

Tensions and potential crisis in the MENA region's food-system in 2050

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Middle East and North Africa (MENA) region is characterized by a high level of dependence on agricultural imports: 40% of its food needs are currently met by imports. Over the last five decades, demographic growth and changes in dietary habits have led to a marked increase in food requirements. Although regional agricultural production has increased substantially over the same period, it has been unable to keep pace with the increase in demand, partly because of the soil and climate constraints and also because of limitations in terms of agricultural policy.

Agricultural imports place a significant burden on state budgets, and agri-food policies in the region continue to struggle with urban and rural poverty. In this situation, the level of agricultural imports dependence reflects tensions and potential crisis in the regional food system – as seen in with the rising prices of basics food products in 2010 and 2012. As a result of ongoing demographic expansion and changes in eating habits, this level is likely to continue to escalate in the foreseeable future.

Furthermore, risks associated with climate change – in a region recognized as a climate “hot spot” (Hare et al., 2011)– are expected to rise and affect negatively agricultural resources and production (Iglesias et al., 2011).

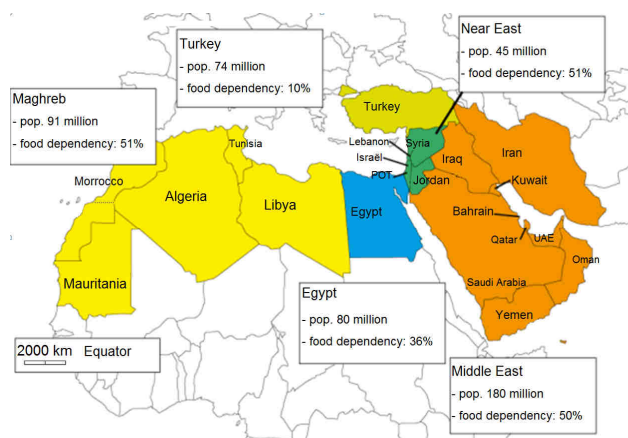
Following foresight studies on the effects of climate change on natural key resources in southern and eastern Mediterranean (MedPro, 2013), this study focuses on factors within the regional agri-food system, and their capacity to contribute to – or, on the contrary, help mitigate – a continued increase in agricultural import dependence. We analyse several scenarios for the region through 2050, taking into account the anticipated effects of climate change. These scenarios were simulated using a biomass balance model. Simulation results suggest that the dependence on agricultural imports is likely to continue to increase in the region, with climate change as a major contributing factor. Several mechanisms are proposed for reducing agricultural import dependence (improved agricultural productivity, moderation of changes in dietary habits, or reduction in waste and losses). They are to be combined to weigh on the increasing import dependence trend in the Maghreb, the Middle East, and the Near East.

The MENA region is notable both for its high percentage of arid and semi-arid lands, characterized by low agricultural productivity, and for its rapid demographic expansion, with a population that has increased by a factor of 3.5 in fifty years – from 139 million inhabitants in 1961 to 496 million in 2011 (Figure 1). A key challenge for the region lies in its ability to meet its food needs. It is for highlighting this that INRA with the support of Pluriagri¹ has undertaken a study on the agro-food system of the MENA region through 2050².

¹ Pluriagri is an association of representatives of some commodity sectors (including Avril, the French Confederation of Sugar Beet Producers, and Unigrains) together with Crédit Agricole S.A. (a major bank), supporting foresight studies of agricultural markets and policies.

² The group assembled for this study was made up of scientific experts specialized in the region and/or agronomic and economic issues and representative of French operators in the commodity sectors (S. Abis (CIHEAM), C. Ansart (Unigrains), P. Blanc (Bordeaux Sciences-Agro and Sciences Po Bordeaux), X. Cassedanne (Crédit Agricole), R. Cuni (CGB), J.-C. Debar (Pluriagri), P. Dusser (Avril), H. Guyomard (INRA), F. Jacquet (INRA), Y. Le Bissonnais (INRA), M. Padilla (CIHEAM-IAMM), M. Petit (FARM), P. Raye (CGB France) and G. Regnard (Crédit Agricole)). This group was solicited to chart each stage of the study

Figure 1
The MENA region and its sub-regions



(2011 data; “pop.”=population; “food dependency”=dependence on imports [percentage of kilocalories consumed that are supplied by food imports])

Agricultural imports cover 40% of regional food requirements and are increasing rapidly

While the demand for agricultural products increased six fold from 1961 to 2011 in the MENA region, as a result of the population’s growth combined with a pronounced nutritional transition, the domestic supply rose only fourfold, partly due to the region’s severely limited land and water resources.

As gains in agricultural production have failed to keep pace with rising food requirements, the imbalance has been made up by an increased reliance on international markets to meet food and feed domestic requirements: net dependence on agricultural imports has increased from 10% to 40% in fifty years, with significant variation among sub-regions (Figure 2). The challenge of supplying the MENA region through international markets that appeared in the 1970s (Allaya et al., 1988) is even more daunting today.

Between the beginning of the 1960s and the end of the 2000s, the Maghreb and the Middle East saw their dependence on agricultural imports increasing from, respectively, 10 to 54% and from 15 to 50%. In the Near East, where this dependence already stood at 40% at the beginning of the period, a similar level around 50% was reached by the end of the 2000s. Egypt shows lower levels of agricultural import dependence, but nevertheless moved from 10 to 30%. Turkey is the exception within the region, with a historically low agricultural import dependence that has reached 10% only in the past few years.

Under current trends, the agricultural import dependence of the MENA region is likely to continue to rise through 2050. We used the GlobAgri-Pluriagri model (see box) to simulate the effects of projecting current trends of the various components of the MENA’s agri-food system through the year 2050 (“Current trends without climate change” scenario) on the regional agricultural import dependence.

In the MENA region as a whole, improved yield up to 2050 would not be sufficient to compensate rising food needs. Because of the constrained cultivable area, the imbalance between domestic supply and demand would be made up by increased agricultural imports, resulting in rising regional import dependence, from 40% in the initial (2008) situation to 45% in 2050.

This regional average masks contrasted situations according to sub-regions. Egypt, the Middle East and the Near East would experience a substantial increase in their import dependence, from 30 to 53%, from 51 to 62% and from 51 to 63% respectively. In the Maghreb and Turkey, domestic agricultural production would expand faster than domestic demand, enabling both sub-regions to reduce their import dependence level between 2008 and 2050 (Figure 2). In the Maghreb import dependence would decrease from 54 to 46%, while Turkey could even become a net exporter of agri-food products, with import dependence shifting from 11 to -10%.

and advise the project team. For further reading on this study, see Le Mouél C., Forslund A., Marty P., Manceron S., Marajo-Petizon E., Caillaud M.-A., Schmitt B., 2015. *Le système agricole et alimentaire de la région Afrique du Nord – Moyen-Orient à l’horizon 2050: Projections de tendance et analyse de sensibilité*. Final study report for Pluriagri. Paris and Rennes: INRA-DEPE & INRA-SAE2, 138 pp. and INRA, 2015. *Addressing Agricultural Import Dependence in the Middle East-North Africa Region through the year 2050*. Executive summary of the study supported by Pluriagri, 8 pp.

Climate change effects are likely to increase significantly agricultural imports of the MENA region

As MENA is potentially one of the regions the most heavily affected by future climate change, we considered the most extreme case projected by the IPCC (RCP-8.5). According to the available literature, we then adjusted the hypotheses on crop yield growth and on maximum cultivable areas relative to the “Current trends without climate change” scenario. In the resulting “Current trends with increased climate change” scenario, crop yields in 2050 are between 10 and 20% less than in the previous scenario. Regarding cultivable land, the Maghreb would be the most affected sub-region, losing close to half of its cultivable land area between now and 2050. The Near East would also be strongly impacted, losing a quarter of currently cultivated area. Cultivable land area would remain unchanged in the Middle East. Given its distinct geography, Turkey could experience a significant increase in cultivable land area, amounting to 15% of currently cultivated land.

The severe deterioration of the conditions of agricultural production in the Maghreb would result in a sharp increase in its dependence on agri-food imports, increasing to 68% of domestic consumption by the year 2050 (Figure 2). The increased dependence on agricultural imports in the Middle East and Near East sub-regions would also be aggravated, with coefficients of import dependence reaching now 64 and 67%, respectively. For those subregions, climate change is likely to translate in aggravated risks for the food system.

Within this rather bleak overall picture, Turkey appears once again as the exception, with the beneficial impacts of climate change in terms of cultivable land area compensating for the negative impacts in terms of yields. This country could slightly strengthen its position as a net exporter of agri-food products in the “Current trends with increased CC” scenario relative to the previous one, and its role in the region’s food supply

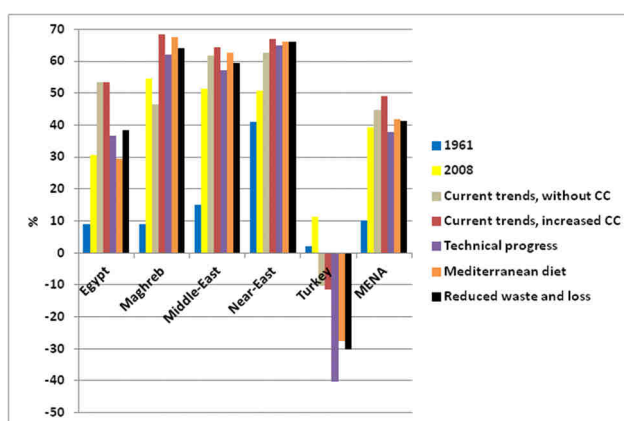
Which levers to reduce food dependence?

Current trends in population growth, dietary habits and agricultural production would lead to a continued rise in agricultural imports in the MENA region through 2050. The economic, social and political risks of reaching such elevated levels of agricultural import dependence are well known: trade imbalances; increased national public debts; strong exposure to global market fluctuations; recurrent food crises; increasing poverty; and an overall weigh on the region’s food-system resilience.

Slowing this rise in agricultural import dependence is thus imperative. In this study, we analyzed three ways of reducing the burden of import dependence in the MENA region: i) stimulating agricultural production (“Technical progress” scenario that allows an improvement of both crop yields and animal efficiency); ii) regulating food demand (“Mediterranean diet” scenario that reduces the regional food demand and centers it around traditional products); and iii) reducing food waste and losses along the food supply chain (“Reduced waste and loss” scenario, that increases the apparent crop yields in reducing losses at the field margins and decreases apparent food consumption, i.e. “food availability” in limiting losses at the distribution and consumption stages).

Figure 2

Agri-food net import dependence of the MENA region and sub-regions in 1961, 2008 and in 2050 in each scenario
(share in % of net imports in total domestic consumption, expressed in kilocalories)



As we assume continued availability of water for irrigation, yields and cropping areas are unchanged for irrigated agriculture. As a result, our “Current trends with increased CC” scenario leaves Egypt unaffected relative to the previous scenario³.

³ For a complete analysis on the water challenge and agriculture in Egypt, see Blanc and Abis, 2014.

As we can see in Figure 2, none of these three options, taken individually, would make it possible to significantly counterbalance the rising effect of current trends in the Maghreb, Middle East and Near East sub-regions. Even if the “Technical progress” option would be the most favourable, it just brings agro-food import dependence in the Maghreb from 68% to 62%, that of the Middle East from 64% to 57% and that of the Near East from 67% to 66%. For these three sub-regions, only an integrated policy approach seeking to combine the three strategies would likely be effective in limiting the rising trend of their agricultural import dependence, and thus the potential for food and/or public debts crisis.

Nevertheless, given that regional agricultural import dependence will become more pronounced as the impacts of climate change become more severe, the most effective means of limiting import dependence is to take steps to mitigate climate change, which only international agreements and the adoption of vigorous global climate policies would make possible.

This study confirms the relevance of the “Partnership for Research and Innovation in the Mediterranean Area” (PRIMA), stemming of the article 185 of Treaty on the Functioning of the European Union (TFEU), especially because this partnership focuses on agri-food systems and water management.

Bibliography / More information

- Blanc P., Abis S., 2014, “Egypte, entre insécurité alimentaire et inconnues géopolitiques”, in Déméter 2015: économie et stratégies agricoles, Club Déméter (Paris, France), pp.193-249.
- Bouwman A.F., Van der Hoek K.W., Eickhout B., Soenario I., 2005. Exploring changes in world ruminant production systems. *Agricultural Systems* 84: 121–153.
- MedPro, 2013, *Technical Report n°28 : Assessment of socio-economic and climate change effects on water resources and agriculture in eastern and southern Mediterranean countries*, 128 p.
- Hare W.L., Cramer W., Schaeffer M., Battaglini A., Jaeger C.C., 2011. Climate hotspots: key vulnerable regions, climate change and limits to warming. *Regional Environmental Change*, 11(Suppl 1): S159-S166.
- Mougou R., Moneo M., Quiroga S., 2011. Towards adaptation of agriculture to climate change in the Mediterranean. *Regional Environmental Change*, 11 (Suppl 1): S1-S13.
- Allaya M., Labonne M., Papayannakis M., 1988. *Les échanges agro-alimentaires méditerranéens : enjeu mondial*. Options Méditerranéennes, Série Etudes, 1988-V: 1-307.
- Dumas P., 2014. *GlobAgri: Disaggregation and reaggregation of livestock data*. Contribution for Agrimonde-Terra, 8 p.

GLOBAGRI

GlobAgri is a database and a quantitative modelling tool developed by both INRA and CIRAD to analyze agricultural resource use and availability at the global and regional levels. GlobAgri uses the commodity balances of the FAOStat database and a few sources of complementary data (notably data from Herrero et al., 2013, and Bouwman et al., 2005, for more details, cf. Dumas, 2014). GlobAgri-Pluriagri divides the MENA region into five sub-regions (Figure 1) and the rest of the world into 12 regions. For each of these regions, the model establishes a biomass balance for 36 agricultural products in which, for each product, domestic production plus net imports (imports minus exports) equals the sum of uses for human consumption, animal feed, and other uses, plus losses (mainly associated with processing phases) and stock variations. FAOStat data regarding processed products were processed to be reintegrated as primary products in the various uses (for more details, see Dumas and Manceron, 2014).

Consumption levels are set a priori by the modeller, along with certain supply side factors such as crop and livestock yields. Adjustments determine the levels of imports, exports, and domestic production necessary to achieve equilibrium between resource availability and resource use. To do so, two constraints are introduced: the first ensures that, at the global level, the sum of all imports equals the sum of all exports; the second imposes a maximum cultivable land area for each region. When the limit on cultivable land area is reached, equilibrium is achieved by reducing exports (i.e., the world market shares of the region) and/or increasing imports (i.e., the coefficients of import dependence). Specific resolutions of the equilibrium were applied to the case of the MENA region.

First, the model did not adjust quantities exported, because of the specificity of the production types involved (mainly fruits and vegetables, which exports, as they are an important source of revenue for the region, are unlikely to be reduced). Second, as cultivable land area is particularly low in the region, a calculation was added to the simulation results so that all the cultivable land is cultivated if the simulation showed otherwise.