the environment.

A-Precipitation: It plays an important role in the presence or absence of vegetation.

Table 02: Average monthly precipitation at l-Euch 1981-2018 (mm)

Month	January	February	Mars	April	May	June
Average	27	20. 21	25. 9	25. 8	22. 1	7. 5
Month	July	August	September	October	November	December
Average	1. 4	7. 5	39. 6	22. 1	24. 5	27. 5

Source:Summary monograph of Bordj BouArreridj 2000-2010

From the table above, we remark a monthly irregularity in precipitation, with a higher rate which reached 46. 1 mm in September and a lowest one in July with 7. 9 mm per year

B-Temperature: a very important climatic factor with an extraordinary influence on the development of vegetation.

Table 03: The average monthly temperature at El-Euch

Month	January	February	Mars	April	May	June
Average	6. 08	7. 38	10. 08	12. 78	17. 98	23. 58
Month	July	August	September	October	November	December
Average	27. 25	26. 3	21. 85	16. 8	10. 07	5. 5

Source:Summary monograph of Bordj BouArreridj 2000-2010

This table shows that the lowest temperature is recorded in the month of January with 6'9 and the maximum level is reached in the month of August with 26. In the region of El-EUCH, different rates are recorded, the minimum temperature is reached in the month of December with 5. 5 while the highest temperature is recorded in July with 27. 25.

C-Humidity: the maximum level is of 75% in the month of January; lowest level is in July with 41%.

Wind: at BBA, different frequencies of wind are recorded along the year. The frequencies of the most important winds are those from the south west and North West.

At EL-EUCH area: This region is characterized by sirocco winds, warm winds from the south, they have harmful effects on agriculture, and they last for six months a year: southerly winds account for about 40 days in the month of May and October

D- Environmental outline: we try to delimit and characterize the region from a few parameters:

*Q2 'EMBERGER': it is a coefficient used especially in the Mediterranean climate, from this index we can know the real amount of water for the flora in the region, and the index is calculated as follows:

$$Q2 = \frac{200P}{(M2 - m2)} \quad (M, m \text{ in Kelvin, } t^{\circ}K = t^{\circ}C + 273)$$

The calculation of the coefficient gives us $Q2 = 28.32$. From this index we can say that the region of BBA is a virtually barren area.

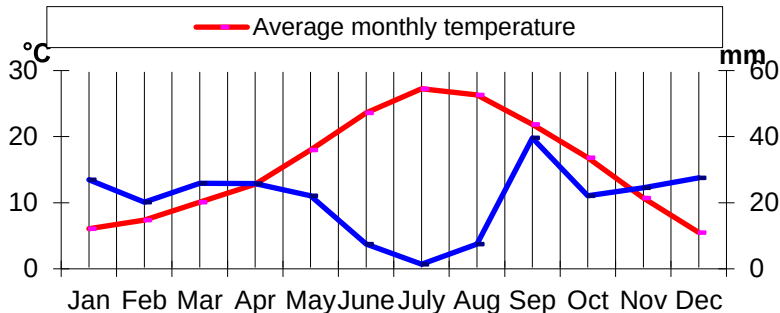
Similarly we calculated this index for the region of El-euch that is: $Q2 = 35.59$, the index tells us that this region is more arid relative to BBA.

* Ombrothermic measurement:

This index shows us relatively dry seasons compared to others. It is developed by H. Gaussen and F. Bagnouls. The index is formulated as follows: $Q3 = \frac{T}{\sum P + 2T}$

For the city of BBA for example, the arid season lasts four months: the month of May until late September while in the region of El-Euch the dry season extends from April to October as shown in the diagram below.

Figure n°01 : Ombrothermique Graphical representation



Source: Based on data from monograph of Bordj Bou Arreridj 2000-2019

From above the wilaya of Bordj Bou Arreridj could be considered as a steppe zone. Desertification affects 26/34 joint that contains the city of BBA. The area affected by desertification is 127.692 hectares, equivalent to 33% of the total area of the wilaya that could be divided as follows:

Desert areas: they are 87 113 hectares, with 23% from the area of BBA.

Medium desertification areas: they are 4051 hectares or 10% of the total area of the wilaya.

II. The reasons for environmental degradation:

The natural environment is submitted to a delicate balance. Because it is exposed to desertification, the natural and social environment is characterized by a poverty that can be found at the first contact with the population of steppe regions. For this purpose, the interaction between agents and their environment as part of the socio-economic life creates a fragile balance. Environmental conditions impact negatively on the conditions

of economic and social life and vice-versa (this is the vicious circle of poverty and desertification).

1-The natural and human factors:

Soil degradation is the result of interaction between two factors which are:
The natural factor: this is closely related to the physical geography of the region. The origin of land degradation is the fragile ecosystem of the steppe regions: the water flow, higher frequencies of the wind, especially from the southeast. As a total area of 279. 88 km2 that constitute the municipality of EL_EUCH, we find the following distribution:
The region marked by desertification represents 69. 20% of the area of the municipality it is the equivalent of 262. 92 km2.

A region which is an intermediate desert represents 7'64% of the total, it is equivalent to 28. 99 km2

An area that can be scored by desertification represents 15. 52% of the area of the municipality with 58. 99 km2

A fully covered area of desertification accounts for 7. 645 of the area of the municipality. with 28. 9 km2.

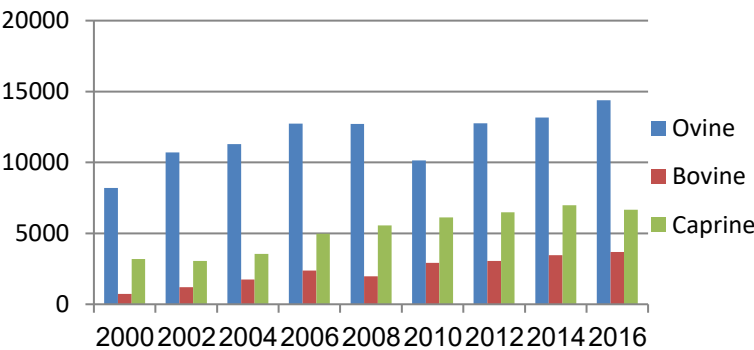
2-Human factors: it is the result of human intervention over the nature. Human is closely bound to the natural system that dictates a way of being, by imposing the kind of compatible activity with the natural environment. the incompatibility of human action with the system of nature leads to dysfunction.

III-The consequences of environmental degradation:

Today, we note profound changes in the steppe regions. These changes are not a new phenomenon. However, the magnitude or the size of the phenomenon is recent. Among the most disastrous consequences: we have the degradation of lands that consequently reduce their productivity, particularly those intended for the production of food bugs.

1-Fodder production: The increase in livestock population has effects on the environment. The capacity of the fields for grazing does not stop to decrease as the number of animals increase. Statistics on hay production show that the production of this product marked a continuous decline over the period of 16 years as shown in the figure below.

Figure n° 02: Evolution of the number of cattle2000-2016



Source: Based on data from monograph of BordjBouArreridj 2000-2019

As a side note from the table, we remark that the area devoted to hay production varied between 130 and 290 hectares which is insignificant compared to the total area of the

study municipality that reaches 37,989 hectares. This is the result of environmental degradation.

The average production per hectare is 29.18 forage units per hectare, prompting some farmers to supply concentrate forage. While some return to the nomadic activities to provide needs for their cattle.

2-Grain production:

Although the nature of soil could not be the server to the production of cereals, there was a certain limited output which ranged from 300 units up to 70,150 units for the period 1999 - 2009. As shown in next table.

Table 04: Grain production in El-Euch (2000-2018)

	2000	2002	2004	2006	2008
Production (U)	2610	/	34610	35600	13780
Area (hectare)	2460	2991	3208	1950	3600
	2011	2012	2014	2016	2018
Production (U)	61770	48600	69900	50570	58500
Area (hectare)	4100	3750	5328	5100	3500

Source: Summary monograph of Bordj BouArreridj 2000-2018

There is a significant variation in the production of grains from one year to another and therefore the circumstances of this production cannot be controlled

3-Gardening productions:

The evolution of cultures in gardening is indifferent. It is minimal production of vegetable crops throughout the year. The table below shows the evolution of production and the area used during the period of 18 years.

Table 05: Gardening productions in El-Euch (2000-2018)

	2000	2002	2004	2006	2008
Production (U)	5960	5805	9395	17060	21024
Area (hectare)	113	80	115	215	273
	2011	2012	2014	2016	2018
Production (U)	25596	27180	32315	39960	31550
Area (hectare)	193	208	217	217	197

Source: Summary monograph of Bordj BouArreridj 2000-2018

These statistics show an increase in crop production in gardening. We also note the existence of some variations: the lowest level of production is recorded in the period of 1999 with 4772 units, while the maximum one is recorded in 2016 with a production of 39960 units noting that the area devoted to production also has an increase.

4-Arbiculture Production:

Arbiculture is a secondary activity for the region; nevertheless it remains consistent regarding the nature of the environment.

Table 06: Arbiculture Production in El-Euch (2000-2018)

	2000	2002	2004	2006	2008
Production (U)	389	350	441	718	963
Area (hectare)	42	118	282	440	554
	2011	2012	2014	2016	2018
Production (U)	706	4339	13809	14427	7594
Area (hectare)	101.62	744	1069	100	100

Source: Summary monograph of Bordj BouArreridj 2000-2018

Arboriculture production recorded a continuous increase. This is remarkable especially for the period 2002-2014, the production noted a minimum of 350 units in 2002, it will reach the level of 2156 units in 2009. we also note that the land of this agriculture has dedicated an increase to achieve 1069 hectares in 2014.

5-Animal production:

The region offers a variety of production. We mention the production of white and red meat, milk, eggs and honey. The positive variation in the production is outstanding in the following table:

Table 07: Animal production in El-Euch (2000-2018)

	2000	2002	2004	2006	2008
White meat Q	467	681	873	796	951
Red meat Q	1618	2180	1767	1858	2514
Milk L	1317904	1206723	1588040	2044329	1890958
Egg U	609350	790440	1058788	1234080	2138400
Honey kg	51	66	217	213	330
	2011	2012	2014	2016	2018
White meat Q	1638	1842	2381	2566	3019
Red meat Q	2038	2382	3985	5800	8970
Milk L	3417000	3773000	9848000	3104000	1516000
Egg U	3749000	7510000	14000000	10396000	19375000
Honey kg	121	142	148	174	146

Source: Summary monograph of Bordj BouArreridj 2000-2018

From the table, we note that the production of red and white meat marked a continuous increase. This is due to the increasing number of breeders as we have noted in the previous chapter. Regarding the production of milk, eggs and honey, the production is random: an increase during the period (2000-2004) and a decrease for the period (2004-2006), and then an augmentation again till 2018.

The main results obtained in the study area:

Population growth significantly influences the milieu and the environment, in addition to the intensification of grazing as we have shown in the preceding statistics. Apart from a few exceptional periods, the number of livestock has continued to increase. The reasons for this augmentation can be identified in the following elements:

6-Demographic reasons: The continuous increase of the population in the steppe regions. The potential of demand on sheep meat.

The level of productivity in raising cattle: The gratuitousness and availability for a long period of hay, and the grant price of imported livestock.

Sheep breeding is the main activity of the region. In fact, reducing investment margins in other industries leads to the concentration of investment in farming.

It should be noted that the reduction in the production of hay is due to drought, and techniques of land use increases the risk of erosion. However, statistics for hay production could not explain the actual increase in production, unless one considers that the services responsible for developing a state of the sector are not aware of the severity reached in the state of environmental degradation which could not logically shows an increase in production. The land shows that output is a logical decreasing. But unlike those

"administrative studies", geological Survey of the milieu shows that the situation is not as attractive as the region evolved under the threat of permanent risks of desertification.

IV- Achievements and programs against the desertification

1-The realized programs:

The works are held by the National Fund to fight against desertification in the study area, and these are programmed by the high commission for the development of the steppes to promote highlands and the conservation of forests which are:

- *The realization of the transfer of dams.
- *The realization of deep boreholes.
- *The development of water sources.
- * The realization of pipes (irrigation channel) irrigation.
- *The realization of works for the protection of land and water.
- *The pastoral settings.
- *The distribution of the implantations of the arboriculture.

In what follows the financial costs of the projects proximity to combat against desertification for the period (2003-2009) in the study area.

Table 08: Financial status of projects to combat against desertification

Region	Amount (DA)	year of realization
Maaza	000,00 .950 .6	2003
MaaderEttoumi	000,00 .980 .32	2003
M'khazen	000,00 .050 .44	2003
Ghafisten	000,00 .900 .33	2005
Lemdjaz	000,00 .300 .26	2006
Sed Bel'abbes	000,00 .300 .44	2007
Wled Ahmed –Wled Hamma	000,00 .680 .23	2009
Total	000,00 .160 .212	/

Source:The High Commission for the Development of the Steppe annexe of wilaya of Bordj BouArreridj, 2012.

In the project of fighting against desertification, a budget of 212,160,000. 00 DA is devoted. The objective is, on one hand, the realization of several projects to overcome the degradation of soil and the flora, and on the other hand an increase in the productivity of lands and the creation of jobs. In this sense, we can introduce the plant of *Artiplexhalimus "guetaf"* that develops in harmony with the environment and it is considered as one of the methods of fighting against desertification.

A Summary of achievements for the period 1995/2009 at the study area:

These projects are all made to develop the region by adding water points that improve the culture.

2- The efforts in the domain of fighting against desertification

Algeria is evolving in a marked context by several environmental risks including those related to degradation of the environment (flora, soil, water), such as water erosion, wind erosion (erosion, sandblasting).

Thus, many developed programs are initiated with the objective of offsetting the main evolution of the phenomenon of environmental degradation of milieu of lives: through the preservation of water resources and soils that are fundamental to food safety.

Human is behind the extent of the phenomenon of desertification, and he suffered along with those consequences. The reason may be due to the lack of environmental awareness.

To this end, the partners of awareness on environmental risks to the population are of great importance.

The organization of the combat against these phenomena for the protection of existing flora, rehabilitation of grazing areas, the fight against erosion through sand dune fixation techniques is necessary. The installation of an infrastructure for the isolation of remote areas is also important.

3-The program of reforestation of forests:

Facing the extent of desertification in the steppe zones, reforestation campaigns are initiated: programs include regions of the Sahara and highland areas (for example SENALBA in Djelfa). These regions constitute the main Algerian territory. Thus, the first reforestations in Algeria were engaged just after the country's independence: the first reforestation program carried out by the Office of National forestry is in 1968. Several programs have followed:

The forestry project in the province of Djelfa, in the area of Ain Oussara and Boussaâda in 1969.

Reforestation of the external borders of the town of Ain Touta in 1970.

The redevelopment program of the high forest of Saida in 1971.

4-Green Dam Project (Green Belt)

The Green Dam is one of the major projects against desertification at national level and along the continental plan. The project was started in 1971; it aims to create a secondary belt which extends over 3 million hectares. It is assumed that it extends Moroccan border to the west side of the Tunisian border with a length of 1500 km on an extensive 20km way that covers the plains and Atlas Sahara. For the realization of the project, the country had mobilized the national army in concentration with the Ministry of Agriculture and Agrarian Reform which is responsible for conducting studies, organizing and monitoring the project. The duration of the project lasts twenty years and it will cross at the end of its realization 9 wilayas which are: Djelfa, M'sila, Media, ELbeide, EL Gheouat, Batna, Tebessa, Khenechla.

Towards a new strategy of fighting against desertification:

Today, the phenomenon of desertification does not only concern some of the highland regions. It extends over the entire region. Thus, several parties intervene in concentration through the various programs of development and rehabilitation projects.

4-Development of forestry:

Today, the Green Dam project is considered as an essential complement to the pattern of development of the country. It is part of the national policy of the development of territory. It covers the major works for the protection of soil and water resources.

5- Program against desertification and the development of grazing:

This is a program that targets rural areas in the wilayas where the main economic activity is grazing, as well as wilayas that have grazing parts in their territories. In this sense nomadic families or semi-nomadic populations use collectively their own properties in the state.

6-The national program of agricultural development: (NADP)

The program included the protection of space through the programs of development of the water surface, realization and equipment of stations of water, in addition to creation of jobs. Moreover, giving some help for the realization of private projects, additionally the support and awareness of the population.

7-The national reforestation program:

One of the objectives of this national forestation program is the creation of permanent jobs for the rural population in order to let them achieve decent living standards. This

program is part of government's policies for the development of local agriculture, the development of natural resources and durable development.

8-The economic recovery program:

Desertification is a permanent risk for regions of the highlands. It is a fact that threatens the balance of its ecosystem and consequently the economic and social environment. Awareness on the extent of the phenomenon leads necessarily to the consideration in the economic revival program, adding to this, the creation of the National Fund for highlands in recent years noting that in the economic recovery program, a budget of \$ 4 billion is devoted to protecting areas of pasture.

9- The national conference for the agricultural development.

In the Congress of specialized services to the Ministry of Agriculture and Fisheries in 1996, a program was implemented for the development of the highlands. It encompasses over 19 wilayas in vocation of farming and grazing. It mainly concerns basic sectors such as forests. The objective is centered on the reorganization of work against desertification with the consideration of clauses of agreements to fight against desertification and its aspirations. The final report makes a scientific technique approximation based on the experience acquired in the field, consolidated by a multidisciplinary approach organized in a way so that it extends to include the population covered or concerned by the program.

10-Towards a new development strategy in the highlands:

The renewal of the strategy led to the emergence of considerations compatible with the environment for sustainable development in the highlands. The program contains a series of work on both the medium and the long terms.

11-Programs of the High Commission for the development of the steppe:

The three major projects are: development of the highlands, hay production, rehabilitation of palm gardens, planned by the High Commission of highland development which includes 17 wilayas and 135 municipalities. In wilayas with agricultural and grazing vocation, namely wilayas of Setif, Saida, Tiaret, Medea and Bouira, we note hay and agriculture pastures along an area of 112-500 hectares.

12-Cooperation programs and the fight against desertification:

The Highland wilayas which have a cooperation program are: Khenechla and Tebessa. This is the project of agricultural-forestry-grazing with the German agency. Another project is of Mellak Tebessa with the international fund for agricultural development in which the project reached an advanced level.

13- The national diagram of agricultural development (2000).

The national diagram of agricultural development is a new strategy to boost the sector in Algeria with the establishment of a financial mechanism which is the national fund for the agricultural development.

Conclusion:

Algeria suffers from the severity of the phenomenon of desertification, where many of its regions, especially the steppe strip of degradation and desertification, a large part of which is due to several natural causes, which are the climate changes that have occurred during different periods of time, decreasing rainfall in the years of successive drought, High temperature and range that helps to speed evaporation and accumulation of salts, soil and water erosion, and finally the dunes crawl, and human factors are the population pressure on the environment, the pattern of land use, methods related to the same agricultural practices such as irrigation and soil fertilization and Crop harvesting, poor exploitation of natural resources, such as overgrazing at the forefront of desertification.

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