People's Democratic Republic of Algeria

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Drought management strategy in Algeria

1. Drought in Algeria

The Algerian territory covers an area of 2 381 000 km^2, 80% of this area correspond to a desert area or rainfall is almost zero. It is only in the north of the country where the climate is Mediterranean that we can speak of rainfall and its relation with the water potential in Algeria. The issue of water in our country is a major concern, adds that our water resources are becoming increasingly scarce and difficult to exploit. Their distribution throughout the country is uneven. What is groundwater or surface, the water undergoes past thirty years a significant deterioration and tends to be scarce in the country. All these resources are conditioned by the very erratic rainfall in time and space. They are exposed to the risk of pollution increasingly important that compromise their use in many parts of the country.

The historical climate data of Algeria shows the persistence of drought. This natural phenomenon observed for a long time, has clearly led to the process of quantitative and qualitative degradation of the water reserve and linking, these droughts have had a negative impact on meeting the water needs of all socio-economic sectors, particularly agricultural, and preservation of terrestrial and aquatic ecosystems. The climate of Algeria is highly variable. One of the most worrying manifestations of this variability is drought.

A study conducted by Hirche et al. (in progress) in the Algerian steppe showed a trend especially in the dry south Oran, home of the term alfa (Fig. 1). This drying is associated with an increase in temperature. Changes in temperature between 1975 and 2012 are consistent and always go in the direction of increasing. In the arid, increases do not exceed 1 ° C in general. They range from 0.7 ° C to 0.8 ° C Méchéria Ain Sefra southernmost station. From 1981 to 2013, the average rainfall was often below the average. The combination of a slight rise in temperatures and net drier climate caused a significant water deficit, which has worsened the human-induced degradation of the steppe.

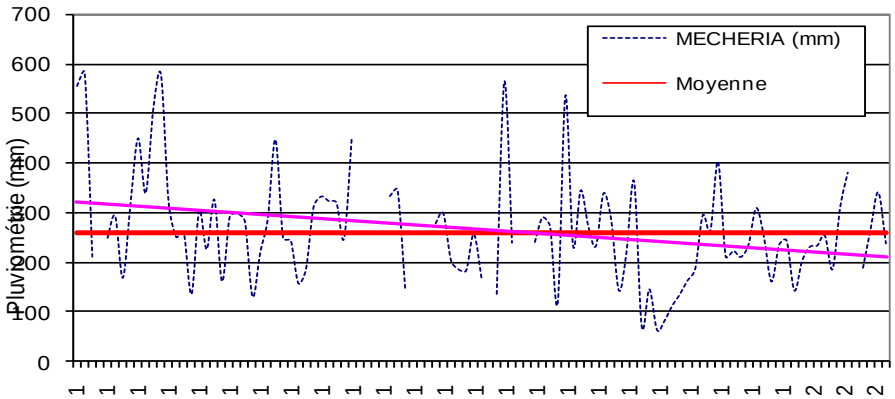


Figure 1. Evolution of rainfall in arid station south of Oran.(in Hireche,2011)

A prolonged drought has a negative impact on soils. Drying of the water reserve results in the accentuation of wind erosion that causes loss of soil fertility.

Soil drying is also accompanied by salinization phenomena of topsoil by capillary rise effect. The deposited salts destroy soil structure. These aspects are not negligible in the Algerian soil.

According Djellouli and Nedjraoui (1996), the Algerian steppes have experienced in recent decades a significant decrease in annual rainfall, sometimes several consecutive years of persistent drought. Reduced rainfall is about 18 to 27% and the dry season has increased two months during the last century.

2. Drought Monitoring Systems

In Algeria, there is no particular structure specifically dedicated to the drought. Meteorological services of the wilaya of the National Meteorological Office (NMO) coordinate all weather activities throughout the province and provide local or an important economic activity, meteorological services for the protection of property and people as well as the secure management of certain economic and social infrastructure. The data of meteorological services are distributed to users through:

- The establishment of climate indices cards in Algeria

- The performance of space-time studies in temperature, rainfall patterns and extreme events,

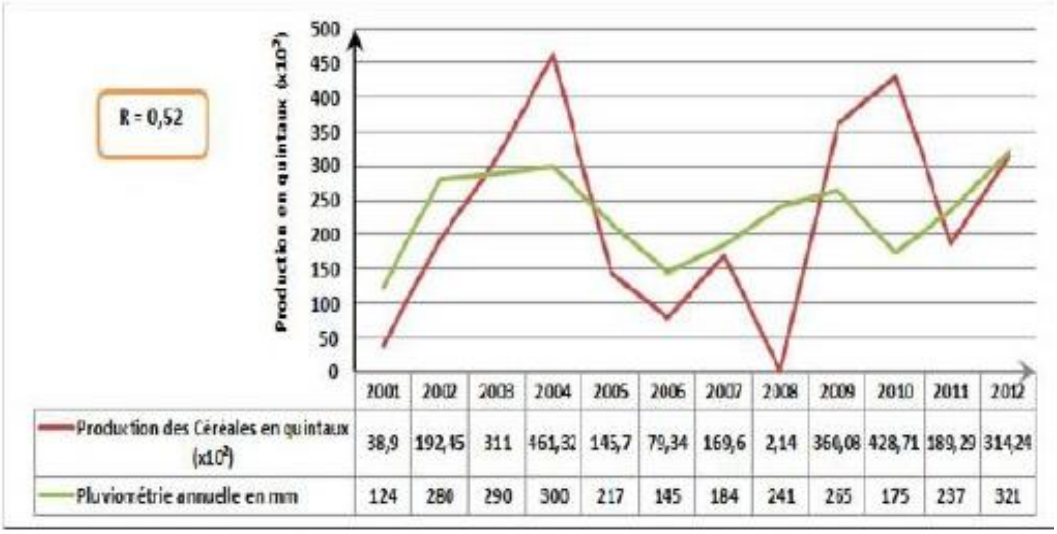
- The development of a monthly newsletter seasonal forecasting of rainfall and temperatures.

Furthermore, the National Agency for Water Resources operates a hydro climate observation network spread across the national territory consists of 220 hydrometric stations, 860 rainfall stations, 36 rain gauges and 56 full climate stations. These data are used to achieving timely hydrological studies (water management, sanitation ...) or regional and development of thematic maps on different flow parameters (general rainfall map, evapo-transpiration card map flows) to the edition of hydrological yearbooks and monthly rainfall newsletters

Also, the National Centre for decision support from the Ministry of Interior is responsible to collect, disseminates and exploits real-time information and data from early warning systems of all kinds.

3. Impact of drought on grain production

Agriculture, consuming 70% of mobilized water resources is one of the economic sectors most exposed to weather and therefore the most sensitive to drought. Figure 2 shows that grain production is dependent on the annual rainfall.



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Production des Céréales en quintaux (x10²)	38,9	192,15	311	461,32	145,7	79,34	169,6	2,14	366,08	428,71	189,29	314,24
Pluviométrie annuelle en mm	124	280	290	300	217	145	184	241	265	175	237	321

Figure 2: Change in cereal production depending on the annual rainfall in the southern steppe of Sidi Bel Abbes prefecture (in Hellal et al, 2014.).

For the cereal sector about 1.5 to 2 million ha/year is sown and nearly 56 million quintals are processed annually by the industry. The average national production increased from 22.5 million quintals in 1990-1999 to 34.3 million quintals in 2004-2008, with fluctuations

related to climate ranging from 9.3 million quintals of dry years to 43 million quintals in wet years.

Thus, the lack of rainfall, but also the poor distribution of rainfall during the year largely explains the large variation in grain production.

Now estimated at 8 billion $, agricultural production employs 1.2 million people or nearly 20% of the active population and contributes to GDP with an average of 10% thanks to the implementation, since 2000, the National Agricultural and rural Development Plan (PNDAR) 1

The PNDAR (National Program for Agricultural and Rural Development) also encouraged the introduction of appropriate irrigation technology to dry regions. The private sector has invested primarily in the production and installation of irrigation systems "drip" and micro aspersion. Moreover, in the oasis, the PNDAR financed, at the request of local communities, the rehabilitation of traditional irrigation systems (foggaras).

Water Resources Vulnerability

The water potential is estimated initially to 19.4 billion m3. These potentials are dependent on rainfall. Taking account of drought, water potential would be 17 billion m3 / year with 10 billion m3 of surface resources in the northern region, a decrease of 11% (Ministry of Water Resources, 2012). Water availability per capita is 600 m3 / inhab. / Year, Algeria and is in the category of poor countries in water resources under the scarcity threshold set by the World Bank at 1000 m3 / inhab. / Year .

The decrease in surface water resources is due to drought, but also to siltation inherent in deforestation and severe erosion reduces the storage capacity of the dams of 2 to 3% and the decrease in runoff

4. Strategies against drought

Algeria has implemented various strategies against droughts that can be divided into two groups:

- Great work are to improve the hydraulic equipment of the country for the mobilization and storage of water.

- Rural development of water conservation and soil improvement works.

- The organization of institutional structures that fight against drought. These structures have the goal of integrating the risks of "drought" in planning

The authorities have implemented in the early 2000s a water policy with three strategic objectives:

- Improving access to public water services to ensure sustainable Household and Industrial safe water supply quantity sufficient in required quality and at fair and progressive tariffs to better manage demand.

- Strengthening access to public sanitation service to ensure the safety of the living environment and the protection of water ecosystems.

- The development of an efficient irrigated agriculture water to support national food security policy.

The effects of the new water policy (mobilization of conventional and unconventional resource with the desalination of sea water and wastewater reuse) and the major projects implemented during the decade used to ensure coverage of current and future water needs, for a population that will grow by 40 to 50% in 2030 (45 to 50 million), for industrial activities and expanding irrigated agriculture that needs to be expanded and modernized.

Indeed, the changing needs caused by socio-economic development and the need to secure the supply of drinking water need to maximize the mobilization of surface water and groundwater with an expanded use of unconventional resources (desalination, reuse treated wastewater).

These objectives also require rational use of water with a policy of incentives and economic awareness of water and its valuation.

Following the efforts made in the field of water during the last decade, the rate of connection of the urban population to the drinking water public network from 78% in 1999 to 93% in 2010 with an average grant of 168 l / day / person and daily distribution for 70% of the population.

These results were achieved through (i) the realization of many conveyances from dams, transfers and groundwater aquifers (ii) rehabilitation and expansion of water supply networks of cities and (iii) strengthening the management capacity covering both the technical and business functions.

For sanitation, with enlargement of sewerage networks including linear reached 40 000 km, the connection rate of urban population to the public network from 72% in 1999 to 86% in 2010.

Regarding the objective of water resource protection and recovery unconventional resources, a major wastewater treatment plant design program has been initiated in recent years by addressing priority

- Wastewater from settlements upstream dams exploitation and groundwater as well as agglomerations of more than 100 000 people.

- Wastewater from settlements upstream dams under construction or planned.

- Wastewater from coastal areas.

The treatment plants and lagoons park now reached 110 units with a total capacity of about 600 million m3 / year. With projects in realization, the park will reach 205 stations of which 96 lagoons which will increase treatment capacity of 800 million m3 / year. In the medium term, it will reach 1.2 billion m3 / year.

In irrigation, the equipped area in large areas has reached 220 000 hectares, of which 100 000 ha meadows made in the period 2000-2009. Currently, an average of 45 000 ha is actually irrigated because of the resource constraints that will be solved in the coming years with the mobilization of new water resources.

For small and medium irrigation, irrigated area exceeds 900 000 ha mainly from groundwater resources. The hill chosen park includes over 400 works including a hundred made over the period 2000 -2009, to mobilize 50 million m3 and irrigate an area of 10 000 ha.

Regarding the economic awareness of the water, individuals and social groups, fully and without discrimination, access to information and education on issues related to water and, through various channels communication such as commercial agencies technical institutions and services in charge of the management of public water services and call centers.

Legislative and regulatory framework

In Algeria, an important legislative and legal framework for water and the environment was set up in the 80s.

There may be mentioned:

- la loi n° 83-17 du 1er juillet 1983 portant Code des eaux (complétée par l'ordonnance n° 96-l3 de juin 1996)

- la loi n° 83-03 du 5 février 1983 relative à la protection de 1'environnement;
- la loi n° 85-05 du 15 février 1985 relative à la protection et l'amélioration de la santé;
- les lois n° 90-08 du 17 avril 1990 et n° 90-09 du 27 avril 1990 relatives à la commune et à la wilaya et qui définissent les compétences de ces dernières en matière de service public de 1'eau;
- le décret n° 93-160 du 10 juillet 1993 réglementant les rejets d'effluents liquides industriels;
- le décret n° 93-100 du 6 mars 1996 portant définition du bassin hydrographique et fixant le statut type;
- le décret n° 96-301 du 15 septembre 1996 définissant les modalités de tarification de l'eau potable, industrielle et agricole et de l'assainissement, ainsi que les tarifs y afférents;

Bibliography :

- Quatrième rapport national sur la mise en œuvre de la convention sur la diversité biologique au niveau national, Mars 2009, Ministère de l'Aménagement du territoire et de l'Environnement, projet FEM-PNUD, 115 p.
- Seconde Communication Nationale de l'Algérie sur les changements climatiques à la CCNUCC. 2010.- Projet GEF/PNUD N°00039149, 211p.

  DJELLOULI Y. & NEDJRAOUI D., 1996.- Evolution des parcours méditerranéens. *In* Pastoralisme, troupeaux, espaces et société. Hatier ed. 440-454.

  Rapport national de l'Algérie, 2011. -**19ème session de la Commission du Développement Durable des Nations Unies (CDD-19), 42 p.**

  Mohamed SAFAR ZITOUN évaluation des dispositifs d'alerte

  précoce a la sécheresse existants a l'échelle nationale, .-**cas de l'Algérie, OSS n° 82, 40p.**

  Hellal T, Hellal B, Bardadi A, Ayad N., Bensmira Z. 2014.- Incidences de la pluviométrie sur la culture des céréales dans la steppe du sud de la préfecture de Sidi Bel Abbes (Algérie occidentale), European Scientific Journal June, vol.10, No.17, p.364-374.