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FOOD SECURITY IN THE MIDDLE EAST SINCE 1961

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SUMMARY – The Middle East imports more food per person than any other region of the world. The results of this study are largely based on a detailed and complex analysis of FAOSTAT data. Food imports by Middle Eastern nations have risen dramatically over the last forty years, which is primarily due to population growth in the latter half of the twentieth century. Furthermore, per capita consumption of cereals also increased during this period. The level of food security in the region differs substantially from country to country. This variability is based mostly on wealth levels, though the climatic potential also plays a role. The oil-rich Gulf states Kuwait, Saudi Arabia and the UAE can easily afford to purchase grain from the world market, as can Israel. The poorer countries of the region are less able to afford such imports. Jordan is the most food insecure Middle Eastern nation, whilst the Palestinian Territories, Lebanon and Yemen also have low levels of food security.

Keywords: Middle East food security, food aid, cereal imports, income levels, food security index

1. INTRODUCTION

The Middle East is amongst the driest regions on earth. Five of the fourteen countries in the region are 100% hyper-arid, according to the Terrastat approach based on growing period (Bot *et al*., 2000) Four other nations have more than 50% of their territory defined as either hyper-arid or arid, *i.e.* unusable for rainfed agriculture (FAO, 2004). Rainfed agriculture in these countries is either impossible or very limited, as a result. The Middle East arguably has the largest food deficit of any region in the world, in terms of cereal imports as a proportion of consumption. In 2002, Israel, Jordan, Kuwait, Lebanon, Saudi Arabia and the UAE all featured in the world's top 20 per capita cereal importers, while Syria is the only Middle Eastern nation to have produced a fairly regular cereal surplus during the last forty years. Concerning water scarcity in the region, Yang & Zehnder (2002) calculated that the amount of cereals imported by Israel between 1995 and 1999 was equivalent to importing 53 m^3 of water per capita per year. Extrapolating this figure to the entire region, the Middle East imported the equivalent of 2.8 billion cubic metres of water in 2002 alone, in the form of cereals.

The rapidly growing population of the region is one of the main reasons for increased grain imports; the UAE experienced the largest population increase in the world during the 1961-2002 period (a 2897% increase), whilst Kuwait, Jordan and Saudi Arabia also featured amongst the world's ten fastest growing populations. The rising import requirements haves also been caused by an increase in per-capita consumption of cereals in several countries, as well as increases in the use of cereals for livestock feed, other non-food purposes, and wastage.

All data on cereal imports, consumption, usage, aid donations and population in this study is taken from FAOSTAT (2004) unless otherwise mentioned. Unfortunately, data sets for Bahrain, Iraq, Oman and Qatar are incomplete (FAOSTAT provides no data for cereal consumption in these countries), and thus they cannot be analysed in detail. Data for the Palestinian Territories is available from 1996 onwards, and thus the Territories can be included in the analysis of the current situation, but not into the background of the previous 30 years or so.

2. BACKGROUND TO THE MIDDLE EAST FOOD SITUATION 1961-1991

Scenarios of food security around the world have changed rapidly since 1961. India has gone from being a large scale importer of cereals to a medium-size exporter, whilst Mexico has made the opposite transition. In terms of food aid, several countries have eliminated their food aid requirements

since the 1970s, whilst others have become more aid-dependent. In order to analyse the contemporary food security situation of the Middle East, the most recent decadal data were used, covering the years 1992-2002. Nonetheless, it is still important to have a background on the food scenario in the region prior to 1992.

Between 1961 and 1991, every country in the region, with the exceptions of Kuwait and the UAE, increased their reliance on cereal imports (Tab. 1). Even the reductions in imports achieved by these two countries were largely meaningless – both countries had previously imported 100% of consumption requirements, and reduced imports by just 0.4%. The largest increases in cereal imports occurred in Jordan (an increment of 40.7%) and Yemen (48.5%). In both countries, imports overtook domestic production as the major source of cereals. Iran (24.6%), Saudi Arabia (19.6%) and Syria (25.5) also experienced fairly large rises in cereal imports. Israel and Lebanon both recorded somewhat smaller increases of 5.6% and 8.4% respectively, though both countries were already large importers during the 1960s.

Table 1. Changes in cereal imports and production as well as population during 1961-91

Nation	Average cereal imports (% of consumption)			Average cereal production (thousands tonnes)			Population (% change)
	1961-71	1981-91	Change	1961-71	1981-91	Change	1961-71
Iran	5.0	29.6	+ 24.6 %	4532	8736	+ 93 %	+ 169 %
Israel	79.8	85.4	+ 5.6 %	168	288	+ 71 %	+ 112 %
Jordan	48.9	89.6	+ 40.7 %	153	66	- 57 %	+ 268 %
Kuwait	100.0	99.6	- 0.4 %	-	0.8	-	+ 583 %
Lebanon	83.6	92.0	+ 8.4 %	65	39	- 39 %	+ 45 %
Saudi Arabia	50.6	70.2	+ 19.6 %	387	2302	+ 495 %	+ 276 %
Syria	4.9	30.4	+ 25.5 %	967	1824	+ 89 %	+ 172 %
UAE	100.0	99.6	- 0.4 %	-	1.4	-	+ 2035 %
Yemen	13.0	61.5	+ 48.5 %	802	640	- 20 %	+ 127 %

Based on data from FAOSTAT (2004)

The main reason for this increase in imports was the high rates of population growth in the region. Only in Saudi Arabia did cereal production grow at a rate faster than population (Tab. 1). In Jordan, Kuwait and Yemen, cereal production actually fell between the 1960s and the 1980s, whilst the populations of all three countries grew by at least 100%. Iran, Israel and Syria all increased cereal production by over 50%, but in all three countries, population increases were much higher than cereal production – 169%, 112% and 172% respectively. Though Kuwait and the UAE began to produce cereals during the 1970s, the amounts were largely insignificant – the largest harvest prior to 1992 in Kuwait produced just 1.8 kg of cereals per capita. These two countries also experienced the largest population increases; 583% and 2035% respectively, as foreign workers flooded in (foreign workers outnumber locals in both countries (CIA, 2004)).

Changes in the use of cereals were also a factor in the increased imports by Middle Eastern nations. Firstly, individual consumption of cereals for food has increased in most countries in the region (Tab. 2). Per capita consumption grew at the fastest rate in Iran and Saudi Arabia. Only in Kuwait, Lebanon and the UAE did it decline. The amount of cereals for livestock feed increased in six of the nine countries. In addition, every country except Iran and Yemen experienced a growth in the amount of cereals used for other purposes, such as seeds and food manufacturing, besides an increase in wastage. The latter category accounted for around 25% of all cereals in the UAE during the 1980s.

Table 2. Changes in cereal consumption patterns during 1961-91

Nation	Average cereal consumption (kg/per capita/year)			Livestock feed (% of total consumption)			Other uses (% of total consumption)		
	61-71	81-91	change	61-71	81-91	change	61-71	81-91	change
Iran	149	205	+ 38%	0.0	0.0	-	0.1	0.0	- 0.1%
Israel	148	160	+ 8%	0.1	0.1	-	6.9	23.2	+ 16.3%
Jordan	144	168	+ 17%	15.3	20.9	+ 5.6%	0.4	1.0	+ 0.6%
Kuwait	151	145	- 4%	0.0	0.1	+ 0.1%	8.0	12.5	+ 4.5%
Lebanon	144	141	- 2%	14.9	24.1	+ 9.2%	1.6	9.0	+ 7.4%
Saudi Arabia	127	154	+ 22%	0.0	0.3	+ 0.3%	2.8	2.9	+ 0.1%
Syria	157	184	+ 17%	0.0	0.1	+ 0.1%	7.5	7.7	+ 0.2%
UAE	195	121	- 38%	0.0	0.0	-	22.0	39.5	+ 17.5%
Yemen	153	166	+ 8%	0.0	0.0	-	1.1	0.4	- 0.7%

Based on data from FAOSTAT (2004)

Between 1970 and 1991, the majority of the six Middle Eastern countries that were food aid beneficiaries (and for which data is available) reduced their aid dependence. Jordan, being the region's largest aid recipient, succeeded in reducing its aid requirements by more than half – aid went from 24.7% of domestic cereal consumption in the 1970-1980 period to just 10.4% in the 1981-1991 period. Lebanon, another large beneficiary, cut cereal aid from 10.7% to 5.1% of consumption over the same period. The countries that received somewhat less aid, Iran and Syria, also reduced their aid demands. Iranian aid fell from 0.5% of consumption during the 1970-80 period to just 0.1% during 1981-91. Likewise, Syria reduced its aid dependence from 2.9% to 0.8% of consumption over the same period.

A troublesome issue in the figures is that of food aid to Israel. The country received over 50% of domestic cereal consumption in the form of food aid during the early 1970s, according to the available statistics from FAOSTAT. This is an extremely high amount, and looks somewhat out of place. One possibility is that this aid was destined for the Palestinians, but was included in the figures for Israel (the Palestinian Territories do not appear in FAO statistics until 1996). However, this is an unknown, and thus the statistics are certainly questionable. For the record, Israeli dependence on aid averaged 17.8% of consumption over the 1970-80 period, dropping to just 0.09% during the 1981-91 period.

Yemen was the only Middle Eastern nation to increase its dependence upon food aid during the 1970-91 period. During the first half of this era, food aid contributed around 2.9% of total domestic consumption. By the second half, 1981-91, it had increased to 4.2% of consumption.

3. MEASURING FOOD SECURITY AT A NATIONAL LEVEL

There are a number of indicators for food security that are measurable at a national level, and for the purposes of this study, the last ten years of available data will be used, *i.e.* 1992 to 2002. Although there may have been changes in the food scenarios of the countries in the region since 1992, using data from just one year is highly unreliable, as cereal production can have large year-to-year variations due to irregular rainfall patterns in drylands. Possible future hazards, such as severe local drought or shortages on the world food market are not included in the analysis, which is entirely based on factual information for the period 1992-2002

Food aid is perhaps the most obvious indicator of food insecurity, as any country requiring food aid evidently has supply problems. The proportion of domestic cereal consumption derived from imports is also an indicator of a country's level of food security – countries that have to import a greater proportion of their national food requirements are more at risk in case of low reserves on the world grain market. This second indicator, *i.e.* cereal imports, is linked to a third indicator – national wealth levels. If a country is wealthy enough, it is able to import all its food requirements, even if they make up a significant proportion of total consumption. Wealthy countries are less at risk from reduced grain

supplies, coupled with higher prices on the world market, as they are able to make higher bids in a competitive market. Data on income levels was taken from the *2004 World Population Data Sheet* (PRB, 2004).

3.1. Food aid

Between 1992 and 2002, six of the aforementioned nine Middle Eastern nations received food aid, as did the Palestinian Territories. Only Kuwait, Saudi Arabia and the UAE were not aid beneficiaries during this period.

Israel was an aid beneficiary in only one year, 1993, during which it received just 3000 tonnes of cereals. The quantity was fairly insignificant, amounting to 0.11% of total domestic consumption that year and just 0.01% over the entire 1992-2002 period. The amount of aid received by Iran was also fairly insignificant in national terms. Though the country was an aid beneficiary throughout every year of the 1992-2002 period, aid amounted to no more than 0.25% of consumption in any given year, and averaged 0.06% over the entire period. Syria too was a small aid beneficiary, aid contributing no more than 0.97% of total domestic consumption during any year of the 1992-2002 period, averaging 0.41%.

Lebanon and Yemen are medium-size aid recipients. Over the 1992-2002 period aid contributed 2.4% of total domestic cereal consumption in Lebanon, reaching a high of 11.7% in 2001. In Yemen, aid made up an average of 2.9% of domestic consumption for the above period, though it increased towards the end, reaching a high of 6.1% in 2002.

The Palestinian Territories and Jordan are the largest aid recipients in the region. Unfortunately data for the Palestinian territories is highly problematic. It is only available since 1996, and figures on food aid shipments are only available for the Gaza Strip. Even using the incomplete data, it can be calculated that food aid made up at least 8.4% of total consumption, reaching a high of 22.3% in 2000, though the imbalance in the figures (consumption for the whole territories, but food aid for Gaza only, which has a smaller population than the West Bank) suggests that the real figure is significantly higher. Jordan was the largest aid recipient in the region, according to the available data. Food aid contributed 10.8% of total domestic cereal consumption during 1992-2002, reaching a high of 14.9% in 1992.

3.2. Cereal imports as a proportion of consumption

The region can be split into three groups in terms of cereal imports: (i) countries in which imports constitute less than 50% of domestic cereal consumption, (ii) countries in which imports constitute 50-85% of domestic consumption, and (iii) countries in which imports make up at least 85% of consumption.

The first group contains only Iran and Syria, in which imports made up 30% and 10% of domestic cereal consumption during the 1992-2002 periods, respectively. The second group also contains only two countries; Saudi Arabia and Yemen – Saudi imports made up 66% of domestic consumption between 1992 and 2002, whilst in Yemen, imports made up 75% of consumption.

It is no surprise that the third group – importing 85% or more – is the largest, containing six out of the 10 countries in the region. Both Kuwait and the UAE have imports totalling almost 100% of consumption – 99.6% and 99.9% during 1992-2002, respectively. The other four have imports totalling 90-95% of consumption: 92% in Israel, 94% in Jordan, 89% in Lebanon and 91% in the Palestinian Territories (for which data is only available during the 1996-2002 period).

3.3. Wealth levels

There are sharp contrasts in wealth levels between countries in the Middle East region. The Gulf States of Kuwait, Saudi Arabia and the UAE, together with Israel all have per capita incomes above $10000. Iran, Jordan, Lebanon and Syria all have moderate income levels of between $3000-$7000, whilst residents of the Palestinian Territories and Yemen have average incomes amongst the lowest

in the world, $727 and $800, respectively.

Table 3. National indicators of food security

Nation	Food aid (% of consumption)	Cereal imports (% of consumption)	Income ($)
	1992-2002	1992-2002	2002
Iran	0.06	30.1	6690
Israel	0.01	91.9	19000
Jordan	10.84	94.3	4180
Kuwait	-	99.6	17780
Lebanon	2.45	88.9	4600
Palestinian territories	8.35	91.4[1]	727[2]
Saudi Arabia	-	65.7	12660
Syria	0.41	10.2	3470
UAE	-	99.9	24030
Yemen	2.85	75.3	800

Based on data from FAOSTAT (2004); PRB (2004); CIA (2004)
[1] 1996-2002 only; [2] Per capita average based on different incomes in Gaza and the West Bank

4. CREATING A BASIC FOOD SECURITY INDEX

In order to measure the level of food security, a Food Security Index (FSI) is required. Though Downing (1992) and Dyson (1996) have created FSIs in the past, both are incomplete and out of date. The FAO's Aggregate Household Food Security Index (AHFSI) is also an option, but up-to-date figures are difficult to obtain.

Therefore it is necessary to create a basic FSI in order to measure the current food security situation of Middle Eastern nations, using three key indicators based on the available data presented in the previous section: (1) food aid as a proportion of domestic consumption, (2) imports as a proportion of domestic consumption, and (3) income levels. The first author (Wilson) created this FSI to calculate food security levels for most of the world's nations in his MA thesis. The FSI scores of Middle Eastern nations are reported in this paper. The FSI is determined by calculating a score for each of the above three indicators, which are subsequently combined in order to get a FSI figure for each country. Only data for the 10 year-period 1992-2002 were used to present the most up-to-date picture of food security in the region.

Table 4. Scores for the food aid indicator in a basic FSI.

% of consumption from food aid	FSI score
0%	0
0 – 2%	5
2 – 4%	10
4 – 6%	15
6 – 8%	20
8 – 10%	25
> 10%	30

Food aid is arguably the most important indicator and is given a greater weighting than the two other factors. An arbitrary score is established in relation to the percentage of domestic cereal consumption derived from food aid, ranging from 0 to 30. This range is large enough to highlight clear differentiation between nations.

The import/consumption ratio is arguably a less important indicator of food security, and will be given a score ranging from -20 to 20. This figure is calculated by multiplying the import/ consumption

ratio by 20. For example, Saudi Arabian imports constituted 65.7% of total cereal consumption over the 1992-2002 period; thus the FSI import/consumption ratio score for Saudi Arabia = 0.657 * 20 = 13.

The final indicator, wealth, is given as a negative score between 0 and –20, in order that a maximum wealth score can exactly cancel out a maximum import/consumption score. Evidently, the food security risk of reliance on cereal imports is related to a country's ability to pay for these imports. Wealthy countries are able to import even up to 100% of cereal consumption requirements, whilst still being without a food security risk (as long as the world grain market is stable).

When measuring per capita income in GNI PPP (Gross National Income, Purchasing Power Parity), the $10000 level appears to be the cut-off boundary separating countries that receive food aid from those that do not. In global terms, on only three occasions since 1992 has any country with an average income higher than $10000 received food aid – Slovenia in 1993 immediately after the break-up of Yugoslavia, Israel in 1993, and St. Kitts Nevis in 1995. Alternatively, only 5 out of the 127 countries with an average income of below $10000 have avoided the need for food aid since 1992. Moreover, virtually all countries with an average income of under $2000 required food aid during every year in the 1992-2002 period. Thus any country with a GNI PPP per capita of under $2,000 will receive a FSI score of zero, as the vast majority of countries in this group received aid every year between 1992 and 2002. The score divisions between the other GNI PPP per capita levels are divided equally (Tab. 5).

Table 5. Scores for the wealth indicator in a basic FSI.

Income up to	FSI score	Income up to	FSI score	Income up to	FSI score
$ 2000	0	$ 4947	-7	$ 7895	-14
$ 2411	-1	$ 5368	-8	$ 8316	-15
$ 2842	-2	$ 5789	-9	$ 8737	-16
$ 3263	-3	$ 6211	-10	$ 9158	-17
$ 3684	-4	$ 6632	-11	$ 9579	-18
$ 4105	-5	$ 7053	-12	$ 10000	-19
$ 4562	-6	$ 7474	-13	> $ 10000	-20

Combining the three indicators, the final FSI gives scores in the range of between 50 and –40. A score of 50 represents the most food insecure situation. For example a nation receiving at least 10% of its cereal needs from food aid (score = +30), importing at least 97.5% of its cereal consumption (score = +20), and having a per capita GNI PPP of below $2,000, (score = 0). On the other hand, a score of –40 represents the highest level of food security within the constraints of this FSI classification system. For example a country receiving no food aid (score = 0), exporting the equivalent of at least 100% of domestic consumption (score = -20), and having a per capita GNI PPP of above $10,000 (score = -20). The classification system is shown in Table 6.

Table 6. Overall scores of food security levels in a basic FSI.

FSI score	Food security level
0 and negative	Very high
> 0 – 9	High
10 – 19	Medium
20 – 29	Low
> 30	Very low

The Food Security Index produced the following results, as presented in Table 7:

Table 7. FSI scores for Middle Eastern Nations

Nation	Food aid score	Imports/consumption score	Income score	Total FSI score	Food security level
Iran	5	6	-10	1	High
Israel	5	18	-20	3	High
Jordan	30	19	-5	44	Very low
Kuwait	0	20	-20	‘	Very high
Lebanon	10	18	-6	22	Low
Palestinian Territories	25	18	0	43	Very low
Saudi Arabia	0	13	-20	-7	Very high
Syria	5	2	-3	4	High
UAE	0	20	-20	0	Very high
Yemen	10	15	0	25	low

5. DISCUSSION & CONCLUSIONS

The Middle East contains some sharp contrasts in the level of food security across the region on the basis of the above FSI classification system (Tab 7). Food security is highest in the Gulf states of Kuwait, Saudi Arabia and the UAE. Despite their reliance on cereal imports (virtually 100% for Kuwait and the UAE), these three countries do not face a serious food security threat under current circumstances. This is largely due to their reasonably high income levels, which allows them to purchase all their food needs from the world market, as long as it remains stable. Furthermore, Saudi Arabia has actually managed to slightly decrease its dependence on cereal imports during the last ten years despite its increasing population – by the 1992-2002 period; the country had become the third largest cereal producer (per capita) in the region.

Israel has a high level of food security in the above FSI system. The country is relatively wealthy and can afford to purchase its large cereal import requirements. Indeed, without the food aid it received during the 1990s (perhaps destined for Palestinians, which is not clear from the FAOSTAT data) Israel would instead be classified as having a very high level of food security.

Iran and Syria also have a high level of food security. Both are fairly large cereal producers compared to their regional counterparts, but are less wealthy than the Gulf states and Israel, and also received food aid throughout the 1990s. Syria produced a cereal surplus during three years within the 1992-2002 period, whilst Iran was the second largest cereal producer (per capita), after Syria, during the same period.

Though Lebanon is as wealthy as Syria, its food security situation is classed as low. Lebanon is more dependent upon food aid and cereal imports, whilst also using a larger proportion of its cereals for purposes other than direct human consumption in comparison to most other Middle Eastern nations (only the UAE ranks higher in this category). Yemen too has a low level of food security. Compared to Lebanon the country is less dependent upon cereal imports, and received only slightly more aid per capita, but its average income level is extremely low.

Jordan and the Palestinian Territories have the lowest level of food security in the region. The Palestinians have the lowest average income levels in the region (just $727), are quite reliant on food aid (at least 8.6% of domestic consumption), and strongly reliant on imports (91.4% of consumption), though it should be pointed out that the raw FAOSTAT data are incomplete. Jordan has the highest FSI score in the entire region, *i.e.* the lowest level of food security, which is largely due to its large aid dependence (more than 10% of consumption), reinforced by a high imports-consumption ratio and a fairly low average income level.

Food security in the region, according to the above FSI classification system, appears to be largely dependent on wealth rather than climatic factors. The wealthiest countries, the UAE, Israel, Kuwait

and Saudi Arabia, have a very high level of food security. Iran and Syria, though less wealthy, have a greater amount of arable land per capita suited to cereal crop production than their regional counterparts. Hence they are able to produce a larger amount of cereals domestically, which gives these two countries a high level of food security. Though Lebanon has a favourable climate (without hyper-arid and arid zones), the country only produced around 10% of its cereal requirements during the 1992-2002 period, partially due to its high population density and small size. Yemen produced around 25% of its cereal needs, but is vulnerable to potential food crises, due to its extremely low average income. The lowest levels of food security are found in the Palestinian Territories and Jordan, which have the highest aid dependency rate in the region.

There are two major factors that could reduce food security for the countries in the region, which largely rely on cereal imports: (1) economic instability and declining wealth levels that would make it more difficult to afford buying grains on the world market; (2) population growth, which will increase cereal demands. The population of the ten countries included in this study is expected to grow by 96%, from 157.9 million to 310 million in the period 2004-2050, according to estimates by the PRB (2004). The most dramatic population increases are expected in Yemen (a 256% increase from 20 to 71.1 million) and the Palestinian Territories (a 213% increase from 3.8 to 11.9 million). Both already have a low or very low level of food security. Large population increases will undoubtedly lead to further strains in the level of future food security.

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