

# Food Security and its Dependent on Foreign Trade: The Case of Jordan 2001-2010

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## 1. Introduction

Food security is one of the vital issues on the global level. It is an economic challenge with similar importance to issues like unemployment, energy, and the financial crises of 2008. It is as well an ethical issue in terms of how any country can secure the individuals' basic daily food needs (Lobell, 2010; Rayfuse & Weisfelt, 2012; Smith & Kelly, 2008).

Food security problem is increasing year by year as a consequence of the global climate change, especially in the cereals producing and exporting countries. This led to the decrease in the world cereals production by 3.6% in 2005 and 6.9% in 2006. Also, the world reserves of food and cereals had decreased by 7% over that period. The reserves of wheat and barley decreased, by 15% and 35% respectively. This led to high price fluctuations. Moreover, the world demand on food has increased in the last two decades due to the use of sugar, maize, and palm oil in the production of bio-ethanol fuel.

The Food and Agriculture Organization (FAO) statistics for the year 2007 and 2008 indicate that 1 million ton of cereals, or about 4.7% of the world production, is used in the production of energy. Food prices have also been affected since 2006 by the increase in the transportation and the fertilizers cost due to the increase in the price of petroleum. This led to the increase in the wheat price by 69% and corn price by 7%. Accordingly, the world food imports reached 1 trillion USD in 2010, an increase by 11% for that year. Food production was expected to increase by 1.2% in 2010, but instead decreased by 2%. This led FAO to warn the world that the coming period will be much more difficult than before unless the world production of food increase.

In the Arab world, the issue is more dramatic than on the global level. Food deficit increased sharply from 16.8 milliard USD in 1990 to 27 milliard USD in 2010, where it is expected to reach 44 milliard USD in 2020. This makes the Arab countries highly dependent on imported food.

In Jordan, governments exerted tremendous efforts to narrow the food gap during the last three decades, especially in the basic food goods. Despite such efforts, the gap has widened, especially for cereals, sugar, and animal production, and Jordan has become more dependent on the imports of these goods. However, it is worth mentioning that one of the factors inducing demand on food is population growth on the global level, especially in less developed countries, and Jordan is not an exception here. Population growth in Jordan will be discussed in the following section.

This research aims to examine to what extent food security in Jordan depends on imported goods (Bashir, 2009; Arbah, 1996; Alqasim, 2010; Smith & Kelly, 2008; Campbell, 2010; Seryeetia, 2000; Gharbia, 2010).

## 2. Population Growth in Jordan

Table (1) shows that the population growth rate in Jordan averaged to 2.2% in the period 2001 to 2010. This growth rate was relatively high compared to the annual world rate of growth (1%). This had accompanied with low rate of economic growth (3% in 2010) and high rate of inflation (5% in 2010). However, Jordan population increased from 4.9 million in 2001 to 6.1 million in 2010. In other words, the population in Jordan is increasing by nearly 1 million every decade; this is a burden if the economic growth is taken into consideration (Hamdan, 1999).

**Table 1: Population in Jordan during the period 2001-2010**

Year	Population	Annual rate of growth %	Urban population %	Rural population %	GDP rate of growth %	Inflation %
2001	4978	2.5	79	21	4.2	-
2002	5098	2.4	79	21	4.2	1.8
2003	5230	2.6	79	21	3.2	5.4
2004	5350	2.3	82	18	7.5	3.4
2005	5473	2.3	82	18	7.1	3.5
2006	5600	2.3	83	17	6.4	6.3
2007	5723	2.2	83	17	6.0	6.3
2008	5850	2.2	83	17	7.6	13.9
2009	5980	2.2	83	17	2.3	-0.7
2010	6113	2.2	83	17	3.1	5.0

**Source:** Jordan Department of Statistics, Yearly Statistical Book for the Years 2001-2010, Jordan

The data in the table also show that rural population decreased gradually from 21% to 17% in 2010. This had weakened agricultural production in general and the production of cereals in particular.

## 3. Cereals Production in Jordan

Due to the limited cultivable land, Jordan has to use most of this land to produce and secure some of its food needs, especially wheat and barley as these are the daily food for people and animals.

### 3.1. Land Area for Planting Cereals

Due to scarcity of water for irrigation, rice is not produced in Jordan nor is there any land allocated for planting rice. In 2011, the total planted area in Jordan was 2.4 million acres of which 850 thousand acres were planted with fruit trees, 428 thousand acres planted with vegetables, and 1.1 million acres planted with cereals. About 94% of the latter area was planted with wheat and barley (Jordan Department of Statistics, 2012).

Table 2 shows that the area planted with wheat decreased gradually from 443 thousand acres in 2001 to 207 thousand acres in 2007, and decreased again to reach 193 thousand acres in 2010. Out of this planted area, the harvested area was amounted only to 143 thousand acres in 2011. This means that the unharvest area was about 74% of the total planted area. This was due to the low rainfall in that year, while most of the planted area was used to feed sheep.

Table 2 also shows that the area planted with barley in 2011, which amounted to 865 thousand acres, increased slightly from 837 thousand acres in 2007 to 831 thousand acres in 2010. The harvested area was 277 thousand acres in 2011. This means that the unharvest area was about one third of the planted area. This loss was due to the low rainfall, poor technology used in planting, inadequate advisory activities and ineffective programs for fighting insects.

**Table 2: Planted area with wheat and barley, and the harvested crop during the period 2001-2010 (Thousand Acres)**

Year	Wheat				Barley			
	1 Planted Area	2 Harvested Area	3 (1-2)	% (3/1)	4 Planted Area	5 Harvested Area	6 (4-5)	% (6/4)
2001	443.6	134.5	309.1	%30	837.0	202.7	634.3	%24
2002	427.1	327.5	99.6	%77	851.5	553.8	279.7	%65
2003	500.6	297.8	203.8	%59	633.1	259.2	363.9	%41
2004	345.30	107.3	238.0	%31	1.036.7	290.1	746.6	%28
2005	385.8	292.9	92.9	%76	713.3	361.5	531.7	%51
2006	418.6	269.2	149.4	%64	713.8	360.3	353.5	%50
2007	207.6	207.6	-	-	468.4	291.5	176.9	%62
2008	247.9	124.6	123.4	%50	738.2	271.8	466.3	%37
2009	240.5	158.8	81.8	%66	682.7	312.6	370.1	%46
2010	300.1	214.7	85.4	%72	831.8	195.0	636.7	%23
2011	193.0	143.3	49.7	%74	865.1	277.9	587.2	%32

Source: Jordan Department of Statistics, Agriculture Statistics, (2002-2012)

### 3.2. Production and Productivity

Wheat production in Jordan reached to 190 thousand tons in 2011, less than the production in 2002 and 2010. However, productivity rate is an indicator to reflect the efficiency in planting wheat. This indicator can be measured by the following formula:

$$P = O / A \quad (1)$$

Where  $P$  is the rate of productivity for a certain crop,  $O$  is the production in one season, and  $A$  is the planted area.

When applying this formula, the results can be seen in Table 3. The data shows that  $P$  of wheat was amounted to 103 kg/acres in 2011, and productivity rate was higher than that of 2002 and 2010, but it is a low rate compared with those in developed and developing countries.

Barley productivity rate amounted to 39 kg/acres in 2011, a figure lower than that in 2002, 2003, and 2005. It was also much lower than that in other developing countries.

In conclusion, the previous rates of productivity indicate that there were no improvements neither in the production of wheat or in the production of barley. This fact clearly indicates that Jordan production in cereals did not meet the demanded quantities of these two products.

**Table 3: Planted area, production and productivity in Jordan during the period 2001-2010**

Year	Wheat			Barley		
	Area (000 Acres)	Production (000 Ton)	Productivity (Kg/Acres)	Area (000 Acres)	Production (000 Ton)	Productivity (Kg/Acres)
2001	443.6	19.3	44	837.0	17.3	21
2002	427.0	43.8	102	851.5	56.8	67
2003	500.6	42.5	85	633.2	25.8	41
2004	345.3	13.1	38	1.036.7	21.0	20
2005	385.8	34.4	89	713.3	31.8	45
2006	418.6	22.9	55	713.8	18.4	26
2007	207.6	21.0	101	468.4	13.5	29
2008	248.0	7.8	32	738.2	10.3	14
2009	240.5	12.5	52	682.7	17.1	25
2010	300.1	22.1	74	831.8	10.7	13
2011	193.0	19.8	103	865.1	29.3	34

Source: Jordan Department of Statistics, Agriculture Statistics (various years)

**Table 4: Wheat and Barley Planted Area, Production and Productivity for Jordan, the Arab World, and the World, for 2010**

	Planted Area (Million Hectare)			Production (Million Ton)			Productivity (Ton/Hectare)		
	World	*Arab Countries	Jordan	World	*Arab Countries	Jordan	World	*Arab Countries	Jordan
<b>Wheat</b>	217	10	0.075	651	25	0.022	3	2.5	0.3
<b>Barley</b>	48	6.4	0.270	123	7	0.010	2.5	1.1	0.052

- For the Arab Countries, Annual average 2009-2011
- Hectare = 4 Acres or (4000 square meter)
- Reference: Arab Organization for Agricultural Growth, Agricultural Statistical Year Book vol. 31, 2011.

#### 4. Consumption and Food Gap

Following is an analytical approach to the consumption of wheat, barley and rice in Jordan (Swaminathan, 2009).

Consumption of the above three cereals, during the period 2001-2010, increased year by year. Part of this increase was due to the high population growth on one side and the hosting of refugees from neighboring countries on the other side. Wheat consumption increased from 566 thousand tons in 2001 to 749 thousand tons in 2009. Recently, the yearly wheat consumption was estimated at 780 thousand tons, or nearly 65 thousand tons per month.

Barley consumption increased gradually from 490 thousand tons in 2001 to reach the peak of 895 thousand tons in 2006, then decreased sharply to reach 241 thousand tons in 2010. Recent estimations reflect that Jordan annual consumption of barley amounted to 600 thousand tons, or about 50 thousand tons per month. However, Jordan reserves of wheat are 607 thousand tons of wheat and 252 thousand tons of barley. According to recent statements of the Ministry of Industry and Trade, wheat reserves is enough to meet local

demand for a period of eight months, while barley reserves is enough for five months (Hospes & Hadiprayitno, 2010; Shaw, 2007).

Rice consumption increased gradually from 102 thousand tons in 2001 to 133 thousand tons in 2010 (Table 4).

**Table 4: Cereals production, consumption, and gap from 2001-2010 (000 Ton)**

\*P=Production; \*C=Consumption

Year	Wheat				Barley				Rice			
	1*P	2*C	2-1 Gap	1/2 %	3*P	4*C	4-3 Gap	3/4 %	5*P	6*C	6-5 Gap	5/6 %
2001	19.3	567.1	547.7	3.4	17.3	490.5	473.2	3.5	0	102.9	102.9	0
2002	43.8	662.1	618.4	6.6	56.8	372.4	315.6	15.3	0	104.8	104.8	0
2003	42.5	762.5	719.9	5.6	25.8	593.2	567.4	4.3	0	125.4	125.4	0
2004	13.2	683.6	670.4	1.9	20.9	785.8	764.8	2.7	0	136.2	136.2	0
2005	34.4	739.7	705.3	4.6	31.8	658.9	627.1	4.8	0	130.7	130.7	0
2006	22.9	766.8	743.9	3	18.4	895.2	876.8	2.1	0	138.4	138.4	0
2007	21.1	763.6	742.6	2.7	13.5	864.4	850.9	1.6	0	158.1	158.1	0
2008	7.8	765.8	757.9	0.7	10.3	671.9	661.5	1.5	0	135.2	135.2	0
2009	12.5	74.9	624.7	2	17.1	630.9	613.9	2.7	0	166.3	166.3	0
2010	22.1	511.8	489.6	4.3	10.7	241.9	231.3	4.4	0	133.2	133.2	0

Source: Jordan Department of Statistics, Agriculture Statistics (various years)

#### 4.1. Cost of the Food Gap

Jordan wheat imports amounted to 84 million USD in 2001, and increased sharply to reach 111 million USD in 2010. On the contrary, imported barley decreased from 55 million USD in 2001 to 42 million USD in 2010. Also, imported rice was fluctuating over the period under study. It increased from 40 million USD in 2001 to 95 million USD in 2007, then decreased slowly to reach 22 million USD in 2010 (Table 5).

The total value of imported wheat, barley, and rice ranged between the minimum of 176 million USD to the maximum of 685 million USD. These figures can be compared with the annual total food exports that ranged between 230 million USD to 962 million USD. That is, Jordan imports of these three cereals were equal to about two thirds of the country's total food exports.

**Table 5: Jordan imports of wheat, barley and rice during the period 2001-2010 (Million USD)**

Year	Imported Wheat	Imported Barley	Imported Rice	Total Imports
2001	83.88	55.35	40.41	179.64
2002	83.88	55.35	40.41	179.64
2003	65.54	53.82	50.64	170.00
2004	133.48	103.48	61.26	298.22
2005	119.99	100.58	59.19	279.76
2006	93.05	114.38	67.38	274.81
2007	93.05	251.00	94.85	438.9
2008	404.79	240.88	39.27	684.94
2009	131.0	104.37	19.78	255.15
2010	110.88	42.58	22.69	176.15

Source: Jordan Department of Statistics, Agriculture Statistics (various years)

## 5- The Role of Foreign Trade in Jordan's Food Security

Trade policy in Jordan adopted import substitution measures throughout the seventies of the last century. Since the nineties, this policy has shifted towards export expansion, in a step aiming to assure the provision of hard currencies to finance Jordan's payments for imports especially food imports. Slow growth in exports will decrease the country's potential for imports, and therefore negatively affect Jordan food security.

To measure the country's dependency on imported food, the following indicators will be studied (Sivakumar, Selvaraju, and Hamdan, 2013; Odularu, 2010).

### 5.1. Jordan Dependency on Outside World

Domestic production of wheat, barley and rice should be evaluated in light of domestic demand on these goods with contrast to similar imported goods. If the ratio of the imported goods over the domestic production is high, this indicates that the country is highly depended on other countries to make foodstuff available for the people, and as a consequence food security will be vulnerable to outside economic and political situation.

Table 6 shows that the ratio of dependency on imported cereals during the period 2002-2010 soared high. Wheat self-sufficiency averaged only at 3.5%, with dependency on imported wheat at 96.5%. Barley self-sufficiency averaged only at 4.4%, leaving 95.6% of domestic demand on barley for imports. As for rice, Jordan does not produce this good, noting that the domestic demand on rice was and still is 100% dependent on imports. These ratios of dependency on imported goods clearly demonstrate the vulnerable situation of Jordan (Al-Saidi, 2012; Arbah, 1996).

**Table 6: Jordan cereals self-sufficiency, dependency on imports during the period 2002-2010 (%)**

Year	Wheat		Barley		Rice	
	Self Sufficiency %	Dependent on Imports %	Self Sufficiency %	Dependent on Imports %	Self Sufficiency %	Dependent on Imports %
2002	6.6	93.4	15.3	84.7	0	100
2003	5.6	94.4	4.3	95.7	0	100
2004	1.9	98.1	2.7	97.3	0	100
2005	4.6	95.4	4.8	95.2	0	100
2006	3	97	2.1	97.9	0	100
2007	2.7	97.3	1.6	98.4	0	100
2008	0.7	99.3	1.5	98.5	0	100
2009	2	98	2.7	97.3	0	100
2010	4.3	95.7	4.4	95.6	0	100
Average	3.5	95.5	4.4	95.6	0	100

Source: Calculated from Table 4.

### 5.2. Food Trade Balance

Food trade balance is another indicator used to measure food security gap. To measure the real percentage size of the food gap, the following formula was used:

$$Z = 1 - (FX / FI) \quad (2)$$

Where  $Z$  is the percentage size of food security gap,  $FX$  is food exports, and  $FI$  is food imports

A positive figure result indicates food gap, while a negative or zero result indicates no food gap. Applying this formula on the data in Table 7, the (Z) results were all positive, ranging from 0.5 to 0.68, and thus indicating real food gap. The fourth column in the table supported these results that show a chronic deficit in food trade since 2002. These results conclude that Jordan is highly dependent on other countries to secure food needed now and in the future. This would affect Jordan's political stand in the global level (Al-Saidi, 2012; Arbah, 1996; Abdul Aziz, 2000).

**Table 7: Food trade balance as an indicator during the period 2002-2010 (Million USD)**

Year	Food Exports	Food Imports	Food Balance	Trade	Z Indicator
2002	237.67	557.91	-320.24		0.57
2003	230.78	636.90	-406.12		0.64
2004	443.71	1079.69	-635.98		0.56
2005	566.32	1129.68	-563.36		0.50
2006	648.15	1460.74	-812.59	0.56	
2007	585.30	1804.13	-1218.83		0.68
2008	962.31	2637.87	-1675.56		0.64
2009	943.77	2220.69	-1276.92		0.58
2010	871.97	2254.01	-1382.04		0.61

Source: Arab Organization for Agriculture Development (AOAD, various years)

### 5.3. The Ratio of Food Imports to Total Exports

This indicator is used to give the country's capability of purchasing food imports by exports. Table 8 shows that the ratio of the value of imported food over the value of total Jordan exports increased gradually, year by year, from 20% in 2002 to 38% in 2010. Also, the ratio of imports over exports witnessed increase over the whole period 2002-2010. This ratio was 181% in 2002 and increased to 262% in 2010. These ratios indicate that Jordan's capability of covering its food imports was decreasing. It also shows how much Jordan was and still is uncovered in food security (Khasnabis, Acharya, and Davis, 2007; Al-Saidi, 2012; Gharbia, 2010).

**Table 8: Food imports as a percentage to total exports during the period 2002-2010**

Years	Jordan (USD)			3/1 Indicator %	2/1 Indicator %
	(1)Total Exports	(2)Total Imports	(3)Food Imports		
2002	2773.87	5026.61	557.91	20	181
2003	3017.93	5751.41	636.90	21	191
2004	3888.42	8190.96	1079.69	28	211
2005	4307.20	10512.57	1129.68	26	244
2006	5211.72	11564.54	1460.74	28	222
2007	5740.11	13731.63	1804.13	31	239
2008	7956.21	17035.31	2637.87	33	214
2009	6384.18	14115.82	2220.69	35	221
2010	5954.80	15607.34	2254.01	38	262

Source: Arab Organization for Agriculture Development (AOAD, various years)



#### 5.4. Foreign Trade and the Future of Food Security in Jordan

Foreign trade plays a vital role in the provision of needed goods for countries and individuals. This role can be seen in the transfer of technology to developing countries on the one hand, and in the provision of food and consequently help in reducing the level of food gap.

This research shows that Jordan was highly dependent on imported food stuff, in particular cereals. Since no change in the requirements of cereal production has changed since 2002, this situation is expected to continue and deepen in the future. In fact, during the 1960s, domestic wheat production reached to about 60% of Jordan's need, while now it is only 3.5%. A possible scenario for Jordan as comparative advantage may be to produce vegetables and import cereals. Yet, such an argument requires further research for proof. It seems that the adoption of the open economic policy by Jordan, and the joining of the WTO were intended partly to open new markets in various countries for the purpose of maintaining access to foreign food markets and to secure Jordan's needs from different markets (Suresh & Ashok, 2005; Khasnabis, Acharya, and Davis, 2007; Boote, 2011).

#### 5. Conclusions

This research paper concludes the following:

1. Jordan cereals production was and still is low and does not meet more than 4% of the required quantities.
2. The food security gap in Jordan was widened and deepened over the whole period of the study.
3. Jordan was and still is dependent on imports to secure its food needs.
4. All indicators used in this research support the above-mentioned points.

To assure that Jordan is capable to overcome this food security gap, the following are recommended:

1. Cereals productivity must be enhanced to make it comparable with the world average.
2. Jordan has to continue its open economy policy in order to maintain access to various cereal markets in different countries.
3. Jordan has to support its cereal reserves to last six months instead of currently three months.
4. Jordan has to enhance its terms of trade.

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