

Review

Cereals, the Key to North African Food Security

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Abstract: Agriculture plays a fundamental role for the economies of North African countries, in the development of territories and the fight against poverty. The region faces a cereal deficit and their supply of this material is highly dependent on international markets. During 1990-2010, the volume of agricultural imports tripled for North African countries. National cereal production remains insufficient to meet the growing needs of the population. Productivity remains limited by many constraints and imports of agricultural products will continue to play a key role in food security. Among the factors involved, climate change is responsible for drought and floods, uncertainty and weakness of international agricultural product markets in supplying national markets, and rising food prices. Regional trade and international cooperation, despite little development between this region and the industrial agri-food world, could ensure temporary food security for North Africa and benefit from the complementarity of their agriculture and industries. North African countries should favor an approach to global and plural food security. Such an approach will integrate the objectives of agricultural development, the fight against poverty, sustainable management of water resources and soils, and adaptation to climate change.

Keywords: agriculture; North Africa; cereal deficit; food security; climate change; sustainable management.

1. Introduction

The production of cereals, the main food of a major part of the world's population, draws areas of civilizations revealed by eating habits. key to self-sufficiency or a stake in a race for yield and export, cereal production is an indicator of the level of development and the ability to overcome production problems.

2. History of the world cereal level

Cereal production does not cover the needs of developing countries due to several factors such as insufficient mechanization and irrigation, and underuse of fertilizers which would weigh heavily on the volume of production. Improving yields was a key challenge that farmers in Africa, for example, could not meet. The annual growth rate of cereal yields in West Africa was 1.1% from 1960 to 1970 and 1.86 % from 1970 to 1984 against 6.4 % and 6.36 % in East Asia and the Pacific while experiencing strong population growth [1]. The use of a distribution network and market regulation mechanisms was necessary in the fight against malnutrition. Thus India, the world's fourth largest producer, succeeds in filling its granaries without solving its food problems. USSR, Russia now, faced serious transportation and storage problems. In addition to the difficulties encountered by these

countries, there were also the vagaries of the weather which weighed heavily on cereal production by causing dramatic drops in production. The drought in Africa which affected eight countries (Angola, Benin, Botswana, Ethiopia, Malawi, Mozambique, Niger, and Chad) prompted these countries to resort to increased food aid in 1988, other examples; weak monsoons in India in 1987, and overly wet growing season in Kazakhstan. To deal with these cereal deficits, the countries did not provide the same answers: India sought to increase yields by helping farmers buy fertilizers and seeds and by facilitating access to water sources and electricity, Russia preferred to import wheat, taking advantage of low prices and competition between producing countries. North America and Europe had on the contrary developed a high-yield, scientific agriculture (creation of new varieties of cereals) which is based on an efficient marketing network [1]. Their difficulties are different from those of developing countries (stock limitation policy, commercial struggle for the sale of surpluses), but the bad weather of 1988 (drought in the United States, Canada, and China) and the overexploitation of soils which sharply reduced cereal surfaces each year no longer sheltered them: for world agriculture, stocks had fallen since 1988 by 111 million tonnes and production by 57 million [1].

3. Food security in North Africa

In a critical situation marked by climate change, the economic and financial crisis, and the volatility of agricultural and energy prices, the countries of North Africa face a challenge which is to ensure their food security becomes an essential strategic issue. Since 2008, the North African region has experienced events marked by a succession of political crises and social protest movements. These facts have led to food riots illustrated by the anger of the population against soaring food prices, the low purchasing power of households, and increased unemployment among young people. The armed conflict in Libya has led to massive population displacements inside and outside the country, with serious implications for food security in this region [2]. Heavily dependent on imports of basic food products, in particular cereals, countries are facing a dizzying increase in their food import bill, which further widens the imbalance in the agricultural and agri-food trade balance. Improving agricultural production and accessibility to food are central issues of public policy in North African countries.

4. Overview of agriculture and main constraints

Agriculture is a fundamental pillar of the economies of North Africa and has a considerable social dimension. The agricultural sector employs 30% of the total active population and is the main source of income and employment for 75 to 80% of the rural population. It also plays an important role in territorial development and the food security of populations. Despite the development of irrigation systems, agriculture has remained essentially rainfed and uncompetitive. The total of irrigated land concerning total cultivated land varies between 7 and 18 %, except in Egypt where nearly 95 % of cultivated land is irrigated by the Nile [3] as well as in Libya where 50 % of cereal production comes from irrigated agriculture. In Mauritania, it is low (10.61% of arable land). Cereal farming occupies approximately 70-80 % of the useful agricultural surface in the countries and is practiced by most farmers (more than 60 %). Cereal yields are currently half of the world's average yields, and this gap continues to grow. The rate of cultivated land (in hectares) under irrigation is greater than that of cultivated land under rainfed conditions. This lack of productivity is explained

by insufficient investment, particularly in agricultural research. In general, the innovation, training, and supervision mechanisms remain very weak.

The multiplicity of risks facing the agricultural sector is mainly climatic, phytosanitary, environmental, and operational. these risks have not been able to favor private investments and have led to heavy indebtedness of small farmers. The agricultural insurance sector is still very underdeveloped in the countries of the region. Algeria has set up drought insurance oriented towards strategic crops such as cereals [4]. In 2011, Morocco launched a strategic study on “risk management and the establishment of an insurance system agricultural. according to several studies, agricultural risk currently represents 26 % of overall production and is concentrated at the rate of 50 % in the cereal sector and 30 % in the fruit and vegetable sector. Agro-industry remains insufficiently developed because of the potential benefits for growth and employment. Regional trade between the countries remains very underdeveloped despite the various discussions between the Maghreb countries on the importance of cooperation and the development of trade.

5. Cereal production deficit and growing dependence

Cereals are the staple diet in North African countries and are considered strategic in the food security of populations. Among the cereals, wheat (common wheat and durum wheat) occupies an important place in the diet of this region and represents more than 50 % of the energy intake of the food ration. cereals represent the main production of agriculture and occupy more than 50 % of cultivated land. The region is experiencing a grain deficit and its supply of basic foodstuffs relies heavily on international markets. The region accounts for 16 to 17 % of world wheat imports, of which 13 to 15 % are due to only three countries (Algeria, Egypt, and Morocco with 6-7 % of world imports), namely Egypt is the first importer of wheat in the world and 10 to 12 % of corn.

According to the FAO, this dependence should increase over the next few years due to population growth and the productivity deficit. All the countries of North Africa will remain potential cereal importers until 2030. Global economic models predict that consumption of cereals and meat in the countries of this region will continue to exceed production, leading to an increasing dependence on food imports [5]. This situation also highlights the limits of the policies implemented over the past two decades to control and reduce countries' food dependence. Cereal production is subject to the combined influence of climatic variations, limited arable land and water resources, low growth in cereal yields, and high production costs. Cereal production experiences annual variations that can be very significant depending on climatic conditions (Table 1).

Table 1. Evolution of cereal production by country (in thousands of tons) [6].

Countries / Years	2005	2006	2007	2008	2009	2010	2011
Algeria (wheat, corn)	3525	4012	4100	1900	6120	4550	4245
Morocco (wheat, barley, corn)	4270	9227	2496	5322	10154	7463	8400
Mauritania (rice, sorghum, corn)	146,665	104,475	127,145	154,785	148,159	175,443	120,000
Tunisia (wheat, Barley, Triticale)	2097	1610,3	1988,4	1188	2533,6	1079,6	2000
Egypt (wheat, corn, rice)	22411	22503	21565	22835	23897	-	-

During the period analyzed (2005-2011), production levels did not change significantly. Only Egypt, thanks to irrigation and intensification (yield of 7-8T/ha), benefits from a much more regular production from one year to the next. Mauritania is struggling to exploit its potential in cultivable agricultural land due to a lack of adequate infrastructure. Libya has only 5 % of arable land (Figure 1).

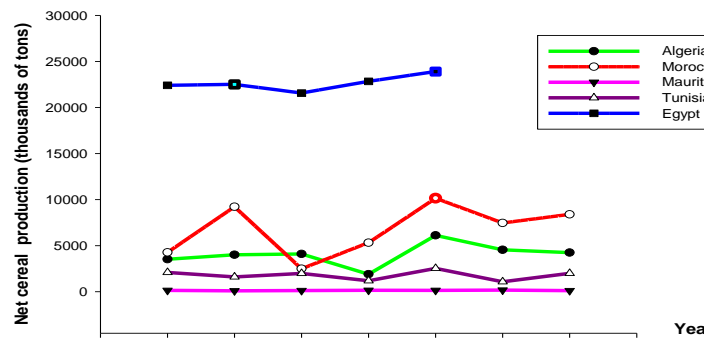


Figure 1. Net cereal production by country.

Favorable climatic conditions in 2008 largely contributed to the record cereal production obtained for the 2008/2009 crop year in most countries. Thus, in Algeria, the record production of 2009 enabled a substantial reduction in the import bill, which went from 3.5 billion USD in 2008 to 1.5 billion USD in 2009. Conversely, the severe drought of 2009 strongly impacted 2009/2010 production in Tunisia and Morocco with a respective drop of 24 % for Morocco and 46 % for Tunisia. The coverage of cereal needs by national production can vary considerably from year to year. In an average year, it stands at 30 % for Mauritania, 40 % for Tunisia, 60 % for Morocco and Egypt, 30-35 % for Algeria, and would reach less than 10 % for Libya [6,7]. The exceptional production of 2009 made it possible to achieve a coverage rate of cereal needs of 91% in Morocco, 56% in Tunisia, and 26.5% in Mauritania. In all countries, national cereal production remains insufficient to meet the needs of the population, which are estimated on average at between 200 and 210 kg/year/inhabitant (Algeria, Morocco, Egypt), knowing that the world average is around 152 kg/year/inhabitant.

6. Conclusion

North African countries face significant challenges in terms of cereal independence, i.e. their ability to produce enough cereals (barley, wheat, and corn) to meet domestic demand and reduce their dependence on grain imports. The main countries in this region that face this challenge are Algeria, Morocco, Tunisia, Libya, and Egypt. Here are some of the challenges they are facing:

1. *Import Dependence:* Historically, North African countries have depended on grain imports to meet a significant portion of their food needs. This exposes them to fluctuations in world grain prices and possible shortages in the international market.
2. *Vulnerability to climate change:* The region is prone to extreme weather conditions, including recurrent droughts and variations in rainfall. These climatic changes can lead to disruptions in agricultural production and affect cereal yields.

3. *Demographic pressure*: Rapid population growth in some North African countries is putting additional pressure on agricultural resources and the demand for cereals. An increase in food demand may be difficult to meet at current production levels.

4. *Water resource management*: Water is a critical resource for agriculture, and some countries in the region face problems of water scarcity and poor water management. Limited water availability can hamper grain production.

5. *Modernization of agriculture*: Some agriculture in the region is still based on traditional practices, which limits yields and productivity. Modernization of agriculture, including the introduction of advanced agricultural technologies, is needed to improve cereal production [8].

North African countries will have to face these challenges while seeking to strengthen their agriculture, increase productivity, and invest in modern agricultural infrastructure. This can include promoting efficient irrigation, researching cereal varieties that are more resilient to local conditions, training farmers, and adopting sustainable farming practices [9,10].

In addition, regional cooperation can play a crucial role in facilitating the exchange of knowledge, agricultural technologies, and resources to strengthen the region's cereal independence.

Conflicts of Interest: The authors declare no conflict of interest.

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