Arab Horizon 2030: Prospects for Enhancing Food Security in the Arab Region

Technical Summary

UNITED NATIONS
الاسكوا
ESCWA

Food and Agriculture Organization of the United Nations

E/ESCWA/SDPD/2017/1/SUMMARY

Economic and Social Commission for Western Asia

Arab Horizon 2030: Prospects for Enhancing Food Security in the Arab Region

Technical Summary

UNITED NATIONS
Beirut

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations or its officials or Member States concerning the status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The authors have taken great care to ensure that the information and data in the publication are as correct and accurate as possible. However, the Secretariat of the United Nations does not provide any guarantee as to the currency, accuracy, reliability, performance, completeness, and/or the suitability of the information found in this publication.

References have, wherever possible, been verified.

References to dollars ($) are to United States dollars, unless otherwise stated.

Symbols of United Nations documents are composed of capital letters combined with figures. Mention of such a symbol indicates a reference to a United Nations document.

United Nations publication issued by ESCWA and FAO.

Acknowledgments

This document is a technical summary of the report entitled "Arab Horizon 2030: Prospects for Enhancing Food Security in the Arab Region", which is the result of the combined efforts of the United Nations Economic and Social Commission for Western Asia (ESCWA) and the Food and Agriculture Organization of the United Nations (FAO). Special thanks go to the persons listed below.

ESCWA Project Team, Sustainable Development Policies Division

Roula Majdalani, Director
Reem Nejdawi, Chief
Fidele Byiringiro, Economic Affairs Officer

FAO Project Team, Regional Office for Near East and North Africa (FAORNE)

Abdessalam Ould Ahmed, Assistant Director General, Regional Representative
David Sedik, Senior Policy Officer
Mohamed Ahmed, Policy Officer

Project Coordinator

Mohamed Al-Hamdi, First Economic Affairs Officer, ESCWA

Lead Authors

Susan Razzaz
Panos Konandreas
Reem Nejdawi
Mohamed Al-Hamdi
David Sedik
Mohamed Ahmed

Contributing Authors

Christopher Ward
Holger Matthey

Medium-term Outlook and Market Analysis Team - Trade and Markets Division, FAO Headquarters

Holger Matthey, Team Leader
Eduard Bukin, Hannah Fried, Jorge Soguero, Jiyeon Chang, Merritt Cluff, Sergio René Araujo Enciso

Authors of background papers

Talal Darwish and Ali Fadel (land degradation), Fidele Byiringiro (food loss and waste), Marie Therese Abi Saab (agricultural production and productivity), Musa Mckee (technology)

Input on food consumption and nutrition security - American University of Beirut (AUB)

Nahla Hwalla, Martin Keulertz, Sibell El Labban, Rachel Bahn

Input on economic access to food in the Middle East and North Africa, World Food Programme Regional Bureau (WFP Cairo)

Mariko Kawabata, Dipayan Bhattacharyya, Muriel Calo

Technical and logistical Support, ESCWA

Mona Fattah, Lara Geadah, Kamil Hamati, Moneem Murrah

Summary of key messages

Among the food security challenges facing the Arab region, undernourishment, poverty, low agricultural productivity under scarce natural resources and food import dependency will remain central up to and beyond 2030. The average dietary energy supply adequacy for the region is around 134 per cent for the period 2014-2016, well above the world average and fairly close to the level of developed countries. This implies that dietary energy supplies stand at 34 per cent more than what would be required for a healthy and active life. However, the figure varies widely within the region, with Arab least developed countries (LDCs) barely reaching the average level of supply adequacy, just above 100 per cent—a modest improvement from 97 per cent 25 years earlier. Moreover, undernourishment remains high in some of the lower-income countries and those in conflict. Much of the undernourishment and micronutrient deficiency is due to poverty. Most of the 33 million undernourished people across the Arab region live in rural areas, where poverty is also concentrated. Conflict has contributed to the large and growing numbers of food insecure people in urban areas, including internally displaced people and refugees.

The prevalence of obesity is also increasing in nearly all countries, even low-income ones. Obesity in the Arab region is among the highest in the world, with nearly one quarter of the population affected. An important driver of obesity is the prevailing diet in many Arab countries: wheat intake in the region is double the world average, and high consumption of sugar, vegetable oils, animal products and processed foods is registered. A variety of policy actions are available to help shift diets, including subsidies and taxes, provision of information through media campaigns and better product labelling, restrictions on marketing unhealthy food and direct bans.

In the Arab region, the demand for food has long exceeded domestic agricultural production. This is a result of the high average annual population growth rate in the region, estimated at 2 per cent, compared with a world average of 1.1 per cent. Another cause is slow growth in agricultural yields. Crop production can be increased through expansion of sown land or increases in yields. With a few exceptions (such as the Sudan), there is little room for expansion of sown land, due to scarcity of suitable land and limited availability of water resources. During the past 20 years, the contribution of yields to gains in cereal production was only 37 per cent in the region, compared with 95 per cent for the world. Yields in the LDCs, for example, are not only a fraction of those achieved elsewhere, but have also been stagnant for several decades. Despite the region's constraints, there are opportunities to partially address food insecurity by increasing food production. Policies and practices should focus on efficient use of water resources and address soil quality and climate change. An integrated approach to land and water management is likely to be more effective through the prioritization of critical issues, such as soil fertility, rainwater use and strategic crop selection.

The Aglink-Cosimo economic model of FAO and the Organisation for Economic Co-operation and Development (OECD) projects agricultural commodity supply, demand and trade, based on plausible assumptions regarding macroeconomic conditions, agriculture and trade policy settings, weather

conditions, long-term productivity trends and international market developments. On the basis of a 'business as usual' scenario for the Arab region, the model projects that demand for food in 2030 will continue to exceed domestic production, in part due to rapid population growth and slow yield growth. With domestic production lagging behind consumption requirements, the region will continue to be dependent on the world market to meet its basic food needs.

Many countries across the world, including Arab countries, successfully manage domestic availability of food supplies through partial or total dependence on the world market. A range of instruments is nevertheless available to manage vulnerabilities stemming from such dependence. At the national level, instruments include measures to increase production in countries where it is economically profitable and environmentally sustainable; targeted investment in food production and related infrastructure in other countries; measures to reduce the cost of importing food; and measures to reduce the impact of world market shocks. At the regional level, intraregional trade can be enhanced through tariff restructuring, non-tariff measures and harmonizing regulatory frameworks. Greater regional coordination of data collection and management can also help countries to further dampen the effects of price volatility and global food supply shocks. Finally, regional cooperation and coordination can also reduce investment costs for physical stocks of food. In addition to the benefits of economies of scale, regional food stocks provide greater price stability, facilitate movement of supplies across borders, and make coordination of market information more effective. Improved regional coordination during international processes can contribute to more favourable terms of international trade, and a reliable global food market, such as through lobbying for greater symmetry in penalties for export and import restrictions, particularly of key agricultural commodities.

Introduction

The report "Arab Horizon 2030: Prospects for Enhancing Food Security in the Arab Region" has three objectives: (a) to examine the status of food security in the Arab countries; (b) to assess the potential achievement of food security in the region within the Sustainable Development Goals (SDGs) framework; and (c) to identify appropriate policy directions at the national and regional levels to support food security, with an emphasis on food availability.

The definition of food security as agreed at the 1996 World Food Summit is the following: "Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life." The concept of food security is thus complex, involving a wide range of actors and physical, economic and biological aspects. Figure 1 is useful to visualize its various dimensions.

The SDGs address the various dimensions of food security: it is the core focus of Goal 2 on ending hunger, achieving food security and improved nutrition, and promoting sustainable agriculture, but it is also integrated into Goals that tackle poverty (Goal 1), heath (Goal 3), gender equality (Goal 5), water (Goal 6), energy (Goal 7), consumption and production patterns (Goal 12),

Figure 1. Dimensions of food security

Source: Available from http://medanth.wikispaces.com/Food+Insecurity.

climate change (Goal 13), desertification and land degradation (Goal 15), peace (Goal 16) and partnerships (including fair trade, Goal 17).

As shown in figure 1, food can be made available from two sources: domestic production and net imports. Reliance on these sources is a key concern at a technical level, in terms of environmental sustainability, and at a political level. Many countries manage their food security through partial or complete dependence on the world market and, in fact, many Arab countries have been doing so successfully for decades. Studies have found scant relation between national food security and the level of self-sufficiency in food production. However, dependence on the world food market has been considered a problem by some, as a symbol of post-colonial dependence. More recently, concern has

risen as the world food balance in basic food commodities was disturbed by the weather, leading to dramatic temporary increases in market prices and an imposition of export prohibitions and restrictions. The debate on the potential limitations of the global food system in providing for ever-increasing food needs has coincided with the recent political upheavals in several Arab countries, and has raised renewed calls for reappraising national food security strategies. Some Governments in the region and elsewhere have questioned the policy of reliance on food imports and supported the notion of food self-sufficiency or 'food sovereignty'.

The prospects for achieving food self-sufficiency are limited by climatic and social factors in the Arab region. Agriculture certainly plays a role in food security by contributing to domestic food supply and reducing import dependence. But its role is broader than this direct contribution: according to 2013 data from the Food and Agriculture Organization of the United Nations (FAO), it also provides 38 per cent of the region's economically active population with jobs and incomes, and thus food access, and contributes to the earnings needed for food imports.

This report addresses the complex interplay of the technical, political, climatic and social factors related to food security in the Arab region. It is composed of two main parts. Part one provides a broad overview of the status of food security including utilization, access and availability. It features projections that assume a continuation of the status quo based on the Aglink-Cosimo model of FAO and the Organisation of Economic Co-operation and Development (OECD). Part two provides a detailed examination of the current situation of national food production and productivity, food waste and loss, and food trade. Projections for the future in those three areas are presented. Looking forward, the report proposes a range of policy options and a simulation of the impact of policies, also using the Aglink-Cosimo model.

Part One

A. Overview of food security

1. Utilization

The nutritional challenges that households face differ starkly between and within Arab countries, ranging from undernutrition and micronutrient deficiencies to obesity, non-communicable diseases and foodborne diseases. Undernourishment, which results from inadequate calorie or protein intake, remains the most important regional challenge. Thirty-three million people suffer from it and moderate undernourishment contributes to half the deaths of children aged under 5 years.[1] The consequences of undernourishment include poor physical, mental and social development of the child, which inhibits an individual's lifelong abilities and leads to chronic ill health, less opportunities for educational growth and low productivity.[2]

The prevalence of undernourishment spans the whole range in the region, from very low to very high levels (table 1). For most countries in the Mashreq, Maghreb and Gulf Cooperation Council subregions, undernourishment hovers around 5 per cent, the order of magnitude seen in developed countries. However, there are certain outliers even within these subregions, with high levels of undernourishment in recent years notably in Iraq, estimated by FAO at 22.8 per cent in 2014-2016, and in the State of Palestine, estimated at a high 31 per cent in 2010-2012. Arab least developed countries (LDCs) also still suffer from very high levels of undernourishment. Aside from Mauritania, where the latest FAO estimate was of 5.6 per cent, all other Arab LDCs registered alarming rates: 70 per cent in Comoros, 39 per cent in the Sudan and 26 per cent in Yemen according to latest estimates. As several Arab countries remain under protracted conflicts, data are unreliable and actual rates may be higher than those reported.

Levels of stunting in under-5 children, a key indicator for chronic malnutrition, show that malnourishment is a concern across the region. In general, the high prevalence of stunting among children is associated with high prevalence of food (caloric) inadequacy. However, caloric inadequacy is not the only determinant of stunting, as is made evident by the relatively high levels of stunting in the case of Egypt (22.3 per cent) despite the apparently very low caloric inadequacy (less than 5 per cent).

While the averages of micronutrient deficiencies in the Arab region are generally below world averages (aside from iodine deficiency), individual country statistics provide a much more worrisome picture. Prevalence of anaemia and micronutrient deficiencies (vitamin A and iodine) is very high in the Arab LDCs, whether compared with the Arab averages or world averages. Stunting affects 38.4 per cent of children under 5 years of age in Arab LDCs. In Egypt, the relatively higher levels of stunting are likely due to micronutrient deficiencies. Even though the country has witnessed a remarkable increase in dietary caloric intake in recent years, encouraged by high subsidies, the bulk of the diet is still dominated by cereals and other basic products (sugar and oil) that are energy-rich but micronutrient-poor. Legumes and cereal grains, which are the main staples of poor households, often contain certain 'antinutrients' (such as phytates) which, if absorbed in abundance and not coupled with other foods or handled correctly, may interfere and reduce the absorption of essential trace

Table 1. Utilization statistics

	Prevalence of stunting among children (%)	Prevalence of deficiencies among children (%)			Prevalence of under-nourishment (%)
		Anaemia	Vitamin A	Iodine	
	Most recent observation				2014-2016
Algeria	11.7	42.5	15.7	77.7	< 5.0
Bahrain	13.6	24.7	..	16.2	< 5.0 (2010-12)
Comoros	32.1	65.4	21.5	..	70.0 (2010-12)
Djibouti	33.5	65.8	35.2	..	15.9
Egypt	22.3	29.9	11.9	31.2	< 5.0
Iraq	22.6	55.9	29.8	..	22.8
Jordan	7.8	28.3	15.1	24.4	< 5.0
Kuwait	5.8	32.4	..	31.4	< 5.0
Lebanon	16.5	28.3	11.0	55.5	< 5.0
Libya	21.0	33.9	8.0	..	< 5.0
Mauritania	22.0	68.2	47.7	69.8	5.6
Morocco	14.9	31.5	40.4	63.0	< 5.0
Oman	9.8	50.5	5.5	49.8	< 5.0
Qatar	11.6	26.2	..	30.0	19.8 (2010-12)
Saudi Arabia	9.3	33.1	3.6	23.0	< 5.0
Somalia	25.3	..	61.7	..	.. (2010-12)
State of Palestine	7.4	30.0	..	..	31.0 (2010-12)
Sudan	37.9	84.6	27.8	62.0	39.0 (2010-12)
Syrian Arab Republic	27.5	41.0	12.1	..	< 5.0 (2010-12)
Tunisia	10.1	21.7	14.6	26.4	< 5.0
United Arab Emirates	..	27.7	..	56.6	< 5.0
Yemen	46.8	68.3	27.0	30.2	26.7
Mashreq	22.1	37.0	15.7	31.8	..
Mashreq without Egypt	21.8	45.7	20.3	36.5	..
Maghreb	13.5	35.1	24.3	64.9	..
GCC	8.2	34.0	2.9	30.6	..
LDCs	38.4	68.7	32.4	51.2	..
Arab region	22.3	43.6	20.1	35.9	..
Developing	28.0	52.4	34.0	29.6	12.9
Developed	7.2	11.8	3.9	37.7	< 5.0
World	25.7	47.9	30.7	30.3	10.8

Source: FAOSTAT Food Security Indicators, available from http://www.fao.org/economic/ess/ess-fs/ess-fadata/en/#.WUzmBWiGO70 (accessed April 2017); and FAO, 2013b.
Note: Two dots (..) indicate that data are not available.

elements such as iron and zinc, leading to the increase of existing deficiencies.[3]

The prevalence of overweight and obesity is also increasing in nearly all Arab countries, including low-income ones. Nearly one quarter of the region's population is obese: this is double the world average, slightly above the average of developed countries and nearly three times that of developing countries. According to the most recent World Health Organization (WHO) estimates, within the Arab region, the GCC subregion has the highest prevalence of obesity, averaging 33 per cent, followed closely by the Mashreq subregion at about 31 per cent, then the Maghreb subregion with 17 per cent, and finally the Arab LDCs with about 9 per cent.

Recent studies on the high incidence of non-communicable diseases, including those related to obesity, point towards people's diet as the most influential determinant.[4] Wheat intake in the Arab region is double the world average and much of it is refined. This does not contribute to a proper diet both in terms of health and environmental sustainability. Some Arab countries have a large consumption of meat, which is also neither healthy nor environmentally sustainable. Shifting diets of the existing and growing middle class is thus a necessity. Current dietary patterns are often influenced by subsidies, which are extensive on wheat, rice and sugar. A variety of policy actions could help to shift diets, such as subsidizing healthy foods and taxing unhealthy ones; providing information including through media campaigns and product labelling; restricting advertisement and marketing of unhealthy food directed to children; and direct bans (e.g. of sodium and trans fat) or mandates (e.g. for vegetable oils).

2. Access

Much of undernourishment and micronutrient deficiency is due to poverty. Indeed, most of the 33 million undernourished people across the Arab region live in rural areas, where poverty is also concentrated (table 2). The table below shows that this is the case for almost all countries. However, recent crises have underlined the large and growing numbers of food insecure people in urban areas, including newly arrived displaced people and people in refugee camps.[5] As the table shows, Jordan now has more poor people living in urban[6] than in rural areas, and this trend is likely to be seen elsewhere in the context of high out-migration from rural areas.

Farm households in Arab countries rely almost exclusively on farming with little rural non-farm activities. Nevertheless, there is

Table 2. The poor are concentrated in rural areas

	Percentage of urban people who are poor	Percentage or rural people who are poor	Percentage of poor in rural areas
Yemen	21	40	84
Sudan	27	85	81
Egypt	10	27	78
Tunisia	2	8	75
Morocco	5	15	68
State of Palestine	21	55	67
Algeria	10	15	52
Jordan	12	19	29

Source: World Bank, 2009.

Table 3. Employment in agriculture in selected countries, 2013 (percentage)

Country	Percentage of total employment	Male	Female	Percentage of total male employment	Percentage of total female employment
Algeria	10.6	9.8	0.8	12	4.4
Egypt	28	19.2	8.8	24	43
Iraq	23.4	13.9	9.5	17	51
Morocco	39.2	23.6	15.6	32	60
State of Palestine	10.5	7.1	3.4	8.5	21
Syrian Arab Republic (2011)	13.2	11.7	1.5	13.4	12.3

Source: Data compiled from FAOSAT, available from http://www.fao.org/faostat/en/#data/OE; and World Bank, World Development Indicators, available from http://data.worldbank.org/data-catalog/world-development-indicators (accessed April 2017).

growing evidence that rural non-farm income (i.e. income derived from wage-paying activities and self-employment in commerce, manufacturing and other services) is gaining importance for farm and non-farm rural households,[7] thus contributing to the rural economy and to access to food.

Despite the low contribution of agriculture to the gross domestic product (GDP) of most countries of the region and the growing importance of non-farm income sources, in the most populous countries like Egypt, Morocco, the Sudan, the Syrian Arab Republic and Yemen, agriculture remains the lead employing sector and contributes to social and economic stability (table 3). Unless the other economic sectors become able to absorb some of the labour force working in agriculture, which given the political and economic conditions is unlikely in the near future, agriculture will remain an essential sector that supports rural economy and contributes to food security, directly through provision of agricultural produce and indirectly through provision of the income needed to purchase food.

While women make essential contributions to agriculture, in many countries of the region their land tenure rights are often not secured. They suffer from reduced access to land, and to other productive resources and inputs, which remains a serious obstacle for agricultural productivity improvement and food security in the region.

Food subsidies exist in most Arab countries, but are costly and do not always reach those most in need. Across the region, food subsidies cost $21.6 billion in 2011 and were highest in Iraq, the Syrian Arab Republic and Egypt, where they represented over 2 per cent of GDP. Most are paid in the form of blanket subsidies on common food items like flour or cooking oil. Studies have concluded that at best, as in Iraq, the benefits of food subsidies are captured equally by all income groups, but it is common for the wealthy to benefit more from subsidies than the poor. Such is the case in Jordan, where around one fifth of the poorest 20 per cent are unregistered and so do not have universal ration cards that grant access to subsidised food. Where subsidised goods are sold through government-operated shops like in Egypt and Mauritania, a common problem is that few are located in poor districts, which makes it difficult for poor people to reach them.[8]

3. Availability

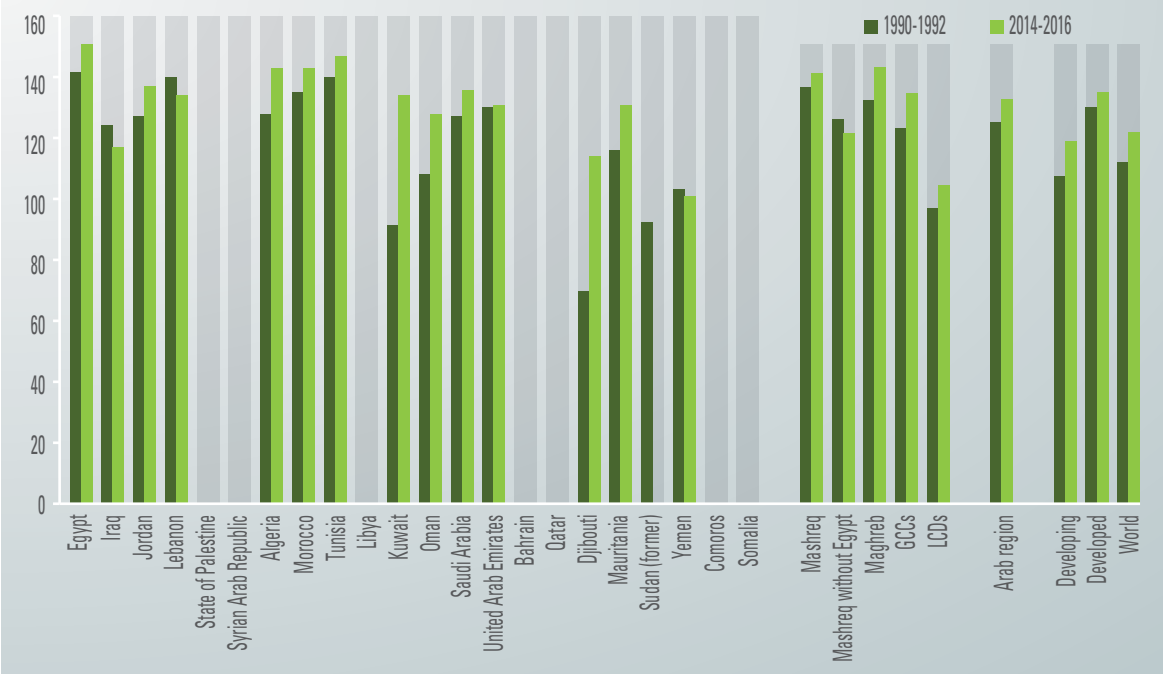
A key measure of food availability is the average dietary energy supply adequacy.[9] A value

greater than 100 indicates that, on average, total dietary energy supplies available in a country are more than enough to meet the needs of the population for a healthy and active life. An important proviso, of course, is how these supplies are distributed among the population.

The average dietary energy supply adequacy for the region was about 134 per cent in 2014-2016, well above the level of developing countries (120 per cent) and the world (126 per cent), and fairly close to the level of developed countries (136 per cent). This implies that dietary energy supplies in the Arab region stand at 34 per cent more than what would be required for a healthy and active life. However, there is a wide variation in the dietary energy supply adequacy within the region (figure 2). LDCs barely make it with a ratio just above 100 per cent in 2014-2016, a modest improvement from 97 per cent 25 years earlier, although some countries in that subregion have reached high levels of supply adequacy, notably Mauritania. At the other extreme, the ratios for the Maghreb and Mashreq subregions are well above 140 per cent, even higher than the average of developed countries. Egypt has the highest dietary energy supply adequacy with a ratio of over 150 per cent in 2014-2016, followed by Tunisia, Morocco and Algeria, and the GCC subregion. It may be noted that the Mashreq subregion without Egypt has a level of supply adequacy well below that obtained when including Egypt, by some 14 per cent in 2014-2016.

Demand for food has increased dramatically in the region, as a result of population growth. The 2010-2015 overall average annual population growth rate for the Arab region was estimated at 2 per cent, compared with a world average of 1.1 per cent.[10] Much of the population growth is concentrated in urban areas, which implies changes in the types of food consumed and an increasing dependence on the market.

Figure 2. Average dietary energy supply adequacy (percentage)



Source: FAOSTAT Food Security Indicators. Available from http://www.fao.org/faostat/en/#data/FS (accessed April 2017).
Note: Data are not available for countries without coloured bars.

While demand for food has increased dramatically, national food production has not kept pace. The region has always had much lower cereal yields than other parts of the world due to less favourable climatic conditions and limited resource endowments of land and water. Even beyond that, however, the productivity gap in cereal yields widened over time. The most worrying case is that of Arab LDCs, where yields are not only a fraction of other regions' yields, but they have also remained desperately stagnant for several decades.

With domestic production lagging well behind consumption requirements, the Arab region is increasingly dependent on the world market to meet its basic food needs. From the food security perspective, the most important food commodity group for which the region continues to be heavily dependent on imports is cereals. In the aggregate, the region imported 65 per cent of its consumption in cereals in 2014-2016, up from just 50 per cent a decade earlier.[11] Dependence on the market had raised concerns for political reasons decades ago, and more recently in the wake of dramatic increases in world prices and an imposition of export prohibitions and restrictions. While the situation returned to normality relatively quickly, such developments brought to the front the challenges of attaining national food security in the face of a potentially volatile world food market.

An increasingly well-recongized cause of food insecurity is food loss and waste. Food loss refers to decreases in food mass occurring at the beginning of the supply chain, whereas food waste refers to decrease in food mass occurring at the retail and consumption stages. Food waste and loss impacts food availability and is due to inefficient practices in production or harvest, post-harvest handling, and storage and processing. It leads to increased consumer prices and exacerbated depletion of natural resources, as production increases to compensate for loss. Utilization is also impacted as food loses micronutrients when inappropriately handled and through delays in transportation. Access is affected through reduced income and revenues for food producers.

4. Conflict

Beyond the structural causes of food insecurity, conflicts and civil insecurity have remained the single most important driving factor of food insecurity in the region in recent years. Conflicts have a direct and indirect effect on food security, undermining it through various channels. Direct effects are due to razing farm land, spreading cluster bombs and mines, killing livestock, destroying machinery and blocking access to markets. Conflict disrupts access to markets by both consumers and producers. It discourages investment into agricultural modernization, thereby reducing the availability of food. It strips government of tax revenues, which prevents the establishment of social safety nets. In addition to constraining economic growth, conflict results in refugee migration and the deterioration of the regional investment climate. In parts of Iraq, Somalia, the Sudan, the Syrian Arab Republic and Yemen, the increase in the number of food insecure was mainly due to the ongoing conflicts.[12]

B. Model and projections

The Aglink-Cosimo model is an economic model that analyses supply and demand of world agriculture. The baseline projection produced through this model is not a forecast about the future, but rather a plausible scenario based on specific assumptions regarding macroeconomic conditions, agriculture and trade policy settings, weather conditions, long-term productivity trends and international market developments. The projections of production, consumption, stocks, trade and prices for the different agricultural products described and analysed in the report have been subject to critical examination by experts from national institutions in collaborating countries and international commodity organizations prior to their finalization and publication. Aglink-Cosimo is also a powerful tool for forward looking analysis of domestic and trade policies through the comparison of alternative policy options against the benchmark of the baseline projections.

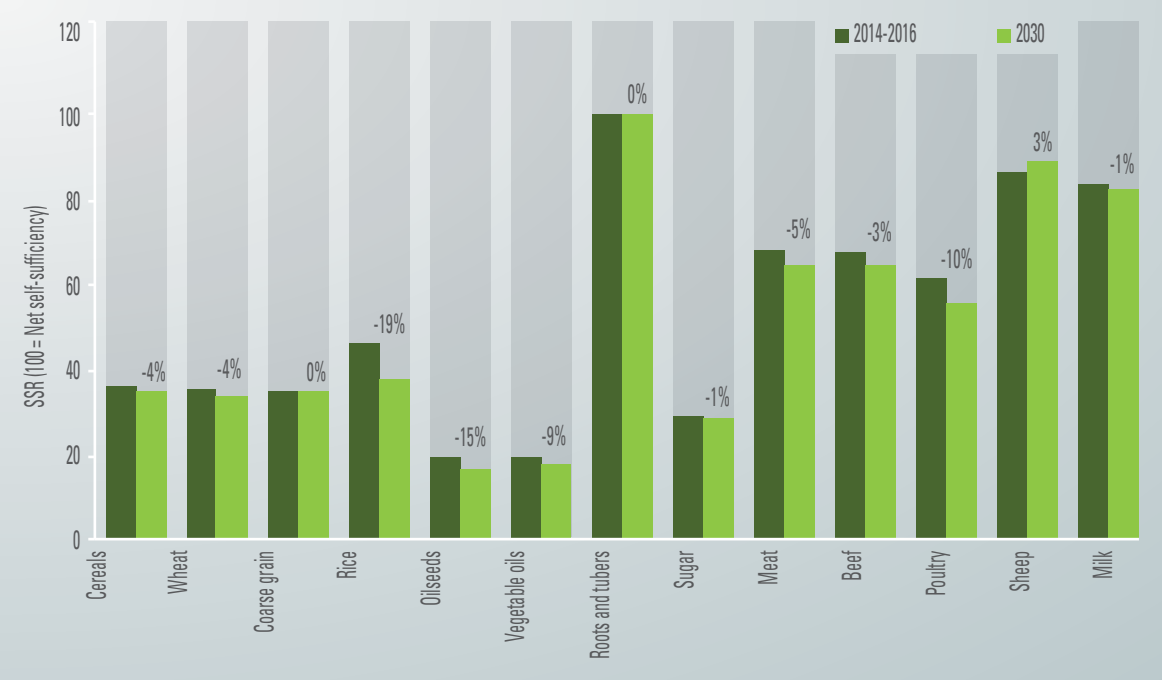
Baseline projections to 2030 show that the average calorie intake will continue to be above the global average.[13] The average daily calorie availability per person, which includes losses and waste, is currently estimated at about 3,000 calories and is projected to reach about 3,100 calories by 2030. More specifically, the already high consumption of cereals is expected to continue across the region. And, even in the LDCs where cereals consumption is currently below the world average, the gap is expected to close by 2030. Calorie intake from animal sources make up a relatively small share of total calorie intake in the Arab region. However, dairy products are becoming an increasingly important nutritional component and consumption is expected to grow at an annual rate of 2.6 per cent until 2030.

Natural resource scarcity, i.e. reduced water availability and land degradation, is the major production limitation in the Arab region and production gains will have to be achieved primarily through efficiency gains rather than through an expansion of the area under cultivation. Over the outlook period, wheat production is expected to increase by 5.6 million tons to reach close to 30 million tons by 2030, as a result of yield gains. Total milk production in Arab countries is projected to expand at around 2.3 per cent per year, primarily from an expansion of the dairy herd. Meat production in the region is expected to expand by 1.6 per cent per year. Significantly, the expansion in meat production will contribute to the increasing demand for cereals.

Demand is expected to grow faster than production, which implies that the region's dependence on imports is expected to grow to fill the gap. Net imports of wheat into the region will be twice the amount of the regional supply. Imports of dairy are expected to grow by 2 per cent per year such that by 2030, the region may account for 30 per cent of global dairy imports. Although meat production in the Arab region will expand at a rate above the global rate, it will not be sufficient to cover the increase in domestic demand. As a result, meat imports, which currently amount to about 4.1 million tons, will increase to around 6 million tons.

Food self-sufficiency ratios in the Arab region, which have been declining, are projected to continue following that trend given a moderately increasing gap between supply

Figure 3. Self-sufficiency ratios in the Arab region, selected commodities, 2014-2016 and 2030

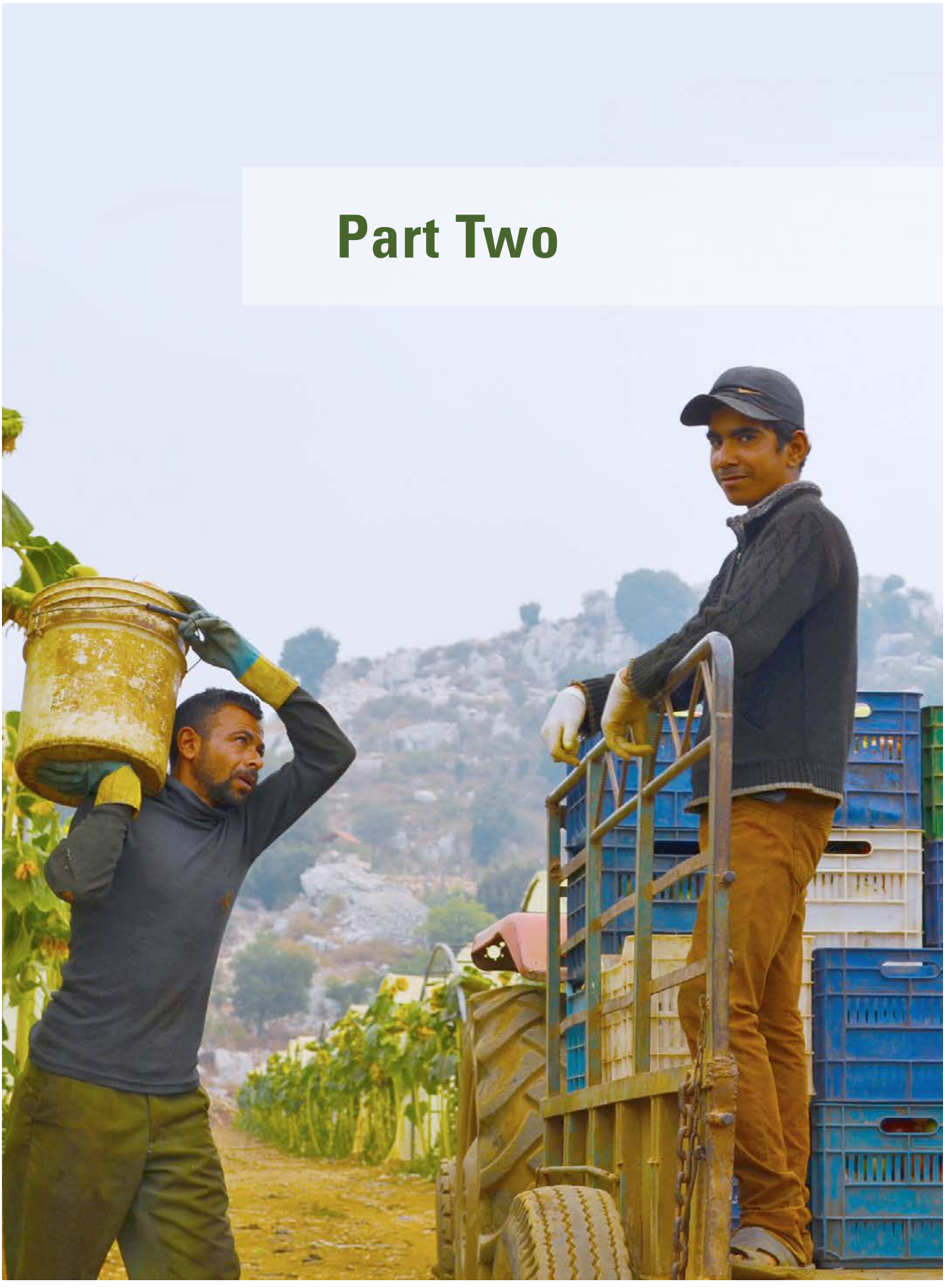


Source: Projections by FAO and OECD using the Aglink-Cosimo projections model.

and demand. Consequently, the Arab region as whole will increasingly rely on imports to meet its food needs. The highest dependency by 2030 will be in oilseeds and vegetable oils, with self-sufficiency ratios staying below 20 per cent (figure 3). For cereals, the rate remains around 34 per cent and for sugar at 28 per cent. Self-sufficiency ratios for animal products, with current levels of around 83 per cent for dairy and 66 per cent for meat, are also projected to decrease over the projection to 78 per cent and 63 per cent respectively, due to domestic production not being able to keep pace with strong growth in demand.

The large differences in self-sufficiency ratios between animal and vegetal products reflect the support of several Governments in the region to reduce import dependency on value-added livestock products through an import substitution policy. Thus, dependency on feedstuffs used in meat and dairy production is increasing. An additional rationale is that livestock and dairy products are harder to transport over long distances and they are an important source of income for many small farmers in the region.

Part Two



A. Productivity and management

1. Current status

a. Extent of land farmed and yield

National food production is a function of extent of land farmed and yield. Historically everywhere in the world, expansion of food production has come first from increasing the area under cultivation followed by increasing productivity, as areas suitable for cultivation became scarce. With a few exceptions, this shift from extensive to intensive exploitation of land has not taken place in the region. In fact, due to the very poor performance in productivity gains, any increase in cereal output continues to come largely from area expansion. During the 20-year period of 1990-1996 to 2010-2016, the contribution of yields to the gains in cereal production of the Arab region was only 37 per cent, compared with 95 per cent for the world (figure 4). In contrast, the main increase in cereal production in the Arab region overall has come from area expansion (67 per cent of the increase between 1990-1996 and 2010-2016), compared with 5 per cent for the world.

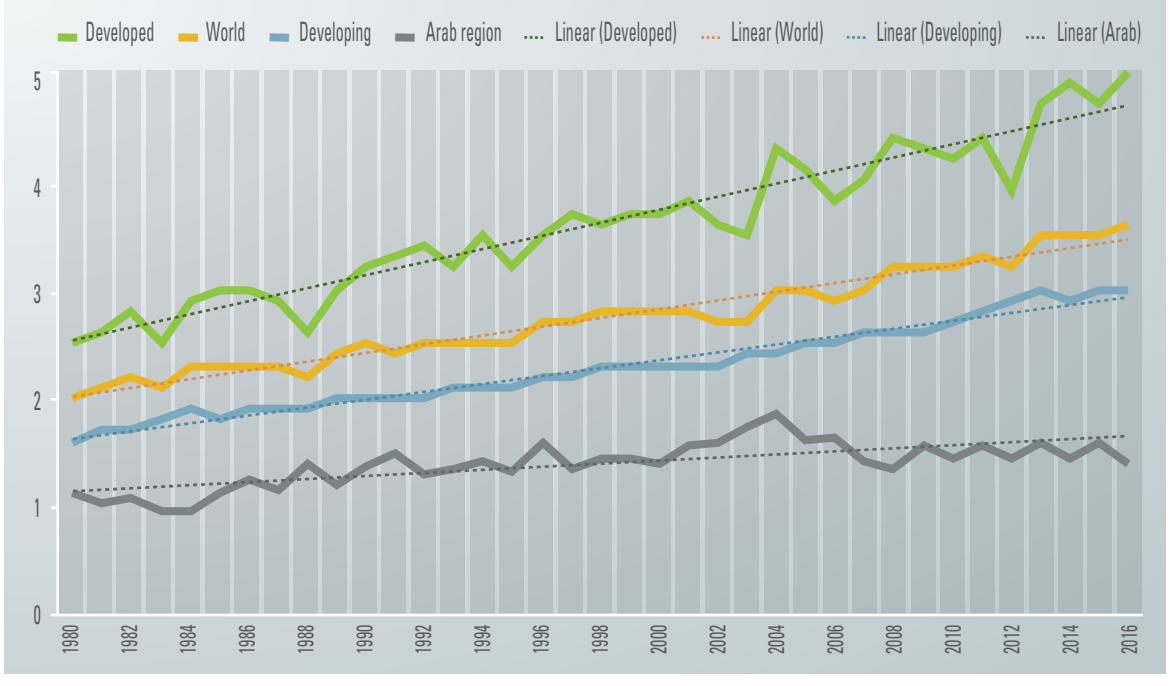
The increase in the total number of hectares farmed in the Arab region was paralleled by a faster increase in population size. As a result, the quantity of farmed land per person has fallen by 6 per cent in the last 50 years. Moreover, there are large year-on-year fluctuations in harvested area due to variations in rainfall.

Figure 4. Area and yield contribution to cereal production increases from 1990-1996 to 2010-2016 (percentage)

Source: Based on data from FAO, Country Cereal Balance Sheet data. Available from http://www.fao.org/giews/data-tools/en/ (accessed April 2017).

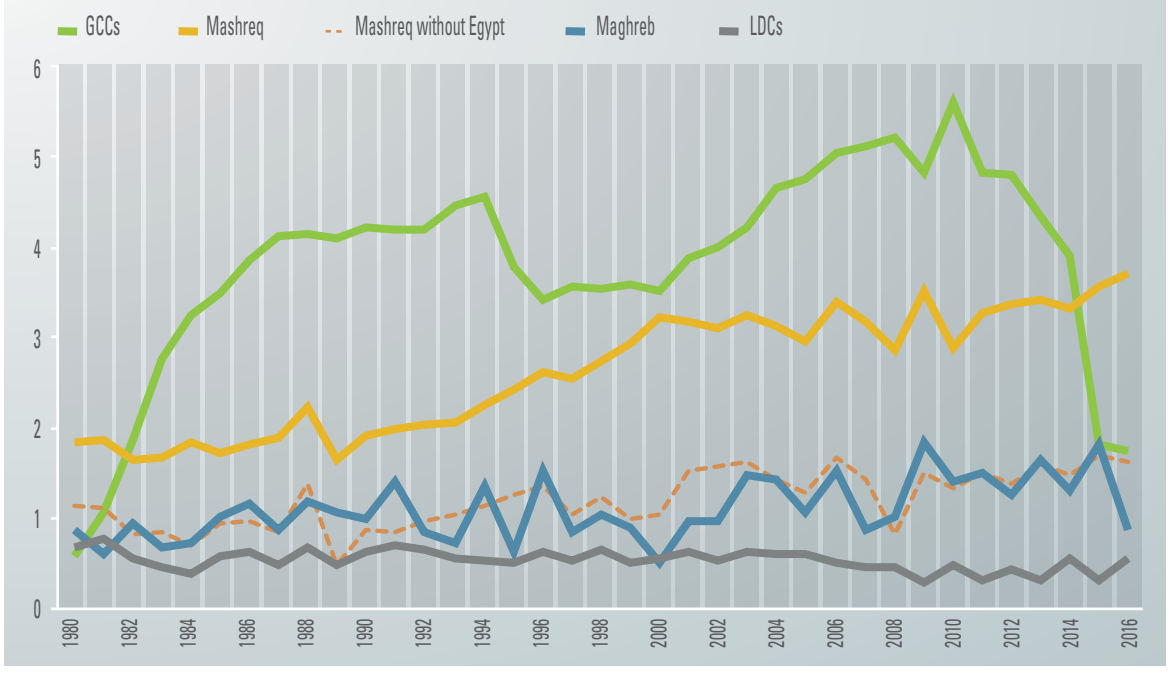
As indicated earlier, the Arab region compares very unfavourably with other world regions in terms of productivity gains (figure 5). Actual performance in cereal yields going back to the 1980s shows that gains have been very modest compared with world gains or those of other developing countries. Moreover, there are huge differences in productivity gains between the different Arab subregions (figure 6). The Mashreq subregion, which accounts for the bulk of the area devoted to cereal production in the region and harvests the lion's share of cereal output, has achieved yields consistently much higher than those of the other subregions. However, this performance is due to Egypt, as Mashreq without Egypt has much lower yields, similar to the other subregions. The most worrying case in the Arab region is that of the LDCs where, as underlined previously, yields have stagnated at desperately low levels. There has even been a considerable and sustained decline in productivity during the past decade.

Figure 5. Comparisons of regional trends in cereal yields



Source: Based on data from FAO, Country Cereal Balance Sheet data. Available from http://www.fao.org/giews/data-tools/en/ (accessed April 2017).

Figure 6. Trends in cereal yields by Arab subregion



Source: Based on data from FAO, Country Cereal Balance Sheet data. Available from http://www.fao.org/giews/data-tools/en/ (accessed April 2017).

b. Quality of land

The region's soils suffer from severe, ongoing degradation. The situation is particularly problematic for rain-fed croplands, which have experienced extensive loss of soil cover and deteriorated fertility. Of the region's 30 million hectares of rain-fed cropland, three quarters (22 million hectares, 73 per cent) are estimated to be degraded. Water erosion is predominant in that part of the region, which has sloping lands. Land in the Arab countries is also highly vulnerable to wind erosion. Recent studies have estimated the economic cost of land degradation in the region at a massive $9 billion each year (between 2 and 7 per cent of individual countries' GDP). Salinity has greatly reduced crop yields and is the cause of economic losses across the region, estimated at $1 billion annually, equivalent to $1,600-$2,750 per hectare of affected lands. In some Arab countries, the reduction in soil productivity has been estimated to be in the range of 30-35 per cent of potential productivity.

c. Water

Water scarcity is a common challenge in the region. It is in fact the most water scarce in the world, and both economic and demographic pressures are increasing relative scarcity. All Arab countries use most of their water for agriculture (table 4). This reflects the historic and contemporary importance of the agricultural sector and of food production, but in most countries, the fast-rising demand from other sectors is creating calls for water transfer out of agriculture. Some argue that there is an economic case for transferring water out of agriculture to higher value municipal and industrial uses, others argue agriculture's importance for incomes of the poorest and to protect against risks related to the global food markets. But all agree on the priority of improving management for optimal

Table 4. Shares of water by sector in selected Arab countries

Country	Percentage withdrawn by sector		
	Agriculture	Domestic	Industry
More than 90% of withdrawals used in agriculture			
Yemen	95	4	1
Syrian Arab Republic	95	3	2
Iraq	92	3	5
Oman	90	8	2
More than 80% of withdrawals used in agriculture			
Morocco	87	10	3
Egypt	86	8	6
Saudi Arabia	86	10	3
Libya	83	14	3
Tunisia	82	14	4
Less than 80% of withdrawals used in agriculture			
Jordan	75	21	4
Lebanon	67	33	1
Algeria	65	22	13

Source: Based on data from Aquastat. Available from http://www.fao.org/nr/water/aquastat/main/index.stm (accessed April 2017).

allocation and efficient use, environmental protection to prevent degradation, and adaptation to climate change.

The differences in productivity between Arab countries are primarily driven by differences in reliance on rain-fed versus irrigated farming systems. Rain-fed farming systems still predominate in the Maghreb subregion, the Mashreq subregion (other than Egypt) and the LDCs, covering 55 million hectares (more than two thirds of the region's cultivated land), and provide livelihoods for nearly two thirds of the agricultural population region-wide.[14] In Algeria, Iraq, Jordan, Lebanon, Libya, Mauritania, Morocco, the Sudan, the Syrian Arab Republic, Tunisia and Yemen, rain-fed agriculture is practiced on more than half of all arable land.[15]

Rain-fed farmers face the challenges of low productivity and unpredictable rainfall, which are growing as climates change. Soil fertility is also key to productivity in rain-fed agriculture. For soils that are naturally poor in nutrients or are degraded, maintaining and enhancing soil texture and fertility will improve crop water productivity. The most widespread response in the region has been to step up fertilizer use, and average fertilizer use in the region is above world average, although with wide variations.[16] Despite the importance of rain-fed agricultural systems, agricultural incentive structures have disfavored research and investment in rain-fed systems, focusing instead on commercial and irrigated production.

While countries of the region that rely on rain-fed systems have generally low productivity, those that focus on irrigated farming systems have yields that are higher than the global average. Irrigated systems occupy less than one third of the cultivated area (24 million hectares) but contribute almost half of agricultural value, thanks to the focus on high-value added commercial crops and generally efficient irrigation systems that result in relatively high yields.[17] Egypt's productivity per hectare is three times the regional average.[18]

The problem of irrigated farming systems is sustainability. Groundwater use is convenient and is generally unregulated, but has resulted in depletion, deterioration and destruction of aquifers. The apparently impressive performance of the GCC subregion is mainly due to the resource-intensive and expensive production systems in Saudi Arabia based on underground fossil water supplies. However, as underground water supplies were severely depleted, Saudi Arabia adopted in 2008 a major shift in policy to phase out all wheat production in eight years.[19] Wheat production has plummeted since then and the country has been relying exclusively on imports since 2016.

Although irrigation faces challenges of sustainability, it is vital to the future of agriculture in this largely arid and semi-arid region. Efficiencies are already high compared with those achieved in other regions of the world, nevertheless, the future growth of agriculture depends on making further efficiency and productivity gains.

Management of irrigation occurs at two levels: water service to the field and in-field water management. Water service to the field, in particular, has been shown by FAO studies to be more efficient in the Arab region than the global average.[20] A commonly used measure of efficiency is proportion of water that contributes to plant growth, referred to as water use efficiency. Water use efficiency can approach 100 per cent with drip irrigation in greenhouses, but these systems are often more expensive than open field furrow irrigation, particularly in terms of operating costs. Water use efficiency can be improved by minimizing canal losses, timely delivery (water service to the field), conveying water to the plant root zone at the right time and in the right quantity, and minimizing non-productive evaporation from the field (in-field water management). Pilot projects in Morocco and

Tunisia have achieved remarkable success in increasing water use efficiency.[21]

A related measure of efficiency, referred to as crop water productivity, is the production per unit of water, where production can be measured in either physical or economic units. Globally, physical crop water productivity varies between and within locations and systems by factors of from 2 to 10, and economic crop water productivity varies by factors of from 2 to 8.[22] In some projects within the Arab region, economic crop water productivity can be as much as five times that in other regions.[23] Crop water productivity, or 'more crop or income per drop', can be improved by focusing on high-value crops, particularly low water-consuming crops and varieties or those that return the highest value per unit of water used. Crop water productivity can also be enhanced through soil moisture conservation by reducing tillage, limiting irrigation to critical moments in crop growth, weed and pest management, and by harvest and post-harvest management to reduce losses and increase product quality.

2. Looking forward

Despite the region's constraints, there are opportunities to address food security by increasing food production. Policies and practices should focus on efficient use of water resources and address soil quality and climate change. A holistic approach, including both land and water management issues, is likely to be most effective. While there are some overlapping issues, recommendations for irrigated farming systems are often different from those for rain-fed farming systems.

For irrigated farming systems, the various options can be broadly categorized as either increasing supply of water or reducing demand for water. In terms of increasing supply, the scope is very limited for further water impoundment, though there may be some potential to develop further water harvesting and storage, for example in Lebanon. More promising are non-conventional sources of water for agriculture, such as reuse of treated wastewater, use of saline and sodic water, and use of drainage water. Jordan has had important success in water reuse and such methods are promising, wherever the financial resources for collection and treatment are available.[24] Drainage water is a resource that has been largely neglected in the region with the exception of Egypt, which is considered a world leader in drainage technology and practice.[25] Drainage water is being used on 90 per cent of the irrigated land in Egypt, and is successfully reusing over 10 per cent of the annual freshwater withdrawal without deterioration of the salt balance.

Reducing demand for water by increasing efficiency is the second category of options for irrigated farming systems. Although water use efficiency and crop water productivity are already good in the irrigated farming systems of the Arab region, there is considerable room for improvement especially by adoption and expansion of new technologies. Water use efficiency can be improved at the water service to the field level by minimizing canal losses and timely delivery, and at the in-field level by efficient water conveyance to the root zone, irrigation at the right time and quantity, and minimization of evaporation. Crop water efficiency can be improved through soil, crop and water management (including switching to higher value-added crops and drought-resistant varieties). Investments include physical infrastructure, such as conversion to pressurized irrigation as well as measurement, control and monitoring systems, appropriate accountability mechanisms and capacity-building.[26]

To encourage adoption of these technical approaches to water efficiency, pricing and rationing policies are important to create the right incentives. Water pricing should reflect scarcity and opportunity costs. In practice,

Arab Governments have generally aimed at a lower standard: to recover management, operation and maintenance costs and sometimes a share of the capital costs. In many countries of the region, user fees do not even cover these limited costs, and this impairs maintenance and constrains the scope for private sector participation.

For rain-fed farming systems, approaches are needed to address the region's constraints in terms of low and variable water availability on the one hand, and soil salinity and lack of nutrients on the other hand. There are five general options already available (table 5), but further research and development are needed to refine them. First, soil moisture conservation techniques, such as tillage and mulching practices, inter-cropping and shade planting, can reduce non-beneficial evaporation and make more moisture available to the plant roots, thus improving water use efficiency. Secondly, rainwater harvesting, which captures run off from a

Table 5. Agricultural water management strategies and techniques for improving rain-fed productivity

Aim	Agricultural water management strategy	Purpose	Techniques
Improve water use efficiency by increasing water available to the plant roots	Soil and water conservation	Concentrate rainfall around crop roots	Planting pits
		Maximize rainwater infiltration	Terracing, contour cultivation, conservation agriculture, dead furrows, staggered trenches
	Water harvesting	Mitigate dry spells, protect springs, extend growing season, enable off-season irrigation	Surface dams, subsurface tanks, farm ponds, diversion and recharging structures
	Evaporation management	Reduce non-productive evaporation	Dry planting, mulching, conservation agriculture, inter-cropping, windbreaks, agroforestry, early plant vigour, vegetative bunds
Improve water productivity by increasing productivity per unit of water consumed	Integrated soil, crop and water management	Increase proportion of evapotranspiration (ET) flowing as productive transpiration and so obtain 'more crop per drop'	Increase plant water uptake capacity through conservation agriculture, dry planting (early), improved crop varieties, optimum crop spacing, soil fertility management, optimum crop rotation, intercropping, pest control, organic matter management

Source: Adapted from International Water Management Institute (IWMI), 2007.

managed catchment area and reserves it either in a storage area or in the soil profile, can boost yields by two to three times over conventional rain-fed agriculture. Technologies range from simple in-field structures diverting water to a planting pit, through structures in the catchment which divert run off to storage or run-on fields, to permanent terraces or to dams. The terrace systems of the Yemeni and Omani highlands, which date back at least 3,000 years, are legendary examples of rainwater harvesting. Thirdly, faced with risks of unpredictable rainfall, farmers may use drought-tolerant or shorter cycle crops, or change their cropping calendar. Fourthly, soil fertility can be restored through integrated soil fertility management, including manuring, crop rotations and chemical fertilizers. Most of the region's soils are generally low in natural fertility and are likely to suffer further depletion through erosion and decline in organic matter.[27] Low fertility and poor soil composition reduce the water retention capacity and impede water and nutrient uptake, reducing crop water productivity. Fifthly, supplementary irrigation can be used to provide timely increases in moisture to boost the productivity of rain-fed agriculture. In most cases, a combination of these approaches will be most useful.

Although there are important differences between irrigated and rain-fed farming systems, both need to address some common issues including poor and increasingly degraded soil quality and climate change. Good agricultural practices can overcome many of the soil limiting factors restricting crop yield and food production. For example, sandy soils usually classified into the lowest productivity group can be cultivated to generate income if adequately cropped and properly irrigated. Low water holding capacity can be improved by organic matter, compost or polymer addition and localized irrigation. High pH values can be treated by diluted acid addition to the irrigation water in modern pressurized irrigation systems. Salinity problems can be overcome by positive water balance with improved drainage to leach and evacuate the salts. Sodicity can be managed through chemical treatment and drainage.[28] Erosion risks can be minimized through field measures to reduce surface water flow on slopping lands and to improve natural recharge into the soil and groundwater. A winter cover crop can be grown between large spaced fruit trees, notably the leguminous crops that can protect the soil from the splashing effect of rainfall and improve the soil fertility by fixing nitrogen from the air. Recommended responses to degradation in the region include improving soil resilience by increasing carbon inputs. Ways of reclaiming salt-affected soils include: salt leaching and drainage interventions, chemical and organic amendments, fertilizers, adoption of salt tolerant plants, crop management and phytoremediation.

Climate change is an especially pressing issue for the predominantly dry countries of the region, which are already prone to frequent droughts and a looming water supply shortage. Over the last century, the Arab region has experienced an increase in mean temperatures of up to 0.5°C. In some countries like the Sudan and parts of North Africa, precipitation has decreased by up to 10 per cent in recent decades. Most of the region is expected to become hotter and drier in the future due to climate change. Simulation models indicate that average yearly rainfall could decrease by 10 per cent in the next 50 years.[29] With higher temperatures (causing increased evaporation) and reduced precipitation, loss of surface water would be accelerated and droughts would become more frequent. Already low average yields of rain-fed crops would decline and be more variable. Agricultural output could decrease by 21 per cent by 2080.[30] All farming systems will be exposed to increased aridity and to declines in water availability, with rain-fed systems most at risk (table 6).

Table 6. Climate change impact on farming systems of the Arab region

Farming system	Exposure: What climate change-related events will occur	Sensitivity: Likely impact on farming systems
Irrigated	• Increased temperatures • Reduced supply of surface irrigation water • Dwindling of groundwater recharge	• More water stress • Increased demand for irrigation and water transfer • Reduced yields when temperatures are too high • Salinization due to reduced leaching • Reduction in cropping intensity
Highland mixed	• Increase in aridity • Greater risk of drought • Possible lengthening of the growing period • Reduced supply of irrigation water	• Reduction in yields • Reduction in cropping intensity • Increased demand for irrigation
Rain-fed mixed	• Increase in aridity • Greater risk of drought • Reduced supply of irrigation water	• Reduction in yields • Reduction in cropping intensity • Increased demand for irrigation
Dryland mixed	• Increase in aridity • Greater risk of drought • Reduced supply of irrigation water	• A system very vulnerable to declining rainfall • Some lands may revert to rangeland • Increased demand for irrigation
Pastoral	• Increase in aridity • Greater risk of drought • Reduced water for livestock and fodder	• A very vulnerable system, where desertification may reduce carrying capacity significantly • Non-farm activities, exit from farming, migration

Source: World Bank, 2013.

Governments of the region should develop strategies for adapting to climate change. Because aridity will increase and water is the binding constraint to agriculture in the region, they should evaluate trade-offs between supporting climate change responses in agriculture and preparing parts of the rural economy for transition away from agriculture including off-farm income.

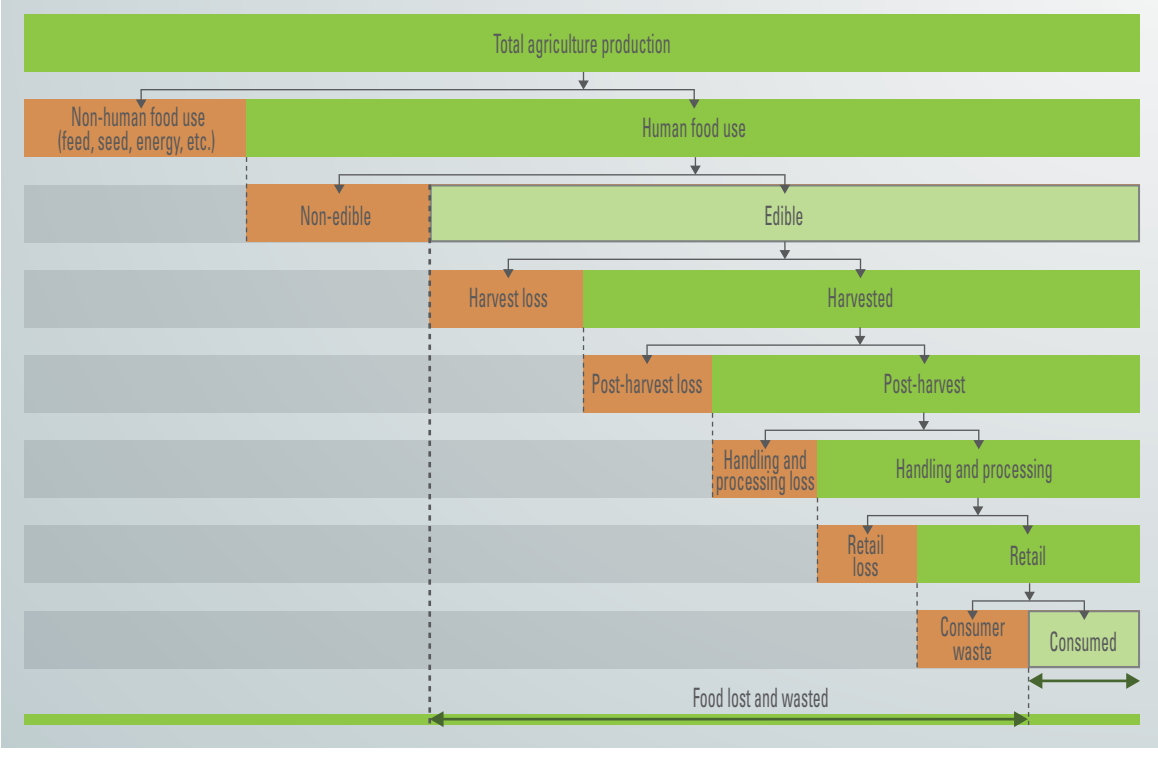
B. Food waste and loss

1. Current status

Food loss refers to decreases in food mass occurring during the stages of production/ harvest, post-harvest handling and storage, processing and retail until prior to consumption, as a result of gaps in practices and technology. Food waste refers to decrease in food mass occurring at the retail and consumption stages at the end of the food supply chain, usually as a result of behaviours of market participants, i.e. both retailers and consumers (figure 7). Food waste and loss has a significant impact on food security at all levels including: reduced quality of food as micronutrients are lost through inadequate handling, storage and processing; reduced income and revenues for food producers; increased prices for consumers; and exacerbated depletion of water, energy and soil nutrients as production increases to compensate for loss.

In the region, food losses are largely driven by poor farming, inappropriate and deficient post-harvest practices and technologies for handling, transporting and processing, and rodent and pest infestation during storage. Food waste at retail level is a result of deficient

Figure 7. Food loss and waste along the supply chain



Source: FAO adaptation of a 2014 report by the High-level Panel of Experts on Food Security and Nutrition. Available from http://www.fao.org/cfs/cfs-hlpe/en/ (accessed April 2017).

Table 7. Per capita food loss and waste by Arab subregion (kg/year)

Region	Comparable region	Per capita food loss	Per capita food waste
Maghreb	North Africa, West and Central Asia	210	40
Mashreq	North Africa, West and Central Asia	210	40
GCC	Europe and North America	280-300	95-115
LDCs	Sub-Saharan and South/Southeast Asia	120-170	6-11

Source: FAO, 2011.

market infrastructures, including inadequate refrigeration, poor transportation and reliance on open air stalls where food products are exposed to pollution, heat, humidity and sunlight, which accelerate the rate of food degradation. At consumption level, food waste is due to overstocking and over-supply. However, other food loss and waste drivers could be cited, including marketing deficiencies, high transaction costs, inadequate financing and investments and deficiencies in sanitation and energy supply.[31]

At the subregional level, the Mashreq subregion accounts for the largest food loss and waste followed by the Maghreb subregion and then the GCC and Arab LDCs subregions (table 7). Food waste in the LDCs remains relatively low compared with other subregions. In the low and middle-income countries of the region, food loss and waste are in large part caused by improper food handling, inadequacy of the infrastructure and use of non-adapted practices and technologies. Investments in infrastructure including roads, water and sanitation, storage and handling facilities, adequate processing and packaging, energy provision for refrigeration, among others, would greatly impact the level of food loss and waste, which could be anticipated.[32] In the high-income GCC countries and increasingly in the upper-middle income countries of the Maghreb and Mashreq subregions, a substantial amount of the food loss and waste occurs in the late stages of retail and consumption, largely as a result of food spoilage and excess volumes of food bought or prepared.

2. Looking forward

Appreciation of the potential for reduction in food waste and loss to contribute to the overall goal of food security is a very recent phenomenon. As with any emerging field, the primary focus needs to be on improving data and raising awareness of the issue. More accurate measurement of the problem, at all stages of the food supply chain and at the retail and consumption stages, is needed on a country by country basis. Development of new and more efficient methods to reduce food waste and loss is also needed. Equipped with better information, policymakers, the private sector and consumers can then mobilize efforts.

Adoption of appropriate technologies will be needed in the upstream stages of the food supply chain, including for agriculture production and harvest, post-harvest storage, handling and processing. Government and relevant private sector entities involved in food logistics can usefully support food waste and loss reduction by addressing structural deficiencies including bureaucratic red tape, taxes and regulations. At the retail level, food loss can be addressed through improved business techniques, such as inventory and production management. At the consumption level, reform of policies that lead to food loss, such as non-targeted subsidies, can also support food security.

C. Trade

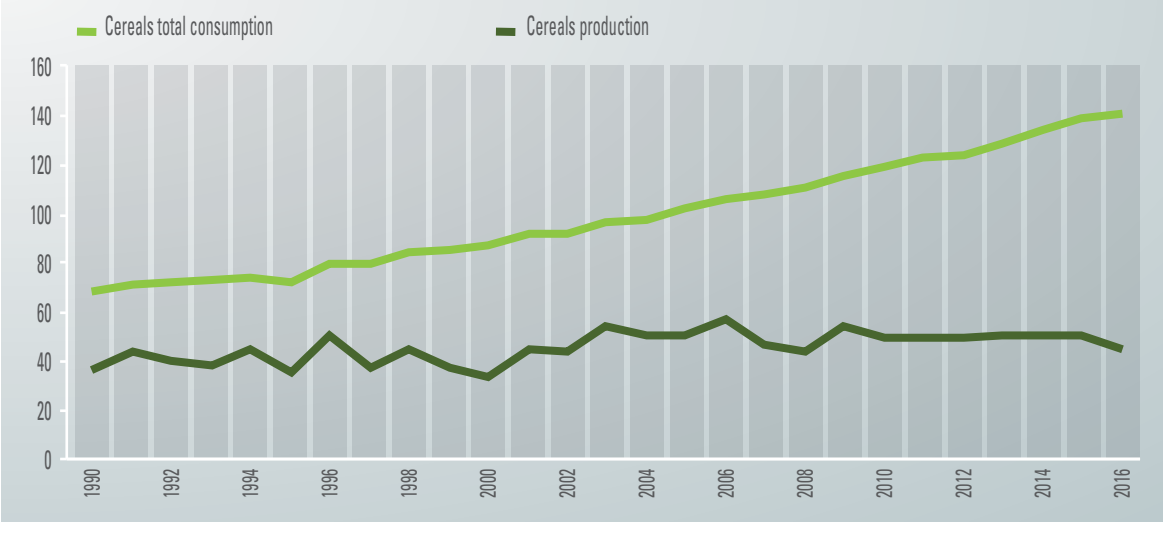
1. Current status

As a consequence of the high population growth rates, increasing urbanization and growth in incomes, demand for food in the region has expericenced high growth rates over the past decades. With domestic production lagging well behind consumption requirements, the region is increasingly dependent on the world market to meet its basic food needs. Increasing imports also reflect increased income in several oil-rich countries.

During the 15-year period ending in 2013, annual growth rates of food imports were nearly 15 per cent. The Arab region is the largest food importer globally, commanding as much as over one third of world imports in some key foodstuffs, particularly cereals.[33] This increased dependence is due to several factors, coming both from the demand and the supply side. On the supply side, the under-performance in productivity gains, is, inter alia, due to resource limitations. On the demand side, increased consumption as a result of food subsidies may have been partly responsible. Figure 8 shows the increasing gap between consumption and domestic production of cereals and demonstrates the region's growing dependence on imports.

Trade imbalances in food commodities are growing rapidly. Without any exception, all Arab countries experienced a negative food trade balance in 2013.[34] Oil-rich Gulf countries are among the ones that register the highest food trade deficits, but non-oil rich countries, such as Egypt, Jordan, Lebanon, Morocco, the Syrian Arab Republic and Yemen, also mark negative food trade balances. The extent to which such imbalances constitute a problem for national food security depends on the overall trade balance of each country.

Figure 8. Trends in food consumption and production in the Arab region (million metric tons)

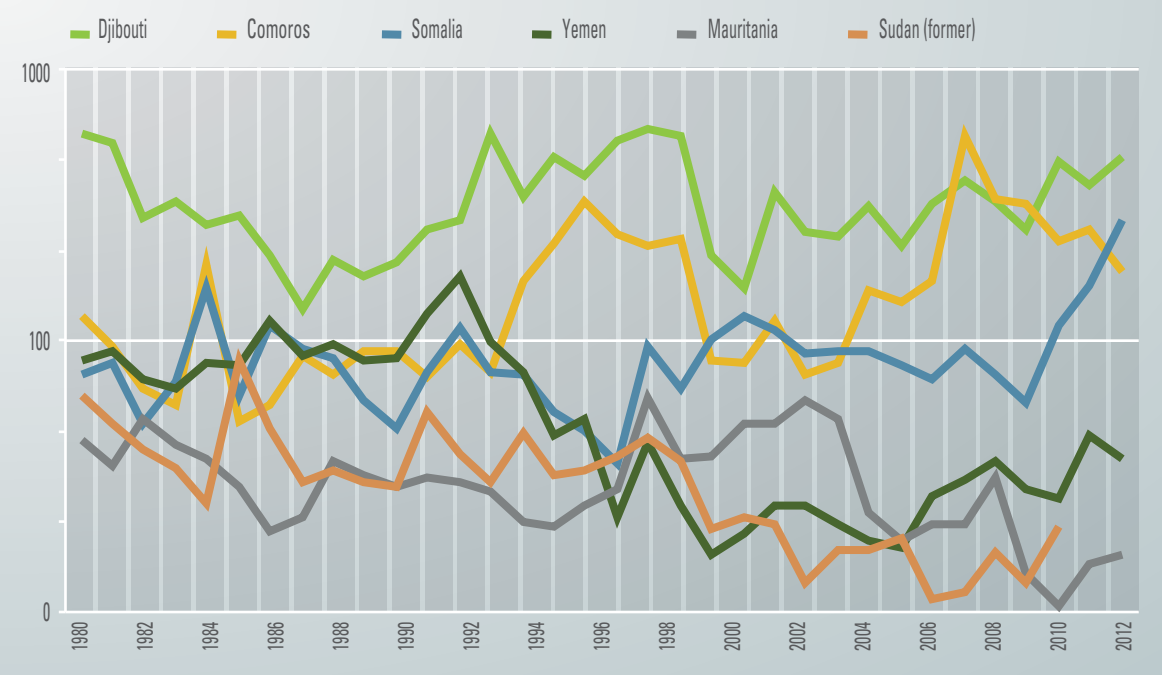


Source: FAOSTAT. Available from http://www.fao.org/faostat/en/#home (accessed April 2017).

A fundamental concern of a country that imports food on a regular basis to meet its needs is its ability to pay for such imports in the present and the future. The balance of total merchandise trade for the Arab region as whole has been consistently positive over several decades, largely due to the surpluses registered by the petroleum-endowed countries. The regional aggregate, however, hides huge differences among individual countries. Several Arab countries exhibit an overall trade deficit (total merchandize trade), including Egypt, Jordan, Lebanon, Morocco, the State of Palestine, the Syrian Arab Republic and Tunisia. Because most of these countries also register large food trade deficits, they are in a precarious situation in terms of food security.

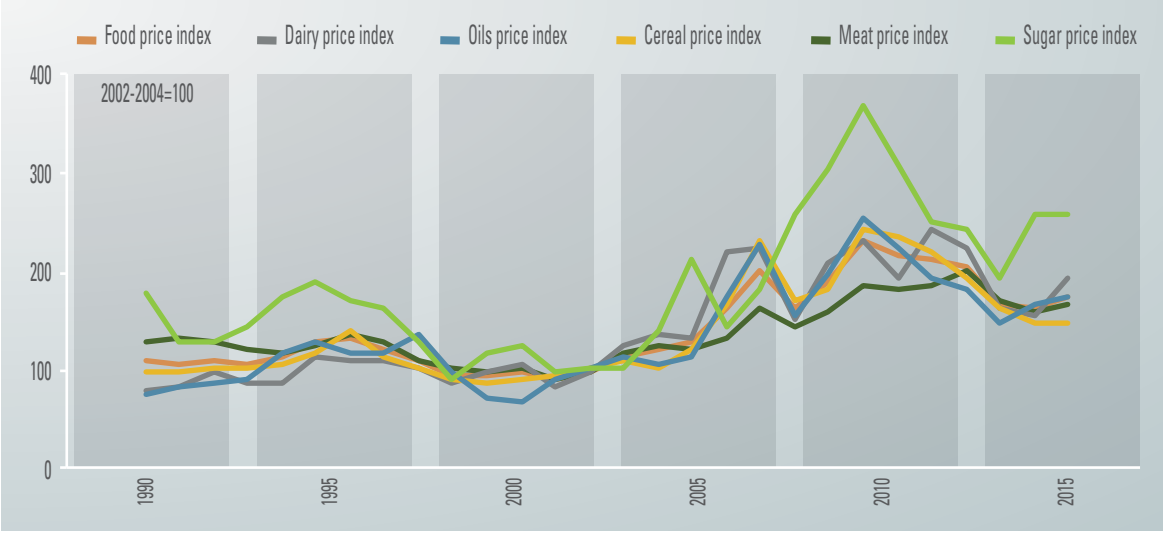
Perhaps the indicator most relevant to assessing capacity to sustain food imports is the share of total merchandize export earnings spent on food imports. This measure would signify a situation of self-reliance for a country when food imports account for a small and stable share of export earnings or, conversely, the non-affordability of importing food sustainably when the share is large and volatile. For the world as a whole, this share is less than 5 per cent.[35] The Arab region average has hovered around 7 per cent in recent years. However, as with other statistics, the regional average hides huge differences between subregions and individual countries. As it would be anticipated, the GCCs have low shares converging around 5 per cent. The share of the Maghreb subregion is double that of the GCC subregion and is also more volatile. The Mashreq subregion registers a share of about 30 per cent, much higher than that of the Maghreb subregion. Finally, the situation of the LDCs is varied and in some cases highly problematic (figure 9). Yemen, Mauritania and the Sudan have had shares in the range of 15-30 per cent in recent years, while the Comoros, Djibouti and Somalia have had shares ranging from 200 to 400 per cent, which means that they

Figure 9. Food imports as a share of total merchandise exports in the Arab LDCs



Source: FAOSTAT. Available from http://www.fao.org/faostat/en/#home (accessed April 2017).

Figure 10. World food commodity prices



Source: Agricultural Market Information System. Available from http://www.amis-outlook.org/amis-about/en/ (accessed April 2017).

spent, year after year, a multiple of their total earnings from merchandize exports on food imports (possibly financed by remittances, other sources of export earnings and food assistance flows). The figures are highly volatile for all Arab LDCs and the situation is hardly sustainable.

The 2007-2008 food crisis prompted a shift in perceptions about global food markets (figure 10). While world food commodity markets have since returned to normality, there remains a close balance between aggregate global supply and demand, which could be easily disturbed. Volatility is a basic characteristic of agricultural markets and adjustments from short-term events have been quick. However, these events did generate new concerns, including the increasingly close linkages of food prices to fuel prices. Hitherto, these links had been mainly on the production side, with energy being an input to agriculture and food production (fertilizer and fuel for machinery, for example). At present, the links are both on the input and the output side of agricultural production. Biofuel production has been a major factor in the strengthening of food prices in recent years, although views vary about the relative importance of biofuel subsidies and high energy prices in the growth of the biofuel industry.[36]

2. Looking forward

The broad consensus by food commodity experts is that global supplies of food and agricultural commodities are likely to be tighter in the future because of several factors,[37] including scarcity of land and water resources, climate change,[38] higher energy prices,[39] and decreasing returns from existing productivity. Longer-term structural changes are likely to affect the level, and perhaps the volatility, of food prices in the future.

A range of instruments is available to manage vulnerabilities stemming from dependence on food imports. At a national level, it includes increasing production in countries where it is economically profitable and environmentally sustainable; targeting investment towards food production and related infrastructure in other countries to gain direct access to supplies; reducing the cost of importing food; and reducing the impact of world market shocks.

- Governments of countries with potential to increase food production can invest in related agricultural infrastructure and provide targeted support to their farmers. All Arab countries (whether members of the World Trade Organization (WTO) or in the process of accession) are hardly constrained in their choices to provide support to their farmers, either at the border or through direct transfers. However, they differ considerably in their agricultural resource endowments and their capacity to provide such support because of budgetary constraints. In view of these limitations and the imperative of economic sustainability, the primary consideration in providing direct budgetary support is in designing reversible programmes and encouraging long-term sustainable practices.[40]
- In addition to directly addressing production domestically, several countries of the region have taken steps to directly control production beyond their borders, by investing in land-abundant countries through purchase or lease of land, so as to have secure access to food produced on such land. The largest land acquisitions have been by GCC countries (Saudi Arabia and the United Arab Emirates in particular) in the Sudan. The 'outsourcing' of food production to poor, generally food-insecure countries, has been an important but controversial development.
- Because the primary factor constraining imports is affordability, anything that can reduce the cost of imports can support food security. There is considerable scope to reduce the cost of imported food by investing in infrastructure to store and transport food, and generally improving the import chain management and logistics. There are significant differences in performance of the supply chains throughout the region, with some countries experiencing bottlenecks at ports while others have inefficient inland transportation systems. Overall, the Arab region scores poorly on the World Bank's Logistics Performance Index. Specifically, in the importation of wheat, average import supply chain costs in 2009 were of $40 per metric ton for 10 Arab countries, four times the average of the Netherlands.[41] Bottlenecks at the port and poor domestic transport were key problems.
- The food crisis of 2007-2008 raised awareness of the supply and price risks associated with a dependence on the world market. One way of responding to supply risks is though greater diversification of trading partners. In general, for most countries, historical trade ties determine the bulk of both imports and exports. As a result, some countries concentrate their trade with a few number of suppliers, which renders them vulnerable to supply risk. Diversification in the sourcing of imported supplies is an effective way to reduce such exposure. The most common practice of sourcing supplies in bulk generally involves a public tendering process whereby the supplies are obtained from the most competitive bidders. The more transparent and open-to-entry this process is, the more it encourages broader participation of traders and favours greater diversification of suppliers.
- There are also ways of responding to price risks and in general smoothing out the price paid for imports over time. First, the price risk can be transferred to exporting trading partners through long-term arrangements, including forward contracts or options for the delivery of a certain quantity of a particular commodity at a certain price. Secondly, the price risk can be hedged through the use of financial market instruments by paying a premium proportional to the degree of protection desired. Thirdly, countries can invest in physical stocks of food. Prices stabilization stocks (often referred to as buffer stocks) involve the public sector buying commodities when prices are low and releasing stocks into the market when prices

are high (thus reducing the scarcity-induced price increase). Because stocks are expensive – tying up capital and often resulting in food waste and loss – their careful management is of critical importance.

A variety of instruments are also available at the regional level that can help countries of the region to respond to their common challenge of growing dependence on imports.

- Intraregional trade among the Arab countries is significantly lower than would be expected based on the economic, cultural and geographic characteristics of the region. For most countries of the region, intraregional trade accounts for less than 10 per cent of total trade.[42] It has been estimated that limited regional integration results in forgone GDP growth between 1 and 2 per cent. Some limited steps have been taken including removal of intraregional tariffs under the Greater Arab Free Trade Area agreement, and some investments in roads and telecommunications that reduce the cost of trade. However, there is enormous untapped potential, especially in reforming non-tariff measures and harmonizing regulatory frameworks (e.g. phytosanitary and technical regulations, testing and certification).
- By taking advantage of economies of scale, regional coordination of information collection could reduce the cost for each of the participating countries. Recent episodes of price volatility revealed major gaps in the capacity of Governments in assessing the situation on the ground and responding quickly to market shocks. Market information on basic foodstuffs at a regional level was inadequate and slow, creating uncertainty and panic behaviour by consumers. Improving the information base would entail developing a regional early warning system as a means of obtaining more reliable estimates of regional stocks, domestic production and movement of food supplies, as well as a mechanism for coordinated policy reactions. A regional system could complement the Agricultural Market Information System, of which Saudi Arabia and Egypt are members.
- Regional cooperation and coordination can also reduce investment costs for physical stocks of food. The constitution of such regional reserves could simply entail the earmarking of a certain percentage of each country's national reserve into the regional food reserve. In addition to the benefits of economies of scale, regional food stocks provide greater price stability, facilitate movement of supplies across borders, and make coordination of market information easier. An Arab food security fund was proposed by various international and United Nations agencies and by the League of Arab States, but it has not been implemented. This fund could be designed exclusively to provide relief during food shortages or emergencies and ensure a rapid response, without the need to secure additional resources as is currently the case for international humanitarian actions.

Finally, at the global level, action by the international community can greatly contribute to improving food security in the region, especially as regards expectations for a reliable global food market.

- Much attention has been given internationally through the WTO to disciplining import policies, but far less to export policies. In particular, export prohibitions and restrictions have proven to be a very common policy response by several exporting and trading countries during the recent period of world food price increase. While the rise in domestic prices may be contained somewhat in the countries imposing export restrictions, the adjustment burden is carried by other countries and naturally occurring shocks can become globally magnified.

The asymmetry between disciplines for imports versus exports was pointed out during the Doha Round of WTO negotiations on agriculture and proposals have been made for developing stronger rules on exports.

- In view of their high import dependence, the frequent emergencies due to conflicts and other adversities, vulnerable Arab countries and populations within will continue to need international food assistance. In-kind grant (food assistance) programmes have benefitted several countries of the region, including Egypt, during crises. Considering the growing incidence of emergency situations including in the Arab region, a broadening of the food aid donor base beyond traditional contributors would allow established international institutional arrangements, such as the Food Assistance Convention and the World Food Programme (WFP) to expand their food assistance to the region. One other form of assistance was envisaged in the Marrakesh Decision of the Uruguay Round Agreement in 1994, specifically for the net food importing developing countries and the least developed countries. These countries may be eligible to draw on the resources of international financial institutions under existing facilities, or facilities that may be established, in the context of adjustment programmes to address financing difficulties in importing food. Existing facilities (such as the International Monetary Fund Cereal Import Facility), have proven of marginal utility for affected countries. An alternative proposal by FAO and the United Nations Conference on Trade and Development called for the creation of a food import financing facility from which eligible countries could get short-term credit guarantees to import food in the event of soaring food import bills.

Endnotes

1. Food and Agriculture Organization of the United Nations (FAO), 2015b; and World Health Organization (WHO), 2011.
2. United Nations Children's Fund (UNICEF), 1990; and The Lancet, 2013.
3. Welch and Graham, 2002.
4. WHO, 2011.
5. International Food Policy Research Institute (IFPRI), World Food Programme (WFP) and Central Agency for Public Mobilization and Statistics (CAPMAS), 2013.
6. Around 75 per cent of poor people live in rural areas across the region according to the World Bank, 2009.
7. Maystadt, Tan and Breisinger, 2014.
8. Sdralevich and others, 2014.
9. The average dietary energy supply adequacy is defined as the ratio of the dietary energy supply to the average dietary energy requirement, where the dietary energy supply is the average calories per capita per day derived from all food supplies over a specified period of time and the average dietary energy requirement is a normative reference measure for adequate calorie intake of the average individual in a country for a healthy life and a normal level of activity.
10. World Bank estimations, available from http://data.worldbank.org/indicator/SP.POP.GROW?locations=AE (accessed April 2017).
11. FAOSTAT data, available from http://www.fao.org/faostat/en/#data/TP (accessed April 2017).
12. Jobbins and Henley, 2015.
13. Staff of the Medium-term Outlook and Market Analysis Team of the Trade and Markets Division, FAO, who have contributed to this publication, have provided model results, projections and scenarios.
14. World Bank, 2013.
15. FAO and World Bank, 2001; IFAD, 2010; and FAO and IFAD, 2007.
16. Based on data from FAOSTAT, available from http://www.fao.org/faostat/en/#data (accessed April 2017).
17. World Bank, 2013.
18. In 2014, Egypt held a share of about 13 per cent of the cereal area and produced about 35 per cent of total cereal output, demonstrating that its productivity per hectare was three times the regional average.
19. See http://www.fao.org/giews/countrybrief/country.jsp?code=SAU.
20. FAO, 2015a.
21. FAO, 2013; and Feltz and Vanclooster, 2013.
22. International Water Management Institute (IWMI), 2007
23. FAO, 2015a.
24. Shatanawi and others, 2005.
25. Egypt's experience helps to define four features that characterize successful programmes for drainage water reuse: (a) drainage water reuse has to be assessed at the level of overall basin efficiency and socioeconomic benefit; (b) a legal and regulatory framework is needed to control drainage water reuse; (c) successful programmes for drainage water reuse should be developed in association with users and should be extended explicit water entitlements in the same way as fresh canal water; and (d) trade-offs should be well managed.
26. The Mapping System and Service for Canal Operation Techniques, developed by FAO, has been successfully used in the Arab region, including in a variety of irrigation methods and sizes.
27. FAO, 2011.
28. The International Center for Biosaline Agriculture is producing excellent technical solutions for improved management of saline soils and saline waters for the Arab countries. See http://www.biosaline.org.
29. Intergovernmental Panel on Climate Change (IPCC), 2007.
30. Cline, 2007. Some farming systems may benefit from warmer temperatures which will extend the growing season or increase productivity of winter crops. In Yemen, for example, where rain falls in the summer months, an increase in average temperatures of 2ºC could be expected to extend the growing season by about six weeks (World Bank, 2013). Some areas are expected to receive more rainfall, with higher frequency of floods. This trend has already been observed in Oman, Saudi Arabia and Yemen.
31. FAO, IFAD and WFP, 2014.
32. Economist Intelligence Unit (EIU), 2014.
33. Based on data from FAO, Country Cereal Balance Sheet data. Available from http://www.fao.org/giews/data-tools/en/ (accessed April 2017).
34. Based on data from FAOSTAT. Available from http://www.fao.org/faostat/en/#home (accessed April 2017).
35. Ibid.
36. Babcock, 2011.
37. See FAO, 2006; and FAO, Committee on Agriculture, 2007.
38. Climate change is also associated with greater variability in precipitation and temperatures, increasing the frequency and intensity of droughts and floods that will significantly magnify the impact of climate shocks on agriculture. Developing regions including Africa will be negatively affected by these developments (Cline, 2007).
39. While oil prices have come down considerably from their peak witnessed in 2008, there is broad agreement that over the longer term, prices of fossil fuels would be higher than past average prices. This would lead to higher agricultural production costs than in the past (through pressure on the cost of machinery, fuel and other energy-dependent inputs such as fertilizer). Beyond the farm gate, costs of inputs and long-distance food distribution would also be affected by higher transport and refrigeration costs.
40. In countries with large parts of the population spending most of their income on food, an input subsidy is preferable to an output subsidy: it reduces production costs to farmers without raising the price paid by consumers (which could be the case in output price support).
41. World Bank and FAO, 2012.
42. World Bank, 2010a; 2010b; and 2010c.

References

Babcock, Bruce (2011). The impact of US biofuel policies on agricultural price levels and volatility. International Centre for Trade and Sustainable Development, Issue Paper No. 35. Geneva.

Cline, William R. (2007). *Global Warming and Agriculture: Impacts Estimates by Country*. Washington, D.C.: Center for Global Development and the Peterson Institute for International Economics.

Economist Intelligence Unit (2014). Global Food Security Index 2014 - Special report: food loss and its intersection with food security. London.

Feltz, Nicolas, and Marnik Vanclooster (2013). Factors explaining on-site irrigation performance variability in Triffa's irrigated perimeter (East Morocco). *Procedia Environmental Sciences*, vol. 19, pp. 757-766.

Food and Agriculture Organization of the United Nations (FAO) (2003). Measurement and Assessment of Food Deprivation and Undernutrition. International Scientific Symposium Rome, 26-28 June 2002. Summary of Proceedings. Available from http://www.fao.org/3/a-y4250e.pdf.

_____ (2006). World agriculture: towards 2030/2050. Interim report. Rome. Available from http://www.fao.org/fileadmin/user_upload/esag/docs/Interim_report_AT2050web.pdf.

_____ (2008). *State of Food Insecurity in the World 2008: High Food Prices and Food Security–Threats and Opportunities*. Rome.

_____ (2011). *The State of the World's Land and Water Resources for Food and Agriculture: Managing Systems at Risk*. Rome: FAO; London: Earthscan.

_____ (2013a). Regional Initiative on Water Scarcity in the Near East and North Africa. Cairo. Available from http://www.fao.org/neareast/perspectives/water-scarcity/en/.

_____ (2013b). Regional Initiative on Water Scarcity in the Near East and North Africa. Background paper by A. Bullock. Cairo.

_____ (2015a). Food security and sustainable agriculture in the Arab region. Issues brief for the Arab Sustainable Development Report. Rome.

_____ (2015b). *Regional Overview of Food Insecurity 2015. Near East and North Africa: Strengthening Regional Collaboration to Build Resilience for Food Security and Nutrition*. Cairo.

Food and Agriculture Organization of the United Nations, Committee on Agriculture (2007). Environment and agriculture. 25-28 April. COAG/2007/6. Available from ftp://ftp.fao.org/docrep/fao/meeting/011/j9289e.pdf.

Food and Agriculture Organization of the United Nations, and International Fund for Agricultural Development (IFAD) (2007). *The Status of Rural Poverty in the Near East and North Africa*. Rome: FAO.

Food and Agriculture Organization of the United Nations, International Fund for Agricultural Development, and World Food Programme (WFP) (2014). *The State of Food Insecurity in the World 2014: Strengthening the Enabling Environment for Food Security and Nutrition*. Rome: FAO.

Food and Agriculture Organization of the United Nations, and World Bank (2001). *Farming Systems and Poverty: Improving Farmers' Livelihoods in a Changing World*. Rome: FAO; Washington, D.C.: World Bank.

Intergovernmental Panel on Climate Change (IPCC) (2007). *Fourth Assessment Report: Climate Change 2007*.

International Food Policy Research Institute (IFPRI), World Food Programme, and Central Agency for Public Mobilization and Statistics (CAPMAS) (2013). *Tackling Egypt's Rising Food Insecurity in a Time of Transition*. Cairo.

International Fund for Agricultural Development (2010). *Rural Poverty Report No. 168*. Rome.

International Water Management Institute (IWMI) (2007). *Water for Food, Water for Life: A Comprehensive Assessment of Water Management in Agriculture*. London: Earthscan; Colombo: IWMI.

Jobbins, Guy, and Giles Henley (2015). *Food in an Uncertain Future: The Impacts of Climate Change on Food Security and Nutrition in the Middle East and North Africa*. London: Overseas Development Institute; Cairo: World Food Programme.

Lang, Tim, and David Barling (2012). Food security and food sustainability: reformulating the debate. The Geographical Journal, vol. 178, No. 4, pp. 313–326.

Maystadt, Jean-François, Jean-François Trinh Tan, and Clemens Breisinger (2014). Does food security matter for transition in Arab countries? *Food Policy*, vol. 46, pp. 106-115.

Pérez-Escamilla, Rafael, and Ana Maria Segall-Corrêa (2008). Food insecurity measurement and indicators. *Revista de Nutrição* [online], vol. 21 (July/August). Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1415-52732008000700003&lng=en&nrm=iso.

Sdralevich, Carlo, and others (2014). *Subsidy Reform in the Middle East and North Africa: Recent Progress and Challenges Ahead*. Washington, D.C.: International Monetary Fund.

Shatanawi, M., and others (2005). Irrigation systems performance in Jordan. In *Irrigation Systems Performance*, N. Lamaddalena and others, eds., pp. 123-131. Bari: Centre International de Hautes Etudes Agronomiques Méditerranéennes.

Shideed, Kamel (2008). The food crisis and its socioeconomic impact: towards reducing the food gap in the Arab countries. *Arab Agriculture Investment Journal*, vol. 6, pp. 31–35.

The Lancet (2013). *Maternal and Child Nutrition Series*. Available from www.thelancet.com/series/maternal-and-child-nutrition.

United Nations Children's Fund (UNICEF) (1990). Strategy for improved nutrition of children and women in developing countries. Policy Review Paper, E/ICEF/1990/1.6. New York.

Welch, Ross M., and Robin D. Graham (2002). Breeding crops for enhanced micronutrient content. *Plant and Soil*, vol. 245, No. 1, pp. 205-214.

World Bank (2010a). *Economic Integration in the Gulf Cooperation Council*. Washington, D.C.

_____ (2010b). *Economic Integration in the Maghreb*. Washington, D.C.

_____ (2010c). *Economic Integration in the Mashreq*. Washington, D.C.

_____ (2013). *Climate Change in the Middle East and North Africa*. Washington, D.C.

World Bank, and Food and Agriculture Organization of the United Nations (2012). *The Grain Chain: Food Security and Managing Wheat Imports in Arab Countries*. Washington, D.C.

World Bank, Food and Agriculture Organization of the United Nations, and International Fund for Agricultural Development (2009). *Improving Food Security in Arab Countries*. Washington, D.C.

World Health Organization (WHO) (2011). *Global Status Report on Non-Communicable Diseases*. Geneva.

17-00392