

## Agricultural Resources and Food Security in Arab Maghreb Countries

الموارد الزراعية والأمن الغذائي في بلدان المغرب العربي

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*Received: 12/01/2019*

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*Accepted: 22/11/2019*

**الملخص:** يهدف هذا البحث إلى تحليل وضع الأمن الغذائي في البلدان المغاربية خلال الفترة 2005-2015 ، من خلال تحليل مؤشرات الموارد الزراعية وكمية إنتاج المنتجات الغذائية النباتية والحيوانية والسمكية ، و تحليل الفجوة الغذائية والاكتفاء الذاتي. وتوصلت الدراسة إلى أن البلدان المغاربية لا تزال تعاني من أزمة الغذاء ، وهذا يعني استمرار الاعتماد على الخارج ، على الرغم من توافر الإمكانيات الطبيعية والبشرية لتمكينهم من تحقيق الأمن الغذائي.

**الكلمات المفتاحية:** الاقتصاد الزراعي ، الموارد الطبيعية ، الأمن الغذائي ، العجز الغذائي ، البلدان المغاربية.

**Abstract:** This study aims to analyze the food security situation in the Maghreb countries during the period 2005-2015, through analysis of the indicators of agricultural resources, as well as the quantity of major food commodities production (plant, animal and fish products), food gap analysis and self-sufficiency ratio, the most important result of this study is that the Maghreb countries are still suffering from the food crisis, namely the continuation of external dependency, despite the availability of the natural and human potential to achieve food security.

**Key words:** Agricultural Economics, Natural Resources, food security, food gap, Maghreb countries.

**JEL Classification:** Q11, Q18.

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**Introduction:**

The Arab Maghreb countries, like other Arab countries, are suffering from the problem of food insecurity in various forms, which has resulted in a decrease in the average per capita food required for its activity and health, despite domestic and regional efforts to provide commodities and food products to the population, such as grains, oils, sugar, vegetables, fruits, dairy, meat, fish, etc, due to a combination of factors and determinants in the quantities of agricultural production and the size of the food gap in the Maghreb countries, namely, the limited cultivated area, the scarcity of water resources, the low efficiency of irrigation and the limited irrigated area.

In addition to the agricultural technology gap, which reflected in the agricultural research output do not meet the requirements of agricultural development, and the low productivity of crops and livestock.

Therefore, increasing the production of agricultural crops to meet local food consumption needs is one of the major components for food security.

Most of the Maghreb countries have been able to achieve sufficiency and export surpluses in some food commodities such as vegetables and fish. Although there has been an increase in the production of cereals and other crops, the value of the gap for major food commodities has continued to rise, and the deficit has continued in a number of major crops, where the Maghreb countries import about 62% of their cereal needs, 78% of vegetable oils and more than 90% of sugar. These goods constituted about 76% of the value of the major food commodity gap in 2014.

So, the following question can be posed: Did the Maghreb countries achieve food security in light of the agricultural potential they possess?

Through this research, we aim to analyze the most important criteria and indicators used to determine the level and situations of food security of the Maghreb countries by addressing:

- Agricultural resources of Maghreb countries.
- Production of major food commodities in the Maghreb countries.
- Foreign trade of major food commodities.
- food consumption in Maghreb countries.
- Food gap and self-sufficiency ratio of major food commodities.

**1. Agricultural resources of Maghreb countries:****1-1. Land resources:**

The land and cultivated areas in the Maghreb are mainly concentrated in the northern regions surrounding the southern Mediterranean, as well as in the areas bordering the Atlantic Ocean in Morocco and Mauritania.

The area cultivated in the Maghreb states is estimated at 25.83 million hectares, or 4.30% of the geographical area of the Maghreb, 22.6% of the agricultural area is cultivated with sustainable crops and 53.4% in seasonal crops, while the area left behind has decreased In 2014 to 20.1% from about 24% in 2012, forest and pasture occupy about 3.1%, 19.1% of the Maghreb geographical area (Arab organization for agricultural development AOAD, 2015).

## **1-2. Water resources:**

The Maghreb states face a severe scarcity of water sources, which are subject to considerable pressure and depletion, with the vast majority of their lands spreading across arid and semi-arid climatic zones, and renewable water volumes are limited, irregular and barely absent in desert areas.

The climate of the Maghreb is characterized by fluctuations, low and erratic annual precipitation, and the severity of the drought is sometimes so severe that it leads to serious economic, social and environmental disasters, with the rate of precipitation varying between 350-1500 millimeters in the northern and highland areas and between 50-350 mm in the steppe and semi-desert regions, and less than 50 mm in desert areas.

The volume of surface water resources (rivers, dams and valleys) was about 40.4 billion m<sup>3</sup>/year, while groundwater was estimated to be about 920 billion m<sup>3</sup>, with important reservoirs in the common desert between Algeria, Tunisia and Libya that contain important water stocks and have a renewable volume of annually 17 billion m<sup>3</sup>, of which about 15 billion are used, and these reservoirs are located at the Atlas Mountains in Tunisia, Algeria and Morocco.

The per capita annual internal renewable water in Maghreb has declined to 892 m<sup>3</sup> in 2014, compared with 1513 m<sup>3</sup> in 1992, due to climate change, the warming of the Earth, the scarcity of rainfall, population growth and environmental degradation, which is less than the world average of 1000 m<sup>3</sup> per capita. Considering that North Africa is one of the regions that will face a sharp decline in water resources by 2050 (FAO, 2015).

## **1-3. Human resources and agricultural labor:**

The total population of the Maghreb, estimated to be more than 95 million people in 2015, the rural population reached 32%. Below the world average of 47%, compared to 67% in 1960 (worldbank, 2016), this ratio is steadily decreasing as a result of rural-urban migration owing to the slow and weak development plans in rural areas, as well as low income levels for rural and agricultural populations.

The agricultural labor is also one of the main factors of production in agricultural development in the Maghreb countries, accounting for 26.5% of the total labor force in 2014, which is 39.20% and 49.43% in Morocco and Mauritania, and is only 22% and 19% in Algeria and Tunisia, below it in Libya by 2.4% (Arab organization for agricultural development AOAD, 2015).

## **2. Production of major food commodities in Maghreb countries:**

The plant, animal and fish production sectors provide quantities of food commodities available to the Maghreb consumer, and the availability of these goods varies from one state to another.

### **2-1. Plant production:**

Cereals are one of the most important food crops in the Maghreb countries; its production in the main Maghreb countries (Algeria, Tunisia and Morocco) in 2015 is estimated to be 16.7 million tons, an increase of 68.5% compared to 2005.

**Table 01: cereals production in the main Maghreb countries 2007-2015**

Area: 1000 Ha Yield: Kg/Ha Production: 1000MT

Country	2005		2007-2012			2014		2015		
	prod	area	yield	prod	area	yield	prod	area	yield	prod
<b>Algeria</b>	3527.44	2854,16	1551	4452,94	2509	1370	3435.2	2686.08	1400	<b>3760.95</b>
<b>Tunisia</b>	2118.90	1365.88	1495	2036,7	1242	1840	2285.5	1188.50	1150	<b>1366.59</b>
<b>Morocco</b>	4269.63	4837,41	1273	6000,14	4750.2	2082	9889.2	6317.33	1834	<b>11589.11</b>
<b>Total</b>	<b>9915,97</b>	<b>9057,41</b>	<b>1440</b>	<b>12489,75</b>	<b>8501.2</b>	<b>1763</b>	<b>14509</b>	<b>10191,91</b>	<b>1461</b>	<b>16716,65</b>

Source: AOAD, Arab agricultural statistics yearbook, vol. N° 28-35-36.

We note that cereal production has been characterized by varying fluctuations and growth rates from year to year, due to climate-specific vulnerability to prevailing temperatures, fluctuating rainfall times and quantities, and the degree of dependence on irrigation from dams, rivers and groundwater...

The average cereal productivity increased from 14.4 quintals / ha in the average period 2007-2012 to 17.60 quintals per hectare in 2014, although the observed improvement is still below the world average of around 36 quintals per hectare in 2012. Morocco contributes the largest share of wheat production by 56.4%, followed by Algeria with 26.7%, Tunisia 16.7%.

Almost the same for other grain types, such as rice, barley and maize, which are still not sufficient to meet the needs for fodder, in addition to Rice, which is concentrated in Mauritania and Morocco, with a production volume of about 215 thousand and 33 thousand tons in 2015, respectively.

**Table2: Main crop groups production in the main Maghreb countries 2007-2015**

Crops	Production -1000 tones-				
	2005	Average 2007-2011	2013	2015	Change rate 2005- 2015
<b>Cereals</b>	9915.97	12155.19	16428.4	16716,65	68.58%
<b>Potatoes</b>	3995,05	4611	6794,5	6753,36	69.04%
<b>Oil seed</b>	1815,44	2229.74	2618.51	3388,23	86.63%
<b>Vegetables</b>	10964,67	15484.77	19370.81	20624,63	88.10%
<b>Fruits</b>	6412,87	8970.01	9707.93	9646,69	50.42%
<b>Sugar crops</b>	4570.5	4008.25	3184.25	3502,65	(23.63%)
<b>Pulses</b>	<b>362,52</b>	<b>388.91</b>	<b>468.02</b>	<b>443</b>	<b>22.2%</b>

Source: AOAD, Arab agricultural statistics yearbook, vol. N° 28-35-36.

From the table above we show the significant increase in the production of vegetables, potatoes in 2015 at rates of 88% and 69% compared to 2005, which is due to its export significance, which has increased interest in Maghreb countries, which have been able to achieve high rates of self-sufficiency.

Fruit production also increased by a half in 2015 compared to the same period, with dates, oranges, grapes and apples being considered as important and strategic fruits especially in Algeria and Tunisia.

The oil seeds of olive basically, groundnut and sunflower have been produced with a significant increase of 86.6% in 2015 compared to 2005; Morocco and Tunisia are the leading producers, especially olive due to its large export value.

### 2-2. Livestock, poultry and fish production:

Animal Products (red and white meat, dairy products, eggs) and fish are an important source of animal protein in the Maghreb countries. The number of livestock in 2015 is estimated at 107 million head, most of these livestock are raised in the traditional and mobile pastoral system, with low productivity of meat and dairy.

**Table3: production evolution of animal and fishery products in Maghreb countries**

Unit: 1000 tons

Product	2005	2007-2011	2013	2015	Change rate 2005-2015
<b>Red meat</b>	935.02	1092.4	1143,52	1158,63	23.9%
<b>Poultry meat</b>	714.77	958.46	1334.66	1466,56	105.18%
<b>Fish</b>	1942.95	2198.4	2135.53	2255,12	16.06%
<b>Eggs</b>	448.37	587.66	810.05	796,21	77.57%
<b>Milk &amp; derivatives</b>	<b>4754.11</b>	<b>6137.51</b>	<b>7421.50</b>	<b>8179,1</b>	<b>72.04%</b>

Source: AOAD, Arab agricultural statistics yearbook, vol. N° 28-35-36.

Despite the livestock development programs pursued by the Maghreb countries, the growth of red meat production is still enough, by 1.16 million tones in 2015 with a growth rate of 23.9% compared to 2005, as well as the well growth of milk production and its derivatives, which stabilized at 8.2 million tons during o period as shown in table3.

The Maghreb countries also made a major breakthrough in white meat production compared to red meat, Algeria and Morocco achieved self-sufficiency, increasing by 105% in 2015 compared to 2005.

Fish is one of the main export commodities in some Maghreb countries, mainly in Morocco and Mauritania, producing about 2.25 million tons in 2015, a slight increase over 2005 production.

Therefore, the Maghreb countries, especially Tunisia, Algeria and Libya, should make more efforts to increase fish production, develop fish and conserve fish stocks.

### 3. Foreign trade of major food commodities:

Foreign trade is integrated with the food production sector in the provision of food in the Maghreb countries, which export food goods that have a comparative and competitive advantage in their production, and in return import basic food commodities to cover their production deficits, as well as food commodities and products Other, as shown in the following table:

**Table 5: Exports and imports of major food commodity groups in Maghreb countries**

Unit: Billion Dollars

Years	2007-2011	2013	2014	2015
<b>Total Exports</b>	<b>132.2</b>	<b>151.30</b>	<b>149.5</b>	<b>124.55</b>
<b>Agricultural exports</b>	5.98	8.50	7.98	<b>8.01</b>
<b>Food exports</b>	4.25	6.10	5.61	<b>4.50</b>
<b>Total imports</b>	<b>115.71</b>	<b>148.33</b>	<b>153.15</b>	<b>140.08</b>
<b>Agricultural imports</b>	17.02	29.26	31.12	<b>22.71</b>
<b>Food imports</b>	12.53	17.61	18.45	<b>11.91</b>
<b>Agricultural trade balance deficit</b>	<b>11.04</b>	<b>20.76</b>	<b>23.14</b>	<b>15,53</b>
<b>Ratio of exports to agricultural imports %</b>	35.13	29.05	25.64	<b>35.27</b>
<b>Trade Balance Deficit of Food Commodities</b>	<b>8.28</b>	<b>11.58</b>	<b>12.84</b>	<b>7,41</b>

Source: AOAD, Arab agricultural statistics yearbook, vol. N° 35-36.

From the above table, agricultural exports in 2015 increased in most of the Maghreb countries, amounting to about 8 billion \$, compared to about \$6 billion \$ during the 2007-2011 average, especially in Algeria where there was a significant increase and about 258% in the same period.

Despite the improvement in agricultural exports, agricultural imports increased more rapidly than exports, reaching 31.12 billion dollar, then declining to 22.71 billion dollar in 2015 (which is mainly due to the decline in agricultural imports in Algeria by about 8 billion dollars as a result of import restrictions due to the decline in oil revenues) compared with 17.02 billion dollars in the average period 2007-2011, which exacerbated the food deficit, which was confirmed by most studies and forecasts before the food crisis of 2008, which is generally due to the decline in production and increased demand for food.

Food exports represent 56.2% of total agricultural exports in 2015, which was about 70% in previous years because of the increasing in domestic demand for food in these countries, while food imports represent around 60% of total agricultural imports during the period 2007-2015 in the Maghreb.

The foreign trade of food commodities stood at about 16.4 b\$ ,24 b\$ in 2015,2014 respectively, with exports contributing about 4.5 billion dollars, or 27.4 percent in 2015, also the food balance deficit rose from 8.28 billion dollars in the average period of 2007-2011 to 12.84 billion dollars in 2014. Then records a decline to 8 billion \$ due to the decline in agricultural imports generally.

Food exports also have improved especially in the main Maghreb countries producing vegetables, fruits and natural oils, which amounted to 4.5 billion dollars in 2015 compared to 4.2 billion dollars in the average period 2007-2011, and the value of food imports, especially grain, flour, pulses, dairy products and raw sugar to 11.91 billion dollars, after reaching a maximum in 2014 by 18.45 billion dollars, Which is generally due to lower global food prices because of shrinking demand and increased supply.

#### 4. Food Consumption in Maghreb country:

The availability for consumption of food commodities is mainly the quantities produced domestically in Maghreb countries from those goods plus imported quantities, minus the quantities exported, plus the change in storage quantities.

Consumption of food commodities in the Arab Maghreb rose by 14.5% to 101 million tons in 2014 compared with the average period of 2009-2012. The grain group accounts for about 40% of the total consumption of foodstuffs, followed by vegetables, dairy products and derivatives. Fruits

The availability for consumption of food commodities in the Maghreb increased by 18.65% to about 104.75 million tones in 2015 as compared to the average period 2009-2012, the cereals groups represent about 40% of the total food available for consumption, followed by vegetables, dairy products and fruits.

**Table 5: Available for consumption in Maghreb country 2009-2015**

Unit: 1000 tones.

Commodities	Avrge 2009-2012	2014	2015
Cereals	34401.16	39691.31	42839,34
Potatoes	6024.40	7581.79	7189,07
Pulses	733.72	754.09	770,15
Vegetables	18222.75	19830.95	20850,47
Fruits	8356.07	9870.62	9897,91
Sugar(refined)	3102.73	3335.27	3423,66
Fats & oils(total)	2244.54	2401.19	1915,03
Meats	2339.84	2607.62	2747,34
Fishes	1605.27	1805.53	1815,6
Eggs	659.50	816.13	805,09
Milk & dairy prod.	10592.27	12413.3	12494,36
<b>Total</b>	<b>88282.25</b>	<b>101107.8</b>	<b>104748,02</b>

Source: AOAD, Arab agricultural statistics yearbook, vol. N° 36.

Although the high per capita availability of food commodities consumption in 2015 compared to previous periods (2009-2014), this average is still lower than the world level of animal products (red and white meat, dairy products) and higher in plant products (Wholesale grain, vegetables, fruits...).

#### 5. Food gap and self-sufficiency ratio of major food commodities:

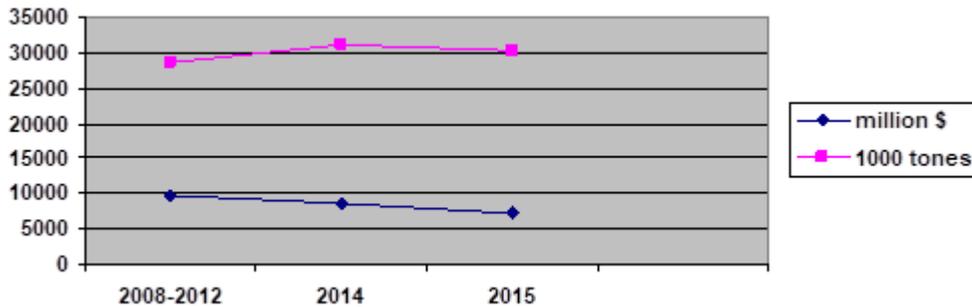
##### 5-1. Food gap:

The food gap is reflected by the inability of the growth rates of domestic food production to keep pace with food consumption growth rates. The food gap is the difference between food commodities available for consumption from domestic production and total food consumption, in other words net imports of major food commodities (AOAD, 2015,p27).

The value of the Maghreb food gap, especially in recent years, has decreased, from about 9.7 billion\$ in the average of 2008-2012, to 8.8 and 7.37 billion\$ in 2014 and 2015 respectively, which is mainly due to the rise in the prices of food commodities and the repercussions of the global food crisis in 2008, which led to an increase in the value of food imports to the Maghreb countries.

Despite the high quantities of food commodities such as cereals, potatoes, sugar and dairy products, the value of the food gap declined at the end of 2015 due to low prices in the international market, also Morocco and Tunisia achieving surplus food balance sheet, as shown in the following figure:

**Figure01: Evolution of the value and quantity of the food gap in Maghreb countries (2008-2015)**



Source: Data of Table: 01 of the Appendix.

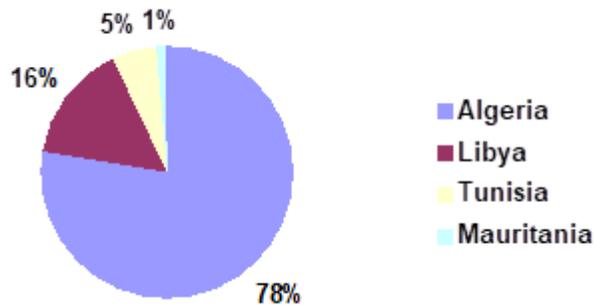
The total of cereals in the forefront of the deficit commodities in 2015 is about 62% of the value of this gap, especially wheat and flour, followed by milk and dairy products by 14.81%, then refined sugar by 12.67%, oils and fats contributes by 2.72%, meat by 3.9%, and finally pulses, potatoes and eggs about 2.45%, 1.33% and 1% respectively.

Fishes topped the surplus goods by 64.6% of the surplus value, followed by vegetables by 23.54% and the fruits by 11.8 % (table 01 of the appendix).

The contribution of the Maghreb countries to the value of the Maghreb food gap varies according to their population, levels of income and consumption habits, as well as the size and efficient use of available agricultural resources, and it is clear from the table that Algeria alone contributes 77.5% of The total value of the food gap, followed by Libya by 15.1%, Tunisia by 3.2%, and Mauritania by 1.70%. Except for Morocco, this achieved a surplus in the years 2014-2015, which contributed to reducing the value of the food gap, even symbolically by 1.52% during the period 2008-2015

(Table 03 of the appendix), as shown in the following figure:

**Figure02: Contribution ratio of Maghreb countries to the value of the food gap for the average period 2008-2015**



Source: Data of Table: 03 of the Appendix.

### 5-2. Self Sufficiency Ratio:

The main food commodities in the Arab Maghreb countries can be classified into four groups according to the self-sufficiency ratios. The first group includes commodities that have achieved sufficient and surplus export in some countries, including vegetables in Morocco and Tunisia, fishes (Morocco and Mauritania) the second group includes the commodities that achieved high sufficiency levels as fruits, meats and eggs at rates ranging between 94-97%. The third group includes the food commodities that achieved medium satisfaction ratio, namely potatoes, pulses, milk and dairy products. Fats and Oils at rates of 79%, 77% 69.7% and 57.32% respectively, while The fourth group consists of goods that have low rates of sufficiency, and constitute the largest group in the food gap, namely cereals (wheat, rice and maize) by 35.7%, then refined sugar by 6.2% (table 04 of the appendix).

### Conclusion:

Through the presentation of the most important indicators of the food security situation of Maghreb countries, the following results were obtained:

- Maghreb countries have large agricultural resources, but a large proportion of them are not exploited, and even the exploited ones have not reached the level of optimum economic exploitation.
- The Maghreb countries continue to suffer from food problem, which boils down to the inability of agricultural production to cope with the growing demand for food commodities resulting from the rapid increase in the population.
- The contribution of the agricultural sector to the gross domestic product (GDP) has been significantly reduced as a result of weak agricultural investments, inadequate investment climate and weak attractiveness for agricultural work.
- The achievements in the agricultural field are still below the required level, which is manifested by the widening of the food gap for most agricultural crops and food commodities, especially cereals.
- Indicators of food conditions in the Maghreb countries, especially those associated with food production and self-sufficiency ratios, indicate the heavy dependence

on imports to provide food needs, especially the basic ones such as wheat, oil and sugar, which exacerbate the food security risks of these countries.

-Weak coordination and integration in the field of agriculture among the countries of the Arab Maghreb, which is reflected in the low volume of intra-trade in agricultural and food commodities.

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### Appendix:

**Table01: food gap for major food commodities groups**

Value(V) : Miillon U.S.Dollars

Quantity (Q) : 1000 M.T

Commodities	2008-2012		2014		2015	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>Cereals</b>	20840.08	6535.47	23768.93	6549.66	25470.47	6358.94
<b>Potatoes</b>	162.34	110.03	170.88	113.75	233.14	136.61
<b>Pulses</b>	599.38	588.05	221.58	248.32	261.92	251.67
<b>Vegetables</b>	(644.41)	(742.16)	(815.86)	826.73	(617.51)	633.15
<b>Fruits</b>	(165.12)	(328.82)	(281.65)	115.51	(175.85)	317.39
<b>Sugar(refined)</b>	2687.24	1448.03	2776.84	1303.08	3050.67	1300.21
<b>Fats &amp; oils(total)</b>	1486.56	1335.07	1183.89	869.26	1107.54	279.33
<b>Meats</b>	105.03	326.22	126.98	451.23	122.15	400.23
<b>Fishes</b>	(442.76)	(1546.44)	(419.05)	1700.37	(439.52)	1739.42
<b>Eggs</b>	10.49	32.15	7.85	33.59	8.88	10.68
<b>Milk &amp; dairy prod.</b>	3836.63	1588.12	4396.36	2216.41	4315.26	1519.91
<b>Total</b>	28455.46		31136.75		30337.15	

Source: AOAD, Arab agricultural statistics yearbook, vol. N° 36

**Table 02: Contribution of Maghreb countries to the value of the food gap**

Value(V) : Miillon U.S.Dollars

Countries	2008-2012	2014	2015
Tunisia	623.75	406.32	(102.94)
Algeria	6482.70	7332.39	6886.82
Libya	1798.09	1294.09	1008.45
Morocco	607.71	(388.91)	(531.62)
Mauritania	186.73	166.25	109.29
<b>Total deficit</b>	9698.98	9199.05	8004.56
<b>Total Surplus</b>	/	388.91	634.26
<b>Total food gap</b>	9698.98	8810.14	7370.3

Source: AOAD, Arab agricultural statistics yearbook, vol. N° 36

**Table 03: Contribution ratio of Maghreb countries to the value of the food gap (%)**

Countries	2008-2012	2014	2015
Tunisia	6.43	4.42	(16.18)
Algeria	66.83	79.70	86.03
Libya	18.54	14.07	12.60
Morocco	6.26	(100)	(83.82)
Mauritania	1.92	1.81	1.37
<b>Total deficit</b>	/	100	100
<b>Total Surplus</b>	100	100	100

Source: AOAD, Arab agricultural statistics yearbook, vol. N°.36.

**Table 04: Self Sufficiency Ratio for major food commodities groups in Maghreb countries in 2015**

Commodities	Self Sufficiency Ratio (%)
<b>Cereals</b>	35.71
<b>Potatoes</b>	78.90
<b>Pulses</b>	76.82
<b>Vegetables</b>	93.7
<b>Fruits</b>	96.72
<b>Sugar(refined)</b>	06.2
<b>Fats &amp; oils(total)</b>	57.32
<b>Meats</b>	95
<b>Fishes</b>	90.51
<b>Eggs</b>	94.30
<b>Milk &amp; dairy prod.</b>	69.70

Source: AOAD, Arab agricultural statistics yearbook, vol. N°. 36