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Organización
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Unidas
para la
Agricultura
y la
Alimentación

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Near East Agriculture Towards 2050: Prospects and Challenges

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I. INTRODUCTION

1. The 28th FAO Regional Conference for the Near East (NERC-28), held in Sanaa, Yemen, in March 2006, requested FAO to "... conduct a prospective study that would outline the expected long-term changes in the global economic environment and their anticipated impact on agricultural development and food security in the Region." This document is in direct response to this request. It is based on the FAO global study "World agriculture: towards 2030/2050" (Interim Report, published June 2006; hereafter called AT2050)¹. The AT2050 study examined the world prospects for food and agriculture to the year 2050 and provided the broad framework within which prospects for particular countries or regional groups may be assessed by taking into account possible evolutions in the whole world.

2. Due to limitations of available or reliable data, this study covers only 14 countries of the Near East Region (plus Iraq, when data was available):

- North Africa: Algeria, Libya, Mauritania, Morocco, Tunisia;
- West Asia: Iran, Iraq, Jordan, Lebanon, Syria;
- North East Africa: Egypt, Somalia, Sudan;
- Arabian Peninsula: Saudi Arabia, Yemen.

3. The main contributing factors of agricultural production have been identified and analysed separately. However, because of space constraints, the results presented are mainly at regional level or for selective alternative country groups which masks wide inter-country differences. In addition, the degree of uncertainty increases as the time horizon is extended, so the results envisaged for 2050 should be interpreted more cautiously than those for 2015 and 2030.

4. This study uses a "positive" approach rather than a "normative" approach. This means that its assumptions and projections reflect the most likely future but not necessarily the most desirable one. Therefore, the prospective developments presented here are not strategic goals. Rather, they can provide a basis for action when coping with both existing problems that are likely to persist and new ones that may emerge. It should also be stressed that the projections are not trend extrapolations. Instead, they incorporate a multitude of assumptions about the future and often represent significant deviations from past trends.

II. THE REGION IN A GLOBAL CONTEXT

5. The Region's high dependence on food imports, largely a consequence of the meagre agricultural resources of most countries, makes it necessary to examine its food and agriculture futures within the context of the global food and agriculture economy. In analysing possible developments until the year 2050, the FAO AT2050 study provides the required framework to explore prospects up to the time when the end of world population growth would be within sight. The AT2050 study concludes that, by and large, world agriculture should be capable of producing the necessary food, provided the efforts to invest in infrastructures, agricultural research and human capital continue and sustainability issues are addressed. The message of the AT2050 study, however, is far from optimistic for a number of reasons, but most specifically because of i) the likely continued prevalence of poverty and ii) relatively high population growth continuing well beyond 2050 in several developing countries. For those countries with little

¹ This study is based on the ongoing work in the Global Perspectives Studies Unit (ESAG) at FAO, which aims at updating the AT2050 Interim Report, published in June 2006. Therefore, the projections presented in this regional study should be considered as temporary, with the understanding that further revisions could be introduced in the revised global AT2050 study.

agricultural development potential and poor prospects in other sectors of their economies, improvements in their food and nutrition situation could be a very slow process.

6. Another dimension of the global food economy of particular interest to countries with high dependence on food imports is the growing tightness of energy markets with the parallel diversion of agricultural products and associated land and water resources and investments to the production of biofuels which has continued to a rise in food prices. Although the AT2050 study did not examine this issue any further, *per se*, the conventional food and agriculture projections to 2050 provide a first and necessary base for identifying potential problems. For example, they can help establish how much more food and related agricultural resources the world may need and in which countries – a valuable input into any evaluation of the potential for diverting agricultural resources to other uses and what this may imply for food security and the environment. Several countries of the Region may be shielded from adverse effects of eventual energy-related commodity scarcities and rising world food prices because they gain from rising energy prices. However, those not in that position could be confronted with increased risks to their food security.

7. The countries of the Near East Region span a wide range of developmental situations, ranging from those with low incomes, high rates of poverty and undernourishment and often high dependence on agriculture for food supplies and employment (Mauritania, Sudan, Somalia, Yemen) to those in the middle-income range (all others except Saudi Arabia). By and large, the apparent food consumption levels (kcal/person/day) estimated in FAO's Food Balance Sheets (FBSs) are in the upper middle range and generally above those of the majority of the other developing countries, except for the above-mentioned low-income countries. As a consequence, FAO's estimates of the prevalence of undernourishment indicate that it is fairly contained in most countries and below the levels commonly encountered in the majority of the other developing countries. Again, the above mentioned exceptions apply here. The high levels of food consumption, often originating in high direct food consumption of cereals, are associated with increased risk of obesity and related growing incidence of diet-related diseases. Such problems can co-exist with significant incidence of undernourishment in particular population groups. For example, some countries of the Region are prime examples of diet transitions combining continuing prevalence of stunting among children with pronounced incidence of obesity and overweight among adults, a phenomenon often labelled as "the double burden of malnutrition".

III. THE NEAR EAST REGION IN THE FUTURE

Demographic trends and food consumption

8. At 1.8 percent per annum (p.a.), the Region's population is growing faster than that of the rest of the world (1.2 percent during 2000-2005) and will continue to do so in the years ahead (1.3 percent p.a. versus 0.8 percent for 2005-2050). Consequently, the Region would account for 7.1 percent of world population in 2050, up from 6 percent at present (2005). This notwithstanding, the global demographic slowdown mentioned above is also present in several countries of the Region (Tunisia, Morocco, Algeria, Lebanon, Iran), with population growth rates falling to less than 0.5 percent p.a. by 2050 (Table 1). However, other countries of the Region are projected to continue having growth rates exceeding 1 percent p.a., even by 2050 (Yemen, Somalia).

9. Viewing the Region's prospects in a global and long-term context is particularly relevant because of high and growing dependence of the majority of the countries on imports of basic foods: cereals with a self-sufficiency rate of 49 percent in 1999/01 on average (ranging from 3 percent in Jordan and 8 percent in Libya to 84 percent in Syria), vegetable oils/oilseeds with a self-sufficiency rate of 31 percent, sugar 41 percent, meat 85 percent, milk/dairy 82 percent (FAO FBS).

Table 1: Population: data and projections

	Population (x1000)			Growth rates (% p.a.)				
				Initial			Terminal	Average
	2005	2030	2050	2000-05	2015-30	2030-50	2045-50	2005-50
Algeria	32 854	44 726	49 610	1.5	1.1	0.5	0.4	0.9
Libyan Arab Jamahiriya	5 918	8 447	9 683	2.0	1.1	0.7	0.5	1.1
Mauritania	2 963	4 944	6 364	2.9	1.8	1.3	1.0	1.7
Morocco	30 495	39 259	42 583	1.1	0.9	0.4	0.3	0.7
Tunisia	10 105	12 529	13 178	1.1	0.7	0.3	0.1	0.6
North Africa	82 335	109 905	121 417	1.4	1.0	0.5	0.3	0.9
Egypt	72 850	104 070	121 219	1.8	1.3	0.8	0.6	1.1
Somalia	8 196	15 193	21 057	3.0	2.2	1.6	1.4	2.1
Sudan	36 900	58 446	73 029	2.0	1.7	1.1	0.9	1.5
North East Africa	117 946	177 709	215 305	2.0	1.5	1.0	0.8	1.3
Iran (Islamic Republic of)	69 421	91 155	100 174	1.0	0.9	0.5	0.3	0.8
Iraq	27 996	47 376	61 942	2.2	2.0	1.3	1.1	1.8
Jordan	5 544	8 554	10 121	2.9	1.4	0.8	0.6	1.3
Lebanon	4 011	4 925	5 221	1.2	0.7	0.3	0.1	0.6
Syrian Arab Republic	18 894	29 294	34 887	2.7	1.5	0.9	0.7	1.4
West Asia	125 865	181 304	212 344	1.6	1.3	0.8	0.6	1.2
Saudi Arabia	23 612	37 314	45 030	2.5	1.6	0.9	0.7	1.4
Yemen	21 096	40 768	58 009	3.0	2.4	1.8	1.5	2.2
Arabian Peninsula	44 708	78 082	103 039	2.7	2.1	1.4	1.2	1.9
Total countries above	370 854	547 000	652 105	1.8	1.4	0.9	0.7	1.3

Source: UN (2006), *World Population Prospects, The 2006 Revision*, New York

10. Given the fairly high levels of food consumption (kcal/person/day) already attained by several countries, we also can expect the growth of the demand for food to slow down and, with it, the trend for their growing dependence on food imports to ease. Naturally, the demand slowdown will be less in those countries that combine continued high population growth with low levels of food consumption per capita. Countries in this category are Yemen, Somalia, Sudan and Mauritania.

11. However, the slowdown in demand will be moderated if diets shift towards more livestock products whose production requires increased quantities of feed. Such shifts in the commodity structure of food demand are related to, *inter alia*, changes in the distribution of population between rural and urban. Urbanization has been proceeding at a rapid pace in most countries of the Region. Currently, some 56 percent of the population of the Region is urban and projections indicate that this proportion will have grown to 67 percent by 2030. Naturally, country situations differ widely from one another. At one extreme, Lebanon is 87 percent urban followed by Libya, Jordan and Saudi Arabia (81-85 percent urban). At the other extreme, Yemen, Somalia, Sudan, Mauritania and Egypt are 57-73 percent rural.

Overall Economy

12. In our projections, income growth is the main driver of changes in the demand for food (level and commodity structure). The World Bank classifies countries into income categories, from low to high depending on the per capita Gross National Income (GNI), as shown in Table 2. The Region comprises countries with very pronounced income differences ranging from low (incomes less than US\$550: Yemen, Mauritania, Sudan, Somalia) to high (Saudi Arabia). These income differentials are less pronounced when adjusted for Purchasing Power Parities (PPPs) and expressed in international dollars.²

Table 2: Income and GDP growth

	WB income classification ²	GNI per Capita, 2004, current prices		GDP (at market prices) growth rates		
		US\$ – WB ATLAS	PPP – Int. \$ ³	1990-04	2005-15	2015-30
Algeria	Middle-Lower	2 270	6 322	2.61		
Libyan Arab Jamahiriya ¹	Middle-Upper	4 400	..			
Mauritania	Low	530	2 048	4.73		
Morocco	Middle-Lower	1 570	4 253	2.86		
Tunisia	Middle-Lower	2 650	7 427	4.65		
North Africa				3.04	4.9	3.8
Egypt, Arab Rep.	Middle-Lower	1 250	4 200	4.59		
Somalia ¹	Low			
Sudan	Low	530	1 811	5.72		
North East Africa				4.71	5.4	3.4
Iran (Islamic Republic of)	Middle-Lower	2 320	7 533	3.89		
Iraq ¹	Middle-Lower			
Jordan	Middle-Lower	2 190	4 765	4.81		
Lebanon	Middle-Upper	6 010	5 547	4.59		
Syrian Arab Republic	Middle-Lower	1 230	3 496	4.04		
West Asia				4.03	4.6	3.8
Saudi Arabia	High	10 140	13 811	2.25		
Yemen, Rep.	Low	550	809	5.38		
Arabian Peninsula				2.38	4.8	3.4
Total countries above				3.37	4.9	3.6

1. Country not included in the group growth rates, 1990-2004 and projections.

2. Economies are divided according to 2004 GNI per capita, calculated using the World Bank Atlas method. The groups are: low income, \$825 or less; lower middle income, \$826 to \$3,255; upper middle income, \$3,256 - \$10,065; and high income, \$10,066 or more.

3. Gross National Income (GNI) per capita in PPP Current International Dollars.

Sources: Historical data and classifications from World Bank, *World Development Indicators 2006*, Washington DC
GDP projections from World Bank, *Global Economic Prospects 2007*, Washington DC

² An international dollar would buy in the country a comparable amount of goods and services a US dollar would buy in the United States.

Prospects for food, nutrition and major commodity sectors

13. The macro-economic projections of the World Bank (to 2030), taken in conjunction with the population growth rates, indicate that (a) per capita incomes should continue to grow at similar rates to those of the past and (b) wide income differentials among countries will likely persist with consequent persistence of poverty in some countries. For our work, the exogenous projections of per capita incomes are used to project demand for food. In principle, demand rises fast as incomes grow when the latter, as well per capita food consumption, are low. At higher levels of consumption, the growth of demand for food attenuates in terms of volume or calories, while structural changes in the commodity composition towards higher value and preferred products (e.g. livestock, fruit) become more evident.

14. This kind of income growth in the past was associated with growing food consumption per capita in several countries. Some of them have reached the fairly high level of more than 3300 kcal/person/day. This suggests that the scope for further increases in per capita consumption will be more limited than in the past. However, structural change in diets towards more livestock products will continue – a process reinforced by urbanization. By implication, the growth of aggregate food demand will be lower than in the past. This slowdown will be further accentuated by the lower population growth rate projected for the future (1.25 percent p.a. for the Region as a whole, down from 2 percent p.a. in the preceding 15 years). In conclusion, a defining feature of future developments will be that demand for food will not grow as fast as in the past, and, by implication, neither will production nor net imports. This is just as well, given the growing scarcities of land and water resources in the Region, a situation that may be aggravated by the prospect of climate change.

15. Table 3 provides the projections for per capita food demand for the Region. Inter-country differences in the per capita food consumption levels will continue in the future, but they will not be as pronounced as current ones. The latter are very wide, ranging from less than 2000 kcal/person/day (Somalia, Yemen) to more than 3400 kcal/person/day (Morocco, Iran). In the future, the range may narrow to 2500-3500 kcal/person/day. In countries remaining at the lower level of this range, food security problems and inadequate nutrition levels will continue to prevail, although they will lessen.

16. Among the main food commodity groups, the slowdown in the growth of aggregate demand for food will be most pronounced for *cereals* because, in the FBSs, several countries have per capita apparent food consumption in the high range 200-260 kg/person/year. For these countries, future levels will likely be lower because consumption of other commodities will increase. The demand for cereals for animal feed will, however, continue growing faster than that for food. Overall, cereals demand for all uses may grow at 1.4 percent p.a., down from the 2.4 percent p.a. of the past (Region excluding Iraq), with a good part of the slowdown being due to the lower population growth.

17. Consumption of *meat* grew relatively slowly in the past rising slightly from 21 to 24 kg/person/year in the last 15 years. There is scope for significant increases in the future and the average of the Region may grow to 39 kg (mostly poultry meat) during the projection period. Even at that level it will still be well below the average level of 71 kg currently prevailing in the more developed countries of southern Europe (the developed countries closest to the Region). The consumption of *milk and dairy products* may follow a similar trajectory with per capita consumption rising from 75 kg/person/day (liquid milk equivalent) in 2001-03 to 105 kg by 2050.

Table 3: Per capita food demand

	1991/93	1999/01 ³	2001/03	2015	2030	2050
	All Countries – Excluding Iraq					
Cereals, food (kg/capita/year)	209	203	202	205	201	197
Sugar (raw sugar eq.- kg/capita)	28	28	28	32	33	33
Pulses, dry (kg/capita)	7	6	7	8	8	8
Vegetable oils, oilseeds and products (oil eq.-kg) ¹	14	15	14	12	13	14
Meat (carcass weight - kg)	21	24	24	28	33	39
Milk and dairy, excl. butter (fresh milk eq.- kg)	68	73	75	91	97	105
Other food (kcal/person/day)	350	400	410	356	373	390
Total food (kcal/person/day) ²	2 900	2 970	2 970	3 126	3 187	3 253

1. Oils from crops other than oilcrops proper (e.g. maize oil) are included as consumption of the primary commodity concerned (e.g. maize) in quantities corresponding to the calorie content of oil (e.g. consumption of 1 kg of maize oil having 8 840 kcal is shown as consumption of the kg of maize (2.53 kg) required to produce this amount of Kcal).

3. Base year of AT2050.

18. Concerning *vegetable oils*, the Region is highly dependent on imports, with only 20 percent self sufficiency. The two major oils it consumes (soybean oil and palm oil) are almost wholly imported. Its own production of oilcrops is limited to olives, cottonseed, groundnuts and sesame – with production of each concentrated in a small number of countries. The per capita food consumption has remained unchanged (at 14 kg/person/year) in the 15 years and is not expected to exceed this level over the projection period. This is unlike developments in other developing countries where this item is a high income elasticity food and has been growing rather fast (from 9 kg/person/year to 12 kg/person/year). Vegetable oils and fats are also important inputs in production of non-food industrial products, e.g. paints, detergents, lubricants and oleo-chemicals which are, in general, fast-growing commodities whose demand increases with the growth incomes, industrialization and urbanization.

19. Concerning *sugar*, the per capita consumption of the Region at 28 kg/year is slightly above the world average of 27 kg but still much lower than that of the neighbouring developed countries of southern Europe (35 kg). Therefore, there is scope for further increases in the future and the average per capita consumption of the Region may grow to 33 kg.

IV. AGRICULTURAL PRODUCTION AND RESOURCE USE

20. Agricultural production in the Region is projected to grow by more than 60 percent between 2001/03 and 2030 and to more than double by 2050 (Table 4). In spite of this noticeable increase in the volume of production, in terms of annual growth rates this would imply a considerable slowdown from the 3.1 percent growth of the last 15 years (1990-2005) to 1.9 and 1.4 percent over the periods 2005-30 and 2030-50 respectively.

21. The share of livestock production in total production would continue to rise to about 45 percent by 2050 reflecting a shift in demand towards preferred goods, in particular meat and dairy products. Annual growth rates in the production of red meat (bovine and ovine) will be relatively high (2.5 and 2.4 percent, respectively) over the period 2005-30 but are expected to slow during the 2030-50 period, reflecting the considerable slowdown in population growth. Although annual growth rates in the production of poultry meat are also expected to slow, they

will continue to remain relatively high, decreasing from a high 6.7 percent during the last 15 years (1990-2005) to 2.9 and 2.3 percent during the periods 2005-30 and 2030-50 respectively. Similar trends are also projected for dairy production, with annual growth rates decreasing from 5.2 percent during the 1990-2005 period to 1.9 and 1.5 percent during the periods 2005-30 and 2030-50 respectively (Table 5).

Table 4: Production indices and growth rates

		Index (2003/05 = 100)				Growth rate, % p.a.			
		1991-93	2003-05	2030	2050	1990-2005	2005-30	2030-50	2005-50
North Africa	Total agriculture	73	100	154	189	2.6	1.7	1.0	1.4
	All crops	72	100	143	168				
	Livestock	76	100	173	220				
	Share livestock (%)	41	39	44	46				
North East Africa	Total agriculture	63	100	178	239	4.0	2.2	1.5	1.9
	All crops	65	100	169	218				
	Livestock	59	100	191	271				
	Share livestock (%)	38	40	43	46				
West Asia*	Total agriculture	71	100	160	207	2.9	1.8	1.3	1.6
	All crops	74	100	154	190				
	Livestock	64	100	172	238				
	Share livestock (%)	31	34	37	39				
Arabian Peninsula	Total agriculture	80	100	191	281	1.9	2.5	1.9	2.3
	All crops	98	100	176	231				
	Livestock	64	100	204	324				
	Share livestock (%)	43	54	57	62				
Total above*	Total agriculture	69	100	165	216	3.1	1.9	1.4	1.7
	All crops	72	100	154	192				
	Livestock	65	100	182	254				
	Share livestock (%)	36	39	43	45				

* projections for Iraq used 1999-2001 data for the 2003-2005 period.

Source: FAO: FAOSTAT; AT2050

Table 5: Livestock production

		1991-93	2003-05	2030	2050	1990-2005	2005-30	2030-50
		1000 tonnes				Growth rate, % p.a.		
North Africa	Bovine meat	332	356	603	734	0.6	2.0	1.0
	Ovine meat	388	434	694	829	0.9	1.8	0.9
	Poultry meat	495	848	1 571	2 203	4.2	2.7	1.7
	Total meat	1 289	1 727	3 015	3 934	2.3	2.3	1.3
	Milk (whole eq.)	2 852	4 547	7 342	9 184	3.5	2.1	1.1
	Eggs	385	524	892	1 124	2.9	1.9	1.2
North East Africa	Bovine meat	611	973	1 953	2 685	4.0	2.7	1.6
	Ovine meat	289	453	1 020	1 504	4.7	3.8	2.0
	Poultry meat	332	684	1 915	3 105	8.6	3.7	2.4
	Total meat	1 386	2 333	5 406	7 982	5.4	3.2	2.0
	Milk (whole eq.)	7 916	14 245	21 409	29 055	5.0	1.6	1.5
	Eggs	173	290	609	876	4.2	3.0	1.8
West Asia*	Bovine meat	337	504	769	1 160	3.9	2.6	2.1
	Ovine meat	530	720	1 192	1 501	2.6	1.7	1.2
	Poultry meat	744	1 667	2 957	4 522	8.1	2.4	2.1
	Total meat	1 646	2 912	4 944	7 212	5.3	2.2	1.9
	Milk (whole eq.)	6 142	10 086	15 352	20 039	4.6	2.0	1.3
	Eggs	606	991	1 531	2 005	6.4	2.0	1.4
Arabian Peninsula	Bovine meat	66	93	140	190	2.8	1.7	1.5
	Ovine meat	123	155	260	350	1.8	1.9	1.5
	Poultry meat	366	637	1 470	2 575	6.0	3.2	2.8
	Total meat	600	931	1 953	3 217	4.2	2.9	2.5
	Milk (whole eq.)	726	1 432	3 100	4 800	7.5	3.1	2.2
	Eggs	138	198	383	586	4.1	2.8	2.1
Total above*	Bovine meat	1 345	1 926	3 465	4 769	2.8	2.5	1.6
	Ovine meat	1 330	1 772	3 167	4 185	2.5	2.3	1.4
	Poultry meat	1 937	3 836	7 913	12 405	6.7	2.9	2.3
	Total meat	4 921	7 903	15 317	22 344	4.3	2.6	1.9
	Milk (whole eq.)	17 636	30 490	47 203	63 078	5.2	1.9	1.5
	Eggs	1 302	2 003	3 414	4 591	4.4	2.2	1.5

* projections for Iraq used 1999-2001 data for the 2003-2005 period.

Source: FAO: FAOSTAT; AT2050

22. The Region (with the exception of Sudan) is characterized by scarce land and water resources. Increases in crop production therefore would have to come mainly from more intensive cultivation: some 80 percent of the projected growth in crop production in the Region is expected to come from yield increases and higher cropping intensities.

23. It goes without saying that, in a Region characterized by land scarcity and dominated by arid and semi-arid conditions, irrigated agriculture plays a major role. In fact, it is estimated that, while irrigated land accounts for about a third of all arable land, roughly 80 percent of all crop production (some 70 percent of cereal production) originates in irrigated agriculture.

24. The FAO/IIASA³ 2002 Agro-Ecological Zone (GAEZ) study finds that there is still land with rainfed and irrigated agricultural production potential not yet in use in the Region (Table 6). During the next 50 years, arable land could expand by some 11 percent (from 75 to 83 million ha), of which some 28 percent (from 23 to 29 million ha) would be irrigated. The latter, however, would mean that, by 2050, many of the countries in the Region would have exhausted the potential for irrigated land expansion (or exceeded this potential in the case of fossil water use).

25. As mentioned earlier, yield growth will remain the mainstay of crop production growth. For most crops, however, the annual growth rate of yields over the projection period will be well below that of the past. The overall result for yields of all the crops covered in this study (aggregated with standard price weights) more than halves the average annual rate of growth during the projection period as compared to the historical period (Table 6).

26. For cereals, which account for nearly two-thirds (63 percent) of the Region's harvested land, the slowdown in yield growth would be particularly pronounced: down from 2.1 percent p.a. in 1990-2005 to 0.8 and 0.6 percent p.a. in the periods 2005-30 and 2030-50 respectively. This slowdown in the yield growth is a gradual process that has been underway for some time and is expected to continue in the future. It reflects the deceleration in crop production growth explained earlier as well as the gradual narrowing of the yield gap (difference between maximum attainable and that already achieved).

27. Naturally, even this slower yield growth may not happen unless we make it happen. In particular, the higher yields of the future cannot come only, or even predominantly, from the unexploited yield potential of existing varieties in the countries and agro-ecologies where such potential exists. It also will need to come from countries and agro-ecologies where such potential is very limited. This requires continued support to agricultural research to develop improved varieties (including those coming from modern biotechnology) for such environments.

28. For the Region, *irrigation water* withdrawals could increase by some 29 percent, from the current 269 km³/yr to 346 km³/yr in 2050 (Table 7). This increase is modest compared to the more than 50 percent increase projected in the harvested irrigated area. Most of this difference will result from the expected improvement in the water requirement ratio, leading to a reduction in irrigation water withdrawal per irrigated ha. On average, it is estimated that this ratio for the Region was a high 52 percent in 2003/05 and could increase to 66 percent by 2050.

29. Irrigation water withdrawal in 2003/05 was estimated to account for a very high 62 percent of total renewable water resources in the Region. Of the 15 countries included in the Region, 10 already used more than 40 percent of their water resources for irrigation in the base year (2003/05), a situation that can be considered critical. An additional four countries used more than 20 percent of their water resources, a threshold sometimes used to indicate impending water scarcity, while three countries (Libya, Saudi Arabia and Yemen) used volumes of water for irrigation larger than their annual renewable water resources. If one adds the expected additional water withdrawals needed for non-agricultural use, the picture will not be much different since agriculture represents the bulk of water withdrawal.

³ International Institute for Applied Systems Analysis (Austria).

30. Taking into account the expected impacts of *climate change* by 2050 (through the combined effect of changes in precipitation and in evapotranspiration), overall the availability of renewable water resources decreases while, at the same time, irrigation water withdrawals would need to increase, thus severely worsening the situation of water scarcity in the Region.

Table 6: Crop production and land use in the Region*

		Rainfed land			Irrigated land			Total land		
		Area	Yield	Prod.	Area	Yield	Prod.	Area	Yield	Prod.
		mln ha	mt / ha	mln mt	mln ha	mt / ha	mln mt	mln ha	mt / ha	mln mt
Cereals (incl. rice paddy)	2003/05	28.2	0.92	26.0	10.6	4.64	49.0	38.8	1.93	75.0
	2030	27.9	1.09	30.4	14.7	5.13	75.4	42.6	2.48	105.8
	2050	30.0	1.23	36.9	17.1	5.51	94.4	47.1	2.79	131.3
Oil crops	2003/05	5.0	0.94	4.7	1.0	2.01	2.0	6.0	1.11	6.7
	2030	7.9	0.81	6.4	1.7	2.75	4.7	9.7	1.16	11.2
	2050	9.5	0.98	9.3	2.1	3.08	6.5	11.6	1.36	15.8
Vegetables, citrus and fruits	2003/05	0.8	8.31	6.9	4.6	18.02	82.9	5.4	13.81	89.8
	2030	1.2	9.41	11.2	6.7	19.87	132.5	7.9	18.25	143.7
	2050	1.4	10.82	15.2	7.4	22.03	163.7	8.9	20.18	178.9
Pulses	2003/05	1.3	0.65	0.9	1.1	1.60	1.7	3.3	0.78	2.6
	2030	1.4	0.89	1.3	1.1	2.13	2.4	2.6	1.43	3.7
	2050	1.6	0.97	1.6	1.2	2.36	2.9	2.8	1.58	4.5
Total harvested land	2003/05	33.8			22.4			56.2		
	2030	40.6			30.3			70.8		
	2050	44.7			34.3			79.0		
Cropping intensity (%)	2003/05	65			99			75		
	2030	77			117			90		
	2050	84			120			96		
Arable land	2003/05	51.9			24.2			76.1		
	2030	52.6			25.8			78.7		
	2050	53.4			28.6			82.6		
Potential land		152			35			171**		
idem excl. Sudan		59			33			77**		
Arable land as % of potential	2003/05	34			64			43		
	2030	35			73			46		
	2050	35			81			48		

* projections for Iraq used 1999-2001 data for the 2003-2005 period.

** total potential land is not equal to the sum of rainfed and irrigable potential land since part of the latter is on rainfed land

Source: FAO: FAOSTAT; AT2050

Table 7: Annual renewable water resources (RWR) and irrigation water requirements

		North East Africa	West Asia	North Africa	Arabian Peninsula	Total Region
		Water availability				
Precipitation	mm	308	225	102	78	177
Internal RWR	km3	37.8	176.2	48.1	6.5	268.5
Net incoming flows	km3	108.7	28.3	11	0	148
Total RWR	km3	146.5	204.5	59.1	6.5	416.5
		Irrigation water withdrawal				
2003/05						
Water requirement ratio	%	57	48	55	50	52
Irrigation water withdrawal	km3	98.4	126.2	22.2	21.7	268.5
idem as percent of RWR	%	67	62	38	334	64
2030						
Water requirement ratio	%	62	57	60	58	59
Irrigation water withdrawal	km3	125.1	160.1	29.1	21.5	338.6
idem as percent of RWR	%	85	78	49	331	81
2050						
Water requirement ratio	%	69	65	64	64	66
Irrigation water withdrawal	km3	130.2	164.7	30.1	21.7	346.2
idem as percent of RWR	%	89	81	51	334	83
2050 with climate change*						
Precipitation	mm	330	221	92	78	179
Total RWR	km3	147.5	195.7	47.5	6.6	397.3
Water requirement ratio	%	71	67	64	65	68
Irrigation water withdrawal	km3	137.5	174.1	33.8	22.6	365.8
idem as percent of RWR	%	93	89	71	343	92

*Under the assumptions of the International Panel for Climate Change (IPCC) Special Report on Emissions Scenarios, Scenario "SRES B2"

Note: The water requirement ratio is defined as the ratio between irrigation water requirements for optimal crop growth and water withdrawn for irrigation.

Sources: FAO: FAOSTAT; AT2050; for IPCC assumptions: IPCC (2000), "Special report on emissions scenarios – Summary for Policymakers", WMO and UNEP.

V. AGRICULTURAL TRADE

31. More than any other group of developing countries, the Region depends on trade for its domestic food supplies. On average, about 25 percent of all food and agricultural produce consumed in the countries come from imports. This also means that food imports account for a high share of overall imports, accounting on average for 10 to 15 percent of total imports. Within the food group, cereals are the single most important import category.

32. Falling self-sufficiency ratios in conjunction with rising overall demand will translate into even faster rising import volumes in absolute terms. In 1990 prices,⁴ the Region's overall agricultural imports will essentially double from about US\$18 billion in 2003/05 to US\$37 billion in 2050. Crops will account for the lion's share of the imports, reaching an overall import volume of US\$30 billion by 2050 (Figure 1).

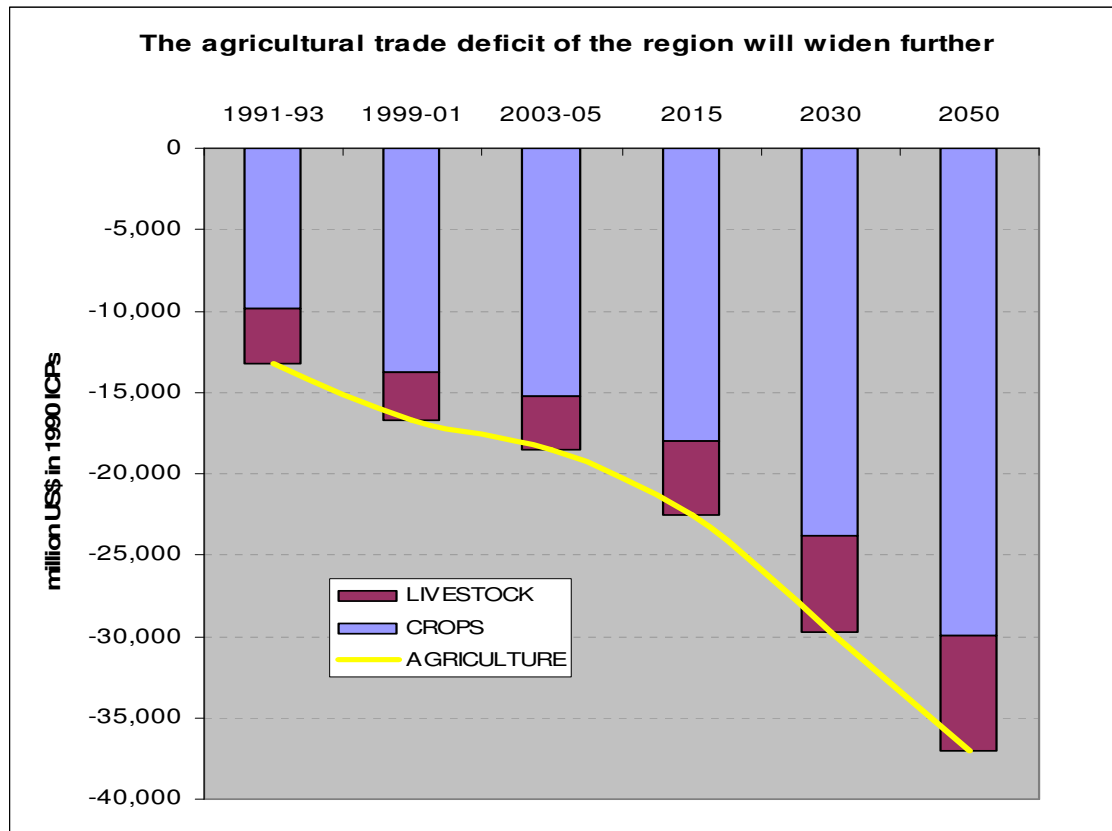


Figure 1: Projected agricultural trade balance of the Region

33. While food imports are crucial for the Region, exports of food and agriculture are rather insignificant. This is both a reflection of agricultural production constraints faced by many countries of the Region as well as the dominant role of hydrocarbon (oil, gas) exports. For the Region as a whole, revenues from hydrocarbon exports are the key source of finance for food imports: *hydrocarbon exports pay for carbohydrate imports*.

⁴ International prices of commodities (ICPs) are weighted averages of national prices converted into a common currency and weighted by national outputs. ICPs are used to aggregate quantities of diverse commodities into volume aggregates and to track the evolution of volume aggregates over time. Prices and price deflators for agricultural prices are taken from the World Bank's "Pink Sheets", 2002, Washington DC.

34. Long-term projections suggest that the importance of trade for the Region's supply of food and most of the currently observed trading patterns will remain a feature in the long-run. But the projections also suggest that the world's agricultural system will be able to provide the extra import requirements of the Region, even in the face of growing import competition from large emerging economies such as China and India. Within the Region, the pronounced difference between individual countries in their dependence on food imports and their ability to finance these imports will continue to be a feature. With rising oil prices, the existing differences in import dependency may rise even further.

35. Where revenues from hydrocarbon exports are expected to be (or remain) substantial, the dependence of countries on imported food will remain high. Import dependency has traditionally been high in countries such as Libya, Saudi Arabia and a number of smaller, hydrocarbon-rich countries such as Kuwait, Oman or Qatar. This group could be joined by countries such as Yemen and Sudan, as revenues from oil exports come on stream. In this latter group, the combination of high population growth, currently low consumption levels and the prospects of higher revenues from oil and gas exports could even increase import dependency. In other mostly hydrocarbon-importing countries, high oil prices will put a brake on import growth and could promote domestic import substitution efforts. With the growing importance of bio-energy and the parallel increase in food and energy prices, these countries will face a growing *double burden* of rising food and oil import costs for their current account balance.

VI. RECOMMENDATIONS FOR FURTHER WORK

36. The document was prepared based on a more detailed study and should be considered a work-in-progress in light of great uncertainties about the suitability of the data used. The objective was to start the process of generating a more detailed complete study as a final product. Substantial follow-up work would be needed to ensure greater accuracy of the baseline data used and make the projections more reliable. Moreover, the projections included in this study were all based on deskwork exercises and have not yet been exposed to the scrutiny of local knowledge and expertise to test their reliability.

Therefore, the following follow-up work is recommended.

Country-level

37. Member countries are recommended to use the preliminary results presented in this study as a starting point to develop their own more detailed country studies based on available data and local expertise. Local multidisciplinary experts should review the underlying assumptions regarding the various projection parameters to ensure that they accurately reflect local conditions. Such country-level reviews could involve the holding of national expert consultations, with the participation of international experts (including FAO), to review country-level assumptions and results. This could also be expanded to the conduct of full-blown national studies that would involve a more comprehensive data collection exercise and provide a more solid base for future projections.

FAO follow-up

38. It is recommended that FAO/RNE support, within its available resources, member countries that might be interested in developing fuller, more detailed country studies of the prospects for their agricultural sectors by 2030 or 2050. This would include extending the country coverage to other Near East countries not included in this study, provided the necessary country-level data are available.

39. FAO/RNE is also recommended to organize Regional expert consultations on key policy issues highlighted by this study. The issue of the rapid expansion of bioenergy use and its implications on agricultural and food policies should receive a high priority.

40. Within the context of the ongoing work to finalize the AT2050 study, the concerned technical divisions at FAO/HQ should continue to work on addressing the problems associated with the reliability of the FAO data sources. Moreover, these technical divisions are also recommended to identify other sources of relevant and reliable data that could be used to improve the reliability of the projections.