Agriculture in the Maghreb, what adaptation strategies to climate change?

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Abstract:

With *population growth and the effects of climate change, water resources could become scarce in the coming decades on a global scale. The current rate of water consumption for agricultural purposes is around 65% to 80% depending on the region. As a result, the scarcity of rains and their irregularity have direct repercussions on agriculture and can constitute a real handicap for the development of this sector and other sectors, namely industry and tourism.*

We are trying through this work to point out the potential impacts of climate change on agriculture and water scarcity in the Maghreb and what adaptation strategies are possible?

Keywords: *Climate change, Adaptation Strategies Agriculture, water.*

JEL Classification: Q54, Q10, Q25.

الزراعة في المغرب العربي، ما هي استراتيجيات التكيف مع تغير المناخ؟

ملخص :

مع النمو السكاني وتأثيرات تغير المناخ ، يمكن أن تصبح موارد المياه شحيحة بشكل متزايد في العقود القادمة على نطاق عالمي. المعدل الحالي لاستهلاك المياه للأغراض الزراعية في حدود 65٪ إلى 80٪ حسب المنطقة. ونتيجة لذلك ، فإن ندرة الأمطار وعدم انتظامها لهما تأثير مباشر على الزراعة ويمكن أن يشكل عائقاً حقيقياً أمام تنمية هذا القطاع وقطاعات أخرى ، خاصة الصناعة والسياحة.

نحاول من خلال هذا العمل أن نشير إلى الآثار المحتملة لتغير المناخ على الزراعة وندرة المياه في المغرب الكبير وما هي استراتيجيات التكيف الممكنة؟

الكلمات المفتاحية : تغير المناخ، استراتيجيات التكيف، الزراعة، المياه.

تصنيف JEL : Q54، Q10، Q25 .

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Introduction :

Water resources could become scarce in the coming decades on a global scale. This situation will significantly affect regions with arid to semi-arid climates. Many scientists have claimed that climate change could lead to significant changes threatening human existence on the planet.

According to experts from the Intergovernmental Panel on Climate Change (IPCC), climate change can be defined as any lasting change (from decades to millennia) in climate parameters, whether due to natural variability or to human activity (IPCC, 2007) . This definition differs from that proposed in the United Nations Framework Convention on Climate Change (UNFCCC), which states that "climate change" is "changes in climate which are attributed directly or indirectly to human activity altering the composition of the earth. the global atmosphere and which are in addition to the natural variability of the climate observed during comparable periods. "

Globally, statistics show that during the 20th century the earth warmed by 0.76 ° C. Meteorological data for North Africa indicate that global warming is more accentuated in this region compared to the world average. Indeed, the increase in temperatures in the 20th century relative to North Africa was between 1.5 and 2 ° C depending on the region, and the decrease in precipitation is estimated between 10 and 20%. This shows that the countries of North Africa will bear the impacts of climate change more than other regions .

What is certain is the physical organization of societies which would undergo profound changes. As with any new socio-economic phenomenon, it is necessary to reflect on the new distribution of wealth.

Regarding our subject, the Maghreb region and more precisely the Mediterranean, “ the climate forecasts for the coming decades are particularly unfavorable there, because of the consequences of the“ greenhouse effect ”. The summer drought, a major characteristic of the Mediterranean-type climate, will undoubtedly extend to a large part of the year. In the Maghreb as in the Middle East, the worsening of aridity will have the effect of imposing semi-desert climatic conditions ” (Lacoste, 2009) , there will probably be no water war since there will be no water war. There are no large cross-border rivers, but aridity constitutes, according to specialists, the most serious threat because it can lead to friction relating to “ climate refugees ”.

In the light of this approach we propose to point out the potential impacts of climate change on water above all, on agriculture then the consequences that will constitute migration and the fundamental question of national security in this common space.

Among the four“ constellations of conflict caused by climate ” according to the scientific advisory board of the German federal government namely ; The degradation of water resources, that of agricultural production, the increase in cyclones and floods and migration ; the Maghreb region, especially Algeria, would be affected mainly by the latter.

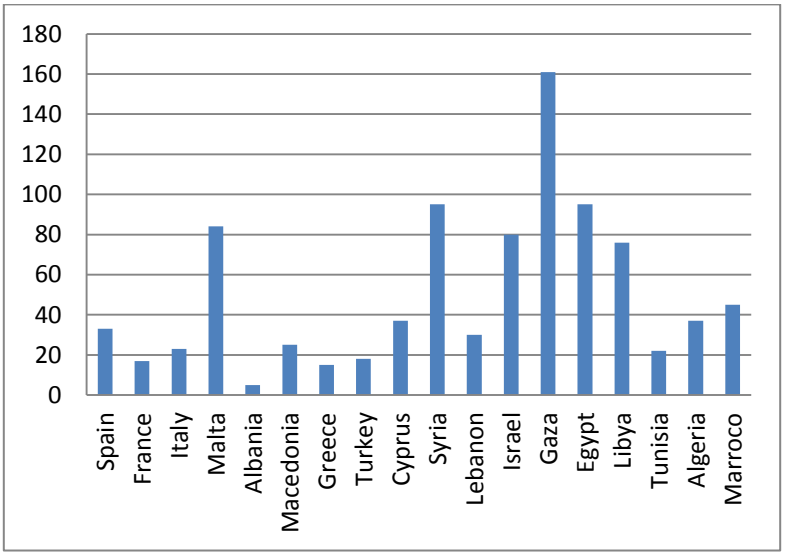
This work will focus on the analysis of these elements and their possible impact on the following points:

1- The scarcity or exhaustion of fresh water reserves would be at what level of threat ?
2- In a warming world, what would be the agricultural loss ?
3- What are the axes of adaptation to change climatic?

The question of water : In the Mediterranean countries, water resources are posed above all as a constraint on economic and social activity. The gap between a potential available in water resources and the evolution of demand is growing , which can lead to a deterioration in quality. This requires the implementation of management policies for this resource, particularly in agriculture that consumes a lot of water.

The scenarios that address this issue in the Mediterranean region consider that it is one of the most vulnerable regions taking into account the population density, the extreme concentration of economic activity in the coastal areas all around. of this " lake ". During the 20th century, temperatures would have risen by 1.5 ° to 4 ° c depending on the region including that of the Maghreb. There is even talk of a change in marine flora and fauna. This seems obvious when you consider the water pollution that cause the urbanization s not mastered s and industrial discharges.

Moreover, the WEI (Water index exploitation) by country which compares the percentage of renewal of the resource compared to the level of exploitation in progress indicates the alert rating insofar as consumption exceeds the level of renewal, we consume therefore a non-renewable resource.



Source : (Eugenia Ferragina, 2008)

Figure (1) : Exploitation Index of renewable water ressources (%)

This water scarcity has led each country to invest heavily in order to increase and diversify the possibilities of access to the resource by using the most appropriate technologies, including in the desalination of seawater which comes from unconventional water. just like the reprocessing of wastewater.

Water resources are vulnerable to climatic variations. Water and its management are problems conditioning the future of the Maghreb countries, climate change could place

these countries, in particular Algeria, in uncomfortable situations since the maximum volume of water that can be mobilized would be in deficit by 2020. In addition, the nature of the sloping land, the fragility of the plant cover, the lack of afforestation and urbanization upstream of the dams generate strong erosion which reduces the storage capacity of the dams by 2 to 3% each year, due to siltation due to the transport and deposition of sediment by rainwater. Currently in Algeria, 14 dams out of the sixty that exist are silted up (NICHENE M., 2015) .

Climate-related events have a huge impact on society as they affect food supplies, living conditions, as well as access to clean water and energy. For example, a recent report from (Climate Action Network Australia) predicts that climate change may reduce precipitation in grassland areas, which could lead to a 15% decrease in rainfall. forage production. In turn, this could result in a 12% reduction in average cattle weight, significantly reducing the supply of beef. Under such conditions, it is predicted that dairy cows will produce 30% less milk and that new parasites are likely to spread to fruit growing areas. In addition, such conditions are predicted to result in a 10% decrease in drinking water.

The process of climate change will result in a northward shift of the Mediterranean bioclimatic stages, leading to a rise in arid and desert areas, particularly in the Maghreb region. Studies predict a drop in agricultural yields in the Maghreb ; the increase in temperatures and their variability implies a delay and reduction in growth periods, as well as an acceleration of soil degradation and loss of productive land. Algeria anticipates average reductions in cereal yields of 5.7% to nearly 14%. Climate change will also affect the production of vegetables, whose yields would decrease by 10 to 30% by 2030 (Chabane, 2012) . For its part, Morocco anticipates a drop in cereal yield from 10% in a normal year to nearly 50% in a dry year by 20 3 0, and a drop in vegetable yield to nearly 40%.

A new approach to resource management is required in all areas and at the level of each sector, in particular agriculture, which is estimated to receive 80% of water availability for losses equivalent to 50% in the Mediterranean and especially in the south, the question of supply of basic agricultural and food products is far from meeting the ever increasing demand . It is foreign trade which faces this shortage except for a few countries such as France or Turkey.

The Maghreb and the Middle East are heavily dependent on imports of cereals, dairy products, sugar, and oils. In terms of production, yields remain low. The deficit is therefore enormous between growing consumption, stagnant production at best, and ever increasing imports. A public policy is essential especially since it is to be noted that the intensive productivist system extends only to the fifth of the cultivable surfaces.

Climate change is in fact amplifying the faults of agriculture. " Climate change accentuates the water deficits undergone by agriculture, and particularly rainfed crops which cover most of the arable land in Algeria " (Bessaoud, July 21 to 27, 2008) .

Taking charge of this aspect is not easy and requires considerable budgetary envelopes for the mobilization of technical and scientific resources in human and material terms.

1. What adaptation policies?

The solutions to these problems can only be global, experts from the IPCC (Intergovernmental Panel on Climate Change) believe that the peak in global greenhouse gas emissions should be before 2020. They should drop thereafter until 2050 to reach half of their 1990 level. It is on this condition that the increase in the temperature of the planet will be less than or equal to 2 ° while everything else remaining equal, it will rise at least 4 ° (Supiot, 2008) . These forecasts in fact provide the horizon for the implementation of policies to be implemented.

As far as the stakes are concerned, the question is more delicate ;

- The threat is global, there is hardly any loser or winner from the imbalance of biosphere regulations.
- 80% of accumulated emissions are due to developed countries and collectively they continue to be the main polluters.
- According to experts, the countries of the North will be less affected than those of the South during the first decades of the century by climate changes in the direction of sea currents, ocean acidification, drinking water shortages, extreme weather events, change in rainfall patterns ...
- Does the weakness of many States enable them to face the social consequences of an environmental upheaval?
- Will there be sufficient possibilities for humanitarian interventions in the event of an explosion of disasters ?

There is obviously a double question :

- The need for cooperation.
- Equity and justice in the face of common peril and therefore equity in the financing of programs. Solutions and resources highlight a pressing need for adaptation as defined by the IPCC " the adjustment of natural or human systems in reaction to climatic stimuli (current or expected) or their effects, reducing damage or exploiting them. earning opportunities (Easterbrook, 2007) .

Adaptation appears to be an important issue insofar as many options could significantly reduce the damage of climate change. While it is possible to draw up lists of measures that minimize impacts, questions about the processes by which they might become effective remain unresolved. The measures taken will be at two levels: on the one hand, autonomous adaptation, decided and implemented by private agents at farm level, and on the other, adaptation policies, carried out by public bodies.

Adapting to rapid change is a new challenge. Studies show good adaptability to changes in long-term average conditions, but much more limited success in the face of variability and rapid changes in climate. In the case of the Maghreb, the droughts of the last 20 years corroborate this aspect: few actions capable of limiting the risks have been put in place by the farmers and the impacts have been considerable. Autonomous adaptation is

therefore likely to be insufficient. First, many options require planned actions on the part of state bodies. Then, if some could be taken at the individual level, the means available to private agents and their capacity to adapt will probably be insufficient. Finally, autonomous adaptation will be above all reactive, leading to more costly adaptation trajectories than anticipatory strategies based on a structured understanding of medium and long-term modifications of bioclimatic conditions.

It is important here to mention the Albian aquifer that lies largely in the S ahara Algerian and that can save the fate of agriculture not only in Algeria but in the Grand Maghreb, it is the largest reserve of freshwater to the world. It contains more than 50,000 billion cubic meters of fresh water, the equivalent of 50,000 times the " Beni Haroun " dam which is located in the east of the country and which supplies six neighboring wilayas. This water is the result of the accumulation which took place during the humid periods which followed one another for 1 million years.

The water table extends over an area almost twice the size of France, between Libya, Tunisia and mostly Algeria. The territorial distribution is estimated at for Algeria : 70%, for Libya : 20% and finally for Tunisia : 10% . (The Albian tablecloth. Algeria. Wikipedia free encyclopedia) .

Source : (wikipedia, 2019)

Figure (2) : Aquifer system of the northern Sahara.

In a report from the General Council for Food, Agriculture and Rural Areas (CGAAER), made public on July 21 , 2017, this council warns of the heavy impacts of climate change on water in agriculture (status scenario quo) and highlights the mobilization of actors in the field to " move the lines ". The development of water resources, the improvement of irrigation efficiency and the adaptation of cropping systems are among the possible solutions. Among the solutions proposed by the (CGAAER) ; The **storage of part of the winter surpluses** for postponement of use to periods of deficit in order to meet new

needs (public financial support for water storage and sustainable irrigation must be taken into account by development policies. agricultural and rural), storing 4 % of annual runoff would avoid the predicted droughts, meet agricultural needs and gain competitiveness, estimates the CGAAER. The **pumping in rivers or abundant resources tablecloths and surplus rivers transfers to being deficient water** can be another solution. **Promoting precision irrigation** can also improve the efficiency of water supplies. Finally, **a new societal dialogue** and the promotion of a green economy approach remain necessary.

Conclusion :

To prepare for such climate changes, we must first improve climate prediction models. Research should be done to make predictions about climate change more reliable. Safe strategies should be identified and implemented to ensure reliable access to food and water supplies to ensure national security. A set of adaptive measures should be put in place to respond to and prepare for inevitable climate-induced events, such as mass migration, disease and epidemics, shortages of food and water. Science may allow us to better predict the consequences of climate change. In this perspective, the countries of the world and especially the Maghreb will have to take urgent measures to prevent and mitigate some of the most important impacts. Diplomatic action will be necessary to minimize the likelihood of conflict, however, massive population movements are inevitable. Learning to control these populations, the tensions that arise at borders and the resulting refugees, will become essential.

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