



Building Sustainable Agriculture for Food Security in the Euro-Mediterranean Area: Challenges and Policy Options

edited by Maria Cristina Paciello

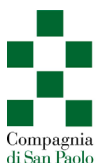


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List of Abbreviations

AEC	Agricultural Export Council (Egypt)
ANGED	Solid Waste Management Agency (Tunisia)
APHIS	Animal and Plant Health Inspection Service (USA)
AOAD	Arab Organization for Agricultural Development
AR5	Fifth Assessment Report (IPCC)
ARLEM	Euro-Mediterranean Regional and Local Assembly
BIE	Bureau International des Expositions
BLSS	Bio-regenerative Life Support System
CAP	Common Agricultural Policy (EU)
CAPQ	Central Authority for Plant Quarantine (Egypt)
CEPF	Critical Ecosystem Partnership Fund
CGE	Computable General Equilibrium
CGIAR	Consultative Group for International Agricultural Research
CIHEAM	Centre International de Hautes Etudes Agronomiques Méditerranéennes
CSOs	Civil society organizations
DCFTA	Deep and Comprehensive Free Trade Agreement
DCP	Decentralized Cooperation Program (FAO)
DDGS	Dried distiller's grains with solubles
DDR	Doha Development Round
EC	European Commission
EDGE	Economic Development and Growth for Enterprises (Cyprus)
EFSA	European Food Safety Authority
EFTA	European Free Trade Association

EIA	Economic Integration Agreement
EMFTA	Euro-Mediterranean Free Trade Area
EMP	Euro-Mediterranean Partnership
ENP	European Neighbourhood Policy
ENPARD	European Neighbourhood Programme for Agriculture and Rural Development
ENPI	European Neighbourhood and Partnership Instrument
EP	Entry Price
EPA	Environmental Protection Agency (USA)
ETp	Evapotranspiration
EU	European Union
F&V	Fruits and Vegetables
FAO	Food and Agriculture Organization of the United Nations
FAs	Farmer Marketing Associations
FD	First-Differences
FDA	Food and Drug Administration (USA)
FE	Fixed Effects
FTA	Free Trade Agreement
GAP	Good Agricultural Practice
GAP	South-East Anatolian Project
GATT	General Agreement on Tariffs and Trade
GCC	Gulf Cooperation Council
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GHI	Global Hunger Index
GMO	Genetically modified organism
GOIEC	General Organization for Imports and Export Control (Egypt)
HES	Household Expenditure Survey
IAV	Institut Agronomique et Vétérinaire Hassan II (Morocco)
ICARDA	International Center for Agricultural Research in the Dry Areas
IDRC	International Development Research Centre (Canada)
IEA	International Energy Agency

LIST OF ABBREVIATIONS

IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IFRC	International Federation of Red Cross
IMF	International Monetary Fund
INA	Institut National Agronomique (France)
INRA	National Agronomic Research Institute (Morocco)
IPCC	Intergovernmental Panel on Climatic Change
IPEMED	Institut de Prospective Économique du Monde Méditerranéen
IPPC	International Plant Protection Convention
IUCN	International Union for Conservation of Nature
KRG	Kurdish Regional Government
LCU	Local Currency Unit
MALR	Ministry of Agriculture and Land Reclamation (Egypt)
MFN	Most Favoured Nation
MR	Multilateral Resistance
NBC	National Biosafety Committee
NMO	Living Modified Organism
MEDA	Mediterranean Development Aid (EU)
MENA	Middle East and North Africa
MFF	Multiannual Financial Framework
MoU	Memorandum of Understanding
MPCs	Mediterranean Partner Countries
MTE	Maximum Tariff Equivalent
NBI	Nile Basin Initiative
NCPV	New-Concept Photovoltaic
NGO	Non-governmental Organization
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
ONSSA	Office National de Sécurité Sanitaire des Produits Alimentaires (Morocco)
PAPSA	Programme d'appui à la politique sectorielle agricole (Morocco)
PMV	Morocco Green Plan

PPLI	Pro-poor Livestock Initiative
PPML	Poisson Pseudo Maximum Likelihood
PPP	Purchasing Power Parity
QMV	Qualified Majority Vote
R&D	Research and Development
SAP	Structural Adjustment Programme
SEMCs	Southern and Eastern Mediterranean Countries
SPS	Sanitary and Phytosanitary
TBT	Technical Barriers to Trade
TCC	Turkish Cypriot Community
TFEU	Treaty on the Functioning of the European Union
TFP	Total Factor Productivity
TFPG	Total Factor Productivity Growth
TFPI	Total Factor Productivity Index
TII	Total Input Index
TOI	Total Output Index
TRNC	Turkish Republic of Northern Cyprus
TTIP	Transatlantic Trade and Investment Partnership
UAE	United Arab Emirates
UCLG	United Cities and Local Governments
UFPP	Urban Food Policy Pact
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
UNSCN	United Nations Standing Committee on Nutrition
URAA	Uruguay Round Agreement on Agriculture
USA	United States of America
USAID	US Agency for International Development
USDA	United States Department of Agriculture
USTR	United States Trade Representative
VPM	Value of Preference Margin
WEI	Water Exploitation Index

LIST OF ABBREVIATIONS

WFP	World Food Programme
WHO	World Health Organization
WMRI	Water Management Research Institute (Egypt)
WTO	World Trade Organization

Foreword

We are very pleased to present the volume “Building Sustainable Agriculture for Food Security in the Euro-Mediterranean Area: Challenges and Policy Options”. The publication is one of the last products of the strategic partnership between the Istituto Affari Internazionali (IAI) of Rome and the OCP Policy Center of Rabat on Mediterranean issues which was launched at the end of 2012.

At the beginning of 2014, the two study centers started a two-year research project on the topics of food security and agriculture in the Middle East and North Africa (MENA) and on the role that the European Union (EU) can play in fostering regional cooperation in the field. The choice of this topic is testimony to the importance both partners give to agriculture and food security as a strategic field and a development catalyst. Within the framework of this project, a two-day conference was held on November 20-21, 2014, at the OCP Policy Center in Rabat to discuss the challenges of food security and sustainable agricultural in Euro-Mediterranean relations and identify the most effective ways and means to deal with them. The present volume collects the revised and updated versions of the twelve papers that were presented at the conference.

We wish to thank all the experts who took part in the conference and contributed to this publication. We are especially grateful to Prof. Rachid Doukkali, Professor at IAV Hassan II and Senior Non-Resident Fellow at OCP Policy Center, Morocco, and Prof. Terry Roe, CIFAP, Minnesota University, US.

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1.

Understanding Food Security and Agriculture Challenges in the Euro-Mediterranean Region

Maria Cristina Paciello

1.1 FOOD SECURITY AND SUSTAINABLE AGRICULTURE

The Food and Agriculture Organization of the United Nations (FAO) defines food security as “a situation when all people, at all times, have physical, social, and economic access to sufficient, safe and, nutritious food to meet their dietary needs and food preferences for an active and healthy life” (FAO 1996). Indeed, in addition to food production, food availability and access are important parts of food security. At the macro-level, food security is achieved when a country has adequate food supplies to feed its population, either via domestic production, the global market or food aid (Breisinger et al. 2010). The dramatic rise in food prices in 2007-2008 highlighted the risks of the overdependence of many countries, including those in the Middle East and North Africa (MENA), on imports for their food security and, consequently, the need to find a balance between dependency on global markets and home production.

Food security also has a micro-level dimension, that is household and individual access to available food. The availability of adequate food at the national level is a necessary but not sufficient condition for food security. As A. Sen (1981) showed, even when national food supplies are adequate, there can be hunger and famine at the micro-level if individuals have no access to available food. For example, unemployment and low wages reduce access to basic foods in MENA countries (Cederstrom et al. 2009). To cope with the drop in purchasing power caused by higher food prices in 2007, households in Morocco reduced the purchase of fresh fruits, vegetables and protein, with negative effects on nutrition (Cederstrom et al. 2009).

Gender relations are also important determinants of food security at the micro-level as access to resources is not distributed evenly within

households, with women and girls most disadvantaged. While women appear to play a key role in ensuring food security, for example by protecting biodiversity, gender-based inequalities and norms may impede the attainment of food security. With the growing feminization of agriculture around the world, the specific problems faced by women farmers (e.g., insecure rights in the land they cultivate, scarce access to fertilizers and so on) may put at risk food security in many countries (Agarwal 2014).

Food security is strongly interlinked with sustainable agriculture. As various studies show, sustainable forms of agriculture, based on production systems that sustain the health of soils and ecosystems, appear to make a substantial contribution to food security by improving food supply, nutrition and livelihoods. According to FAO, sustainable agriculture can protect and enhance natural resources (land, water and others), while ensuring food security; promote a system of global governance, particularly trade regimes and policies, that is concerned with food security; and protect and improve rural livelihoods, equity and social well-being.¹

Furthermore it is important to stress that our understanding of food security cannot be approached from a purely economic perspective; the political processes at the heart of unequal access to food, at the global, regional, national and household level also need to be considered.² The concept of food sovereignty highlights the political dimension of food security. At the individual and local level, it implies the right for individuals, local communities and small farmers to define and implement their own agricultural and food practices, based on people's needs, the protection of their environment, biodiversity and natural resources.³ Recently, the concept of food sovereignty has been also referred to the nation-state level, as elaborated by J. Harrigan (2014:15) for Arab countries, to reflect the fact that sovereign states want to increase their control and access over food supplies vis-à-vis multinational corporations and powerful countries. Food sovereignty at the level of nation states may often collide with food sovereignty at the individual level when, for example, states dispossess small farmers from their land and pursue unsustainable agriculture practices (Harrigan 2014).

¹ See the *Post-2015 Development Agenda* recently elaborated by the UN: <http://www.fao.org/post-2015-mdg/14-themes/sustainable-agriculture/en>.

² For a political economy analysis of food security and agriculture-related issues in the MENA, see Bush (2011) and Harrigan (2012, 2014).

³ The concept has been developed by non-governmental and civil society organizations, particularly the peasant movement Via Campesina, since the mid-1990s.

1.2 WHY DID THE MENA REGION BECOME A NET-FOOD IMPORTER?

The MENA is generally characterized as one of the most food insecure regions in the world owing to its heavy reliance on food imports. As food production in the MENA has declined during the last two decades, the demand for food imports has significantly increased. Most MENA countries now import at least 50% of the food calories they consume and the region is the largest importer of cereal in the world (Harrigan 2012). Given that MENA countries import a large percentage of their food requirements, the sharp increases in international food prices since 2007 have had severe adverse effects, causing macro-economic problems (inflation, trade deficits, fiscal pressure), increased poverty and political instability (see Harrigan 2011, Kamrava and Babar 2012).

Several reasons account for soaring prices at the global level including increased demand for food and animal proteins, rising fuel prices and consequent higher costs of fertilizers and energy, increased bio-fuel production and so on. In addition to these global factors, specific structural ones such as rapid population growth, urbanization, lack of arable lands, water scarcity and environmental degradation have significantly constrained agricultural production in the MENA. Yet, the economic, social and legal policies implemented in the region since the 1950s have played a large part in deepening food security problems.

Public authorities in the post-independence tended to neglect rural areas and agriculture to the advantage of urban areas and industrial modernization, by imposing heavy taxation on agriculture and investing scarce resources in it (Richards and Waterbury 1998). Land reforms implemented in Egypt, Iraq, Syria and Tunisia in the 1950s-1970s, while reducing the inequalities inherited from the past, caused land fragmentation (Richards and Waterbury 1998, Kamrava and Babar 2012). This was at the cost of declining cereal production and farm labour force in agriculture. During the oil boom of the 1970s, when rising oil rents combined with rapid population growth fuelled rising demand for food, the food security gap exploded, leading to a dramatic increase in food imports.

Since the mid-1980s to early 1990s, after the economic crisis triggered by the end of the oil boom, economic liberalization reforms have been implemented in the MENA region. Strategies proposed by most international organizations to address food insecurity in the MENA have prioritized a trade-orientated approach that calls for greater reliance on foreign trade

and food imports (see World Bank, FAO and IFAD 2009). As a part of this approach, international organizations have advocated for liberalizing trade in agricultural commodities, changing the structure of agriculture towards export crops and/or diversifying into industrial and manufactures for export in order to earn foreign currency to import food (see Harrigan 2012). Economic liberalization policies appear to have worsened food dependency of MENA countries through exacerbating competition over resources, liberalizing the land market, strengthening agribusiness and encouraging investment in products for export at the expense of food-producing agriculture and small peasants (Ayeb 2012). The global food crisis of 2007 clearly showed the risks of agricultural policies that are strongly dependent on the international market.

With the region's dependence on food imports projected to increase in the coming two decades and the persistent high volatility of international food prices, most governments in the MENA region have become aware of the tremendous vulnerability caused by reliance on global food markets to meet domestic demand. Public authorities have thus responded to the soaring food prices following different approaches. Many of them seem to have started reorienting their food strategy from a trade-based food security strategy toward greater levels of domestic food production in an attempt to reinstate their political control over food supply (see Harrigan 2012, 2104). Other MENA countries such as Gulf countries, Egypt and Libya have been adopting the policy of acquiring land in third party countries, the so-called land grab phenomenon, to secure food supplies from abroad (see Harrigan 2014).

1.3 THE CONTRIBUTIONS TO THE VOLUME

Although food security has been a growing concern in the MENA region, agriculture has been mostly neglected in Euro-Mediterranean relations due to strong opposition from the EU. Since 1995 trade liberalization has been the focus of Euro-Mediterranean cooperation, but the liberalization process for agricultural trade has proceeded very slowly and unevenly. The EU has opted to restrict agricultural imports from the South Mediterranean in order to preserve the European Common Agricultural Policy (CAP) and fearing possible competition from the other shore of the Mediterranean. Over the last decade, EU policies seem to have accentuated

ated MENA countries' foodstuffs trade dependence on Europe (Joffé et al. 2009) and this is likely to put greater stress on the fragile agricultural environment along the Southern shore (Abis 2012).

Liberalization of Euro-Mediterranean trade in agricultural goods did not begin until 2005 when an Euro-Mediterranean roadmap for agriculture (the "Rabat roadmap") was launched at the Barcelona conference in November. However, the bilateral trade agreements that were signed by the EU with Jordan (2007), Egypt (2010) and Morocco (2012) do not seem to have made significant concessions in agriculture to these three Southern Mediterranean countries. Moreover, the new CAP agreed in June 2013 remains a conservative policy and it does not address the question of Euro-Mediterranean cooperation at all (Petit and El-Hadad 2013).

Despite decades of neglect of agricultural issues and unfair trade agreements in Euro-Mediterranean relations, academics and policy-makers have increasingly acknowledged that agriculture is a key strategic sector for European and Southern Mediterranean countries. The new initiative launched in 2012 by the EU, the European Neighbourhood Programme for Agriculture and Rural Development (ENPARD), is indicative of this awareness insofar as it places agriculture on the agenda of Euro-Mediterranean relations and emphasizes, among other factors, the key role of agriculture in terms of food security in the region. The European Union and the MENA region also face common problems such as climate change, food insecurity, environment challenges and unsustainable farming systems.

Given the sensitiveness and the strategic importance of agriculture for both shores of the Mediterranean, the IAI and the OCP Policy Center jointly organized a two-day Conference in Rabat on November 20-21, 2014, to discuss food security and agriculture challenges in the framework of Euro-Mediterranean relations. The present volume collects the updated and revised versions of the twelve papers that were discussed in that meeting.

The first part of the volume discusses some of the major challenges to food security in the Southern Mediterranean region. Eugenia Ferragina's chapter examines the water and food security nexus and its geopolitical implications, highlighting, *inter alia*, how the trade liberalization process, favoured by structural adjustment policies and by agreements with the European Union, has fostered specialization in the cultivation of highly water-intensive fruits and vegetables, thus reinforcing unsustainable agriculture systems. The chapter by Hamadeh, Jaber and Diehl discusses the key role that livestock plays in all aspects of Arab countries' food security, namely production, stability of supply, access and quality. It also investi-

gates constraints and possible synergies in Euro-Mediterranean relations concerning the livestock sector. Corona's chapter deals with an important aspect of food security and sustainable agriculture, namely the question of the use of genetically modified organisms (GMOs) in the agricultural sector to increase domestic production, by investigating the case of Morocco and its relations with its most influential trade partners, the EU and the US.

The second part of the volume focuses on the topic of small farmers. The chapter by Caroline King and Abdrabbo Shehata analyses the case study of Egyptian citrus producers in a major production area to the west of the Nile Delta, illustrating the difficulties encountered by small producers in accessing international markets, including the EU market. Mohamed Taher Sraïri and Marcel Kuper show how public policies in Morocco have been to the advantage of a small minority of farms specialized in high value cash crops vis-à-vis a vast majority of smallholder units with diversified crop/livestock systems. According to the authors, policies that support smallholder units by encouraging farming diversification and crop/livestock integration are key to enhancing food security in Morocco. Omer Gokcekus and Clare M. Finnegan discuss how the EU could help small poor farmers in the Euro-Mediterranean area by analysing two case-studies, Turkish Cypriot beekeepers and Turkish Cypriot citrus farmers.

In the third part of the volume, the focus is on trade liberalization in the Euro-Mediterranean area. The first two chapters address the impact of trade through quantitative modelling. In the chapter by Dhehibi, Frija and Telleria, trade liberalization in Tunisia and Egypt is found to have the most significant effect on the agriculture total factor productivity (TFP) of the former country, showing that the variables affecting TFP are context-specific. Beyond the effect of trade, their empirical findings also suggest that farming activities in Tunisia and Egypt still need much technical support, better extension, and enhancement of the comparative skills of farmers. The chapter by Márquez-Ramos and Martinez-Gomez shows that trade preferences granted by the EU to Morocco appear to positively affect Moroccan monthly exports of fruit and vegetables. Offering an historical perspective, the third chapter, by Marko Lovec, shows how the institutional mechanisms facilitating the process of the European Union's CAP reforms have influenced the evolution of Euro-Mediterranean relations in the field of agriculture, particularly Euro-Mediterranean trade integration.

The last part of the volume discusses the policy options and opportunities for Euro-Mediterranean cooperation in the field of food security and

sustainable agriculture. In his chapter, Michel Petit argues that trade has so far received too much attention and that EU-SM cooperation should now play a crucial role in strengthening rural development in the Southern Mediterranean region through agricultural research and education. Lorenzo Kihlgren Grandi and Cecilia Emma Sottilotta explore the multi-faceted challenges that the phenomenon of fast urbanization in the Southern Mediterranean area poses to food security, taking the case of the Urban Food Policy Pact, the City of Milan's strategy for the promotion of wide participatory networks of municipalities, as an example of a city seeking to address such challenges. In the last chapter, Marco Adami and Alberto Battistelli discuss technological solutions to overcome the potential conflict between food and energy production that could be adopted on both sides of the Mediterranean. They present a working project on advanced technological photovoltaic cells that combines high productivity of food with the minimal utilization of land and water, which makes it especially suitable for environments with arid land and high solar light availability.

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Part I.
Food Security Challenges
in the Euro-Mediterranean Area

2.

Geopolitical Implications of Water and Food Security in Southern and Eastern Mediterranean Countries

Eugenia Ferragina and Giovanni Canitano

INTRODUCTION

Water and food security are of particular concern for the Mediterranean region where natural resources are under climate and population stress and agricultural production must cope with quality requirements imposed by consumers and their ever-changing consumption patterns. How to feed an increasing population and at the same time safeguard natural resources for future generations is a great challenge for this area. Water is key to food security because agriculture requires large quantities of water for irrigation and for many production processes.

This paper examines water and food security issues in the Southern and Eastern Mediterranean Countries and their geopolitical implications. The chapter first gives an overview of the impact of global climatic change on water and food security in the Southern and Eastern Mediterranean Countries (hereinafter SEMCs) where climate unpredictability, linked to fluctuations in rainfall levels, affect lands used for cereal cultivation. Then, the discussion turns to the water-food nexus, stressing how water consumption in SEMCs is strictly linked to the production, consumption and trading system of agro-food products. The trade liberalization process, favoured by structural adjustment policies and by agreements with the European Union, has fostered specialization in the cultivation of highly water-intensive fruits and vegetables, despite the critical water supply of several of these countries. SEMCs are particularly vulnerable to price fluctuations on international markets due to their dependence on imports of basic foodstuffs. During the last years, the world has experienced many crises (economic crises, food crises, energy crises), often related to the diminishing of natural resources. Challenges like development, economic

growth, stability, peace and security are strictly connected in a globalized world and affected by scarcity and pressure over natural resources. The chapter goes on to analyse the political repercussions of food security in SEMCs during the bread riots of the 1980s and the global food crises of 2008 and 2011, both of which contributed in some measure to the outburst of the Arab Spring. It also explores the geopolitical dimension of water and food security, suggesting alternative competition scenarios at the regional level, involving large international river basins and fossil water aquifers shared by various countries. Finally, some remarks are dedicated to sustainable agriculture and food security at the regional level, analysing the interdependence between SEMCs and European economies and the emerging strategy to strengthen Euro-Mediterranean cooperation in this field.

2.1 THE EFFECT OF CLIMATIC CHANGE ON WATER AND FOOD SECURITY

The evidence for climate change is nowadays considered to be unequivocal. The Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climatic Change (IPCC)¹ confirms the trends of ongoing climatic changes, attributable to the emission of greenhouse gases into the atmosphere, aerosols and change of land use.² In order to limit the average rise in earth temperature to 2°C, which is the maximum increase our planet is expected to tolerate, emissions should be reduced by 40% by 2050 to obtain the result of near zero emissions by the end of the century, along with a progressive reconversion of the world economy from fossil fuels to renewable energies. According to IPCC emissions scenarios, higher temperatures are projected to affect all aspects of the hydrological cycle: droughts and floods are more recurrent and dangerous, their impact increases and a growing population becomes more influenced by atmospheric and hydrological circulation. The impact of climatic change on global water and food security is probably the most worrying aspect

¹ AR5 consists of three Working Group (WG) reports and a Synthesis Report (SYR) which summarizes and integrates the findings. See IPCC (2014a, 2014b, 2014c, 2014d).

² Between 2000 and 2010, emissions have risen at a fast-growing rate compared to the past three decades, with a yearly increase of about one billion tons of greenhouse gases in the atmosphere.

of this report. Climate change significantly impacts agriculture, limiting crop productivity through increasing water demand and reducing water availability in regions where irrigation is needed or useful.

Even the United States government, traditionally sceptical about climatic change, stated in the last National Climate Assessment: "Climate change, once considered an issue for a distant future, has moved firmly into the present" (Melillo et al. 2014:1). The Assessment, a 800-page report compiled by 20 leading experts, says there is no question: climate is changing at a factor of ten times more than naturally. Some changes are already having a measurable effect on food production and public health. Heat waves and change in rainfall have already resulted in a levelling off of wheat and corn production and will eventually cause declines. In a recent research, the Institute of Development Studies and Oxfam have envisaged food price increases fluctuating between 20 and 60% by 2050 due to a reduction in yields connected to climatic changes. These observations, published in a report by Oxfam in 2014, seem to jeopardize the fulfilment of the Millennium Development Goal to reduce world hunger. According to this report, global warming is another crisis factor in an already weakened agricultural context where the decline in seed varieties – accompanied by a decline in development and research investments – has been a record 75% since the last century (Oxfam International 2014).

There is a large body of evidence that the Mediterranean is a "hot spot" of this global climatic change. According to Plan Bleu estimates, the Mediterranean climate will have substantially changed by 2100, with temperatures rising an average of 2 to 4°C, while rainfall decreases by 4 to 30% and sea levels increase by 18 to 59 cm (UNEP Plan Bleu 2012). Many studies concerning climatic change in the Mediterranean region converge on an increase in time-space rainfall variations that will heighten and worsen extreme climate events such as floods, heat waves and droughts – and will consequently result in increased risks of loss of human life, with a concomitant negative impact on the economy. Furthermore, these extreme weather events and sudden temperature variations – especially during long periods of drought – are bound to increase significantly both in intensity and in frequency (Ferragina and Quagliarotti 2008). Finally, coastal areas are likely to be severely affected by rising sea levels. Increases in risk of flooding will inevitably lead to loss of arable land, displacement of populations and degradation in coastal infrastructures (Ferragina and Quagliarotti 2009, Gemenne 2011).

Low precipitation levels are a well-known phenomenon in the region,

evident in a comparison of rainfall data from the 1960s to the beginning of the new millennium. National Rainfall Indices in SEMCs show a strong variability and a decreasing trend that involves most of those countries (Figure 2.1 in the Appendix). However, the most worrying aspect is the extreme weather changes observed on a year-to-year basis, which not only increase uncertainty, but also make it difficult to carry out necessary measures to address sudden and unforeseeable variations in water supply. Water security is also put at risk by heat waves, which have always affected climate trends in the region throughout history but which are now expected to worsen and become more frequent as a result of global warming.

Climatic change reduces rainfall and increases evapotranspiration, highlighting the water deficit of rain-fed crops. This phenomenon has a direct influence on cereal yields because the existing data show the dominance of green water – that is, water derived from rainfall – in cereal production.³ The oscillation of land dedicated to cereal cultivation between 1980 and 2012 shows the adverse influence of weather, with a surface reduction during drought periods, which had become more and more frequent by the end of the 1980s (Figure 2.2 in the Appendix).⁴ The oscillation of land areas under cereal production in SEMCs concerns those countries where such cultivation is mainly on a dry farming basis and employs green water, as is the case for Tunisia, Morocco and Algeria.⁵ This is not the case for Egypt, Syria and Turkey, however, where the implementation of large water works has increased the use of blue water, namely that from surface sources. In these countries, increases in the extension of irrigated lands have reduced the extension of land dedicated to dry agriculture and have consequently reduced the impact of rainfall variability on cereal production.

Climatic change and population growth are jointly stretching the water demand-supply gap at an alarming rate. Total renewable water re-

³ *Green water* is that fraction of rainfall that infiltrates into the soil and is available to plants. It includes soil water-holding capacity and the continual replenishment of reserves by rainfall. *Green water* is the largest fresh water resource, the basis of rain-fed agriculture and all life on land; and yet it has received remarkably little attention in contrast to *blue water* – the fraction of water that reaches rivers directly as runoff or, indirectly, through deep drainage to groundwater and stream base flow.

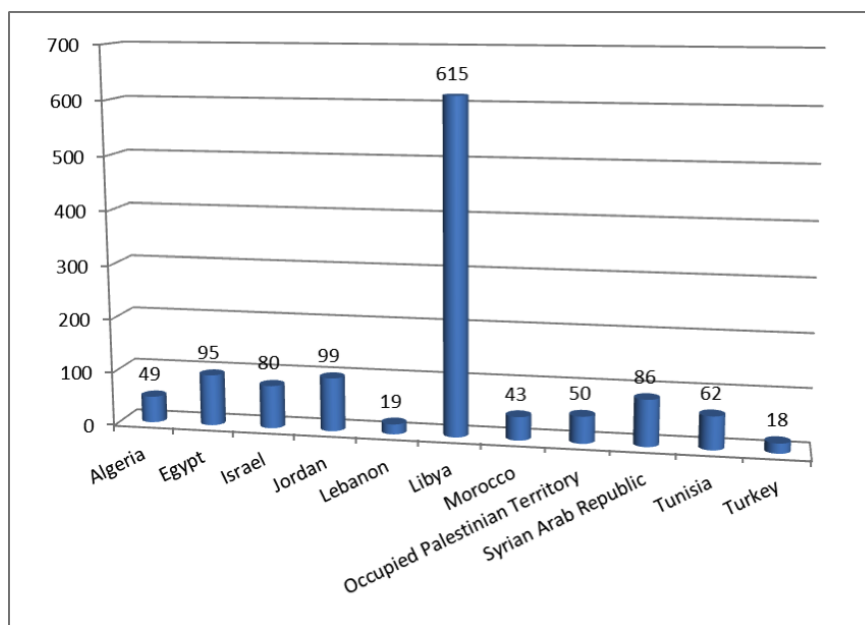
⁴ Climatic change may be seen as a sort of threat multiplier, i.e., one of the aggravating factors of the social unrest underlying the riots in the Arab countries, rather than the major cause. See Werrell and Femia (2013).

⁵ The shrinkage of rain-fed farming area was also due to the expansion of cities over arable land.

sources per capita have steadily decreased in the last few decades and, according to a World Bank datasheet, only Turkey and Lebanon exceeded the threshold of 1,000 m³/inhabitant/year in 2012 (Figure 2.3 in the Appendix).

Human pressure on water resources is measured by the Water Exploitation Index (WEI), which is the annual total water abstraction per year as a percentage of renewable freshwater resources. A water stress situation occurs where the index exceeds 40%. Many SEMCs are far above this percentage and are reaching the alarming level of full exploitation of all renewable water resources; this is the case with Jordan (99%), Egypt (94%), Syria (86%) and Israel (80%). The Water Exploitation Index of 615% in Libya is related to the continued abstraction of fossil groundwater from the Nubian Sandstone Aquifer (Figure 2.4).

Figure 2.4. Annual freshwater withdrawal⁶ as % of total actual renewable water resources 2009-2013



Source: FAO AQUASTAT database (2013).

⁶ Annual freshwater withdrawals refer to total water withdrawals, not counting evaporation losses from storage basins. Withdrawals also include water from desalination plants in countries where they are a significant source. Withdrawals can exceed 100% of total renewable resources where extraction from non-renewable aquifers or desalination plants is considerable or where there is significant water reuse.

Climatic change, reducing the flow of surface water, also leads to an increase in the exploitation of renewable underground water resources. The spread of simple and non-expensive technologies such as motor pumps has facilitated pumping from aquifers, a “silent revolution”, as Ramon Llamas puts it, referring to illegal well-drilling and relevant sample drawing carried out by farmers, activities which are beyond the control of the state and inevitably not subjected to taxation (Llamas and Martínez-Santos 2005, Llamas et al. 2009). Intensive groundwater resource exploitation (1,000 km³/yr) has fostered the development of a flourishing and dynamic agricultural economy, namely “groundwater economics”, but the level of exploitation is in many cases far above the recharge rate of the aquifers (Custodio and Gurguá 1989).

Groundwater overuse involves not only renewable but also non-renewable water resources (fossil aquifers). With a changing climate and growing water scarcity, fossil water represents both a buffer reserve – with which to face the uncertainty of the future – and environmental capital to pass on to future generations. However, the mainstream approach in some countries is to treat these aquifers like another non-renewable fossil resource: oil. Those countries, which all export oil – namely Saudi Arabia, Libya and Egypt – are also mining fossil aquifers.

2.2 THE WATER-FOOD NEXUS

In SEMCs, the limited availability of water and cultivable lands is the greatest concern about how to feed a fast-growing population, which is changing its eating habits in terms of both quality and quantity. These natural constraints are inextricably linked, because more cultivated land depends on more water for agriculture. This water-for-food nexus explains the dominant role of agriculture in water allocation between different economic sectors. According to World Bank and FAO datasheets, agriculture is the largest user of water at the global level and accounts for more than 80% of total water use in many SEMCs, in comparison with a world average of 70%. The highest percentages of agricultural water withdrawal are recorded for Syria (88%), Morocco (87%), Egypt (86%) and Libya (83%) (Figure 2.5 in the Appendix). While in the rest of the world the industrial sector ranks second in water consumption, in SEMCs

domestic consumption⁷ exceeds the world average and results in a higher percentage of domestic withdrawal than of industrial usage. The difference in terms of water allocation by sector depends on two factors: on the one hand, the industrial performance of these countries appears to be weak while, on the other hand, water consumption for domestic use is increasing considerably, due to population growth and advances in water and sanitation. As pointed out in a UNDP Report on Human Development in 2006, cross-sectoral water transfers will be strongly affected by the need to improve the living conditions of populations in the twenty-first century. In SEMCs, the agricultural sector, with its high consumption and unaccounted-for water losses, will be called upon to achieve water economies for the benefit of other sectors – in particular, the domestic one.

In SEMCs, water demand in the agricultural sector is strictly connected to the production and consumption of foodstuffs. In recent decades, cultural choices have led to an increase in water demand, particularly for water-intensive horticultural products. In irrigation schemes the poly-cultivation, that once allowed wildlife-rich habitats to better adapt to local dry ecosystems, has been replaced by intensive mono-cultivation.⁸ A better understanding of the water-food nexus comes from the concept of “water footprint” by Mekonnen and Hoekstra (2011). The water footprint of a nation reveals that the total volume of water used to produce the goods and services consumed by its inhabitants is closely related to the virtual water concept coined by Toni Allan (1998). The term “virtual water” refers to the volume of water embedded in a product and is used to explain the virtual water trade whereby water-scarce countries need to provide for the importation of water-intensive products that they cannot produce due to their own limited water supply. While virtual water only concerns water volume, the water footprint is a multidimensional and geographical spatial indicator because it includes not only the volume of water consumed but also the type (grey, green, blue) and the place where it has been used (Hoekstra 2013). The water footprint measures the actual rate of water demand in a global economy where water demands can be met beyond national borders through the importation of goods. Looking at the Mediterranean region as a whole, Northern Med-

⁷ According to the World Bank definition, withdrawals for domestic use include drinking water, municipal use and supply and use for public services, commercial establishments and homes.

⁸ Nearly 80 species of wild vegetables and grain food plants used by Berber groups in the Ahaggar region of Algeria have been inventoried (Capone et al. 2012:175).

iterranean countries show a higher footprint of water consumption per year and per capita ($2,279 \text{ m}^3$) compared to North Africa ($1,892 \text{ m}^3$) and the Middle East ($1,656 \text{ m}^3$) (Capone et al. 2012:183). In general, these differences are linked to a higher level of production and consumption of services and commodities, especially with respect to diets that are rich in water-intensive products, such as meat.

By examining the water footprint of national per-capita consumption in the world on a sector-by-sector basis, it becomes clear that 90% relates to the consumption of agricultural products. In the SEMCs, this percentage is above the world average: 96% in North Africa and 93% in the Middle East. The countries with a higher percentage of water footprint related to the consumption of agricultural products are Tunisia (98%), Morocco (98%) and Algeria (97%).⁹ On the other hand, the water footprint connected to the consumption of industrial products ranks below the world average in all SEMCs except Israel.

It is paramount to make a distinction between the internal and external water footprints with regard to the consumption of agricultural products in SEMCs. The world average shows an internal water footprint relevant to agricultural products in excess of 70%, versus an external footprint of far less than 20%. In most SEMCs, the external water footprint is above the world average, which shows how highly dependent all these countries are on virtual water. More precisely, the percentage of the external water footprint linked to the consumption of agricultural products exceeds the internal footprint in those countries that are characterized by strong environmental constraints, namely Jordan (83%), Israel (77%), Lebanon (69%) and Libya (64%). As for the other countries of the region, the internal water footprint percentage is higher than the external in Palestine (85%), Syria (80%), Turkey (73%), Morocco (69%), Tunisia (66%) and Egypt (62%) (Figure 2.6 in the Appendix).

Both in Turkey and Syria, a higher percentage of internal water footprint related to the consumption of agricultural products is dependent on the presence of major rivers such as the Tigris and the Euphrates, which allow for a greater supply of water resources compared to the other countries of the region. However, the high internal water footprint percent-

⁹ Mekonnen and Hoekstra's study (2011) examined the net virtual water imports over the period 1995-2005, which is a water savings indicator resulting from trade in agricultural products. Only Tunisia, among the Maghreb countries, presents a negative virtual water balance (-1,666), which shows a higher volume of exports of water-intensive agricultural products compared to those that are imported (Capone et al. 2012:184).

age in Tunisia, Morocco and the Palestinian territories – all water-scarce countries – is attributable to a model of agricultural production focused on fruit and vegetables, which requires an extensive use of the scarcest resource: water.

The water footprint of agricultural product consumption is influenced by consumption patterns and food wastage. In SEMCs, the traditional Mediterranean diet based on cereals and pulses has changed in the last few decades. In most countries, the emergence of a middle class has determined a change in diet and consumption patterns affecting water consumption and aggravating food dependency. The contribution of vegetable products to total dietary energy still prevails, but the consumption of meat and dairy products, which are highly relevant in terms of water consumption, is increasing. Food losses and waste are the major factors affecting the high use of consumptive water in the agricultural sector and actually account for more than 10% of total world caloric energy consumption. Of all food produced globally, about 30 to 50% is not eaten and the amount of food lost or wasted every year is equivalent to more than half of the world annual cereal crop (2.3 billion tons in 2009-2010). In the Near East region, along the whole production chain, 10 to 15% of non-perishables (e.g., grains – about 25% in the rice supply chain) and up to 60% of perishables, are lost (e.g., wheat total loss in Egypt, from harvesting until baking, accounts for 13 to 15%). For farmers and merchants, losses in grain and pulses range from 4 to 10%. Furthermore, post-cooking losses are also significant.

Water-intensive products are also more perishable. The risk of food losses and wastage might also increase, due to both changes in the composition and variety of the food supply, as well as to a tendency to consume a higher proportion of animal food items, as well as fruits and vegetables, which would considerably shorten food durability. Fruits and vegetables, as well as roots and tubers, have the highest wastage rates. Food losses and waste involve all natural resources employed throughout the food chain: land, water and energy. Whilst in developed countries the loss of water embedded in alimentary products is concentrated at the end of food chain and is related to an enormous wastage of food,¹⁰ in SEMCs this loss of water occurs mainly at the beginning of the food chain and is caused by the lack of storage, packaging and transport infrastructures for agricultural products.

¹⁰ Research by the FAO states that rich countries waste a quantity of food (222 million tons per year) almost equivalent to the production of Sub-Saharan Africa (230 million tons per year) (Hoekstra 2013).

These factors call production and consumption models in SEMCs into question. Actually, it is fair to question the sustainability of their agricultural systems, since by mainly focusing on irrigated cultivation – fruit and vegetables – water footprints appear to be too high in comparison with the scarce water resource endowment of these countries. More sustainable production and consumption patterns could reduce the strong pressure on water resources as well as the food dependency ratio.

2.3 THE QUEST FOR FOOD SECURITY IN SEMCs: ECONOMIC AND POLITICAL IMPLICATIONS

Food security has deteriorated in most SEMCs as a consequence of the agricultural development strategies adopted since the 1960s, which have mostly turned out to be unsuccessful, not only in terms of overall results for agriculture productivity but also regarding people's specific needs. Worldwide phenomena, like food crises and climatic change, have accentuated the structural weakness of the agricultural production model adopted by these countries, increasing social and political frustrations.

After post-colonial independence, new rulers considered the mobilization of water resources as central to agricultural development. Substantial investments were consequently allocated to the water sector, mainly focusing on the construction of dams and major networks, with the aim of increasing irrigated areas (Molle 2011:111). This “hydraulic mission” responded to economic and political priorities. Governments' willingness to meet the needs of their fast-growing populations was consistent with land distribution to farmers, thus ensuring their political support. Further, the increase in water allocation to the agricultural sector was aimed at containing the rural exodus, which would have more likely fed territorial imbalances and made cities politically ungovernable.

Thus, it can be concluded that the “hydraulic mission” of the state was accomplished by redirecting economic, political and social objectives into authentic “hydrocracies”, which needed to rely on tangible plans in order to reinforce their legitimacy (Molle et al. 2009). While massive investments in water infrastructures were spearheading agricultural modernization, land reforms, implemented at the beginning of the 1960s, did not ensure an equal distribution of land ownership. Water works and land reforms both contributed to create a dualistic agricultural sector: one side

comprising many small subsistence farms that produce chiefly for internal consumption, the other made up of big export-oriented farms located in irrigated areas (Molle 2011).

Beginning in the 1980s, the international financial institutions fostered trade liberalization in the SEMCs within the framework of Structural Adjustment Programmes (SAPs). The austerity measures caused a drastic reduction of government transfers to the agricultural sector and influenced the rural development projects. In these countries agricultural self-sufficiency was no longer pursued, due to the limited endowment of natural resources (land and water), in combination with a low productivity in basic foodstuffs. Accordingly, policy options shifted from self-sufficiency to food security through specialization in high-value irrigated agricultural production (fruit and vegetables such as oranges and artichokes) and the purchase of basic foodstuffs on international markets. This strategy was favoured by the effects of European and American agricultural subsidies, which led to a 53% drop in food product prices on the global market between 1976 and 2001.

Thus, the liberalization process prioritized the export of fruit and vegetables, reduced the internal price of cereals and yet still fostered imports. These trade policies have widened the production-consumption gap of cereals, which are the main food of the most vulnerable segments of the population. Since the 1980s, reductions in agricultural subsidies for staple food, imposed by SAPs, along with climate deterioration, have resulted in the first signs of a future linkage between water, food crises and political imbalance in SEMCs. In Morocco in June 1981, the reduction of subsidies within the SAP context led to a significant price increase of staple food. The impact on the less-privileged segments of the population was worsened by a persistent drought (the first drought in the country began in 1980 and lasted until 1984) and a very high inflation rate (12.5% in 1981). Social unrest erupted in the slum areas of Casablanca. In response to a request from the IMF in December 1983, the Tunisian government announced increases in the price of bread and cereal products such as semolina in an attempt to stabilize the domestic economy. As a result, bread riots broke out between 27 December 1983 and 6 January 1984.

The self-sufficiency index for cereals clearly shows the deterioration of the food situation in SEMCs.¹¹ In the 1960s, Tunisia's index was 0.54

¹¹ Self-sufficiency index is the ability of a country to feed its population through domestic production, considering import and export food commodities. Food self-sufficiency

and Libya's was 0.87, while the index average for the region was 0.69; at the beginning of the new century, however, the average fell by 0.25, indicating a general increase in degree of food dependence. This progressive decrease appears to be significant for a few countries: Libya went from a rate of 0.87 to 0.07, Algeria from 0.75 to 0.10, Israel from 0.58 to 0.08 and Jordan from 0.63 to 0.03 – in other words, Israel and Jordan became unable to rely on their national production to feed their populations. The other countries of the region show a smaller decrease in the self-sufficiency rate, with values ranging from 0.40 to 0.22 for Syria and Egypt respectively. The only exception is Lebanon, which seems to reflect the self-sufficiency rate of the 1960s, despite its unstable development (Figure 2.7 in the Appendix).

The low self-sufficiency rate for cereals has created a strong vulnerability of SEMCs to food price fluctuation on the international markets. In the last few years, the world economy has been entering a period of “*agflation*”, a phase in which inflation is mainly driven by the price of food staples. For many decades the effects of the green revolution in developing countries, together with increases in productivity in developed countries and export incentives of the greater agricultural producers, Europe and the USA, all assured low international food prices. However, this situation has been changing in recent years due to a number of factors related to both demand and supply: 1) high levels of concentration in the food market have made the pricing of food staples strictly dependent on the yields of the main world producers and therefore the supply of agricultural products on the global market cannot but be strongly influenced by climatic hazards that affect the main food exporters; 2) world food demand is increasing due to demographic growth and improved living conditions in the emerging economies; 3) biofuel production incentives in Europe and the USA have reduced the extension of land and water devoted to agricultural production for human consumption; and 4) basic agricultural products have become an important target for investment, increasing related financial speculation on the global market (Ferragina and Quagliarotti 2009).

The vulnerability of SEMCs to the increase of food prices on the global market in 2008 and in 2011 was also due to the high percentage of population under or close to the poverty line and to the share of family expenditure devoted to food (35.8% in Tunisia, 38.8% in Egypt, 43.9%

index ranges from 0 to 1, where 1 stands for full food self-sufficiency and 0 indicates a total dependence on imports.

in Algeria). In an economic context marked by increased social inequalities and growing unemployment, the pressure on domestic bread prices played a role in triggering social unrest (Gana 2012). The food crisis also contributed to disrupting the social contract upon which the legitimacy of Arab regimes had been based (Galal and Selim 2013).

In 2011, climatic hazards made an important contribution to the food crisis. In 2010 wheat production was curtailed in Russia (-32.7%), Ukraine (-19.3%), Canada (-13.7%) and Australia (-8.7%). China – the biggest producer and consumer of wheat in the world – was forced to face a drought in the eastern part of the country by purchasing wheat on the international market, thus contributing to the global food crisis. In this context, the Arab Spring cannot be considered a direct consequence of the environmental phenomena that occurred between 2008 and 2011, however, climatic change certainly acted as a “threat multiplier”. In a global world where, as pointed out earlier, countries tend to externalize their water and food demand by resorting to international markets, local hazards may generate a global impact by interacting with different economic, social and political drivers of instability.

A new concept of security comes to the fore that analyses security issues from a human perspective.¹² According to this wider concept, in SEMCs water and food security are strategic issues that will be affected by, and will affect, the regional political equilibrium in a compelling and unpredictable way.

2.4 CONFLICT OVER LAND AND WATER: A GEOPOLITICAL ISSUE

In SEMCs, the need to meet the water and food requirements of fast-growing populations has increased competition within international river ba-

¹² The concept of human security emerged at the end of the Cold War, challenging the dominance of focus on the states. This individualized conception of security lies in the evolution of international society’s consideration of rights of individuals in the face of potential threats from states. The human security approach was introduced in the 1994 global Human Development Report to broaden the scope of security analysis and policy from territorial security to the security of people. The scope of global security should be expanded to include threats in seven areas: economics, food, health, environment, personal, community and political (Myers 1993).

sins and led several countries to play a “hydro-hegemonic” role at the expense of their co-riparian neighbours.

An important hydro-conflict area is the Tigris and Euphrates basin, involving Turkey as upstream country and Syria and Iraq as downstream countries. In this basin, the geopolitical setting was altered in 1977 by the launch of the South-East Anatolian Project (GAP) that forecast the implementation of 22 dams and 19 hydropower stations in the Kurdish area. This project can be considered emblematic of the geopolitical factors affecting the water issues in the Middle East. The project aims to integrate the Kurdish minority in the economy of Turkey by reducing the high unemployment rate and improving living conditions; at the same time, however, the government wishes to impose strict political control throughout the territory and over its population (Ferragina 2010). This internal political aspect is very important, above all after the creation of a *de facto* Kurdish Regional Government (KRG) in the North of Iraq. Concerning the regional equilibrium, the implementation of the GAP project will strengthen the hegemonic power of Turkey in the Middle East and will influence the exploitation of water resources in the basin by downstream countries, becoming a strong instrument of pressure and political blackmail for Turkey (Clément 2010).

Another arena for competition over water control for agricultural development is the Nile basin. The Nile flows into the Mediterranean after crossing nine countries plus South Sudan, which was included in 2011. Egypt is the downstream country, 97% dependent on external resources, but it has played a hegemonic role in the basin based on historical rights that for many years were considered non-negotiable, thanks to the impact of its political and economic power on upstream countries.¹³ Since 1997, in an attempt to protect its “acquired rights” on the Nile, Egypt has been developing the South Valley Development Project, a big land reclamation project (one and a half million acres of land) aimed at increasing food security through the production of domestic staples (Cocchieri 2010).¹⁴ The additional yearly consumption of five billion cubic metres of

¹³ An exclusive sharing agreement with Sudan was signed in 1929, when Egypt was under British rule, and then renegotiated in 1959; this excluded all the other upstream countries. Since 1999 comprehensive efforts have been made toward the development of a new Nile Basin regime called the Nile Basin Initiative (NBI). The NBI is a partnership initiated and run by the riparian states of the Nile River through the Council of Ministers of Water Affairs of the Nile Basin States. All riparian states of the Nile Basin are included in the NBI, except for Eritrea, which has observer status.

¹⁴ Launched in 1997, the *Egyptian South Valley Development Project* is one of the ra-

water represented a new claim on the Nile water, a sort of “precautionary use”, jeopardising the initiatives of upstream countries.¹⁵ Nonetheless, in recent years, demographic pressure and climatic hazards have strongly undermined food security in the region, and have created the conditions for a co-riparian counter-hegemonic strategy. The power balance in the basin has been altered by the arrival of new external actors in the region. In particular, China is consolidating its economic and political role in the African continent, financing infrastructural construction, including hydraulic works, and Sudan and Ethiopia have been major recipients of such aid (Cascão 2009). The essential aspect of Chinese financial aid is that it is apparently not linked to certain objectives or standards that must be met, like those of the World Bank concerning long-term political or environmental impacts, and can be accessed much faster than aid from other donors. Hence, it may be argued that China is becoming a powerful alternative to traditional Western donors (Martens 2011).

Another important driver of conflict in the basin is land grabbing, the explosion of land deals fuelled by the increase in the price of food staples on the international markets (Jägerskog et al. 2012). Food crisis made governments increasingly aware of the importance of securing food needs, and the strategy adopted in some cases was to externalize food production and water exploitation. As point out by GRAIN (the most important NGO involved in land grabs analysis, collecting data and information), behind land grabs there are water grabs, because the most precious and scarce resource in SEMCs is water. In fact, the countries most involved in land deals are the ones with less water endowment. Currently, the United Arab Emirates accounts for around 12% of all land deals, followed by Egypt (6%) and Saudi Arabia (4%). Some governments of

rest cases of projects involving two transboundary sources of water: the Nile River and the Nubian Sandstone Aquifer. The first source is shared with nine other countries and is regulated, for any further exploitation, by the Nile Basin Initiative. The Nubian Sandstone Aquifer is shared by four countries and its exploitation is also supervised by a shared committee. The *South Valley Development Project* aims to develop a part of Upper Egypt by bringing water to three regions and, therefore, also employment opportunities for the local population. The regions concerned are the Western Desert Oasis, the Toshka region and the East Owainat area, located in a very remote area of the Western Desert (Cocchieri 2010).

¹⁵ Precautionary use is a non-cooperative use where a state exploits part of a shared resource in order to acquire a right over it. In this case, the aims is to create a *de facto* situation giving rise, over time, to use by precedent or, better, to an acquired right to the resources (Ferragina and Greco 2008).

member states of the Gulf Cooperation Council (GCC; Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates) have adopted explicit policies to encourage their citizens to invest in food production overseas as part of their long-term national food security strategies. Such policies cover a variety of instruments, including investment subsidies and guarantees, as well as the establishment of sovereign funds focusing exclusively on investments in agriculture overseas. Governments, often through sovereign wealth funds, are negotiating the acquisition or lease of farming land.

According to the NGO GRAIN, the Ethiopian government has made deals with investors from Saudi Arabia, as well as India and China among others, giving foreign investors control of half of the arable land in its Gambela region (Quagliarotti 2013). Powerful Saudi businessmen are pursuing deals in Senegal, Mali and other countries that would give them control over several hundred thousand hectares of the most productive farmlands. The al-Amoudi company from Saudi Arabia has acquired ten thousand hectares in southwestern Ethiopia to export rice. Besides food security concerns, it appears that such acquisitions are increasingly perceived by international companies as a useful investment tool allowing for diversification. A number of investment companies and private funds have been acquiring farmland around the globe. These include Western heavyweights such Goldman Sachs and Deutsche Bank, but also Arab players such as Citadel Capital, an Egyptian private equity fund.

The growing interest of public and private foreign investors in leasing land in many co-riparian states of the Nile basin such as Sudan, South Sudan, Ethiopia, Uganda and Tanzania, has favoured big waves of investment in hydraulic infrastructures in the hosting countries, which are opening up their economies to these land deals. In 2001, Ethiopia launched the construction of the Grand Millennium Dam, one of the biggest dams ever built, which will allow for a storage capacity of 63 billion cubic meters of water and enable the country to increase its power supply and water availability. The estimated construction cost of the dam is \$4.8 billion, \$3 billion to be financed by the Ethiopian government and \$1.8 billion by Chinese banks that will cover the cost of turbines and associated electrical equipment of the hydropower plants. This project is jeopardizing the equilibrium along the Nile basin. Ethiopia, following the food price crises in 2008 and 2011, become a recipient of foreign investment, mainly in the form of land acquisition. Those investors, in acquiring land in Ethiopia and elsewhere, have obtained secure access to

water; thus, they have put into question Egypt's "hydroegemony" in the allocation of the Nile water quota.

Sudan is also going to implement new hydropower dams and irrigation schemes, such as the Mérowé dam inaugurated in 2009. The continuous lessening of prospects for Egypt to maintain its water quota over the Nile is forcing the country to change its food security strategy. This change is also related to the limited results of the South Valley Development Project, both in terms of creation of new settlements and attraction of foreign investment. Therefore, as an alternative to failing domestic projects, Egypt has started to buy land and water resources in Sudan, Ethiopia and Tanzania to produce food for its internal consumption.

Competition over water has involved not only watercourse resources but also underground fossil water resources. Overuse of non-renewable water resources is one of the challenges in arid countries. With a changing climate and growing water scarcity, groundwater can be a buffer during shortage of surface water supply, as aquifers have a high storage capacity and are less sensitive to climatic change. The majority of actual projects are focused on agriculture and involve countries searching to increase their food security.

The idea of "greening the desert" has been followed by both Saudi Arabia and Libya, two arid countries almost completely dependent on food imports. In the 1980s, Saudi Arabia began exploiting the Disi fossil aquifer shared with Jordan, with the aim of developing cereal production and reducing food dependency. The operation was more political than economic, since it was launched in a period marked by strong international tensions, when Western countries threatened to use the food weapon against oil producers by reducing their cereal exports. This very expensive irrigation program, associated with public aid for food production, allowed Saudi Arabia to reach cereal self-sufficiency and then become an exporter on the international market. In 2008, internal and external constraints forced the country progressively to forsake the program, which will be completely stopped in 2016.¹⁶ After abandoning the idea of food self-sufficiency, Saudi Arabia decided to externalize its food production and is currently involved in land-grabbing investments (Ferragina 2011). In recent years, Saudi Arabian companies have been acquiring millions of hectares of lands overseas to produce food to ship back home. Saudi Ara-

¹⁶ Governmental subsidies had become very expensive and contravened WTO rules regarding direct aid for food production.

bia does not lack land for food production; water is the scarcest natural resource in the Kingdom, and its companies are involved in water grabbing in countries like Ethiopia (GRAIN 2012).

Libya planned to increase water and food security by launching the Great Man-Made River Project in 1983. The project involved the transfer of water drawn from the Nubian Sandstone Aquifer located in the southern part of the country bordering the coast, through the construction of two branches, one headed towards Tripoli and the other to Bengasi. The canal was also expected to irrigate 250,000 hectares in Bengasi, Sirte and Jeffara, where Italian colonists had developed irrigated agriculture during the 1930s (Abis and Blanc 2012). The Great Man-Made River Project, worth billions of dollars, was developed with the help of Korean engineers – but was never completed and most areas planned for irrigation have never become operational. Its implementation slowed down, due to the international embargo imposed on the country in 1992. In July 2011, NATO forces bombed the water supply pipeline near Brega and destroyed the factory that produces the pipes to repair the infrastructure. Construction of the last two phases of the Great Man-Made River Project was scheduled to continue over the next two decades, but the actual political situation of the country is compromising the restoration and completion of the project. The huge amount of Libyan water withdrawals in the last years has certainly compromised the quality and lifespan of groundwater and at the same time has fostered a pumping competition with Sudan and Egypt, the two countries that share the fossil aquifer with Libya.

In Sudan, the Nubian Sandstone Aquifer exploitation is related to the unprecedented upsurge in land acquisitions because investments by Saudi Arabia and South Korea are promoting an increase in the exploitation of fossil water. Egypt started to exploit the Nubian groundwater within the New Valley project, in the area of East Owainat, where irrigated lands for the cultivation of wheat, barley, potatoes and vegetables have been created in the open desert. Public and private Egyptian firms and Gulf State investors have been taking over the area and have destined production mainly for export. It is clear, however, that this agricultural strategy is rather inconsistent because, while it allows for using national non-renewable water resources to develop irrigated lands in the open desert, the resulting production is destined for foreign markets, despite the large food deficit affecting the country.

Summing up, all these unilateral projects, conflicting with one another, are putting new pressures on the environment as well as on political re-

lations in the region, reducing the prospects for multilateral legal agreements based on the equitable utilization of common water resources. These projects are also unlikely to improve food security due to climatic constraints and long-term environmental effects.

2.5 FOOD SECURITY FROM THE EURO-MEDITERRANEAN PERSPECTIVE

The dependency of SEMCs on food imports has been increasing over recent decades, particularly in terms of imports from Europe.¹⁷ In the context of Euro-Mediterranean trade liberalization, European countries have implemented measures, such as export quotas and calendars, aimed at protecting their most vulnerable sectors from competition. The SEMCs, on the other hand, have become more and more dependent on European cereals, meat and dairy products. The trade liberalization process imposed by SAPs at the end of the 1980s, and later the Barcelona Process in 1995 which speeded up SEMCs' trade integration in Europe, promoted irrigated horticulture in SEMCs. Summing up, protectionist measures adopted by Europe have not allowed SEMCs' exports – albeit on the increase – to fully compensate for their imports.

The trade balance in agricultural products is actually favourable to the EU, with the sole exception of Morocco which is more competitive thanks to better agro-climatologic conditions (see Figure 2.8 in the Appendix).¹⁸

Dependence and verticality are the keywords that explain the Euro-Mediterranean trade in agricultural products. While the SEMCs are strongly dependent on Europe in basic foodstuff and protein products (milk, meat and dairy products), EU countries rely mostly on SEMCs for only some products, such as dates, potatoes and cucumbers. On the whole, around 40% of vegetables and 17% of fruits imported by the EU

¹⁷ The level of food dependency of a country can be determined by different indicators. In this analysis, reference is made to the self-sufficiency index for cereals, assuming that products such as wheat, maize, barley and rice constitute a simplified but representative basket of basic staple foods necessary to meet the needs of Arab populations in the Mediterranean region.

¹⁸ The good agricultural performance of Morocco is related also to the social, economic and environmental measures to support smallholder agriculture adopted in the framework of 2020 Rural Development launched in the late 1990s (Bouras 2014).

originate in the SEMCs, but their market share is dropping since in recent years there has been an increase in European off-season imports from the southern hemisphere (García-Alvarez-Coque et al. 2012). The European dominance in agricultural trade is related to the inability to foster South-South integration. Trade in agricultural products between SEMCs is limited, due to the small complementarities between agricultural farming systems, associated with logistical barriers and political constraints. All of these dynamics weaken Euro-Mediterranean agro-trade relations, as highlighted by the growing role that extra-Mediterranean actors have assumed in recent years. The United States is the main supplier of wheat, maize and soybeans in some Arab countries (Morocco, Algeria, Jordan, Egypt and Turkey), Brazil is increasing its exports of meat, soybeans and sugar, Russia and Ukraine are becoming important wheat exporters in the region and China has tripled its exports of fruits, vegetables and oilseeds in the last decade (Ibid.).

Euro-Mediterranean agricultural trade is strongly influenced by the European Common Agricultural Policy (CAP). Europe maintains support measures to the agricultural sector even though the liberalization process promoted by the World Trade Organization does not allow direct aid to producers. The €45 billion given through decoupled direct payments to European producers is considered to be excluded from the WTO rules, under the “green box” policy (García-Alvarez-Coque 2012). Even though these green box subsidies can be considered a very important step towards a sustainable agriculture, the economic constraints that do not allow SEMCs to give the same direct aid to producers, and a sort of misuse by the European countries of these support measures, create a *de facto* trade distortion. The green box subsidies are going to be reconsidered in the framework of the CAP reform expected after 2014, but they are emblematic of the asymmetries still existing in terms of support to the agricultural sector, between the two shores of the Mediterranean basin.

Euro-Mediterranean agricultural relations continue to be based on bilateral agreements that result in variance in the tariff reductions allowed by the EU for SEMCs agricultural exports, according to product and country of origin. The agreements foresee export quotas and calendars, as in the case of restrictions imposed on Egypt concerning artichokes, strawberries, cucumbers and tomatoes, and on Morocco for artichokes and oranges. The elimination or reduction of tariff quotas applies only to a limited quantity of agricultural production, off-season, in order to re-

duce direct competition with European production. Non-tariff measures, which include quality standards to protect consumers, phyto-sanitary regulations, intellectual property and rules of origin, are another factor affecting SEMCs exports to the European market. Tariff and non-tariff measures contribute to strengthening a specialization model based on high-value crops which are very intensive in terms of water, capital and technology and are therefore affordable only for big export-oriented farms (Ben Zid 2014).

An important issue both in terms of food security and reduced market dependency is support to small-scale farming. Small farms (less than 5 hectares) are the backbone of the agricultural sector in the SEMCs – they represent around 71% of total allotments in Morocco – but are economically inefficient due to high input costs compared to profits and their inability to take advantage of the economy of scale. The weakness of this system also results from: 1) difficult access to agricultural credit; 2) the low level of agricultural mechanization; 3) the lack of farmer training programmes concerning the use of pesticides and fertilizers; 4) weak market access, due to the lack of storage and transport infrastructures; and 5) limited support and incentives for the creation of cooperatives aiming to increase the power of small agricultural producers in face of big dealers and distributors.

Many small-scale allotments practise rainfed agriculture, which means they cultivate without irrigation in areas with annual rainfall of 500 mm or less (FAO 2008b:83-4). Despite predominately dry climates, many Arab countries depend mainly on rainfed agriculture; about 68% of the region's cropland is rainfed, 20% is irrigated and 12% is occupied by permanent trees. Cereal production is mostly rainfed: at least 80% in Sudan and Yemen, and half to two-thirds in the Mashreq countries (FAO 2008a). Factors limiting productivity are the agronomic characteristics of the region, exacerbated by global warming which acts as a threat multiplier in terms of land degradation, poor water endowment, and duration and intensity of waves of drought.

The key to food security in Arab countries is to improve the productivity of rainfed agriculture, above all for cereals which are mostly cultivated without irrigation. Despite productivity growth in recent decades, there is a big agricultural productivity cereal yield gap between SEMCs and European countries (Figure 2.9 in the Appendix). Bridging the yield gap in rainfed agriculture demands a strong investment in research and innovation because is urgent to increase the adaptation of rainfed crops

to climatic uncertainty, to reintroduce cop varieties targeted to dry areas with high levels of resistance to insects and diseases and high tolerance for drought and salinity. The transfer of European agronomic knowledge can play an important role in fostering dry agriculture. Much room for cooperation exists in the field of organic agriculture, where the synergies between European know-how and the availability of land and low-cost manpower in the SEMCs create complementarities between the two farming systems. A strategy to reduce the vulnerability of small farms is the establishment of cooperatives which can help farmers take advantage of economy of scale, facilitate credit access and increase bargaining power vis-à-vis contractors and distributors.

The emergence of a new perspective in Euro-Mediterranean agricultural policy demands a stronger cooperation in some strategic issues: food quality standards, respect for environmental prescriptions, preservation of ecosystems and consumer protection. Cooperation in these sectors can upgrade the quality of agricultural production in SEMCs and increase the competitiveness of these countries in the international markets. Proposals to reform the CAP and the European Neighbourhood Programme for Agriculture and Rural Development (ENPARD) appear to consider the aforementioned aspects that could contribute to strengthening the partnership between Europe and the SEMCs and to promoting local development in rural areas. The most relevant are:

- to foster a new organization of the production chain aiming to redistribute the added value between producers and distributors;
- to promote transnational cooperation in the agricultural sector;
- to increase the competitiveness of agricultural production by supporting research and agronomic innovation; and
- to improve living conditions in rural areas through local governance and social inclusion.

Summing up, agricultural development is at the core of Euro-Mediterranean integration and is going to influence political equilibrium and migration flows between the two shores of the Mediterranean. It is not only a question of food security to avoid bread riots; the real challenge is to improve living conditions in rural areas and increase agricultural wages as part of a whole strategy aiming to reduce pressure on the labour market inside the SEMCs as well as the need for people to migrate.

CONCLUSION

The world is facing a big challenge: how to feed a still-growing global population under uncertain and unpredictable conditions. Many factors – such as unfavourable climatic phenomena and improved living conditions in emerging economies – have played a role in reversing a trend that in recent decades had brought about a reduction of hunger at a global scale. Nonetheless, the food problem in the world is still a matter of poverty because it most affects people suffering from spatial, economic and social marginality. In stark contrast to the one billion people who are undernourished in developing countries, there are one billion people affected by obesity in the economically developed world. What needs to be questioned, therefore, is world production and consumption patterns, the rules of the global food market and the role of food wastage.

All these problems are evident and intimately related in SEMCs. The water-food nexus makes evident the importance of saving water and food, cultivating agricultural products with lower water requirements and adopting a more environmentally friendly vegetable-oriented diet. Production patterns need to be addressed properly in order to feed populations and reduce their exposure to price fluctuations on the global market. This shift in agricultural policy is also essential to avoid social imbalances and political unrest.

Furthermore, the search for food security strongly affects regional economic and political equilibrium. Large waterworks and irrigation schemes have altered the power relations in river basins, and in some cases have fostered the mining of common underground fossil resources. The export-oriented agricultural model prevailing in many countries has reduced self-sufficiency indices for cereals and created a strong dependency on virtual water imports – that is, water embedded in imported food items. Importing food and, as a result, importing virtual water, was for many years a means for water-scarce economies to escape environmental constraints. Furthermore, low pricing of staple foods on the international markets allowed SEMCs not to take the water-food nexus into serious consideration, nor to question their water and agricultural policies. The global food crisis intervened to alter this equilibrium, with diverse political consequences.

The food crisis has also highlighted the dependency of virtual water importers on virtual water exporters – a clear example is the dependency of Egypt on Russia – and reversed a long trend of strategic reliance of sov-

foreign states on world markets for food security. This explains the move toward external land deals chosen by countries such as Saudi Arabia, Libya and Egypt, which had all experienced the failure of agricultural projects launched in desert areas. These countries, mostly relying on global markets for their food requirements, have decided to externalize their food demand by purchasing agricultural lands in foreign countries. Land grabbing, however, certainly does not seem to be a long-term solution for water and food security, since these kinds of investments are mainly speculative in nature and do not focus on feeding people.

Facing the global challenges – climatic change, demographic growth, human pressure on natural resources, global food crises and geopolitical control over land and water – it is imperative for SEMCs to change policies in order to enhance water and food security. The only option is to develop a new “green revolution” that is in harmony with climatic change – one that is able to restore, over time, the capacity of land and water to regenerate the services they provide, thereby creating the necessary conditions for a long-term sustainable agriculture. Investigating methods and policy to develop region-wide cooperation is an important step in this direction.

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3.

Livestock and Food Security in the Arab Region: Policy Impact within the Euro-Mediterranean Framework

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INTRODUCTION

Livestock has traditionally played a role in all aspects of Arab food security: production, stability of supply, access and quality. In addition, it is a significant source of income for smallholders and an economic contributor to the GDP. Livestock represents a year-round asset, a readily available source of food or income, and a source of pride, social values and status.

The Arab livestock sector has been affected by a long history of arbitrary policies that strained the sector and led to the degradation of the scarce natural resources available to support it. The chain of events leading to this situation was fuelled by structural changes during the second half of the past century, most importantly the rapid increase in wealth and population numbers leading to high demand for livestock and feed products. The EU is a major exporter leading a sizeable trade in the direction of the Arab countries while EU imports from the region are regulated under the Euro-Mediterranean Partnership which has evolved into the Union for the Mediterranean. In interrelation with the European Common Agricultural Policy, the developments of bilateral agreements have wide-ranging consequences for production and economic welfare in the Arab countries.

The Arab countries are currently facing a situation of intensification led by the private sector, largely bypassing the peri-urban smallholders and rural pastoralists. This situation aggravates the vulnerability of small producers to poverty and food insecurity and creates an economically and socially delicate balance with constant threat of strife over water and land resources within and across countries.

In recent years, pro-poor livestock development based on policy and

institutional change has gained momentum led by the FAO Pro-poor Livestock Policy Initiative. However, efforts in that direction are still timid in the Arab region in light of the lack of a systematic framework for policy impact assessment. Under this umbrella, and in view of the strong inter-linkages in food security issues, including livestock, between the EU and the Arab world, positive synergies in terms of agricultural policies would have a tremendous impact on the sustainability of livestock food systems.

This paper presents the situation of livestock production in the Arab countries in relation to domestic as well as EU policy impacts. The particular cases of Morocco, Saudi Arabia and Syria (until 2012 and before the deterioration of the security situation) are discussed to reflect the differences between Mediterranean Arab countries and Arab Gulf countries (Morocco and Syria vs. Saudi Arabia) as well as differences within Mediterranean countries with respect to their policies and production contexts and their relationship with the EU (Morocco vs. Syria). Results are discussed in view of potential alignment and synergies with recent sector and trade developments in the Euro-Mediterranean area. The aim is to show options for policy intervention at different levels of decision making for securing long-term food security in livestock production systems.

3.1 THE ARAB LIVESTOCK SECTOR

Today 75% of all poor in Arab rural areas partially depend on livestock for livelihood, with 60% of the income being derived from livestock in pastoral and agro-pastoral systems, while small mixed farming uses livestock for food, manure, draught, buffering seasonal nutritional gaps and providing a source of income for women. Moreover, in peri-urban areas an increasing number of landless mixed farmers feed animals on crop residues and by-products (Fresco and Steinfeld 1998). On the other hand, demand in urban areas is largely met by intensive non-land-based systems such as large poultry and dairy farms. Livestock production in the Arab countries is limited by the distribution of production systems. The vast majority of the territory, up to 90%, falls under rangeland arid or semi-arid regions. These vast arid areas are prone to extensive poverty prevalence, based on the estimates of poverty distribution by production system (Dixon et al. 2001:41), and are therefore among the least food secure.

A continuous rise in livestock demand in Arab countries has been observed for the last decade as reflected by the consumption patterns: Kg whole milk equivalent per capita was estimated to increase from 72 to 81 between 2000 and 2014 while meat consumption (Kg per capita carcass weight equivalent) increased from 21 to 28 (Bruinsma 2003). This trend follows an overall increasing demand for agricultural products, illustrated by rising shares of irrigated land in the region. The increased demand is driven by structural factors as adapted from the report by the World Bank, FAO and IFAD (2009): "Arab Countries are large net importers of food, with 50 percent of their food calorie needs relying on imports. Population growth rate in Arab countries is estimated at around 1.7 percent which is above the 1.1 percent world average, along with a rapid increase in income growth rate estimated at 3.4 percent while the world average is 3 percent. At the same time, Arab countries are facing increased urbanization, estimated at 3 percent growth between 1990 and 2006, as compared to the world average of 2.2 percent. The growth of the agriculture sector, including livestock, in response to increased demand, seems to be hindered partly by the slow growth in arable lands estimated at 1.7 percent as compared to 2.3 percent worldwide between 1995-2005, thus affecting cereal production, for food and feed. Being largely under arid climates, water scarcity is another obstacle noting a heavy reliance on the exploitation of renewable water resources of 75 percent as compared to the rate of 30 percent in other regions". (Hamadeh 2014:159).

Table 3.1. Cow's milk and chicken meat production in three representative Arab countries and related number of animals

Livestock item	Syria		Morocco		Saudi Arabia	
	2000	2012	2000	2012	2000	2012
Milk cattle (head)	458,947	619,665	1,308,000	1,555,000	84,286	162,000
Milk production (tons)	1,156,393	1,604,349	1,184,500	2,500,000	710,000	1,750,000
Milk production to domestic supply ratio		0.94		0.94		0.84
Chicken meat (x1000 head)	106,602	102,000	310,000	500,000	483,000	567,000
Chicken meat production (tons)	106,602	138,202	250,000	560,000	483,000	567,000
Meat production to domestic supply ratio		0.98		1.00		0.46

Source: Compiled from FAOSTAT 2014.

On the supply side, the increase in livestock production has not been uniform across the Arab countries and has fallen short of the demand in spite of important animal inventories. Table 3.1 shows that Mediterranean countries with widely spread mixed farming systems, such as Syria and Morocco, have the potential to satisfy most of their domestic needs in fresh cow's milk and chicken meat. Saudi Arabia data indicate high intensification of the dairy sector as reflected in the high productivity of a relatively small animal number, and a large poultry sector. The growth in the sector between 2000 and 2012 is evident in all three countries.

Feed constitutes the major cost of livestock operations, especially in the Arab countries where local feed production is limited and costly. Given the scarcity of arable land in most of the Arab countries, there is a challenging choice to be made between using the land for human food production or for animal feed. Feed production in the region is mostly rainfed, with low productivity. Attempts to increase local feed production through irrigation have resulted in heavy drainage of the non-renewable water resources in some cases, thus prompting the termination of such programmes in countries where the water reserves have been depleted such as in Saudi Arabia and the UAE (USDA 2012, 2013a).

In Mediterranean Arab countries such as Morocco and Syria, feed production and pasture conditions are highly seasonal and unpredictable depending on climatic and disease conditions. However, these countries remain net cereal importers with imports varying depending on the needs for each year (USDA 2011, 2013b).

The population in the Arab countries is expected to maintain its high growth rate, becoming increasingly urban and consuming more animal products. "Meat consumption will increase by 104 percent and milk consumption will increase by 82 percent. Increases in consumption of animal products will be more pronounced in oil-rich countries – nearly doubling from 2000 to 2030 – driven by surging income and population growth", according to the World Bank, FAO and IFAD report (2009:19).

However, increasing production to meet this demand will be challenging based on the expected aggravation in desertification and the urban expansion on arable land. In the Middle East and North Africa region, which comprises a large number of the Arab countries, it is estimated that available renewable water will be as low as 500 cubic meters per capita and that arable land will shrink to 0.12 hectares per capita by the year 2050 (World Bank, FAO and IFAD 2009:xii).

The area will be also be hard hit by the effects of global warming; and the Middle East and North Africa are expected to be the most affected (Brown and Crawford 2009). Elasha (2010) describes the projected effects of global warming on the Arab countries: Temperatures could increase by 4°C in some countries with a decrease in rainfall of more than 30%, thus making the area threatened by desiccation. Naturally this will affect the agricultural yields which are expected to decrease by 21%, with a decrease in value of as much as 40% in some Arab countries.

3.2 TRADE WITH THE EU

The Euro-Mediterranean Partnership (EMP) was established by the Barcelona Declaration of 1995, signed by the European Union and the Mediterranean partner countries. Bilateral association agreements cover political and safety issues as well as economic and financial partnership. In consequence, there was a progressive but slow liberalization of agricultural trade. The key objective of the trade partnership is the creation of a deep Euro-Mediterranean Free Trade Area, which aims at removing barriers to trade and investment between the EU and Southern Mediterranean countries as well as between the Southern Mediterranean countries themselves. Euro-Mediterranean Association Agreements are in force with most of the partners.

The EU has continued its engagement with the Southern partners in the European Neighbourhood Programme for Agriculture and Rural Development (ENPARD). The process, which started with Tunisia, Morocco, Egypt and Jordan, was extended to Algeria and Lebanon. Programmes adopted so far total €63 million.

Overall bilateral trade flows between the EU and the Southern Mediterranean partners are increasing (preliminary data for 2013; EC 2014a). The main EU objectives comprise the strengthening of trade and investment relations as well as economic integration with the EU internal market, in particular through the establishment of Free Trade Agreements. Negotiation rounds were conducted with Morocco in 2013, while Jordan and Tunisia continued preparatory work. Progress was made with Jordan while the process slowed down in Tunisia in 2013. The Commission launched an exploratory dialogue on the DCFTA (Deep and Comprehensive Free Trade Agreement) with Egypt in June 2013, but developments stalled due to the political events in this country.

Syria:¹ signed the Barcelona Declaration in 1995 and is a member of the Union for the Mediterranean and the European Neighbourhood Policy. Negotiations on an Association Agreement were frozen in May 2011, while bilateral cooperation programmes under the European Neighbourhood Policy have been suspended. With the deference of all loans and technical assistance to Syria the structure of trade flows changed accordingly. The EU is a relevant trading partner for agricultural products, which made up 50% of total imported goods from the EU and 31.4% of export goods in 2013.

Morocco:² has an Association Agreement with the European Union as part of the Euro-Mediterranean Partnership (Barcelona Process). The Agreement grants preferential treatment for agricultural, processed agricultural and fisheries products. Food and animal products added up to 20% of total export to the EU in 2013, while imports of agricultural products from the EU were less significant. An action plan foresees deepening of trade relations and cooperation in social policies, including structural reforms in the agricultural sector towards the establishment of a Morocco-EU free trade area. Considerations include the development and promotion of quality products, investment incentives, improvements in market chains as well as rural infrastructure and diversification.

Saudi Arabia:³ is part of the Gulf Cooperation Council (GCC) framed in 1988 for economic and political cooperation that seeks to improve trade relations and stability as one strategic goal. The GCC countries are classified as high-income economies and accordingly do not benefit from preferential access to the EU market. The aim of negotiations for a Free Trade Agreement was the reciprocal liberalization of trade, but negotiations were suspended in 2008. The GCC countries account for 4.2% of total EU trade and are a significant export market for the EU, currently the fifth largest worldwide. Agricultural products add up to 8% of total import from the EU, while export is low (0.2%).

Trade relations between the EU and the Mediterranean countries are asymmetric and sensitive to political developments in the region. Economic interests and political motivations for bilateral agreements dif-

¹ European Commission DG Trade, *Trade Statistics: Syria*, updated 5 May 2014, <http://trade.ec.europa.eu/doclib/html/111615.htm>.

² European Commission DG Trade, *Trade Statistics: Morocco*, updated 5 May 2014, <http://trade.ec.europa.eu/doclib/html/113421.htm>.

³ European Commission DG Trade, *Trade Statistics: Gulf Cooperation Council*, updated 5 May 2014, <http://trade.ec.europa.eu/doclib/html/113482.htm>.

fer considerably. For the European Union, trade with the Mediterranean countries is by far less significant, with imports accounting for only 2% of overall EU imports, while exports account for only 3% of total EU exports. Limited agricultural trade flows into the European Union do not change competition or labour market structures and are therefore not considered a threat by European farmers. For the Mediterranean countries, in contrast, European market access is important, with total trade volume accounting for 4.5% of total world trade volume in Syria, 50.1% in Morocco and 13.8% for the GCC in 2013. Exports of fruit, vegetables and olive oil contribute significantly to economic growth. Imports of meat and animal feed as well as manufactured goods and technology considerably shape national supply and agricultural value chains. Table 3.2 data clearly indicate a significant increase (almost double) in reliance on EU imports in meat and animal feed over the past decade.

Table 3.2. EU imports of beef, milk, poultry and animal feed in three representative Arab countries

Imports from EU (1000kg)	Syria		Morocco		Saudi Arabia	
	2004-2013	2013	2004-2013	2013	2004-2013	2013
Beef	30	49	1149	1218	81	402
Milk	255	199	2746	1760	15475	12951
Poultry	2333	4156	691	1694	109099	153895
Animal Feed	576,820	1,188,480	2,188,260	2,320,31	2,711,170	6,040,810

Source: Compiled from EC Market Access Database 2014, <http://ec.europa.eu/trade/policy/countries-and-regions/statistics>.

Feed (forage and grain) imports are unavoidable and are expected to increase consistently with intensification, given the constraints in increasing local production. In 2013-14 Saudi Arabia was the major importer of barley from the European Union (EU), buying 46% of the total EU barley exports estimated at 6.8 million tons; whereas Egypt was the major maize importer from the EU with a share of 19% of the total EU exports estimated at 2.5 million tons (EU 2014). Considering the import value of only four major feed ingredients – alfalfa meal and pellets, maize, barley and soybeans – the Arab countries imported, imported the equivalent of \$10.4 million worth of feed in 2012.⁴

⁴ See FAOSTAT 2014, <http://faostat3.fao.org/home/E>.

3.3 NATIONAL POLICIES

Agricultural policies in the Arab region up until 1997 were generally centred on self-sufficiency (instead of self-reliance based on comparative advantage basis) and characterized by lack of coordination and integration within a unified Arab framework. These policies led to weak trade and poor inter-Arab agricultural investments. According to the AOAD Report (2008), this development favoured the rise of national protectionism, which in turn caused one-sided negative effects from trade, investment and financial policies that were targeted at the expense of the agricultural sector.

The livestock sector was affected by this long history of arbitrary policies that strained economic development and led to the degradation of the scarce natural resources available to support it. The chain of events leading to this situation was fuelled by important changes during the second half of the past century, most importantly the rapid increase in wealth and population numbers leading to high demand for livestock products. Consequently, Arab countries introduced policies to increase production to meet the rising demand. However, these policies have been centred on the provision of cheap food for the urban population, leading to interventions that were “urban biased”, disregarding the needs and impacts on rural farmers and the natural resources (Dixon et al. 2001). Other policies were further motivated by concern to alleviate the effect of periodic drought and disease on the most vulnerable producers, but have failed to achieve the desired objective. These interventions could be summarized as follows (compiled from Oram 1998, Al Rowaily 1999, and Bourn 2003):

1. Price support for livestock: This has led to increasing the number of animals irrespective of the available resources to sustain them and benefiting large farmers at the expense of smallholders.
2. Price support for cereals: Leading to agricultural encroachment into marginal lands, exacerbated by the subsidy of fuel and mechanization.
3. Nationalization of grazing lands and attempts to sedentarize nomads: Livestock owners and farmers had open access to rangelands, thus leading to soil and biodiversity erosion and land use conflicts.
4. Subsidized vaccines: Although at heavy price, some governments opted to intervene for the eradication of certain animal diseases through vaccination. This has helped in maintaining large animal numbers.
5. Biodiversity conservation: The increasing trend in establishing natural reserves restricted access to pastures.

Such policies resulted in an unbalance between livestock numbers and feed resources, leading to heavy reliance on government support or shifting to other activities, mainly in urban areas. This situation has aggravated the vulnerability of the rural livestock farmers to poverty and food insecurity and has created an economically and socially delicate balance with constant threat of strife over water and land resources within and across countries.

The following is an overview of the relevant agricultural policies in Saudi Arabia, Syria and Morocco as examples (AOAD 2008):

Syria: Syria's current agricultural policies target competitiveness, increased productivity through efficient resource use, and food security through self-sufficiency. Major policy reforms targeted the financial sector with implications for agriculture, such as financial assistance for the acquisition of modern technology, particularly related to irrigation. Policies targeting the arid regions, *Al-Badia*, focus on pasture restoration, access to grazing lands and support to rural communities including improved animal health services and infrastructure. At the same time, subsidies are prevalent for major agricultural inputs such as fuel, electricity and selected seeds, in addition to price subsidies for flour and bread.

Morocco: The livestock sector in Morocco is well developed benefiting from government support in terms of veterinary services, in addition to loans for farmers to acquire new technologies and invest in the sector. Furthermore, the sector is supported by high import taxes reaching 339% on red meat, 112% on dairy and 128% on poultry meat. "In Morocco, the main agricultural policy objectives are food security, the improvement of farmers incomes and the conservation of natural resources. The new *Plan Maroc Vert* adopted in 2008 aims to make agriculture the engine of economic growth in the next decade, through two pillars: [...] high value added activities [...] and strong export performance" on one side, and "Agriculture Solidaire oriented towards the small farmers sector" on the other (Belghazi 2013:9).

Saudi Arabia: In the 1990s Saudi Arabia set a target to achieve self-sufficiency in wheat, leading to the cultivation of large areas of wheat that were 100% irrigated. However, with the increasing concern about the depletion of the country's non-renewable water resources the government launched a new policy to gradually phase out wheat as well as forage production by 2016 (USDA 2013a). However, SA remains a major dairy producer among Arab countries under large and highly sophisticated intensive systems with heavy reliance on feed imports, mainly from the EU.

The latest policies target the efficient use of resources, especially water, for optimal productivity and economic feasibility of various agricultural activities. In addition, as a member of the WTO the Kingdom has refrained from subsidizing exports and endeavours to improve cooperative work, product certification (SaudiCert) and infrastructure, especially in relation to refrigerated transport and storage. On the other hand, the traditional sheep, goat and camel pastoral systems suffer from the degraded state of the grazing lands for the reasons cited above (Al Rowaily 1999).

3.4 EU POLICIES

In the European Union, awareness around problems of overproduction and risk of market collapse has led to considerable changes in agricultural policies over the past twenty years. Subsidies that were initially coupled to production are now decoupled in favour of income support. Environmental concerns in relation to agricultural land use have increasingly shifted the focus of direct payments towards the provision of public goods (EC 1998).

The European Union holds significant weight in the international trade of agriculture and food. It is by far the largest importer (19% in 2009; €83 billion in 2008-2010), and a major exporter (21% in 2010; €82 billion in 2008-2010). Although a reduction in export refunds and increased market access have reduced trade-distorting effects over the years, the European Common Agricultural Policy (CAP) still accounts for substantial structural changes in agriculture not only within Europe, but also in trading partner countries (EC 2012). Agricultural issues are taken up on a bilateral basis in Action Plans developed as part of bilateral Free Trade Agreements (e.g., EU/Morocco Action Plan: to “ensure the introduction of a coherent agricultural policy (including sustainable rural development measures and product quality policy) with the aim of convergence towards the necessary conditions for establishment of a Morocco-EU free trade area” (EC 2014b).

The livestock sector is thereby influenced by direct and indirect effects from changes in world market prices, market access and trade, but also by indirect effects from European national policies for agriculture, rural development and conservation measures. As yet there is a lack of regional and sectorial studies to better understand transnational impacts

resulting from these relationships, particularly from the European side. The following factors may account for this lack of understanding:

- The relevance of the agricultural sector in terms of GDP and labour is rather small in the European Union, compared to the Mediterranean Partner Countries.
- The relevance of agricultural trade relationships with the Arab countries is less important for the European Union than it is for the Mediterranean region. The composition of traded products is disparate, with livestock and dairy accounting for important export goods from the European Union to the Arab countries.

Impacts of policies on sustainable land use are often excluded from economic assessments or trade negotiations due to a lack of mechanisms in the assessment process. Negotiations cover market access (import regimes and tariffs) and export competition (export refunds, export credits). Indirect impacts from domestic support such as agri-environmental payment schemes and measures for greening are difficult to predict, not least because of differences in subsidy schemes between member states. The impact on the agricultural sector in trading partner countries largely depends on whether a country is a net importer of agricultural products and whether it has preferential trade access to the European Union (Matthews 2010). Taking into account the markets for manufacturers and services, agricultural support instruments are found to have ambiguous effects on the overall sustainability of agricultural production (compiled from Matthews 2010, Boysen et al. 2014, Revoredo-Giha et al. 2011, Jaud et al. 2013a, 2013b):

1. Changes in world market prices: The removal of tariffs and export subsidies causes a decrease in agricultural production within the EU and a rising demand for imported goods. In the Arab countries, the presence of EU export funds creates disincentives for exports and for investment of domestic resources into supply chains. Effects of changes will raise prices for processed products, with adverse effects for processors and urban consumers, particularly for net food importers of meat and dairy.
2. Concentration of trade flows: The European Union sources its agri-food products from a small number of partners. The high concentration, particularly in meat and dairy products, is exacerbated by bilateral tariff quotas and sanitary risk regulation. Production strategies, market entry and survival in export relationships to the

European Union are strongly dependent on the promotion of domestic financial development and well-functioning financial environments in the respective exporting country.

3. Changes in production systems and supply chains: Greening measures are associated with increasing costs of farming and income loss. Agri-environmental payments provide compensation for input-reducing practices, adaptation to crop rotations, reduced fertilizer and pesticide application rates, as well as landscape and habitat measures. A reduction of direct payments is expected to increase production costs and raise prices of the agricultural sectors and their upstream processing industries within the EU. The likely intensification of production in fertile areas and the abandonment of production and land in more marginal regions would have far reaching environmental consequences, while a reduction of production quantities would again change world market prices and shift trade flows (e.g., to a higher demand from southern African states).

The European Commission undertakes sustainability impact assessments for major trade policies by obligation. In 2007 an assessment was conducted for the evolving Euro-Mediterranean Free Trade Area (EMFTA) that is expected to deliver economic benefits to both the EU and Mediterranean Partner Countries (MPCs) in the long term. The agricultural sector, and particularly livestock production, was considered sensitive to an overall decrease in world market prices resulting from trade liberalization. This may impede the ability of small farmers to compete, and thus lead to a loss of jobs in the livestock and dairy sectors. Decrease in non-competitive production of meat will negatively impact small-scale rain-fed agriculture, coupled with increased dependence on EU imports (M'barek et al. 2006). Changes in policy may have consequences for production and conservation management, with beneficial effects on consumer welfare, but adverse socio-economic effects. Bilateral liberalization without mitigating policies and incentives would thus create a burden on producers of subsistence crops, thereby causing significant rural depopulation that other economic activities would not be able to absorb (M'barek et al. 2006). At the same time consequential localized intensification is expected to impact water use and water pollution, as well as transition from traditional production (SIA-EMFTA 2007).

3.5 SYNERGIES BETWEEN EU AND ARAB POLICIES

Arab and European countries have been revising their agricultural policies lately in response to the food security crisis. In the following two sub-sections, the aim is to review the most important policies and reforms in the light of the FAO Pro-poor Livestock Initiative (FAO 2010). This reference resource is chosen since the smallholders and rural poor working with livestock are the most vulnerable to changes in the sector as related to policy modifications or trade agreements. The last section will focus on the Euro-Mediterranean policy framework needed to serve particularly the Mediterranean poor livestock producers and to serve the preservation of food security across the Euro-Mediterranean region.

3.5.1 *Arab Policies*

Policy recommendations should address transition and restructuring within the agricultural sector, given that small farming will lose competitiveness in favour of intensification and localization. Mitigations are needed in absorption of labour, water use and adverse effects of intensification such as increase in waste or water pollution. The composition of small-scale farming and intensification in terms of bio-physical givens and the local capabilities to adapt to changes in agricultural restructuring should be also considered. Policy recommendations for farm-level policies should address capabilities to adjust to exogenous factors such as higher prices and increasing competition for market access. At the same time, policies need to address self-sufficiency for the internal market and maintenance of environmental quality and safe-guarding of resources for long-term benefits in production.

For the development of the livestock sector in the Arab countries, the proposed resource for selecting the appropriate country-specific policies is the “menu” developed by the FAO Pro-poor Livestock Initiative (PPLI) (FAO 2010). The PPLI stems from the important role that the livestock sector can play in poverty alleviation. A menu of policies and programmes was set, targeting a balanced increase in production and productivity of the livestock sector while at the same time reducing poverty. The following is a brief summary of the main domains for policy interventions with examples of relevant approaches adopted in Morocco, Saudi Arabia and Syria as representative countries (AOAD 2008, 2009).

1. “Managing the basics of livestock production”: consists mainly of public actions to “provide livestock keepers with adequate and secure access to basic production inputs, such as land, feed and water for animals, and help them to cope with risks and shocks such as natural disasters and price swings” (FAO 2010:5).

- Given the prevalence and importance of pastoralist and mixed farming systems in the Arab region, access to land is of prime importance. Communal land access based on the time-tested Hima rotational system⁵ was heavily compromised by previous policies, however the PPLI initiative highlights the validity of such approaches in conserving pastures for a sustainable production.
- Rangelands were largely degraded in Morocco, Saudi Arabia and Syria, due to a combination of environmental, policies, human and animal population expansion at the expense of the rangelands. This situation is being addressed in Plan Maroc Vert through the conservation of natural resources including pasture lands.⁶ Saudi Arabia land use policies are being studied for optimal productivity and sustainability. The special attention to the *Al-Badia* development is also part of the Syrian agricultural policies, while the coverage of other rural areas is not clear.
- On another note, most of the Arab policies surveyed lack a clear approach for coping with shocks to the sector and protecting the most affected, which is an important factor in securing production.

2. “Enhancing livestock productivity”: includes policies and programmes aiming to “facilitate farmers’ access to animal health services, credit and output markets – both national and international – all of which are critical for farmers to generate and market production surpluses and for improving livestock’s contribution to household incomes” (FAO 2010:5).

- Health, financial, infrastructure and marketing services are widely variable and most often fall short of reaching smallholders and the poor, where they are most needed. Support at this level is greatly needed, with a strong potential to revive local food systems and facilitate their development through access to local and external

⁵ Hima: Grazing reserve for restricted use by a village community, clan or tribe, set aside to allow regeneration as part of a grazing management strategy (Kilani et al. 2007:3).

⁶ See *Plan Maroc Vert* (2009), http://www.fao.org/fileadmin/user_upload/FAO-countries/Maroc/plan_maroc_vert.pdf.

markets as well as improving their sanitary and phytosanitary standards for improved food safety and marketability.

- Morocco has placed an important weight on improving productivity across the value chain in the Plan *Maroc Vert* policy reform; in addition, it established an agreement with the EC to support the second pillar of the Plan, concerning support to smallholders, with €70 million. Saudi Arabian policies focus on improving productivity and efficiency by investing in improving infrastructure, cooperative work, product quality standards, marketing, and trade agreements. Syria introduced reforms mostly to its financial sector with consequences for agriculture in terms of financing technology adoption, loans and revised subsidies, tariffs and customs.

3. “Sustain[ing] livestock productivity”: covers policies and programmes on “research, environmental protection and all other public actions necessary to support the sustainability and competitiveness of livestock farmers in the medium to long term” (FAO 2010:5).

- Agricultural research in most Arab countries is poorly funded and is often centred in a few research stations or universities with variable linkage to the farmers’ needs. As per the PPLI a more participatory approach is greatly needed to facilitate the two-way flow of information and to make sure the most pressing issues are being studied in a timely manner.
- Environmental protection is another challenge in Arab countries especially given the current unregulated development of the livestock industry driven largely by the private sector in response to increased demand. Morocco, Saudi Arabia and Syria have all adopted policies to improve the sustainable use of their resources especially in response to climate change and increased desertification and resource depletion. These include shifting away from large irrigated cereal/feed production to more economically competitive and/or environmentally sound land uses.

3.5.2 EU Policies

Following a shift in focus towards European smallholders in the course of enlargement to south-eastern Europe, countries in the EU can implement more “pro-poor” targeted instruments on a regional level (EC 2011,

Matthews 2010). This was reflected in the formulation of the CAP reform 2014-2020 (EC 2013) which included options for better structured direct payments, a targeted approach with flexibility to meet local needs within member states, a renewed commitment for rural development with new policy instruments and other reforms targeting a more equitable, greener and sustainable agriculture. From the PPLI perspective these reforms at the EU level seem to be more pro-poor, “moving from product to producer support and now to a more land-based approach” (EC 2013:2). The following section is a brief overview of the new reforms that seem to serve a pro-poor approach:

1. Managing the basics of livestock production: The livestock sector is particularly sensitive to the impacts of decoupling. Support is provided based on land use with special focus on smallholders. In addition, risk assessment and safety net measures are provided, and coupled support can contribute to the maintenance of agricultural activity where livestock production is at risk of disappearing.
2. Enhancing livestock productivity: New reforms include support and incentives for producer cooperation (EC 2013:5) to improve their competitiveness as well as integration within the value chain. Incentives and support for young start-up farmers are also included.
3. Sustaining livestock productivity: Environment protection comprises a major part of the reform, with targeted payments for green operations –e.g., conversion of grassland to extensive use, reduction of livestock density – (Green Direct Payment Plan) and constitutes an integral part of rural development strategies. In addition, emphasis was put on bridging the gap between science and practice through the Farm Advisory System.⁷ Rural development is now organized so that “Member States will have to build their [Rural Development Programs] based upon at least four of the six common EU priorities” as stated in the European Commission overview (2013:9). A more balanced, transparent and equitable payment system is established across the EU, such as the introduction of a minimum national average direct payment per hectare across all member states by 2020, a fairer per hectare payment at the national or regional

⁷ The Farm Advisory System aims at helping farmers to better understand and meet the EU rules for environment, public and animal health, animal welfare and good agricultural and environmental conditions. See the European Commission website: <http://ec.europa.eu/agriculture/direct-support/cross-compliance/farm-advisory-system>.

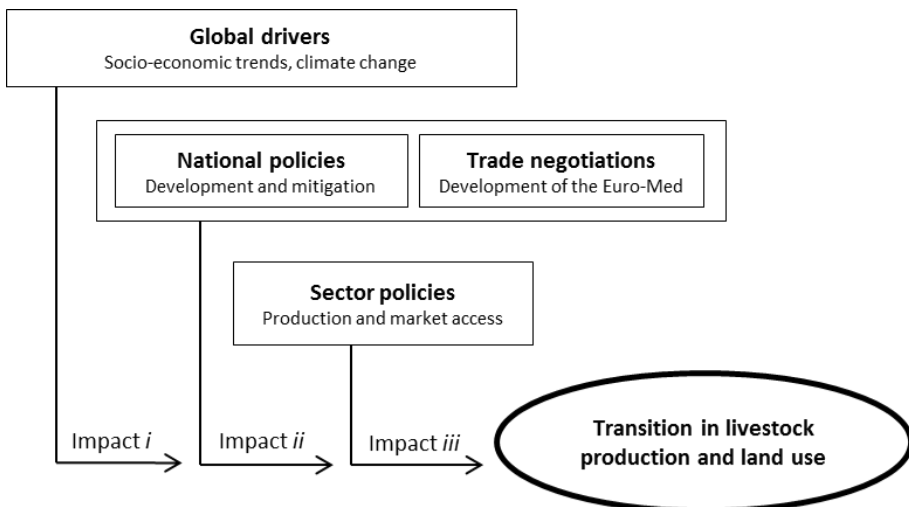
level and the possibility for member states to rebalance payments (EC 2013:8).

3.5.3 Euro-Mediterranean Policies

Previous studies have shown that value generation in agriculture in the Euro-Mediterranean region would benefit from greater integration and cooperation with the European Union. This scenario as elaborated by Belghazi (2013) can help in guiding policy choices and is described as follows: Assuming deep integration, the development of the Euro-Med zone as “one global player” will stimulate increase in production and imports, and a bigger rise in exports and absorption. More producers will receive targeted help to improve their capacities to comply with quality norms. Agriculture and food issues can be built on strategic priorities such as responsible resource management, security of food supply, integrated regional development, measures to address climate change and the emergence of farm-to-table agro-food systems (Belghazi 2013:23).

To that end, policies should target both sides of the agreement, namely the Arab/South Mediterranean countries on one end and the EU on the other. Policy-oriented assessment thereby needs to take account of the relative importance of endogenous versus exogenous factors that have major influence on land use transitions (Lambin and Meyfroidt 2010).

Figure 3.1. Policy relevant impacts on livestock production and land use at different levels of decision making



In Figure 3.1, this line of argument is adapted to the context of developments in the livestock sectors (EU and Med). Exogenous factors are caused by development scenarios driven by socio-economic trends. Trade relations are formed to a great extent by the influence of the European Union as a major trading partner for the Arab countries. Endogenous factors are national policies addressing land use and rural development, as well as sector changes in agriculture and specifically in the livestock sector. Impacts (*i, ii, iii*) can be accelerated or mitigated by policy interventions at different levels of decision making.

The EU's efforts to support agriculture in partner countries have been established through a number of policies and initiatives within its development policy (e.g., 2002: Rural Development Policy; 2004: Action Plan on Commodities; 2007: Advancing African Agriculture; 2008: Food Facility). The rationale behind the EU's CAP reform after 2013 is: (i) viable food production; (ii) sustainable management of natural resources and climate action; and (iii) balanced territorial development. Interventions build on the principle that most food security challenges require country-specific responses.

As previously pointed out, trade with the EU is largely offset in the direction of the Arab countries, which are large importers and thus more vulnerable to any changes in the trade relationships. As stated in FAO (2010:87): "Overall, the prospects for increased integration of livestock markets appear good. However, as livestock are marginally traded by the majority of the world's countries, and as developing countries are often unable to have a voice in international fora, it is difficult for them to influence international trade rules and regulations affecting livestock". This situation could be amended through bilateral trade agreements that safeguard the interests of both trading parties. Fair trade agreements with the EU are essential for the sustainability of the Arab livestock sector, with the key commodity at stake being animal feeds. Most Arab countries rely on cereal and feed imports to meet the needs of their livestock sector, with the EU being a major source. EU-Arab agreements should target securing this trade within a long-term strategy under the rationale of the CAP reforms. This would have a major impact on food security in Arab countries, especially among smallholders, who are most affected by changes in feed prices and availability.

In order to balance trade with the EU, trade agreements should also target providing access for Arab livestock specialty products. However, a major hurdle in this direction lies in ensuring adequate sanitary and

phytosanitary standards of such products to meet the European requirements, especially with local products coming from smallholders and artisanal producers.

As previously seen, Arab countries, to various degrees, are trying to improve services to smallholders and invest in basic infrastructure. A commodity-based trade agreement could allow the identification of selected products eligible for export to the EU and facilitate targeted investment in improving the value chain of such products. The example of Morocco serves as a promising start whereby bilateral agreements between Morocco and EU were able to secure European market access to selected Moroccan products such as argan oil. Morocco was also able to secure financial support for its rural farmers through the *Maroc Vert* national agricultural strategy while maintaining protective measures for domestic Moroccan producers such as livestock-product import tariffs. However, another challenge in opening the European market comes from European protective policies and internal resistance, as also indicated in the case of Morocco where certain trade preferences that were negotiated with European Commission were ultimately refused by the European Parliament due to pressure from the European Producers Association (Belghazi 2013).

With bilateral trade agreements serving as a starting point, policies for better integration could be sought between the EU and partner Arab/Mediterranean countries in the livestock sector.

- Preferential cereal and feed supply from the European side could be considered through adapted European policies while at the Arab national level, policies for a sustainable level of local cereal production should be planned to ensure some self-sufficiency.
- Risk mitigation policies from both sides would also be helpful to prepare for unforeseen price shocks or unpredictable yield changes due to climate change, which would affect the supply and demand. This is particularly important for smallholders, who are most vulnerable to price and climate effects.
- Aligning the Arab countries' policies with the European sanitary and phytosanitary standards for improving the livestock products value chain (including hygiene, safety, environmental impact, sustainability and quality) would be another step towards better integration. Integrating policies with consideration of Protection of Geographical Indications could be also considered, because of the importance of designating products with specific qualities and

preserving the local knowledge related to their production.⁸ Both national and European investments are needed for reinforcing the livestock product value chain, in addition to the policy framework allowing knowledge sharing, infrastructure development and capacity building to that end. This would be most helpful in developing and promoting local and specialty livestock products in international markets and consequently would serve in improving the livelihood of smallholders and producers within their rural settings.

- Revising European and Arab import and export protectionist policies to allow a larger margin of free trade while preserving the interests of local producers. A country-specific approach is needed here.

CONCLUSION

Aiming for livestock food security within the Euro-Arab region seems to be achievable, with an important step being better policy integration. A stepwise approach may be considered, starting with fair bilateral trade agreements and building towards integrated policies. Trade relations depend on market access, import demands in the European Union as well as favourable prices for agricultural goods and feed imports from the EU into the Arab states. Import demands and export prices are influenced by the European Common Agricultural Policy. A favourable composition of imports and exports in terms of food security and sustainable production should be targeted through policies promoting investment into sector development, supply chains and product quality, sector strategies for export and import as well as sector strategies for maintaining competitiveness. It is suggested that policy considerations proposed by the FAO Pro-poor Livestock Initiative be considered at all levels, given that livestock production is a main economic activity for the large poor and rural Arab communities and constitutes an important asset for their livelihood and food security.

⁸ See IDRC website: *Moroccan argan oil first African product to receive special status*, <http://www.idrc.ca/EN/Resources/Publications/Pages/ArticleDetails.aspx?PublicationID=17>.

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4.

Allowing or Banning Genetically Modified Food and Feed? Morocco in Search of a Synthesis between Conflicting Regulatory Models

Daniela Corona

INTRODUCTION

The challenge of a sustainable food system copes with many aspects, including environmental degradation, substantial losses in biological diversity, and consumer concern for food safety. Moreover, for the countries of the Southern Mediterranean region, building a sustainable domestic agricultural system is deeply affected by the EU Agricultural Policy in the framework of Euro-Mediterranean relations. Indeed, following the entry into force of a number of bilateral agreements with the EU (such as the Euro-Mediterranean Association Agreements) and of agreements at the international level (in particular, the Cartagena Protocol on Biosafety to the Convention on Biological Diversity) the Southern Mediterranean Countries have *de facto* rendered their national policies on food law strictly intertwined with delicate political choices on food safety operated by the EU. But does the EU have in place the highest standards of food safety, which, of necessity, profoundly affect the agricultural production system? And do the Southern Mediterranean countries have in place regulations compatible with those standards? What would occur if a choice operated at the EU level endangered a domestic policy choice in a matter falling within the realm of a bilateral Agreement with the EU?

The paper tries to flesh out an important aspect of the broader question of the search for a sustainable and safe food system for the South-Mediterranean Countries, namely the question of the use of genetically modified organisms (GMOs) in the agricultural sector in order to augment national production. In this undertaking, the paper will investigate the case of Morocco.

The paper is organized as follows: first, it briefly sketches the Moroccan national regulatory system on food law and, in particular, on GMO policy; it then analyses the country's relationships with its most important and influential trade partners, namely the EU and the US, in order to finally flesh out the most relevant weaknesses of its legislative system concerning food law, and policy on GMOs in particular. Indeed, the future choices operated by the Moroccan legislator will clearly have an impact not only on the trade flux with its international partners, but also and primarily on Morocco's agriculture, biodiversity and food production system.

4.1 GMOs IN CONTEXT: A POSSIBLE SOLUTION TO FEED THE AFRICAN CONTINENT?

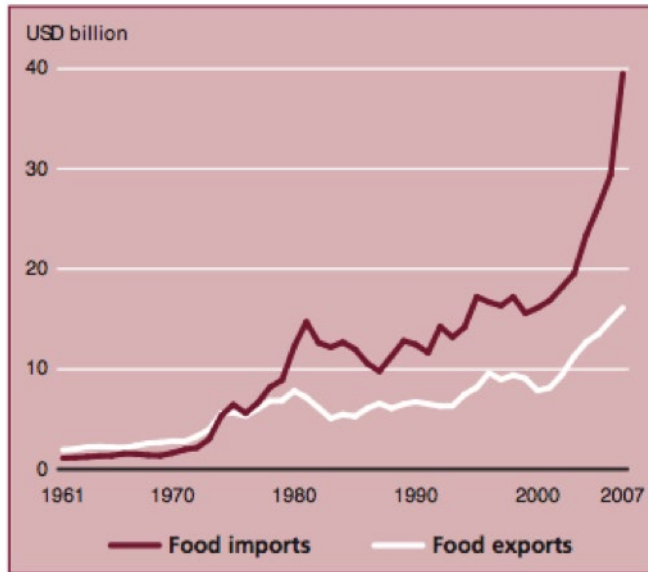
GMO regulation is characterized by a complex and often conflicting interaction of international, regional and national rules. All these regulatory levels, however, should first and foremost be seen in relation to the fundamental choice made by each country on the type of agricultural production system it chooses to employ and the level of protection it establishes for the environment and biodiversity. This choice, in turn, is deeply linked to and influenced by the economic situation of the country concerned, as well as the necessity to increase the level of internal agricultural production, also taking into consideration the different climatic conditions and the different types of farming. Moreover, each country must confront its policy choices with internal and external "constraints" – internally, the public opinion's perceived sensitivity to the theme of the new technologies applied to agriculture and the environment could *de facto* pose obstacles to the development of a new way of production; externally, the possible (inter)dependence between the country concerned and its most important trading partners could deeply influence and orient the adoption of the relevant regulatory and legislative framework.

According to a recent study financed by the EU, it is projected that by the year 2050 the population in Africa will double to two billion people (GRACE 2012) while, at the same time, the land available for cultivation will decrease due to increasing pressures of climate change, water scarcity and increasing livestock densities (Nellemann et al. 2009). It is evident, then, that the challenge to produce food for the growing population is

likely to affect the ongoing reforms of legislative frameworks on food law in the entire African continent.

Indeed, as shown in Figure 4.1, in the mid-70s Africa started to massively import food by creating an increasing food-trade deficit.

Figure 4.1. African's Food Import and Export Trends



Source: FAOSTAT 2011.

The causes of this situation are deeply rooted in the story of the continent and have been also extensively analyzed and commented on (see, *inter alia*, Diao et al. 2008, Omamo et al. 2006, Rakotoarisoa et al. 2012). But what can the African countries, and Morocco in particular, concretely do to change direction? Possible remedies to increase the level of internal production have been broadly documented: countries should develop and modernize their agricultural production systems and the related legislative settings in order to raise their production, develop their trade infrastructure and increase the level of investment in agricultural resources (Diao et al. 2008, Omamo et al. 2006, Rakotoarisoa et al. 2012).

In this complex puzzle, the use of biotechnology in agriculture is seen as a possible “tool” enabling the farmers, and thus the countries, to increase their food production. Indeed, the question is not a matter

of minor importance especially for developing countries like those of the Maghreb, which are trying to modernize their agricultural systems and thus are dealing with the choice of allowing or prohibiting GMOs.

Viewed globally, biotech crop production significantly increased in 2013, with a record 175.2 million hectares of biotech crops being grown, an increase of 3% over 2012. As Table 4.1 shows, of the 27 countries that make use of GM crops, just 8 are industrial, while 19 are developing countries. Indeed, according to the latest available data, in 2013, 18 million farmers grew biotech crops; of these, 90% (16.5 million) were risk-averse small, poor farmers in developing countries.

Table 4.1. Global Area of Biotech Crops in 2013 by Country (million hectares)**

Rank	Country	Area	Biotech Crops
1	USA*	70.1	Maize, soybean, cotton, canola, sugar beet, alfalfa, papaya, squash
2	Brazil*	40.3	Soybean, maize, cotton
3	Argentina*	24.4	Soybean, maize, cotton
4	India*	11.0	Cotton
5	Canada*	10.8	Canola, maize, soybean, sugar beet
6	China*	4.2	Cotton, papaya, poplar, tomato, sweet pepper
7	Paraguay*	3.6	Soybean, maize, cotton
8	South Africa*	2.9	Maize, soybean, cotton
9	Pakistan*	2.8	Cotton
10	Uruguay*	1.5	Soybean, maize
11	Bolivia*	1.0	Soybean
12	Philippines*	0.8	Maize
13	Australia*	0.6	Cotton, canola
14	Burkina Faso*	0.5	Cotton
15	Myanmar*	0.3	Cotton
16	Spain*	0.1	Maize
17	Mexico*	0.1	Cotton, soybean
18	Colombia*	0.1	Cotton, maize
19	Sudan*	0.1	Cotton
20	Chile	<0.1	Maize, soybean, canola
21	Honduras	<0.1	Maize
22	Portugal	<0.1	Maize
23	Cuba	<0.1	Maize
24	Czech Republic	<0.1	Maize
25	Costa Rica	<0.1	Cotton, soybean
26	Romania	<0.1	Maize
27	Slovakia	<0.1	Maize
	Total	175.2	

Note: * 19 biotech mega-countries growing 50,000 hectares, or more, of biotech crops.

** Rounded off to the nearest hundred thousand.

Source: James (2013:3).

In this scenario, the countries of the African continent do not have a unique position as regards the use and cultivation of GMOs: in 1998

South Africa was the first African country to approve GM cotton and, to date, it is producing also GM maize and soybeans. Also, GM cotton is produced in Sudan and Burkina Faso. An additional seven countries, namely Cameroon, Egypt, Ghana, Kenya, Malawi, Nigeria and Uganda, have been developing the technology necessary to conduct field trials and thus to introduce GM crops into their agricultural production. While the trend towards the use of biotech crops appears to be spreading in Africa, some countries, like the Maghreb countries, continue to oppose, more or less “officially”, the cultivation of GM crops, albeit in a very vague and incomplete regulatory framework. Indeed, none of the Maghreb countries has a clear and comprehensive regulatory and legislative framework providing rules on the cultivation, the commercialization and the traceability of GMO products. However, since becoming party to international agreements providing rules on sanitary and phytosanitary measures, plants and biodiversity protection, these countries have all started setting up legislative frameworks on GMOs, though none have yet been completed, above all, with regard to the control mechanisms and the traceability of food and feed products (UNEP 2012).

But what is the current regulatory framework on food law – in particular as regards GMOs – in Morocco? And what are the interests at stake?

It is worth recalling here that agricultural production contributes 15% of the gross national product in Morocco and has a significant effect on the other sectors of the national economy. Indeed, almost 46% of the population works in the agricultural sector (Ait Kady and Benoit 2012). In this context, the latest available data say that Morocco is a net exporter of fruits and vegetables and a net importer of cereals (International Business Publications 2013). In 2012, Morocco imported 2.7 million metric tons of soybeans and feed corn. The main feed corn suppliers were Argentina and Brazil, while the United States was the main supplier of corn gluten (in 2013 Morocco imported from the US the equivalent of \$15.3 million of corn gluten feed and \$3.9 million of corn feed), soymeal (in 2013, it imported \$23.7 million of soybeans) and dried distiller’s grains with solubles (DDGS). As for imports of planting seeds, annually Morocco imports about \$90 million in seeds, 90% of which comes from Europe and just 3% from the US (mainly for vegetables, watermelon, alfalfa, tomatoes and grass) (USDA 2014).

4.2 REGULATORY FRAMEWORK ON FOOD SAFETY IN MOROCCO: THE LONGSTANDING ATTEMPT TO REGULATE GMOs

4.2.1 *International Rules Dealing with GMOs*

At the international level, Morocco is a contracting party to the most important multilateral agreements that govern inter-state relations in international trade (WTO) and the related possible obstacles to trade, including technical barriers to trade (TBT Agreement) and sanitary and phytosanitary measures (SPS Agreement) (WTO 1995a, 1995b).¹

In particular, the SPS Agreement specifies the basic international rules according to which a country has the right to take national measures necessary for the protection of human, animal or plant life or health from risks arising from the entry or spread of plant or animal-borne pests or diseases, or from additives, contamination, toxins or disease-causing organisms in food, beverages or feedstuff. These measures, which ultimately comprise barriers to importing goods from other countries, may take the form of, *inter alia*, inspection of products for microbiological contaminants, mandating a specific fumigation treatment for products, or banning the importation of agricultural biotechnology products.² The Agreement states that each WTO Member has the right to establish its own appropriate level of protection (art. 5) but, at the same time, it also specifies that the SPS measure taken to achieve that level of protection must be based on scientific principles, must not be maintained without sufficient scientific evidence and may be applied only to the extent necessary to protect human, animal or plant life or health (art. 2). In cases where relevant scientific evidence is missing, and by virtue of the precautionary principle, a Member may provisionally adopt sanitary or phytosanitary measures on the basis of available pertinent information and it also “shall seek to obtain the additional information necessary for a more objective assessment of risk and review the sanitary or phytosanitary measure accordingly within a reasonable period of time” (art. 5.7). Finally, the SPS Agree-

¹ Both the Agreement on Technical Barriers to Trade (TBT) and the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS) entered into force with the establishment of the WTO in 1995. On the application of the SPS and TBT Agreements see, in general, Bossche and Zdouc (2013). For further detail, see: US Trade Representative (2014a, 2014b), Johnson (2014), Stoler (2011).

² See Annex A of the SPS Agreement.

ment devotes a special provision to developing country Members, stating that “Members agree to facilitate the provision of technical assistance to other Members, especially developing country Members, either bilaterally or through the appropriate international organizations” (art. 9).

The TBT Agreement can also play a role in the international trade of GM products. A technical regulation can take the form of a document that lays down characteristics of products or their related processes and production methods, or it can deal with terminology and packaging requirements. Also, a TBT measure can consist in mandatory *labelling* requirements for food products not directly justified by reasons related to food safety such as, for instance, the consumer’s right to know (in this case art. 1.5 of the TBT Agreement makes reference to the SPS Agreement).³ As in the case of the SPS Agreement, the TBT Agreement recognizes that WTO Members have the right to take measures necessary to protect human health, safety and the environment at the level they consider appropriate and to achieve other legitimate objectives (see the Preamble of the TBT Agreement). At the same time, however, the Agreement prohibits measures that discriminate against imported products (art. 2.1) or create unnecessary obstacles to trade (art. 2.2); it also requires governments to base TBT measures on relevant international standards where appropriate (art. 2.4 and 5.4.); it encourages Members to accept technical regulations that other Members adopt as “equivalent” to their own if these regulations adequately fulfil the objectives of their own regulations (art. 2.7) and, in general, it requires governments to develop standards-related measures through transparent process (e.g., art. 2.9 and 2.11).

Besides the WTO, Morocco is also part of a number of international agreements dealing more specifically with food safety and biotechnologies, like the International Plant Protection Convention (IPPC) and the Codex Alimentarius (Codex); in April 2011 it ratified the Cartagena Protocol on Biosafety (which entered into force on July 2011), and in June 2012 it signed the Nagoya Protocol (still to be ratified).⁴ The Cartagena Protocol, in particular, deals with the transboundary movement, transit, handling and use of all living modified organisms (LMOs) resulting from modern biotechnology that may have adverse effects on biological diver-

³ See Annex I of the TBT Agreement.

⁴ The Cartagena Protocol on Biosafety entered into force on September 2003, while the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity entered into force only in October 2014.

sity, taking also into account risks to human health. In accordance with the precautionary principle (art. 1), it provides that “each Party shall take necessary and appropriate legal, administrative and other measures to implement its obligations under this Protocol” (art. 2.1) and that “nothing in this Protocol shall be interpreted as restricting the right of a Party to take action that is more protective of the conservation and sustainable use of biological diversity than that called for in this Protocol, provided that such action is consistent with the objective and the provisions of this protocol and is in accordance with that party’s other obligations under international law” (art. 2.4).

4.2.2 National Regulatory Framework on Food Safety: GMO Regulation Is Notably Absent

The adoption of the Cartagena Protocol has been pushing the government of Morocco to finally adopt a legal framework for biotechnology; to date, however, there are no legislative acts regulating GMOs in the country. In 2008 a draft law on the matter was circulated, but it was dismissed in 2011. According to an official communication sent from the Moroccan point of contact created in the framework of the Biosafety Clearing House, “En ce qui concerne le cadre réglementaire de biosécurité, il n’existe pas de texte législatif sur les OGM au Maroc. Seule une circulaire du ministère de l’Agriculture est appliquée: la circulaire du Département de l’Agriculture du 11 août 1999 interdisant l’introduction des produits issus des OGM. Dans ce cadre, l’importation des semences⁵ comportant des OGM est interdite sauf pour l’alimentation du bétail. Les cultures expérimentales au champ et les cultures dont les produits sont destinés à la commercialisation ainsi que les recherches en matière d’OGM et les essais en milieu confiné sont pas encore autorisés” (UNEP 2013). This document should thus serve as legal basis to prohibit the import of biotechnology products to Morocco as well as the cultivation and commercialization of GMOs in the country.

Even if Morocco does not yet have a specific legislative framework on GMOs, a number of laws have been adopted to date that aim to improve the level of food safety and to protect consumer and animal health. In

⁵ The basic Moroccan law on crops is the Decree No. 1-69-169 of July 1969, which regulates seed production and marketing.

particular, a framework law on food safety was adopted in 2010 (Law No. 28-07)⁶ and a number of related implementing measures were adopted in 2011 and 2013. The adoption of these acts, deeply encouraged by the EU, marks an essential step in the process of building a comprehensive regulatory system on food safety in Morocco. Looking at the texts, they provide detailed rules governing the entire chain of food production, namely, “la manipulation, le traitement, le transformation, l’emballage, le conditionnement, le transport, l’entreposage, le distribution, l’exposition à la vente et l’exportation des produits primaires, des produits alimentaires destinés à la consommation humaine et des aliments pour animaux” (art. 2 Law No. 28-07). To this aim, the national law provides the conditions that industries and enterprises must comply with in order to obtain the necessary authorization to operate in the food sector.⁷ It adds that the competent authorities may take all necessary measures to impose restrictions on imported food products if, by virtue of the precautionary principle, they have legitimate reasons to think that such product could be dangerous for the life and the health of consumers and animals (art. 6 Law No. 28-07). Art. 3 of the law specifies the meaning of the precautionary principles in the following terms: “ensemble de mesures prudentielles visant à éviter les risques pouvant être entraînés par la consommation d’un produit primaire, d’un produit alimentaire ou d’un aliment pour animaux, en l’absence de certitudes scientifiques absolues aux fins de garantir un niveau acceptable de sécurité dudit produit ou aliment”.

Among the implementing measures of this legal framework, of particular importance is the Decree No. 2-12-389 of 22 April 2013,⁸ which fixes the conditions and the modalities for food labelling. The right of consumers to be fully informed of the food (“*primaire ou préemballé*”) they are going to buy is the very core of the decree (art. 6). The Decree lists in a detailed manner all the components and ingredients that must be labelled (art. 11) and also indicates the subjects responsible for the correct labelling (art. 4). In addition, Art. 17 of the Decree specifies that all ingredients present in the form of “engineered nanomaterials” be

⁶ Loi n° 28-07 relative à la sécurité sanitaire des produits alimentaires, Bulletin Officiel n° 5822 du 18.03.2010, <http://faolex.fao.org/docs/pdf/mor96767.pdf>.

⁷ On this point in particular, see Décret n° 2-10-473 of 6 September 2011, Bulletin Officiel n° 5984 du 6.10.2011, <http://faolex.fao.org/docs/pdf/mor106652.pdf>.

⁸ Décret n° 2-12-389 du 22 avril 2013 fixant les conditions et les modalités d’étiquetage des produits alimentaires, Bulletin Officiel n° 6152 du 16.05.2013, <http://faolex.fao.org/docs/pdf/mor134680.pdf>.

clearly indicated in the list of ingredients followed by the word “nano” in brackets.⁹

So, even though the legislative framework on food safety sketched above is clearly constructed on international general rules fixed by the multilateral treaties to which Morocco is party, and even though it seems to devote particular attention to the precautionary principle, the GMO sector remains notably absent. Indeed, there is no mention of GM products in the Law No. 28-07, nor in the implementing measures, especially in the Decree No. 2-12-389 on food labelling.

In effect, the question of regulating the presence of potentially dangerous substances in food products is addressed by Law No. 39-12,¹⁰ which concerns the organic production of agricultural and aquatic products.¹¹ Art. 4 of the law specifies the categories of products to which it applies, namely, *inter alia*, “les produits d’origine végétale ou animale destinés à l’alimentation humaine qui ont fait l’objet d’une préparation, les aliments pour animaux, les semences et plants utilisés en agriculture, “and which are to obtain “bio-certification”; while Chapter II sets out the objectives and principles applicable to this type of production and illustrates the rules on production, labelling and controls. In particular, Art. 11 lists the products and the modalities of production which are prohibited under the mode of organic production; in this sense, the first paragraph states that “les organismes génétiquement modifiés (OGM) ou les produits obtenus à partir de ces organismes” are prohibited by virtue of the present law.

In order to develop a specific biosafety regulation following the ratification of the Cartagena Protocol, in April 2005 Morocco set up an ethics committee, the National Biosafety Committee (NBC), which was intended to examine research conducted in the biosafety area, to suggest measures to the government on the use, handling, transfer, release, importation and marketing of GMO products and to check their application. In the accomplishment of these tasks, the NBC was to receive the support of private sector representatives and civil society. Subsequently, the Law No. 25-08’

⁹ This article reproduces art. 18(3) of Regulation (EU) No 1169/2011 of 25 October 2011, which applies as from 13 December 2014.

¹⁰ Loi n° 39-12 du 10.12.2012 relative à la production biologique des produits agricoles et aquatiques, Bulletin Officiel n° 6128 du 21.02.2013, <http://faolex.fao.org/docs/pdf/mor134981.pdf>.

¹¹ A number of decrees have been adopted or are currently in preparation in order to implement the law. See in particular: Décret n° 2-13-359 du 10.03.2014, Bulletin Officiel du 20.03.2014.

created the *Office National de Sécurité Sanitaire des Produits Alimentaires* (ONSSA),¹² which took over the functions of the NBC and became the authority in charge of implementing regulations and agreements related to food safety, sanitary and phytosanitary measures and also regulations and agreements related to biotechnology.

In accordance with the Convention on Biological Diversity,¹³ in 2013 Morocco also published its National Biosafety Framework. In this document the national strategy to protect Morocco's biological heritage is summarized; it also specifies that, in principle, Morocco does not exclude the introduction of modern biotechnologies.

4.3 EU-MOROCCO RELATIONS: EXERTING INFLUENCE AGAINST GMOs

4.3.1 EU-Morocco Relations

Beyond the ancient links that tie the history and the economy of Morocco to the European continent, the European Union has always devoted particular attention to its relationships with the South-Mediterranean countries, and with those in the Maghreb region in particular. Thus an extensive literature exists on the impact and the targets of the Barcelona Process launched in 1995 (re-launched in 2008 as the Euro-Mediterranean Partnership), and the European Neighbourhood Policy (ENP) developed in 2004 (see, *inter alia*, EC 2003b, 2004, 2006, 2011, Govaere et al. 2014, Campailla and Mosconi 2013, Lannon 2012, Icard 2012). In this context, Morocco has the most developed relationship with the EU, as testified by the conclusion of a number of important bilateral trade agreements.

The Association Agreement of 2000 provides the legislative framework for trade relations between EU and Morocco,¹⁴ through the establishment

¹² Loi n° 25-08 du 18.02.2009 portant création de l'Office National de Sécurité Sanitaire des Produits Alimentaires, Bulletin Officiel n° 5714 du 05.03.2009, <http://faolex.fao.org/docs/pdf/mor88001.pdf>.

¹³ Available at: http://www.unep.org/biosafety/files/Maroc%20_NBF%20final%20french_0709.pdf.

¹⁴ Euro-Mediterranean Agreement establishing an association between the European Communities and their Member States, of the one part, and the Kingdom of Morocco, of the other part, in OJ L70/2 of 18.3.2000.

of a free trade area. The Agreement also contains an important political commitment according to which “Cooperation between EU and Morocco shall be aimed at helping Morocco to bring its legislation closer to that of the Community in the areas covered by this Agreement” (art. 52). Even though this is a standard clause, also provided in other Association Agreements,¹⁵ it nevertheless points to the great influence that the EU has in fact had in the development of the Moroccan legislative framework since that time. In addition to the Association Agreements, in 2012 the EU-Morocco Agreement on agricultural, processed agricultural and fisheries products entered into force.¹⁶ This Agreement further opened the markets of both parties in the fruit and vegetables sector, which accounts for 80% of the EU’s imports in agricultural products from Morocco. Concerning the possibility of instituting sanitary and phytosanitary measures which could have an impact on imported products, art. 8 of Protocol No. 1 and art. 7 of Protocol No. 2 of the Agreement simply refer to the general clauses of the SPS Agreement (more precisely, art. 3.1 of the SPS Agreement), both stating that: “L’application des mesures sanitaires et phytosanitaires doit tenir compte des normes, procédures et recommandations des organisations normatives internationales comprenant la commission du Codex Alimentarius, l’Organisation mondiale de la santé animale, l’Office international des épizooties, la Convention internationale pour la protection des végétaux et de l’Organisation européenne et méditerranéenne pour la protection des plantes”. It is quite likely that same article will be inserted in the new Deep and Comprehensive Free Trade Agreement (DCFTA) that is currently under negotiation between EU and Morocco.¹⁷

The DCFTA will be an important step towards the adoption of the *Advanced Status* for Morocco. The new Action Plan (2013-2017) adopted in

¹⁵ See, for example, art. 56 of the Euro-Mediterranean Agreement establishing an association between the European Communities and their Member States, of the one part, and the People’s Democratic Republic of Algeria, of the other part, in OJ L265/2 of 10.10.2005; art. 52 Euro-Mediterranean Agreement establishing an association between the European Communities and their Member States, of the one part, and the Republic of Tunisia, of the other part, in OJ L97/02 of 30.3.1998.

¹⁶ Council Decision of 2 December 2010 on the signature of the Agreement in the form of an Exchange of Letters between the European Union and the Kingdom of Morocco concerning reciprocal liberalisation measures on agricultural products, processed agricultural products, fish and fishery products, in OJ L 241/1 of 7.09.2012.

¹⁷ The DCFTA between the EU and Morocco is currently under negotiation. The first round of negotiation started on 22 April 2013 in Rabat. See the joint press statement of 9 July 2014: <http://trade.ec.europa.eu/doclib/press/index.cfm?id=1120>.

December 2013 outlines the further steps necessary to reach a stronger association between Morocco and EU, a higher degree of economic integration and deeper political cooperation (Council of the EU 2013, on this subject also see Jaidi 2012). As regards national policy specifically concerning sanitary and phytosanitary questions, Morocco has committed itself to complete the implementation of the Law No. 28-07, to reinforce cooperation with the ONSSA and to guarantee the transparency and efficiency of the control system on food imports. To this aim, moreover, the text specifies that “Le Maroc prendra en compte, en matière de convergence réglementaire, avec l’appui de l’UE, la législation européenne pertinente dans les domaines vétérinaire et phytosanitaire” (Council of the EU 2013:38).

In order to assist Morocco through the reform process and to help the national economy, especially in the transformation and modernization of its agricultural system, the EU has been funding several development cooperation programmes under the European Neighbourhood and Partnership Instrument (ENPI).¹⁸

In particular, in 2010 the EU set up a support programme for the Morocco Green Plan (PMV) launched by the Moroccan Government in 2008 in the framework of the First Assize of Agriculture.¹⁹ The core of the PMV is support of small farmers and investment in technology and research for more efficient cereal production techniques. To this end, the PAPSA Programme (*Programme d’appui à la politique sectorielle agricole*) for the period 2010-2014 established a total contribution of €135 million. The first tranche of the contribution was granted in 2010, and in August 2014 a second instalment was agreed upon through the signature of a letter of intent between representatives of the EU and Morocco. This second phase of the PAPSA aims, in particular, at strengthening many production channels in the targeted regions (olives, dates, almonds, sheep meat), developing local products and enhancing the operational and follow-up capacities of the Ministry of Agriculture and Fishing.

Even though the EU-Morocco Agreements and related support programmes outlined above do not legally bind Morocco to adopt the “EU regulatory model” for agricultural policy and, in particular, for the food sector, it is clear that EU policy and related legislative system deeply influence and orient the policy choices of Morocco. Indeed, the current na-

¹⁸ See the ENPI website: <http://www.enpi-info.eu>.

¹⁹ See <http://www.agriculture.gov.ma/pages/la-strategie>.

tional legislative system on food law is, to a large extent, already inspired by that in place in the EU.

4.3.2 *EU Regulation on GMOs: Work in Progress*

The precautionary principle is deeply rooted in the EU Policy on the Environment (see art. 191 TFEU), but in practice, the scope and application of this principle is far wider and covers other policies including the EU Food Law framework.²⁰ In line with the Cartagena Protocol to which the EU is party, as regards the EU approach to GMOs, the Regulation (EU) 178/2002²¹ states that: “In those specific circumstances where a risk to life of health exists but scientific uncertainty persists, the precautionary principle provides a mechanism for determining risk management measures or other actions in order to ensure the high level of health protection chosen in the Community” (recital 21; see also art. 6(3) and art. 7).

Looking in more detail at the EU Policy on GMOs, a comprehensive legislative system is in place. The Deliberate Release Directive of 2001²² and the Food and Feed Regulation of 2003²³ discipline procedures for granting consent for placing GMOs on the market. A number of additional acts complete the regulatory framework, namely the above-mentioned Regulation (EU) 178/2002 which sets up the European Food Safety Authority (EFSA), Regulation (EU) 1830/2003 on the labelling and traceability of GMOs,²⁴ Regulation (EU) 1946/2003 on trans-boundary movement of GMOs,²⁵ and Directive 2009/41/EC on the contained use of GMOs.²⁶ Moreover, since 2003 the EC has adopted a recommendation on guidelines for the development of national measures ensuring the coexistence of GMOs with other types of cultivation (EC 2003a, repealed on 13 July 2010).

The EU Policy on GMOs has always been characterized by profound and apparently irreconcilable positions of the Member States, whose representatives have the final word on granting marketing authorization for

²⁰ See EC (2000). For the review of the application of the precautionary principle made by the Court of Justice of the EU, see the Annex I; more recently, see Court of Justice of the EU (2013a, 2014).

²¹ Regulation (EC) 178/2002, in OJ L 31/1.

²² Directive 2001/18/EC, in OJ L 106/1.

²³ Regulation (EC) 1829/2003, in OJ L 268/1.

²⁴ Regulation (EC) 1830/2003, in OJ L 268/24.

²⁵ Regulation (EC) 1946/2003, in OJ L 287/1.

²⁶ Directive 2009/41/EC, in OJ L 125/75.

GMOs.²⁷ While a stable coalition of Member States (composed of Spain, Portugal, the United Kingdom, the Czech Republic, Denmark, Estonia, Finland, Malta, the Netherlands, Romania, Slovakia and Sweden) has always expressed a favourable vote in the complex procedure leading to the adoption of marketing authorization, an opposing coalition (Austria, Greece, Cyprus, Hungary, Latvia, Lithuania, Luxembourg, France, Italy, Slovenia, Germany and Poland) has consistently voted against; in the middle is a group of Member States which either abstain or vote against.

And how many products containing or originating from GMOs have in fact been authorized so far in Europe? According to the latest data, to date 50 products have been authorized for food and feed uses pursuant to Regulation 1829/2003,²⁸ and 9 GM products have been authorized according to Directive 2001/18/EC. Currently, only two transgenic crops have been authorized for cultivation in Europe: the Amflora potato and Monsanto's Bt maize MON 810. While authorization for the former crop was annulled by the EU General Court in December 2013 (Court of Justice of the EU 2013b; also see Corona 2014b) and cultivation was consequently discontinued, the latter crop continues to be cultivated in the Czech Republic, Spain, Portugal, Romania and Slovakia on about 130,000 hectares, comprising 1.35% of the total maize acreage in the EU 27 in 2012.²⁹ By contrast, as shown in Table 4.2, the cultivation of MON 810 is currently banned in 9 Member States pursuant to the safeguard clause contained in Directive 2001/18/EC.

Because of the divergent positions of Member States as regards the commercialization of GM products and, above all, the cultivation of GM crops, the EU authorization system for GM products has always been extremely lengthy (e.g., Monsanto applied for renewal of its marketing authorization for maize MON 810 in May 2007) and unpredictable not only for the biotech industries that apply for authorization, but also for exporting countries (including the United States), which have brought WTO disputes against the EU (WTO 2006).

²⁷ For further detail on how the authorization procedure works, see Corona 2014a.

²⁸ More precisely: 8 GM cotton, 29 GM maize, 3 GM oilseed rape, 7 GM soybeans, 1 GM sugar beet, 1 GM bacterial biomass, 1 GM yeast biomass. See the EU Register of Authorized GMOs: http://ec.europa.eu/food/dyna/gm_register/index_en.cfm.

²⁹ For official data provided by the European Commission, see: *Questions and Answers on EU's policies on cultivation and imports of GMOs*, http://europa.eu/rapid/press-release_MEMO-13-952_en.htm.

Table 4.2. EU Member States banning GM crops for cultivation

Maize MON 810		
Member States	Basis for the ban	Year of the ban
Austria	Art. 23 Directive 2001/18	2008
Hungary	Art. 23 Directive 2001/18	2006
Luxembourg	Art. 23 Directive 2001/18	2009
Greece	Art. 23 Directive 2001/18 and Art. 18 Directive 2002/53/EC	2006
France	Art. 23 Directive 2001/18 and Art. 34 of Regulation 1829/2003	2008
Italy	Art. 34 of Regulation 1829/2003	2013
Germany	Art. 23 Directive 2001/18 and Art. 34 of Regulation 1829/2003	2009
Bulgaria	Art. 23 Directive 2001/18 and Art. 34 of Regulation 1829/2003	2008
Amflora Potato		
Hungary	Art. 23 Directive 2001/18	2010
Luxembourg	Art. 23 Directive 2001/18	2010
Poland	Art. 23 Directive 2001/18	2013

Source: author's elaboration.

In order to override this *blocage*, the European Commission launched in July 2010 a new GMO package – composed of a Proposal for a Regulation and a Communication – aiming to confer on Member States the freedom to restrict or ban the cultivation of GMOs while keeping the EU authorization system unchanged (EC 2010a, 2010b). Moreover, the legislative text, which finally took the form of a Directive formally endorsed by the Council on 2 March 2015,³⁰ provides that a single Member State could ask, through the Commission, for the biotech industry applying for marketing authorization to exclude its territory from GMO cultivation from the outset; in return, it is anticipated that the Member State concerned will give a favourable vote during the authorization process. Thus, it is quite likely that, by virtue of the new provisions of the Directive, the number of EU authorizations of GMOs will rise considerably, with potential spill-over effects on the Moroccan decision-makers as regards the future of GMO regulation in the country.

³⁰ Directive (EU) 2015/412, OJ L 68 of 13.3.2015.

4.4 US-MOROCCO RELATIONS: EXERTING INFLUENCE IN FAVOUR OF GMOs

4.4.1 *The US Approach to GMOs: Go-ahead!*

The policy of the United States of America (US) on GMOs is positioned opposite to that of the EU, which is based on the precautionary principle. Accordingly, the US is neither a party to the Convention on Biological Diversity, nor to the Cartagena Protocol.

The US does not have any federal legislation that is specifically devoted to GM products. Starting from the assumption that regulation should focus on the nature of products and not on the process by which they were produced, GMOs are regulated according to the same rules governing conventional products.³¹

In practice, three US agencies³² are involved in regulating GMOs: the Animal and Plant Health Inspection Service (APHIS), which regulates the planting, importation or transportation of GM plants through three different authorization procedures that vary in term of complexity of the application advanced by the biotech industries (permit procedure, notification procedure and determination of non-regulated status); the Environmental Protection Agency (EPA), which regulates pesticides and microorganisms developed through genetic engineering; and the Food and Drug Administration (FDA), which regulates the safety of all human and animal food products, as well as drugs and biological products. It should be noted that most GM products fall within the category “generally recognized as safe” and thus do not require preapproval from the FDA.

If the US has a clear position on the absence of any danger for the environment or for human and animal health posed by GM products,³³ at the same time in recent years there has been increasingly strong lobbying for mandatory labelling of GM food/products (see Figure 4.2 in the Annexes). A recent poll found 93% of respondents supporting mandatory food labelling in the US (Kopicki 2013). Proposed federal legislation, the

³¹ See the Coordinated Framework for Regulation of Biotechnology published in 1986 by the Executive Office of the President, Office of Science and Technology Policy.

³² Library of Congress, *Restrictions on Genetically Modified Organisms: United States*, last updated 04.02.2015, <http://www.loc.gov/law/help/restrictions-on-gmos/usa.php>.

³³ The State of California, which is in the forefront in the fight against GMOs in the US, has enacted an ordinance prohibiting the cultivation of GMOs; this example has been followed by the counties of Marin and Mendocino, Hawaii, Kauai County and Hawaii County.

“Genetically Engineered Food Right-to-Know Act”, which would mandate labelling of any GM food, was introduced in April 2013 but is still in the hands of the congressional committee.³⁴

In order to overcome this block at the federal level, more than 60 bills have been introduced in over 20 US states to require GMO labelling or prohibiting genetically engineered food.³⁵ To date, however, only Vermont, Maine and Connecticut have passed state legislation on mandatory food labelling.

The GMO sector has become a significant part of the US economy; according to latest official data, there are 1,300 firms and 1.3 million employees in biosciences in the US, and 5.8 million employees in related industry sectors. In 2013, 93% of soybeans and 90% of cotton and corn grown in the US were genetically engineered for either herbicide tolerance or insect resistance. Given these important economic data, it is thus quite evident that the US has been pushing developing countries, like Morocco, to open up their markets to biotech products and, at the same time, to not adopt a mandatory labelling system for GM food products.

4.4.2 US-Morocco Free Trade Agreement (FTA)

The FTA between the US and Morocco was concluded in 2004 and entered into force in 2006.³⁶ It is a comprehensive agreement providing for, *inter alia*, the elimination of tariffs and the prohibition of restrictions in goods trade (ch. 2), with rules applying to investments (ch. 10), cross-border trade in services (chapter 11), intellectual property rights (chapter 15), the environment (ch. 17), TBT measures (ch. 7) and agriculture and SPS measures (ch. 3). The Agreement does not contain specific SPS provisions but simply refers to the international rules established in the WTO SPS Agreement (art. 3(9)). Moreover, a joint statement on SPS Cooperation between US and Morocco is attached to the text of the Agreement in order to stress the need to further push the process of mutual dialogue

³⁴ H.R. 1699 - 113th Congress: <https://www.govtrack.us/congress/bills/113/hr1699>.

³⁵ Colorado, Proposition 105 defeated with 66% against in midterm November 2014 election; Oregon, Proposition XX defeated with 51.2% against; in Washington, Initiative 522 defeated in November 2013; in California, Proposition 37 defeated with 53% against.

³⁶ See USTR website: <http://www.ustr.gov/trade-agreements/free-trade-agreements/morocco-fta/final-text>.

and to reach agreement on sanitary certificates consistent with international standards.³⁷

In the case of provisions related to technical barriers to trade, the Agreement reaffirms the parties' obligations under the WTO TBT Agreement. It sets out several means for cooperation between the US and Morocco in order to reduce barriers and improve market access; in this sense, a particular emphasis is placed on the acceptance of conformity assessment results (i.e., testing to determine whether a product meets applicable standards, see art. 7(5)), on transparency (i.e., allowing persons of the other Party to participate in the development of standards, technical regulations and conformity assessment procedures, see art. 7(6)) and on information exchange (i.e., providing information or explanations regarding proposed measures within a reasonable period, see art. 7(8)).

The importance of the FTA for both parties is exemplified by increased commercial exchange: from the US side, since the agreement entered into force on 1 January 2006, the value of US exports has risen from \$481 million in 2005 to \$1.95 billion in 2010. This translated into a trade surplus with Morocco of \$1.26 billion in 2010, a 3,505% increase over the \$35 million trade surplus of 2005.³⁸

The US is also financing a number of programmes aimed at increasing Morocco's awareness of the potential benefits that biotech technologies can provide to its agricultural sector. The US Department of Agriculture (USDA), for instance, funds several programmes that have the main objective of facilitating dialogue between US and Moroccan regulators, scientists and government officials on developments in biotechnologies.³⁹ As clearly affirmed by the USDA itself, through these programme the US Foreign Agricultural Service is trying to prepare a trade-friendly regulatory approach to biotechnologies in Morocco (USDA 2014). The smartest strategy to attain this objective is to "maintain a low profile and continue working to promote biotechnology between scientists" and opinion leaders in various government institutions instead of raising the question of

³⁷ To date, in particular, Morocco restricts imports of US live cattle, beef, and beef products due to concern over BSE and growth hormones, and restricts imports of US poultry and poultry products due to AI and Salmonella concerns.

³⁸ USTR, *The U.S.-Morocco Free Trade Agreement (FTA)*, <http://www.export.gov/FTA/Morocco>.

³⁹ See, in particular, the Cochran Fellowship Program and the Norman E. Bourlaug Fellowship Program.

GMOs products to the public opinion, which is likely to be contrary to products containing or originating from GMOs (AgroChart 2014).

CONCLUSIONS

Morocco has initiated a process of reforms that are deeply changing the economy and the policies of the country. This an ongoing process that has been leading Morocco to confront its economic weaknesses and regulatory lacunae with international trading partners which have, as underlined above, opposite policy priorities, especially in the food sector. With agriculture being a key factor for the economic growth of Morocco, it is crucial for Morocco to continue to build a comprehensive regulatory framework, which could help the country in pursuing its own national objectives while respecting, at the same time, its international obligations.

What, then, are the Moroccan policy options on biotechnologies, applied to agriculture and the food sector in general? Given its current regulatory framework on food law, especially the recent Law No. 28-07 and the relevant implementing measures, Morocco seems to have already chosen to adopt a high-standard food protection system. In particular, as regards imported food, art. 3 of the law, in combination with art. 6, set the bar for acceptable health risk at a high level, in line with art. 5.7 of the SPS Agreement and art. 1 of the Cartagena Protocol.

At the same time, however, Morocco has not excluded the introduction of biotechnologies in its agriculture sector. Indeed, several Moroccan organizations are already conducting specific research projects (even though the above-mentioned internal decree of the Minister of Agriculture of 1999 prohibits this). In particular, the National Agronomic Research Institute (INRA) has been seeking solutions through biotechnology for widely used crops specific to Morocco.⁴⁰

It is also true that the EU, the most important trading partner of Morocco, does not exclude the possibility of cultivating and commercializing GM products (in fact in Europe, as in Morocco, animals can be fed with GM products). Also, it is quite likely that the reform of the authorization process for GMOs in the EU will have the effect of increasing the area planted with GM crops, above all in Spain, which is one of Morocco's largest

⁴⁰ Such as developing fava bean resistance to orobanche (broomrape), resistance of date palms to Fusarium, and eventually developing drought-resistant wheat.

trading partners in Europe. This could influence the Moroccan decision makers as regards the future regulation of biotechnologies in the country. But would it be convenient for Morocco to start cultivating GM crops, thereby augmenting the land used for production of GM cereals while diminishing the area used for local conventional production, and possibly for fruits and vegetables, a sector where the country is a net exporter? Indeed, the recent Law No. 39-12 on organic production, which basically aligns the Moroccan legislation in this sector to that of the EU, could be an important instrument to further develop the production of organic fruits and vegetables and thus augment exports to the EU, where the demand for organic products continues to grow (EC 2014). Thus, it is crucial for Morocco to ensure that a possible use of biotechnologies in the food sector does not have a detrimental effect on other sectors of the national agriculture production.

In practice, Morocco has been importing GM products (corn, soybeans and soybean products) from the US since 2001. Indeed, the internal decree of the Minister of Agriculture of 1999 that should serve as the legal basis to block imports of biotech products for human consumption, while permitting the import of feed for animals, cannot guarantee that Moroccan consumers are not already eating GM food. In fact, as revealed by the a recent Report of the USDA, Moroccan importers commonly print “Biotechnology Free” on the label of products used for human consumption, to avoid being asked to provide a “Biotechnology-Free” certificate. Moreover, even though testing for biotech products occurs, it is not systematic and remains limited to the point of entry (USDA 2014). The question then is how it would be possible to effectively control the release of such labels in the absence of legislative “support”? The above-mentioned Decree No. 2-12-389 on food labelling adopted in 2013 is clearly an important step in setting up an internal control system for imported food. It is not by chance, indeed, that US exporters have started complaining about the new rules on labelling in Morocco and that they regularly follow the internal process of law-making for Morocco’s food sector. However, as the decree is silent regarding the possible presence of GMOs in food products, it cannot *per se* guarantee that GM products, especially coming from the US pursuant to the advantageous rules provided by the FTA, are controlled, inspected and possibly stopped at point of entry. In this sense, a comprehensive national legal regulation on GMOs clarifying the national policy on GM food and also including provisions on mandatory labelling of GM foods applying to all food products (national and imported) would be

consistent with both the SPS and TBT Agreements, and ultimately, with the US-Morocco FTA, which refers to these Agreements.

To conclude, while the question of the real convenience of recourse to biotech crops is currently debated,⁴¹ and whatever decision Morocco finally makes on opening its agricultural sector to biotechnologies, the adoption of a clear national regulation as regards GMOs – especially on the labelling of such products and on the co-existence of GMO production with organic and conventional production – cannot be postponed any longer. Such regulation is necessary to protect consumers (giving them the freedom to choose what type of food they what to eat), farmers (giving them the possibility to choose between organic, conventional and biotech production) and the freedom of Morocco to choose its own agricultural production system.

In this sense, the implementation of the Morocco Green Plan will be the moment of truth for the future of the Moroccan agricultural sector: will it be possible, under the current legislative framework, to conjugate support to local farmers and small property owners with the interests of big investors in industrialized countries like Spain, the US, Argentina and South Africa, which are at the forefront of the biotechnology industry?

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⁴¹ See Jennings (2014) for an overview of the debate.

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Part II.

Small Farming and Agricultural
Production Systems in the
Euro-Mediterranean Area

5.

Challenges to Achieving Sustainable Exports of Fruits from Small-Holdings under Water Scarcity Conditions of the Southern Mediterranean

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INTRODUCTION

The EU and its Southern Mediterranean partners face common agricultural challenges such as a changing climate, food price volatility and water stress. Although agriculture provides an essential internal safety net and source of employment for much of the population (WFP/IFPRI 2013), farmers in water-scarce areas of the Southern Mediterranean are faced with growing pressures to secure reliable supplies of sufficient irrigation water, and enhance irrigation management to cope with these stresses. In Egypt, these challenges are becoming particularly acute due to growing water demand from other sectors of the economy, and reduced inflows of water through the Nile River (Nour El-Din 2013). These shared challenges, coupled with the consequences of environmental degradation

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and water stress, underline the need for regional cooperation to develop sustainable agriculture and food systems, while also managing the trade balance across the Southern Mediterranean.

Horticultural crops for domestic sale or export can generate good profits for farmers per unit of water used. However, macro-economic problems (inflation, trade deficits, fiscal pressure), increased poverty and political instability have afflicted the Southern Mediterranean agricultural sector since 2007, first by increasing food prices, and subsequently by disruptions in logistics chains for export (Hamza and Beillard 2012). Costs of inputs including fuel and machinery maintenance for pumping water for irrigation have also been rising across the region (UNDP 2013). Despite the volatility of export markets, continued development of horticultural production is seen as the most feasible strategy to raise the income of the large proportion of the population who work in this sector (IFAD 2011a).

This study explores the challenges faced by small fruit producers in the Southern Mediterranean in order to consider the opportunities for Euro-Mediterranean cooperation to develop sustainable agriculture and food systems. A case study focusing on small citrus producers in Egypt's Nile Delta illustrates these challenges. This case study draws on field research carried out through Doctoral research projects undertaken by the co-authors, and a strategic discussion of research for development opportunities in the New Lands of Egypt's Western Delta pursued during 2011-13, with support through the USAID-ICARDA North Africa and Middle East Water and Livelihoods Initiative.²

5.1 BACKGROUND ON HORTICULTURAL IMPORTS TO THE EU

Each year, the EU typically imports close to €60 billion worth of agricultural products from developing countries. This is more than the other five major importers combined (the US, Japan, Canada, Australia and New Zealand) (EC 2012a). The EU has extensive commercial and cooperation links, bilateral agreements and partnerships with third countries and regional trading blocs. These include Euromed Association Agreements. The key objective of the Euro-Mediterranean trade partnership³ is the

² See <http://www.icarda.org/wli>.

³ See <http://ec.europa.eu/trade/policy/countries-and-regions/regions/euro-medi->

creation of a deep Euro-Mediterranean Free Trade Area, which aims at removing barriers to trade and investment between the EU and Southern Mediterranean countries as well as among the Southern Mediterranean countries themselves. Euro-Mediterranean Association Agreements are in force with most of the Southern Mediterranean countries (with the exception of Syria and Libya).

The EU-Egypt agreement, in force since 2004, established a free-trade area with the elimination of tariffs on industrial products and significant concessions on agricultural products. Since that time, EU-Egypt bilateral trade has more than doubled (from €11.5 billion in 2004 to €23.8 billion in 2012). A dispute resolution agreement and an agreement on agricultural, processed agricultural and fisheries products entered into force in 2010. As a response to the unprecedented events across the Arab world in 2011, the EU identified further avenues to develop and deepen trade and investment relations with Southern Mediterranean partners (EC 2011).

Overall, during 2008-2010, agricultural trade flows from Europe to the Near East and North Africa were worth around €8,000 million, while the flows into Europe from the region were worth around €4,000 million (EC 2012a). Southern Mediterranean countries (i.e., Turkey, Morocco, Egypt, etc.) are responsible for around 20% of fresh fruit imports to the EU. Fresh fruit imports from Egypt, including fresh table grapes, sweet oranges, and fresh strawberries have been increasing notably (from €12 million in 1999 to €187.5 million in 2011) (EC 2012b).

In Europe, fruit is recognized as part of a healthy diet and is promoted through educational campaigns in some countries. However, packaged sweets and sugary foods are available at affordable prices all year round, and are supported by pervasive marketing campaigns. Obesity is a serious health problem in parts of the EU. Healthier eating habits require not only education and time to build, but also a predictable supply of fruits and vegetables to be regularly available to consumers so that they can develop and retain healthy eating habits throughout the year. This is in the interests of European farmers and consumers, as well as those of farmers from outside the EU.

While fruits such as oranges and grapes grown in the EU are harvested late in the summer, imports from outside the EU help to extend the period of the year for which they are available in European supermarkets. For example, table grape consumption is mostly met by domestic

terranean-partnership.

production in the EU from June to the end of the year. Imports from third countries—mostly during the first half of the calendar year from further South – represent 22.5% of total consumption. For oranges, the EU is a net importer, even though the Southern European countries, particularly Italy, produce citrus for both internal consumption and export. The main European destinations for Egyptian citrus are Turkey and Spain (Hamza and Verdonk 2013), which are themselves citrus producing countries and have well-developed markets distributing this fruit across Europe.

The Northern Hemisphere orange harvest starts in October. From June to October, oranges are imported to the EU from the South. The second largest supplier (after South Africa) is Egypt. South Africa's competitive advantage for its Valencia oranges is the advanced production season (July-September) compared to Egyptian Valencia oranges, which are harvested beginning in December. This enables South African exporters to saturate some markets before Egyptian produce can reach them (Hamza and Verdonk 2013). However, because Egypt is closer to Southern Europe, transportation costs and emissions are lower, making Egypt a more environmentally sustainable supplier, and potentially also a more cost-effective one.

5.2 IMPORT STANDARDS AND CONSTRAINTS ON SMALLHOLDERS' ACCESS TO EXPORT MARKETS

Standards define European quality requirements for citrus fruit coming from other countries at the export-control stage after preparation and packaging (UNECE 2012). These require citrus fruit to be:

- intact
- free of bruising and/or extensive healed-over cuts
- sound; produce affected by rotting or deterioration such as to make it unfit for consumption is excluded
- clean, practically free of any visible foreign matter
- practically free from pests
- free from damage caused by pests affecting the flesh
- free of signs of shrivelling and dehydration
- free of damage caused by low temperature or frost
- free of abnormal external moisture
- free of any foreign smell and/or taste.

The UNECE standard defines three classes for citrus as follows:

(i) **“Extra” Class.** Citrus fruit in this class must be of superior quality. It must be characteristic of the variety and/or commercial type. It must be free from defects, with the exception of very slight superficial defects, provided these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package.

(ii) **Class I.** Citrus fruit in this class must be of good quality. It must be characteristic of the variety and/or commercial type. The following slight defects, however, may be allowed, provided these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package:

- a slight defect in shape
- slight defects in colouring, including slight sunburn
- slight progressive skin defects, provided they do not affect the flesh
- slight skin defects occurring during the formation of the fruit, such as silver scurfs, russets or pest damage
- slight healed defects due to a mechanical cause such as hail damage, rubbing or damage from handling
- slight and partial detachment of the peel (or rind) for all fruit of the mandarin group.

(iii) **Class II.** This class includes citrus fruit that does not qualify for inclusion in the higher classes but satisfies the minimum requirements specified above. The following defects may be allowed, provided the citrus fruit retains its essential characteristics as regards the quality, the keeping quality and presentation:

- defects in shape
- defects in colouring, including sunburn
- progressive skin defects, provided they do not affect the flesh
- skin defects occurring during the formation of the fruit, such as silver scurfs, russets or pest damage
- healed defects due to a mechanical cause such as hail damage, rubbing or damage from handling
- superficial healed skin alterations
- rough skin
- a slight and partial detachment of the peel (or rind) for oranges and a partial detachment of the peel (or rind) for fruit of the mandarin group.

A range of specifications are also included by the UNECE concerning fruit maturity, size and presentation. In addition to the mandatory UNECE

standards, European importers often also require additional standards and certification of horticultural produce. Certification standards commonly required for citrus by European importers include GlobalGAP⁴ and Fairtrade.⁵

The Egyptian government has issued procedures to facilitate and control the quality of exported oranges (Hamza and Maldonado 2011). The regulations limit the sorting, grading and packaging of exported oranges to stations that have been inspected, approved and registered by the joint committee of the representatives of the Central Authority for Plant Quarantine (CAPQ) and the General Organization for Imports and Export Control (GOIEC) in coordination with the Agricultural Export Council (AEC). Some 55 to 60 stations all over Egypt are accredited for exports. The registration and accreditation of citrus exporting stations is unique to citrus.

Some markets for citrus have been lost due to concerns relating to infestation with Mediterranean fruit fly (*Ceratitis Capitata*) and peach fruit fly (*Bactrocera zonata*) (Hamza and Verdonk 2013). Standards concerning pesticide residues in fruits can also represent a barrier for access to export markets (IFAD 2012).

Phytosanitary certificates issued by the Animal and Plant Health Inspection Service (APHIS) are required to accompany fruit, vegetable and nut shipments into the EU. APHIS issues phytosanitary certificates in accordance with international regulations established by the International Plant Protection Convention of the Food and Agriculture Organization of the United Nations. This standard-setting body coordinates cooperation between nations to control plant and plant product pests and to prevent their spread. In August 2013, the United States Department of Agriculture issued a Federal Register Notice⁶ of its decision to allow the importation of oranges and tangerines from Egypt, subject to the application of one or more designated phytosanitary measures for fruit flies (USDA 2012, 2008).

Various donor-funded programmes have explored the opportunity for Farmer Marketing Associations (FAs) to offer an appropriate institutional platform for small farmers to organize themselves in order to access agri-

⁴ The most widely accepted private sector food safety certification in the world. See <http://www.globalgap.org>.

⁵ An alternative approach to conventional trade based on a partnership between producers and traders, businesses and consumers. See <http://www.fairtrade.net/what-is-fairtrade.html>.

⁶ See <http://www.gpo.gov/fdsys/pkg/FR-2013-08-16/pdf/2013-19958.pdf>.

business support services. In some parts of North Africa, water user associations have been incorporated into local and regional agricultural development strategies, broadening their mandate to include improvement of production and marketing (Le Gal et al. 2007, 2009). The Egyptian Government has identified the strategic opportunity to organize farmers to undertake the host of activities required for the purpose of production and marketing in the agriculture and livestock sectors (MALR 2009).

IFAD has taken up the argument that Egyptian farmers' associations can also become enterprise incubators and even service providers for their members in overcoming the key challenges of the horticultural and dairy sector (IFAD 2011a). IFAD recommends that farmers become organized into specialized farmer associations to enable: (i) contracts to be signed with the entire group, reducing administrative and logistical costs; (ii) GlobalGAP auditing and organic certification; (iii) peer pressure among members to foster compliance with agreements, production practices and delivery schedules; and (iv) delivery of training (IFAD 2011a).

A growing literature examines smallholders' access to international markets through certification schemes. However, this literature tends to focus on smallholders in countries that receive development assistance, rather than Europe's key trading partners in the Southern Mediterranean. Contributions to the literature often deal with cases where development assistance has been used to explore and sometimes overcome barriers preventing smallholders from obtaining and benefiting from certification. However, there is a notable lack of published studies concerning the experiences of Southern Mediterranean smallholders within certification systems – conceivably because this experience has so far been very limited. To our knowledge, there is even less objective research available regarding the environmental and social strategies of larger firms in the Southern Mediterranean that are currently supplying European markets.

While larger producers or suppliers in the Southern Mediterranean can enter arrangements with European distributors, audits, food safety standards like GlobalGAP and sustainability standards end up weeding out suppliers that do not have systems and economies of scale to implement such arrangements. European firms insist on commitments and onerous documentation requirements at the beginning of the supply chain without paying and with no guarantee to buy (Vorley and Thorpe 2014). This has led some commentators to criticize leading European firms for preaching inclusion in their corporate literature and policies,

while excluding smallholders in practice due to de-risking strategies which push them out (Ibid.).

The literature on access to international markets by smallholders from other regions identifies barriers due to low levels of literacy, lack of management and technical skills, and poor access to information (about quality, buyer demand and standards), poor organization, geographic dispersion and poor infrastructure, including transport and communications (Fayet and Vermeulen 2012). Some of these constraints are less relevant to small farmers in the Southern Mediterranean region – many of whom are highly literate, well-educated and connected to modern communications and road systems. The nature of smallholders' participation in the design of schemes such as GlobalGAP has been identified as a critical concern (Tallontire et al. 2013). This finding is in common with the broader literature on agricultural water management and development, in which farmer's "upstream" participation in the design of programs is also crucial to their "uptake" as beneficiaries of them.

In some contexts, it has been revealed that producing for GlobalGAP-certified export markets is not necessarily profitable for small farmers due to the costs associated with practices required (Subervie and Vagneron 2013). Adoption of certification systems such as GlobalGAP has been found to vary among smallholders, as has compliance (Lemeilleur 2013). Different approaches to the organization of small farmers to access certification systems have been found to make a difference to whether or not these farmers benefit (Kleemann et al. 2014). Comparison of the benefits of different certification schemes for smallholder coffee producers in developing countries has identified Fairtrade certification as somewhat better oriented to the situation of small farmers than other systems (Chiputwa et al. 2015). However, it has also been observed that Fairtrade certification does not have a strong overall effect in encouraging sustainable agricultural practices (Elder et al. 2013).

From an environmental perspective, although GlobalGAP certification does include some attention to water management, the provisions in a tick-box format questionnaire for producers to confirm their water management intentions remain relatively vague, and do not foresee any specific role or responsibility for local authorities and extension services in monitoring and enhancing water management.

5.3 PROGRESS AND CONSTRAINTS TO ENVIRONMENTALLY SUSTAINABLE CITRUS PRODUCTION IN EGYPT

It has previously been suggested that Egyptian farmers could achieve a greater volume and better quality of citrus production while reducing input costs by *reducing* irrigation water inputs by 25%, but investing in more use of nitrogen, as well as increasing labour investments in pruning and harvesting (IFAD 2011b:16). There is a need for careful monitoring of the environmental effects of farmers' water and agrochemical management strategies, however, because in other regions increasing application of nitrogen to citrus crops has led to problems with water quality in near-surface aquifers (Phogat et al. 2014, Lassaletta et al. 2014, Paramasivam et al. 2001).

The most common form of irrigation system in use in Egypt's Nile Delta is surface irrigation. Research has previously demonstrated that for citrus production, shifting from surface irrigation to bubbler irrigation systems can enable water savings above 40% (Hussien et al. 2013). Moreover, bubbler irrigation systems resulted in a significant increase in fruiting parameters (yield kg per tree, number of fruits/tree, fruit weight g). In addition, most of the studied fruit characteristics, both physical and chemical, were improved by use of bubbler irrigation during the first and second seasons, compared to surface irrigation. However, leaf mineral content (N, P and K) was not significantly affected by the change in irrigation methods. The bubbler irrigation system resulted in more effective roots (< 2 mm) in length and number compared with the surface system. This increase was reflected in improved yield and quality of orange production. The study therefore recommended for Washington Navel orange trees grown on clay loamy soil to change from surface to bubbler irrigation systems for better fruit yield and quality while increasing water utilization efficiency to 59.4%.

Applying mini-sprinkler or surface drip irrigation systems enables further reductions in water use and can help farmers to maintain the water-table level at a sufficient depth below the soil surface to avoid water-logging and accumulation of water quality threats in the near-surface. An experiment conducted in a citrus orchard in the Nile Delta compared the effects of surface drip, mini-sprinkler, standard bubbler, low-head bubbler and gated pipes on soil water status (El-Gindy et al. 2006), concluding that the standard bubbler irrigation system enabled farmers to maintain the water-table level at the required depth below the soil surface.

Box 1: Examples of Irrigation Management to Raise the Quality and Economic Grade of Citrus in Other Regions

Spring stress

Early season stress has been observed to significantly reduced peel creasing in a particularly vulnerable navel cv. (Frost Nucellar) without negative impacts on harvest fruit load or size (Goldhamer and Salinas 2000).

Summer stress

During this period of cell expansion in the fruit, deficit irrigation can reduce the fruit growth rate. In fact, severe stress can result in fruit shrinkage. However, reintroduction of full irrigation can increase the fruit growth rate, such that harvest fruit size is unaffected (Goldhamer and Salinas 2000). Harvest sugar concentration can increase because of summer stress, presumably the result of fruit dehydration. The imposition of severe stress during the summer has been used with lemons to induce an off-season bloom and resulting summer harvest fruit. This is known as the Forzatura technique or the Verdelli effect (Barbera and Carimi 1989).

Autumn stress

Numerous studies have shown that autumn stress can increase both the sugar and acid content of the fruit as well as increase the peel thickness.

Winter stress

In Florida, winter stress has been used to reduce immature fruit drop for the next season's Valencia orange crop during mechanical harvesting with trunk shakers (Melgar et al. 2010).

Season-long stress

In a study with the cv. Shamouti, 35% less applied water than fully irrigated trees caused flowers per tree to increase by 52%, but the flower abscission rate was high. This resulted in a 20% lower yield but higher sugars and acid (Moreschet et al. 1983). Another study showed that allowing 80% depletion of available water in the surface 1 m in the summer and winter and 60% depletion in spring and autumn did not reduce yields with navel oranges (Wiegand and Swanson 1982).

Source: adapted from Steduto et al. 2012:319-321.

Deficit irrigation can be defined as an agricultural water management system in which less than 100% of the potential evapotranspiration is provided by the available combination of stored soil water, rainfall and irrigation, during the growing season. Depending on the timing and degree of plant stress, beneficial effects can sometimes be achieved through deficit irrigation. For citrus, quality-enhancing effects are achieved by ensuring sufficient water supply during critical periods of the growth cycle, but applying water stress during selected periods before harvest to induce positive effects on the taste and appearance of the fruit (see Box 1) (Steduto et al. 2012). Positive effects associated with deficit irrigation of citrus so far documented through experimental work include increasing total soluble solid (TSS) and acid levels at harvest (Consoli et al. 2014), increasing harvest sugar concentration and altering harvest dates (Barbera and Carimi 1989), and smoothing of peel (Steduto et al. 2012).

Deficit irrigation (100%, 80% and 60% of evapotranspiration, ET_p) of young citrus trees using microirrigation systems (surface drip, mini-sprinkler, standard bubbler and low-head bubbler) in Egypt has been compared with modified surface irrigation using gated pipes (Aboukheira 2005, El-Qousy et al. 2006a, El-Gindy et al. 2006). Based on the findings of research conducted in Egypt to date, mini-sprinkler and surface drip irrigation systems are the recommended microirrigation systems for citrus under old land conditions. However, the surface drip irrigation system has the highest fuel requirements, followed by the mini-sprinkler while gated pipes have a lower yearly fuel consumption compared with other tested systems, due to the high discharge of gates and consequently the low irrigation time (El-Qousy et al. 2006a). The lowest annual total irrigation cost (653.18 LE/fed./year) was with the gated pipes while the highest (951.93 LE/fed./year) was for the standard bubbler irrigation system (Aboukheira 2005, El-Qousy et al. 2006b).

Due to resource constraints and the resulting short timeframe of the experimental work that could be supported, it was not possible to follow the effects of deficit irrigation on fruit production and quality of citrus trees. However, observed effects of the deficit irrigation systems on growth and vigour parameters, salt accumulation in the soil and cost-efficiencies were encouraging. The surface drip irrigation system achieved high values for all measured performance parameters, whereas both the low-head bubbler and gated pipes recorded low values. The surface drip and mini-sprinkler irrigation systems produced a higher rate of growth and vigour parameters compared with the bubbler and surface irrigation

systems. As the rate of water application was decreased, root intensity in the soil surface layers increased. The highest intensity of roots [5.65 g/hole (79.02%)] at a depth of 20 cm was observed with the surface drip system at the application rate of 60% of potential ETp.

The experimental work pointed to a water quality concern under deficit irrigation systems, which could affect fruit production and quality in Egypt. The lower the water application rates, the higher the salt accumulation value at each soil depth. Gated pipes and low-head bubbler systems, which use more water, resulted in the lowest accumulation of salt in the surface layer, where the value of electrical conductivity ranged between 0.2 and 0.3 dS/m (Aboukheira 2005, El-Qousy et al. 2006b).

5.4 CASE STUDY: CITRUS PRODUCTION IN EL BUSTAN, NILE DELTA,⁷ 2011-13

El-Bustan is located in Behaira Governorate, in the West of the Nile Delta. Through the Mubarak Project, initiated in 1987, land reclamation areas including 11 villages were created at El Bustan 1 and El Bustan 2, covering a total area of around 21,000 hectares. El Bustan 3 was completed later, and includes another 16 villages. These were supplied with water from the El Bustan Canal, which is a branch of the Nubaria Main Canal. Desert land was allocated to poor landless people (beneficiaries), graduates and investors (Adriansen 2009). Beneficiaries received 2.5 feddan⁸ of land while eligible graduates were allotted 5 feddan of land and a 1-bedroom house in the adjacent village. The land was equipped with an irrigation system. For the first five years, various means of aid would be provided until the land could be expected to provide an output sufficient to sustain a family.

In 2011-12, statistics collected by the local agricultural development organization showed that the most prevalent crop grown at El Bustan was citrus, accounting for 13,714 out of the total 23,300 feddan of cultivated area (more than half). The peak period for citrus water requirements occurs during June and July, but trees require irrigation for most of the year (Steduto et al. 2012). Other crops that are frequently grown by farmers

⁷ Based on Shehata et. al. 2014.

⁸ The feddan is a traditional Egyptian unit for measuring land area; 1 feddan = 0.42 hectares.

in this area include winter beans (peak water demand: January), wheat (peak water demand: March) and groundnut (peak water demand: May) (Abdel Kawy 2012). In some parts of the study area, water quality concerns including salinization are increasing and constraining the potential for citrus production. Agricultural activities in the study area also include livestock production, mostly for home consumption.

Because the wholesale market for horticultural produce is liberalized, farmers from El Bustan were affected by changes in prices of fruit for export that occurred over the period 2010-13 (Hamza and Beillard 2012, Hamza and Verdonk 2013).

For highly perishable commodities (e.g., grapes, oranges, etc.), although the potential for retail value may be relatively high, farm gate prices have offered small farmers a share that might be as little as 10-30% of the retail price. For less perishable produce (lemons, etc.), farm gate prices can be negotiated up to a higher proportion of the retail value, around 40 to 60%. Low farm gate prices can cause wasting of produce. Production losses in Egyptian horticulture have been estimated in excess of 30% (IFAD 2011a).

Since the 1990s, efforts to increase production and irrigation system efficiency have been introduced in the area of El Bustan (Sabbah and Metwally 1997). A training and demonstration facility has been established in the area by the Water Management Research Institute (WMRI), including demonstration plots for irrigation of citrus, fig, olive and other fruits under sprinkler, bubbler and drip irrigation. However, farmers were not applying deficit irrigation in 2011-2013 when this study was under discussion, despite the profitability of this strategy for citrus growers in other regions. This was because farmers in El Bustan did not anticipate positive effects on productivity or profitability from deficit irrigation, and were aware of no price premiums or other economic incentives that would reward the improvements in fruit quality that they could achieve by using it (Shehata 2014).

Produce is sold to local traders and wholesale markets. Farmers at El Bustan were keen to find contracts through which to access higher value export markets, but did not know how to do this. The majority of Egyptian exports of citrus come from large producers who have Good Agricultural Practices (GAP) certification and contractual relations with European importers. These producers can afford technical support to ensure a quality of fruit that meets with export standards and any other requirements of their trading partners. Without contractual arrangements in place, small

farmers in El Bustan will not pursue GAP or other certification for export and cannot afford to pay for technical support services to enhance water and agrochemical management.

In 2013 with support from USAID, five small producers' associations located in the area around El Bustan received training and support to obtain certification for GAP and a pack-house was established.⁹ They were then able to gain contracts to supply European supermarkets with higher value "Fairtrade" produce. However, they struggled to produce the volume of high quality fruit that European supermarkets require, and are willing to pay a premium for, because they were not accustomed to the grading system for fruit production, and did not have the skills to achieve the higher grades. Of 100 tons harvested by these associations, only 6 tons were of sufficient quality to meet international export standards (UNECE 2012) due to ineffective pre-harvest agronomic and water management practices.¹⁰

The WMRI training and demonstration facility had established demonstration citrus orchards that could be used to offer the technical training that smallholder farmers need in order apply the environmental standards and achieve GAP certification. However, neither the farmers nor the WMRI training and demonstration facility had the resources to launch these activities unassisted, and no support was available to enable them to do so.

5.5 DISCUSSION

Due to climatic differences and seasonal effects, maximizing opportunities to ensure and sustain a high quality and predictable system for year-round fresh fruit production by small farmers in Egypt and other Southern Mediterranean countries could support efforts to promote healthy eating habits and benefit producers on both sides of the Mediterranean. However, this case study has highlighted the difficulties encountered by small horticultural producers in accessing EU markets, in addition to the shared trans-Mediterranean challenges of the changing climate, food price volatility and water stress. The export sector was not accessible without certification, and did not offer direct support for the certification

⁹ See <http://www.smallgrowers-eg.com/smallproducer.htm>.

¹⁰ Personal communication, Manal Saleh, 30 January 2015.

of small farmers. Those that received support from other sources struggled to fulfil the quality grading requirements of their trading partners. Although improving irrigation water management could help to increase fruit quality and reduce pressure on scarce water resources, this requires technical support to be provided to smallholders – which was not possible during the 2011-13 period.

Where fruits are not of sufficient quality for export to European supermarkets, they can sometimes still be exported for juice. There is not any processing infrastructure for packaging juice or other citrus products in the case study area, but the Egyptian juice market has already been observed to be outperforming the relatively higher-priced imports to the Egyptian market, e.g., Saudi and Gulf juice processors (Hamza and Beillard 2012). However, in 2013, leading supermarkets in both Egypt and Europe (including the Metro chain) were still tending to stock fruit juices imported from South Africa. Importing juice products from the lead competitor outside the Southern Mediterranean region, rather than developing processing industries within Egypt, further reduced market opportunities available to Egyptian citrus producers.

Some development programmes have sought to enable small farmers' access to export markets through capacity-building support to enable them to produce the quality of fruit required by European firms, and to organize sufficient volumes to be available at the times when the market is ready to receive it. However, the case study presented in this paper has demonstrated considerable work remaining to be done before smallholders can benefit from export premiums. This particularly concerns the water and agrochemical management skills of the small producers. However, it also concerns the capacities of extension workers to support small producers in enhancing their technical knowledge, and also the local authorities in monitoring environmental conditions in the production areas.

In the future with the proposed Deep and Comprehensive Free Trade Agreements (DCFTAs) between the EU and Egypt, total trade is expected to expand for Egypt, with an estimated increase of some 8% for both exports and imports in the short run and 25% in the long run (Ecorys 2014:14). Exports to the EU are expected to expand by almost 17% in the short run and even 50% in the long run. In the short run, wages for low-, medium- and high-skilled workers are expected to increase by 1.9%, 4.8% and 0.1% respectively. However, in the long run, these expected wage changes may be less positive, and for low-skilled workers they even turn negative. This is mainly due to the expectation that because of

Egypt's higher economic development, less efficient domestic producers in Egypt will be driven out of the market, thereby reducing the demand for low-skilled labour and increasing demand for somewhat more skilled (medium-skilled) workers.

Since 2013, the EU has entered exploratory dialogues on how to deepen trade and investment relations, in particular through the possible negotiation of DCFTAs. For Egypt, such an agreement is anticipated to lead to a contraction in the agricultural sector, a loss of low-skilled jobs in agriculture, and therefore a possible long-term reduction in water use (1.7%), primarily in agriculture (Ecorys 2014:17).

In light of the challenges concerning smallholders' access to export markets, and improving domestic ones, it has been suggested that rather than enabling farmers to increase the sustainability of agriculture in the Southern Mediterranean, they could instead benefit more from employment on the larger commercial farms that can access these markets more easily.¹¹ This is based on the view of the late D.G. Johnson (Univ. of Chicago), who observed that American farmers had been "stuck" in agriculture in the late 1940s and 1950s because their education was poor relative to workers in urban centres so they got hurt by the advancement of larger farms. The American economy was able to "pull" small farmers with marginal-value products into the labour markets of the commercial farm, marketing, rural services, etc. Besides ignoring the higher educational attainments and capacities of the Egyptian farmers, this view disregards the social value of the small farms to the families that they support, and assumes that the market will provide better alternatives – which has not been the experience in the Southern Mediterranean and Egyptian (WFP/IFPRI 2013).

Disruptions and uncertainties affecting the Egyptian economy over recent years may have hampered development efforts, reduced employment opportunities outside agriculture and deterred investments in agricultural research, extension and training programmes, as well as certification systems (IFAD 2012). Without these in place, the idea that small farmers could self-organize and benefit from export price premiums did not appear sufficiently realistic to the farmers, and most of them felt that they could not afford the investments of time and money that would be required. However, this does not mean that the idea of smallholder partic-

¹¹ Reference is here made to an e-mail message received from Prof Roe, University of Minnesota.

ipation in a socially and environmentally sustainable export system in the Southern Mediterranean should be abandoned. The case study presented in this paper indicates scope for the achievement of development objectives, provided that the political and economic situation permits, and that development programmes include increased attention to small farmers' environmental quality conditions and agronomic practices.

5.6 POLICY IMPLICATIONS

Based on the case study and discussion of the challenges faced by small fruit producers in the Southern Mediterranean presented in this paper, the opportunities for Euro-Mediterranean cooperation to develop sustainable agriculture and food systems can be identified:

1. Enhance support for local economic development within Egypt and development cooperation in the Southern Mediterranean. Focusing development programmes on domestic as well as potential international markets would further help to protect Egyptian producers against future international market shocks. In the case study, the lack of awareness on the part of small farmers of the export grading system and price premiums for quality was due to their experiences with local market conditions. If the premium for better quality produce was not present or not reaching the farmers through the local marketing chains, part of the problem may have been awareness-related. Increased discussion and appreciation of fruit quality and value amongst Egyptian farmers and consumers could draw greater attention to the differentials, and improve the prices that farmers can obtain locally for higher quality produce. Including international partners in the discussion of local quality, value and price might also change some perceptions of what is presently considered desirable in export fruit production (i.e., smoothness, uniformity, colour), and enable a richer appreciation of fruit varieties and tastes.

Since farmers also need to be able to sell lower quality produce and cope with occasional gluts in the market, encouragement of fruit drying, juicing, processing and packaging industries could increase smallholders' options for sale of citrus fruit. Further development of domestic processing industries in Southern Mediterranean countries (such as the juice industry in Egypt) could offer a buffer against market price fluctuations caused by a range of factors, as well as creating local employment and

providing more healthy alternatives to soft drinks. Quality standards for these industries and their resource use practices also require informed policy attention.

2. Enhance support for research and extension in Egypt and knowledge exchange in the Southern Mediterranean. Graduate farmers in the case study area have a sufficient level of education and interest to use scientific equipment such as soil probes to test and monitor soil and water quality on their fields (as recommended in Fares and Alva 2000b, 2000a, for further discussion, see also Shehata 2014). However, at present, despite the presence of facilities and a small number of dedicated extension personnel, there is insufficient technical support available from the local authorities, extension services or certification bodies to enable many smallholder farmers to overcome export quality barriers, and market conditions alone do not appear to them to justify the necessary investments.

The findings from the case study suggest that there is scope for regional knowledge exchanges to enable Southern Mediterranean farmers to overcome the fruit quality challenges that they face in accessing EU markets by improving the integrated management of water, soil, chemicals and pests. Potential for increasing the use of deficit irrigation has been described in this paper. Deficit irrigation tends to be combined with increased chemical use. Both research and practical exchanges of knowledge on these topics would be likely to bring shared benefits to European farmers, as well as to those from the Southern Mediterranean because the changing climate in Europe may be creating new challenges and opportunities for European farmers to learn about fruit production under rising temperatures.

For such exchanges to be possible, there is a need for policy and budgetary support to enable the Egyptian extension services to support the exchange and enhancement of knowledge on water and agrochemical management. Research on these topics carried out by Egyptian researchers, as has been referenced in this paper, is of a high quality and worthy of international exchanges. However, some notable constraints in terms of resourcing and research timeframes are also evident. Research on citrus tree production could be significantly boosted through use of inexpensive data-logging equipment that is more widely available in Europe than in Egypt, increased support for early publication by young Egyptian researchers, and a longer overall timeframe for continuation of research on factors affecting the productivity of trees under Egyptian climatic conditions.

3. Enhance environmental quality in Egypt and the Southern Mediterranean. Meeting the phytosanitary and quality standards for export does not depend only on farmers' own management of water and chemicals, but also on those of surrounding land and water users. This requires the alignment of local and national environmental governance and monitoring systems. Policy support required to enable and sustain improvements to the quality and marketability of smallholder horticultural production includes the creation of more effective systems for environmental monitoring and reduction of environmental pressures that may be caused by overuse or contamination of soil and water by some resource users at the expense of others. Although larger producers in the case study area privately monitor and analyse soil and water quality on their own farms for use in ISO, GlobalGAP and other export certification systems, the local authorities are not presently required to collect this information from them and make use of it for the purposes of water and environmental management (King and Salem 2012).

4. Enhance standards for sustainable agriculture in Egypt and the Southern Mediterranean. It has been observed elsewhere that "co-creation in standard-setting and certification may occur when the chain's commercial exploitation of natural resources threatens sourcing in the long term, when local partnerships experienced in environmental protection of the resource become involved in the implementation, and when global and local partnerships interact not only via hierarchically organised value chains, but also via a newly emerging public space" (Vellema and Wijk 2015:1). The first of these conditions can be observed in the case study presented in this paper, but the second condition (local partnerships involved in implementation of standards and certification) appears weak, and the third (public space for global and local partnerships) seems not yet to be occurring, despite the ongoing EU-Southern Mediterranean partnership-building activities.

The finalization of the proposed DCFTA could offer one possible avenue through which to incorporate provisions to strengthen and monitor environmental management in the Southern Mediterranean, together with enhanced trade and accompanying systems for environmental standard setting and monitoring. Alternatively, a high-level policy discussion could be convened to explore other options for improved integration of international trade standards and local/national environmental management systems.

CONCLUSIONS

Small farmers in the Southern Mediterranean face difficulties in accessing markets in the north due to standards, regulations and certification systems, as well as the logistical challenges and challenges of scale. A solution that is often proposed concerns the organization and certification of small farmers to ensure socially and environmentally sustainable agricultural practices, including stewardship of non-renewable groundwater resources. Although farmers' associations in the South have struggled to achieve these ideals, there are opportunities for trans-Mediterranean capacity building, knowledge exchange and awareness-raising to overcome lack of incentives for sustainable agricultural practices.

There is considerable scope to enhance the social and environmental sustainability of the agricultural sector across the region as a whole by adopting sustainable agricultural production and export systems, and improving incentives for good agricultural practices, including improved water and chemical management, while improving local distribution, processing, income generation and food security. Due to climatic differences and seasonal effects, maximizing opportunities to ensure and sustain a high quality and predictable system for year-round fresh fruit production would support efforts to promote healthy eating habits and benefit producers on both sides of the Mediterranean.

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6.

Réhabiliter les systèmes agricoles basés sur la diversification culturelle et l'intégration de l'élevage en vue de favoriser la sécurité alimentaire au Maroc

Mohamed Taher Sraïri et Marcel Kuper

INTRODUCTION

L'agriculture marocaine est engagée – depuis le lancement de la stratégie “Plan Maroc Vert”, au printemps 2008 – dans une course à une productivité plus élevée. En effet, cette stratégie retient comme fil directeur un accroissement marqué des investissements privés pour augmenter les rendements des principales cultures et de l'élevage. Les projections à l'horizon 2020 sont plus qu'ambitieuses car, pour de nombreuses spéculations, il est prévu de doubler, voire de tripler les volumes atteints en 2008. Or, le lancement de la stratégie “Plan Maroc Vert” semble avoir passé sous silence les nombreuses contraintes auxquelles l'agriculture marocaine a toujours dû faire face, notamment un foncier exigu et morcelé, caractérisé par des statuts qui ne se prêtent pas toujours à l'investissement privé (Akesbi 2012), un climat aride à semi-aride sur plus de 93% de la superficie du pays et dont l'aléa risque de s'amplifier (Schilling et al. 2012), ou encore un faible niveau de formation des agriculteurs. En outre, les débuts du “Plan Maroc Vert” ont coïncidé avec les premiers soubresauts des crises alimentaires et financières majeures qui continuent de secouer le monde. Parmi les conséquences de ces évolutions récentes, le renforcement de la volatilité des prix des intrants et des denrées agricoles vivrières, ce qui a affecté la sécurité alimentaire de nombreuses populations à l'échelle de la planète, au risque de déboucher sur des troubles sociaux et politiques marqués (Bellemare 2015). En outre, les écoles de pensée agronomique ont rebondi sur ces crises récentes pour

reconsidérer les politiques agricoles à mettre en œuvre, pour ne pas simplement se contenter de réaliser plus de production, mais également pour assurer la durabilité des choix opérés (Meynard et al. 2001). À cet égard, l'intégration de la polyculture et de l'élevage semble être une option rentable, aussi bien pour se prémunir contre les risques techniques et économiques que pour garantir la pérennité des activités (Ryschawy et al. 2013). Ces constatations contrastent avec la spécialisation disproportionnée en agriculture, et même en élevage, qui ne serait pas aussi durable que la diversification des activités (Veysset et al. 2014). Partant de ces analyses, cet article a pour objectif de comparer les récentes politiques agricoles adoptées par le Maroc aux réalités complexes du terrain et des défis à venir. Pour ce faire, une série de résultats de recherche, issus de différents terrains d'investigation, serviront à illustrer les propos et à canaliser la discussion sur les perspectives futures des options agricoles ainsi que d'approvisionnement alimentaire qui s'offrent au pays.

6.1 VOLATILITÉ DES PRIX AGRICOLES ET VULNÉRABILITÉ FACE À L'ALÉA CLIMATIQUE

La crise alimentaire mondiale de 2008, issue en grande partie de spéculations non régulées sur les marchés financiers, a eu des répercussions majeures dans le monde et aura canalisé les premiers doutes quant aux difficultés d'approvisionnement des villes en aliments de base, surtout dans les pays caractérisés par un stress hydrique prononcé (Qadir et al. 2007). Ses effets sociaux, économiques, voire politiques, ont été ressentis dans de nombreux pays en développement, notamment en Afrique du Nord et dans le monde arabe. Heureusement pour le Maroc, ses impacts ont été relativement mitigés par une conjoncture climatique exceptionnelle: de 2009 à 2013, le Maroc a surtout connu des campagnes agricoles avec une pluviométrie favorable (avec, à l'été 2013, une moisson record de 97 millions de quintaux de céréales – blé dur, blé tendre et orge). Cela a aussi permis d'assurer une augmentation considérable de l'effectif du cheptel et des productions animales (lait et viande). Par exemple, les bovins sont revenus à plus de 3 millions de têtes, nombre qui n'avait plus été atteint depuis le début des années 1980. Malheureusement, la campagne agricole de 2013-2014 a de nouveau rappelé l'extrême vulnérabilité de l'agriculture marocaine face à l'aléa climatique. Une telle fragilité est d'ailleurs mise en exergue par de

nombreuses études qui soulignent que, compte tenu du poids du secteur primaire (agriculture et pêche) dans les fondamentaux économiques du pays (jusqu'à 17% du PIB et plus de 40% des emplois), l'exacerbation de l'incertitude climatique aurait des conséquences majeures sur ses équilibres sociaux et politiques (Schilling et al. 2012; Agoumi et Debbarh 2005). Lors de la dernière campagne agricole 2013-2014, de faibles niveaux de pluies, très tardives et mal réparties dans l'espace et dans le temps, ont entraîné à l'été 2014 une baisse drastique des quantités de grains moissonnés ainsi que du disponible en fourrages (notamment dans les zones d'élevage pastoral), entraînant une chute sensible des prix du bétail.

Les revers de la production céréalière et de l'élevage qui lui est inféodé, en 2013-2014, ont coïncidé avec une reprise inattendue de la volatilité des prix des intrants, que de nombreux économistes s'accordent à reconnaître comme le fait le plus marquant des évolutions récentes des marchés internationaux (Garnotel 2014). Par conséquent, dans de nombreuses filières d'approvisionnement en produits alimentaires, les prix de revient ne sont plus stables et surtout orientés à la hausse, lorsque les prix au départ de la ferme stagnent, grevant les marges des exploitations. Ainsi, dans certains élevages bovins, de telles tendances ont débouché logiquement sur des productions à perte, amplifiant les tensions au sein de la chaîne d'approvisionnement laitier et cristallisant le débat autour de la question de la répartition de la valeur entre les opérateurs: éleveurs, ramasseurs, industriels de la transformation et revendeurs (Sraïri et al. 2013a). En fait, à l'instar d'autres contextes d'élevage, notamment en Europe, ces conflits sont en grande partie issus de la volatilité des prix des intrants mais aussi de la stagnation des prix du lait «départ ferme». Ces évolutions peuvent déboucher sur la déprise de l'élevage, voire son abandon (Jürgens and Pappinga 2013). Par conséquent, à l'échelle du Maroc, et en dépit de la dynamique insufflée par le "Plan Maroc Vert", l'année 2013 aura été la première où la production de lait bovin au Maroc aura chuté d'au moins 10%, après le niveau record de 2,5 millions de tonnes atteint en 2012.

6.2 LE TRAVAIL AGRICOLE: DE L'ABONDANCE À L'EXACERBATION DES TENSIONS

Les revers de la production céréalière dans les zones d'agriculture pluviale, ainsi que de l'élevage laitier, ont été exacerbés par les nouvelles

difficultés qui se cristallisent autour de la question du travail agricole. Longtemps considéré comme un facteur abondant et peu onéreux (lorsque la journée de travail durait au moins 8 heures entières et se négociait à 50 DH), le marché de la main-d'œuvre agricole a connu au cours de ces dernières années, à l'instar des autres intrants, des tensions palpables. À l'échelle mondiale, l'astreinte de travail dédié à l'élevage est partout perçue comme l'une des difficultés majeures auxquelles aussi bien les éleveurs que la recherche doivent s'atteler pour en diminuer la pénibilité et les charges et proposer des voies alternatives d'allègement des contraintes (Dedieu et Servière 2012). Au Maroc, cette astreinte de travail relatif à l'élevage semble encore être supportée comme un «mal nécessaire» par les membres des familles paysannes, surtout par la majorité des exploitations de petite taille, malgré des rémunérations faibles et des tâches routinières pénibles, du fait des rôles majeurs qu'assurent les troupeaux: thésaurisation des excédents des années fastes, restitution de fumier aux sols pour l'entretien de leur fertilité, dépassement des périodes de difficultés de trésorerie par les ventes d'animaux, etc. (Sraïri et al. 2013b). Toutefois, pour les travaux associés à l'entretien des cultures de rente (arboriculture, maraîchage), la disponibilité de la main-d'œuvre est devenue instable, remettant en cause la réussite de certains chantiers, surtout au moment des pics de travail (semis, plantation, entretien et récolte). De surcroît, même les compétences requises pour certaines opérations pointues ne sont pas toujours au rendez-vous, compromettant la réussite des productions. Par rapport à cette question des besoins en travail, les céréales et les légumineuses alimentaires en pluvial s'avèrent d'ailleurs particulièrement compétitives en cas d'années climatiques favorables, lorsque les rendements sont satisfaisants, du fait de leurs exigences limitées dues à la mécanisation poussée des chantiers qu'elles nécessitent. En outre, leurs prix «départ ferme» sont relativement stables et parfois mêmes garantis par les pouvoirs publics, ce qui assure des rémunérations horaires du travail qui peuvent souvent être meilleures que celles des denrées horticoles (fruits et légumes), dont les cours sont très variables. Ainsi, en 2014, les cours des principaux fruits (pommes, agrumes, pêches) ont été marqués par des baisses significatives et parfois inexpliquées par rapport aux années précédentes, amenant les associations de producteurs à exiger un arbitrage des pouvoirs publics pour défendre les intérêts des arboriculteurs. Ces spéculations, comme d'ailleurs les productions maraîchères (pommes de terre, haricots, tomates, oignons, etc.), exigent des volumes de travail très élevés que ne peuvent assumer,

à eux seuls, les membres des familles d'agriculteurs, ce qui oblige à recourir à de la main-d'œuvre extra-familiale. Cela ravive les tensions sur sa disponibilité en période de pointe de travaux (installation, entretien et récolte des produits horticoles) et peut même compromettre la réussite de ces cultures. On le constate, notamment, pour les cultures destinées à l'export, comme dans le bassin du Souss-Massa, où les conflits sociaux issus des aspirations des ouvriers agricoles à des revenus meilleurs et plus stables ont entraîné la cessation d'activités et la remise en cause de contrats signés avec la grande distribution à l'étranger.

6.3 L'ENJEU DE LA DURABILITÉ FACE À DES RESSOURCES HYDRIQUES MENACÉES

Au-delà de ces considérations sociales et économiques, les évolutions récentes de l'agriculture marocaine ont aussi révélé l'impératif de prendre en compte la durabilité écologique des choix opérés. À cet égard, la question des disponibilités hydriques est devenue d'une brûlante actualité et l'on peut affirmer qu'elle le sera encore plus à l'avenir, en se basant sur les prévisions météorologiques qui indiquent une incertitude climatique accentuée pour le Maroc (Parry et al. 2004). En effet, dans de nombreux bassins hydrauliques du pays, notamment dans les zones les plus arides du sud et de l'est, où l'irrigation est une condition nécessaire à la garantie de productions agricoles pérennes, les volumes d'eau renouvelable sont souvent totalement mobilisés (Agoumi et Debbarh 2005). Ceci est le résultat d'une demande en eau en constante augmentation due à des objectifs irrationnels d'accroissement des rendements et des surfaces mises en cultures, parfois avec des plantes très exigeantes, à des périodes où il ne pleut pas: le cas des agrumes ou encore des pommiers étant le plus manifeste, puisque ces deux types d'arbres arrivent en fruit à l'automne, ce qui suppose de les irriguer en plein été. Un pareil constat est fait également pour la luzerne, culture fourragère stratégique pour des troupeaux à niveau élevé de production (les bovins laitiers, notamment) mais dont le pic d'activité végétative correspond à l'été, avec des températures souvent supérieures à 40°C (Le Gal et al. 2009). Face à cet état de fait, les solutions adoptées tiennent en deux recettes, supposées régler les problèmes: le pompage dans les nappes souterraines et la conversion des systèmes d'irrigation vers le goutte-à-goutte. Théoriquement, ces

mesures semblent séduisantes, mais dans la réalité, elles sont loin d'être une panacée. Le pompage dans les nappes a atteint des proportions inquiétantes, et dans plusieurs zones elles sont en très forte baisse, ce qui compromet la pérennité des systèmes de production installés, allant jusqu'à la fermeture totale de bassins de production si des instances de régulation drastique ne sont pas mises en œuvre (Kuper et al. 2014), à l'instar de ce qui a été révélé dans le sud de l'Espagne voisine (Berbel et al. 2013). En outre, la reconversion de l'irrigation gravitaire au goutte-à-goutte n'est pas toujours synonyme de diminution des consommations d'eau, lorsqu'elle ne s'accompagne pas d'une formation adaptée à son utilisation. Or, les encouragements sous forme de subventions à des plafonds équivalents jusqu'à 100% de l'investissement consenti pour l'équipement en goutte-à-goutte ont simplement accéléré le rythme d'adoption de ce matériel, mais sans aucune garantie sur sa maîtrise effective. D'ailleurs, de récents travaux de recherche menés dans la plaine du Saïss (centre-est du Maroc, entre Meknès et Fès) démontrent sans équivoque aucune que dans plusieurs exploitations, le goutte-à-goutte ne concourt pas à une diminution des usages d'eau, et il n'améliore pas non plus l'efficacité de l'irrigation (Benouniche et al. 2014). Il sert plus à intensifier la production et à étendre la superficie irriguée, entraînant une pression accrue sur la nappe et, dans certains cas, à légitimer un statut social particulier de l'agriculteur au sein de sa communauté locale (Quarouch et al. 2014). Toutefois, notons une réelle plasticité dans l'appropriation des techniques d'irrigation au goutte-à-goutte par les exploitations agricoles, notamment familiales avec des capitaux et une taille réduits. Compte tenu de la désertion du terrain du conseil agricole, induite par le désengagement des services étatiques et par des initiatives souvent intéressées des fournisseurs d'intrants pour écouler leurs marchandises, les exploitations familiales en sont arrivées à constituer leurs propres réseaux pour le dimensionnement de leur système d'irrigation (Ameur et al. 2014), ou encore pour l'acquisition du bagage technique nécessaire à l'amélioration de la gestion de leur cheptel bovin laitier (Faysse et al. 2012). De telles initiatives peuvent être assimilées à de la domestication des techniques nécessaires à l'amélioration des performances, et elles entraînent des tentatives de bricolage en vue d'assurer la résilience des systèmes agraires dans leur intégralité.

Outre le pompage dans les nappes et le goutte-à-goutte, qui véhiculent avec eux, comme on l'a vu, des marges de manœuvre limitées qu'il est important de maîtriser, est apparu aussi, récemment, un discours prônant

le dessalement de l'eau de mer, que certains érigent comme le miracle pour résoudre le problème du stress hydrique. Manifestement, les porteurs de ce discours semblent éloignés des réalités de terrain et des contraintes de l'économie de production. Car à près de 10 DH le m³, lorsque les frais d'amortissement des centrales de désalinisation sont comptabilisés, l'eau ainsi obtenue ne peut être valorisée de manière rentable que par des spéculations à très haute valeur ajoutée, notamment les primeurs (tomates, melons, etc.) destinées à l'exportation. Même les agrumes ou l'olivier ne peuvent d'ailleurs s'accommoder de tels niveaux de prix.

Les contraintes induites par la rareté de l'eau au Maroc intiment à l'avenir d'accorder davantage d'intérêt à la valorisation de cette ressource par les productions agricoles et même par d'autres opérateurs économiques. Compte tenu de la compétition pour l'eau entre différents secteurs d'activité (agriculture, tourisme, industrie, eau domestique, etc.), les prévisions futures d'évolution des besoins imposent des arbitrages qui risquent d'être complexes. Dans le domaine de l'agriculture, responsable de plus de 85% des retraits annuels d'eau renouvelable, des décisions courageuses devront être prises. Elles sont du ressort d'une valorisation optimale d'abord des précipitations, mais aussi des eaux souterraines et de surface, pour garantir la pérennité des systèmes agraires en activité, la diversité des productions vivrières et de rente qui ont traditionnellement été associées à la renommée du pays et de ses terroirs agricoles, ainsi que de sa gastronomie. Pour ce faire, la révision des choix d'assolement par région devra être adoptée, non seulement dans l'optique de l'usage durable des ressources hydriques, mais aussi pour la sécurisation des revenus des agriculteurs, ainsi que pour l'approvisionnement en produits alimentaires de base.

6.4 DÉPENDANCE VIS-À-VIS DE GÈNES IMPORTÉS

Les exemples de transferts de technologies supposés alléger les problèmes de la rareté de l'eau, comme le goutte-à-goutte ou le dessalement, s'avèrent en fait peu concluants dans la réalité et on les rencontre également dans le domaine de l'élevage. En effet, dans le discours techniciste prégnant, l'amélioration génétique est une condition indispensable, voire prioritaire pour l'essor de la profession. Or, dans les faits, le pays importe annuellement des milliers de vaches de races laitières (notamment, la

Holstein et la Montbéliarde) avec des potentialités de rendements très élevés (au moins 7000 kg de lait par an), mais sur le terrain, elles affichent des niveaux de production limités, souvent inférieurs à 3000 kg de lait par an (Sraïri et al. 2009a). Ce décalage s'explique d'abord par une approche réductrice qui considère que l'action sur une seule variable (en l'occurrence la structure génétique du cheptel bovin) est suffisante pour lever les contraintes. Or, le développement laitier dans toute la région de l'Afrique du Nord est nettement plus complexe, et il s'inscrit dans "le temps long" (Bourbouze 2002), où il faut d'abord garantir, avant même l'amélioration génétique du cheptel, les conditions de l'environnement où il va évoluer, et plus particulièrement des disponibilités alimentaires suffisantes et équilibrées pour subvenir à ses besoins. En effet, des suivis d'élevages le long de l'année démontrent les chutes marquées de l'offre alimentaire lors de la période estivale, y compris dans les zones irriguées. Cela se concrétise aussi bien par la dépréciation des quantités de matière sèche (MS) ingérées effectivement par les vaches laitières, que par les teneurs en nutriments (énergie nette et protéines) dans les rations. La conséquence principale de ces évolutions consiste en une chute rapide des rendements laitiers enregistrés par vache, encore plus évidente pour les femelles à haute potentialité de production, comme celles de races spécialisées, surtout lorsqu'elles sont à leur pic de lactation (Sraïri et al. 2015). En outre, ces carences alimentaires ont des répercussions sur la reproduction des vaches avec l'allongement de l'intervalle vêlage-vêlage, ce qui détériore davantage les performances économiques des exploitations agricoles (Sraïri et Mousili 2014). En parallèle, les évolutions récentes des options dans le domaine de l'élevage ont également été accompagnées de la promotion du croisement industriel (races à viande x races à lait ou locales) dans les troupeaux bovins à partir de 2008, avec le lancement de la stratégie "Plan Maroc Vert". De tels choix renseignent aussi sur la volonté d'augmenter la production de viande, moyennant le croisement comme voie d'amélioration génétique, surtout à travers l'insémination artificielle. À cet égard, les pouvoirs publics ont même adopté le jeu des subventions pour encourager la diffusion de ces croisements, en promulguant une prime à la naissance de 4000 DH par veau. Les conséquences de ces interventions ont rapidement entraîné l'augmentation des niveaux de production en viande bovine, qui se serait toutefois principalement réalisée au détriment de la production de lait. En effet, les exploitations agricoles confrontées à la stagnation du prix du lait "départ ferme" et à la tentation induite par les subventions sur les veaux croisés ont vite

fait de se rabattre sur la viande, comme produit plus rémunérateur. Cela s'est produit dans de nombreux élevages qui ont alloué davantage de ressources alimentaires aux animaux en croissance plutôt qu'aux vaches en lactation (Sraïri et al. 2009b). Malheureusement, l'année climatique défavorable de 2013-2014 a vite fait de révéler les failles de ce genre de choix, puisque outre la chute des niveaux de production de lait, qui met en péril toute la dynamique de croissance de la filière lait, les cours du bétail se sont effondrés, dépréciant les gains escomptés du croisement industriel. Aussi, de telles observations imposent d'ailleurs de considérer à nouveau la pertinence de l'obstination d'amélioration génétique, dans un pays qui, aujourd'hui, n'a pratiquement plus d'emprise sur le patrimoine animal qui assure l'essentiel de ses approvisionnements en lait, viandes et œufs: les bovins laitiers sont importés ainsi que les semences d'insémination, aussi bien pour le lait que pour le croisement terminal (lait x viande), tout comme le sont les gènes avicoles (reproducteurs pour les souches de poulet de chair et de poules pondeuses). Par conséquent, pour que la volonté permanente d'amélioration génétique du cheptel soit effectivement couronnée de succès, il est impératif qu'elle soit couplée à l'amélioration des conditions d'alimentation des troupeaux, ce qui revient à encourager un encadrement zootechnique de proximité des exploitations d'élevage. Cela relève pour l'instant quasiment de l'utopie, d'autant que les services techniques traditionnels de l'État, en charge de la vulgarisation agricole, ont vu leurs activités fortement réduites, à cause des politiques d'ajustement structurel qui ont tari les fonds nécessaires à ce genre d'interventions.

Dans le secteur horticole, les mêmes constats sont relevés. Les exportations marocaines les plus significatives, notamment de tomates ou de melons, sont réalisées à partir de variétés qui ne sont pas originaires du pays. C'est aussi le cas pour les intrants nécessaires à ces productions (substrats édaphiques comme la tourbe, engrais foliaires, pesticides, etc.), ce qui réduit très fortement la plus value engendrée par ces exportations. Pire, les cours de ces produits sont très volatils et déterminés davantage par les marchés acheteurs, ce qui amplifie les risques économiques pour de très nombreux opérateurs dépendant de ce secteur d'activité (entreprises horticoles spécialisées, ouvriers agricoles, fournisseurs d'intrants, etc.). C'est ce qu'a révélé la campagne d'exportation 2013-2014 des agrumes où la concentration des efforts sur le marché russe a engendré des prix de vente peu rémunérateurs. En outre, la dynamique de promotion des plantations des vergers d'agrumes, induite par les subventions prévues par le "Plan Maroc Vert", ne semble pas avoir été suivie des

mesures d'accompagnement nécessaires à l'écoulement des surplus de production: diversification des marchés étrangers, mise en place d'une industrie locale de traitement des fruits (jus, confitures, etc.) et développement en parallèle du marché local.

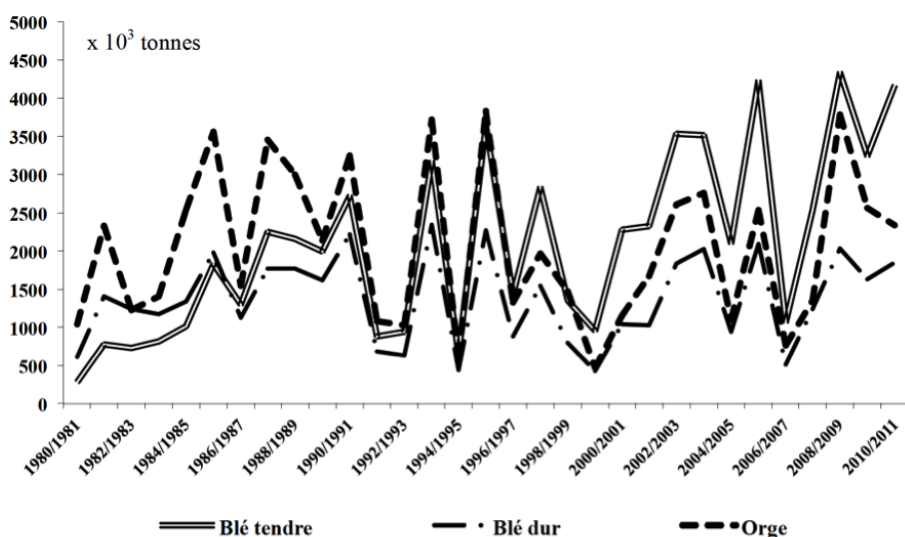
6.5 STAGNATION DES RENDEMENTS DES CULTURES VIVRIÈRES ET AUGMENTATION DES IMPORTATIONS

La conséquence des choix effectués, avec la priorité aux cultures d'exportation en irrigué, et les lacunes de la recherche-développement pour les céréales et les légumineuses en pluvial ont entraîné une aggravation des déficits de la balance des paiements pour les produits alimentaires. Pour la seule année 2013, les importations ont ainsi atteint, selon l'Office des Changes, le niveau de 2,7 millions de tonnes de blé tendre (soit près de 82 kg par habitant et par an), 1,8 million de tonnes de maïs grain destiné en priorité à l'alimentation de la volaille et du bétail, ainsi que 53000 tonnes de beurre et 13500 tonnes de fromage, sans oublier 10400 tonnes de viande bovine congelée et même 30000 tonnes de dattes. Enfin, les importations du Maroc en produits alimentaires représentent près de 3,1 milliards d'euros en 2013 (environ 93,2 euros par habitant par an), dominés à plus de 44,9% par les céréales, le sucre et le thé. En valeur, les importations totales alimentaires correspondent en fait presque aux 2,9 milliards d'euros d'exportations des mêmes produits (Office des Changes 2013). Ces dernières sont d'ailleurs dominées par les produits halieutiques (près de 45,0% de la valeur totale), suivis de la tomate et des agrumes (respectivement 10,8 et 10,2%). Certes, l'accroissement démographique et l'urbanisation se sont accompagnés de besoins alimentaires sans cesse en augmentation, aussi bien en quantité qu'en qualité, mais y subvenir par un recours démesuré aux importations a des effets négatifs sur la balance des paiements. Pire, les choix stratégiques ne semblent pas converger vers un allègement de la dépendance alimentaire.

Outre l'augmentation marquée des importations alimentaires, la production interne en produits vivriers de base, notamment les céréales et les légumineuses, est en stagnation certaine. Ne pouvant pas compter sur l'extension de la surface emblavée au vu des contraintes climatiques et de fertilité des sols, le Maroc devrait concentrer ses efforts sur l'amélioration des rendements, surtout dans les zones les plus favorables. Or, les

études les plus récentes confirment que les rendements moyens des trois principales céréales (orge, blé dur et blé tendre) plafonnent à des niveaux très éloignés de leurs potentiels, y compris lors des années relativement pluvieuses. Ainsi, les évolutions des niveaux annuels de production des trois céréales révèlent une tendance en “dents de scie” (Figure 6.1), très fortement déterminée par les volumes de précipitations.

Figure 6.1. Évolutions des productions de blé tendre, blé dur et orge au Maroc (1980/1981-2010/2011)



ONICL, 2012.

En fait, à l'image des décalages entre potentiels et performances réelles relevées dans le domaine de l'élevage bovin laitier, les céréales et légumineuses souffrent aussi des difficultés à diffuser auprès de la majorité des exploitations agricoles les paquets technologiques élaborés par la recherche agronomique: du travail du sol, au choix de semences sélectionnées adaptées à la diversité des zones agro écologiques, en rajoutant les éléments d'une fertilisation raisonnée selon les types de sols et les précédents culturaux, et sans omettre une lutte phytosanitaire efficace (Ouattar et Ameziane 1989). En outre, bien que les céréales représentent annuellement plus de 50% des assolements au Maroc, elles ont longtemps souffert, du moins dans les politiques officielles et même dans les programmes de recherche-développement, d'une sorte de discrédit, étant donné leur faible compétitivité par rapport aux denrées importées

de pays avec un avantage comparatif pour ces cultures (Europe, Ukraine, Amérique du Nord). Dans les années 1990, des moissons importantes de grains de céréales étaient même parfois mal considérées pour les équilibres financiers de l'État, car ce dernier garantissait un prix de vente aux agriculteurs supérieur au prix international. Ces temps semblent cependant aujourd'hui révolus, et avec la volatilité des cours des céréales et des légumineuses alimentaires (fève, haricot sec, lentille, et pois chiche principalement) il est même à présent certain qu'il faudrait maîtriser la production locale de ces denrées de base, non seulement pour améliorer la sécurité alimentaire du Maroc, mais aussi en raison des effets d'accompagnement de ces spéculations sur toute la croissance agricole et même économique du pays.

6.6 UNE AGRICULTURE DIVERSIFIÉE POUR UNE MEILLEURE SÉCURITÉ ALIMENTAIRE

Par ailleurs, la discrimination entre les zones irriguées et pluviales, avec ce qui s'ensuit comme différentiel dans les aides agricoles, a accentué la rupture entre les deux domaines. Or, dans la réalité et surtout depuis l'extension rapide des superficies irriguées par pompage privé, ils sont intimement liés, notamment au sein de l'exploitation agricole, qui gère souvent des parcelles en "bour" et d'autres irriguées. C'est de leur complémentarité que l'exploitation assure d'ailleurs ses arrières: les productions de céréales et de légumineuses vivrières à des fins d'alimentation du groupe familial et dont les résidus (pailles, chaumes, son, fanes, feuilles et tiges et écarts de triage de grains) contribuent à l'affouragement du cheptel; ce dernier ayant des rôles de diversification des sources de revenus et de thésaurisation des excédents des années fastes, souvent oubliés. Rappelons également les retours de fertilité aux sols sous forme de fumier, indispensables à la restauration de leur teneur en matière organique et contribuant à assurer la durabilité des systèmes agraires. En outre, les productions du domaine irrigué, moins aléatoires et ayant une valeur ajoutée consistante, assurent des revenus meilleurs et mieux répartis dans l'année, lorsque les termes de leur écoulement sont favorables ... De même, la ségrégation entre une agriculture spécialisée, incarnée par des fermes de très grande taille qui ont été les principales bénéficiaires des allocations de l'État ainsi que de son patrimoine foncier, et l'exploita-

tion familiale de petite taille, largement majoritaire de par ses effectifs et sa superficie, mais encore considérée par le discours ambiant comme arriérée, n'a pas œuvré au renforcement de l'intégration des activités agricoles. Ce sont sûrement les excès de ce clivage selon la taille, même à l'échelle mondiale, qui ont précipité un mouvement de réhabilitation de l'exploitation familiale, puisque l'année en cours (2014) lui a été dédiée par la FAO. Il faut d'ailleurs rappeler à ce propos que l'exploitation agricole familiale demeure à ce jour un acteur incontournable, à l'échelle de la planète, de l'approvisionnement des marchés en produits vivriers de base (riz, blé, café, thé, etc.). Dans un pays comme le Maroc, ce type d'exploitation demeure aussi crucial pour la fourniture des produits animaux, des légumes, des céréales, etc. Toutefois, l'essor de l'exploitation familiale devra composer avec les nombreuses contraintes qu'elle doit affronter et qui risquent de s'amplifier sérieusement dans le futur proche: accaparement foncier, atteintes à l'environnement physique, faiblesse et irrégularité des rémunérations au vu de l'astreinte de travail exigé par rapport à d'autres secteurs d'activité, etc. (Sourisseau 2014). Celles-ci représentent d'ailleurs autant de défis qu'auront à relever les organismes de soutien à l'agriculture ainsi que la recherche agronomique, et ce, aussi bien à l'échelle locale que planétaire. Il reste toutefois à garantir que le regain actuel d'intérêt pour la petite exploitation agricole ne demeure pas de l'ordre du slogan et qu'il se traduise dans les faits par des politiques qui lui soient adaptées, ainsi que par la mobilisation de moyens suffisants pour en soutenir l'essor.

CONCLUSION

Les évolutions récentes de l'agriculture au Maroc démontrent que le simple indicateur des volumes produits n'est pas suffisant pour en évaluer la trajectoire. D'autres références relatives aux performances économiques et de durabilité sont tout aussi importantes. À cet égard, et en application de tendances mondiales, l'intégration de l'élevage et des cultures doit être aujourd'hui considérée comme une condition préalable indispensable pour garantir les bases de la pérennité des systèmes agraires. De plus, l'investissement dans des ressources humaines capables de s'approprier intelligemment des transferts de technologie est fondamental. Il devrait s'imposer en priorité par rapport aux subventions d'équipements

agricoles dont les impacts réels ne sont pas toujours évalués finement. Outre les moyens matériels mobilisés, il faut restituer aux évaluations systémiques toute leur place dans l'appréciation des productions. Ainsi, dans un pays à climat surtout semi-aride, voire aride, le rôle central des cultures pluviales doit être renforcé, y compris au sein des exploitations agricoles pratiquant l'agriculture irriguée. À ce titre, les céréales et les légumineuses vivrières continuent de représenter plus de la moitié des assolements, car ce sont les cultures les plus adaptées à la réalité climatique du pays (précipitations concentrées uniquement en automne, hiver et début de printemps). Elles valorisent au mieux l'eau pluviale et s'accompagnent de revenus considérables par unité de temps de travail humain; autre contrainte majeure à gérer dans les systèmes agraires. Les céréales ainsi que les légumineuses servent aussi de support à l'élevage, par les coproduits qu'elles élaborent, outre les grains. Aussi devraient-elles être suffisamment encouragées par des politiques de prix pertinentes aussi bien en amont (approvisionnements en intrants) qu'en aval (valorisation et vente des grains) des chaînes d'approvisionnement. En outre, la promotion de tous les paquets technologiques nécessaires à leur réussite en pluvial (amélioration variétale, travail du sol, fertilisation, irrigation d'appoint, etc.) s'avère indispensable pour améliorer les rendements et récupérer des manques à gagner. De plus, le rôle clé de l'élevage comme banque de l'exploitation et aussi comme support de garantie de sa pérennité, doit être renforcé. Cela passe aussi par une amélioration des termes de son alimentation suffisante et équilibrée, ce qui suppose de réhabiliter les mesures prévues pour la production de fourrages, et la généralisation des techniques de rationnement du bétail. Tout simplement, car la volatilité des prix des matières importées a démontré que les solutions de facilité basées sur les usages massifs de concentrés pour alimenter les ruminants étaient dépassées. Par conséquent, la promotion de l'autonomie fourragère conjuguée à la minimisation des gaspillages de nutriments est incontournable pour garantir la rentabilité et la durabilité de l'élevage. Par ailleurs, la volatilité des prix agricoles souligne également la nécessité pour le Maroc de prévoir des relations innovantes avec son proche voisinage pour relever les défis agricoles et alimentaires. En effet, le monde méditerranéen est dans son ensemble impacté par le stress hydrique et une incertitude climatique accrue, et le Maroc aurait fort à gagner à établir des partenariats institutionnels et de recherche-développement avec les pays euroméditerranéens pour s'appliquer à trouver des solutions aux conséquences de ces problématiques.

Enfin, la réflexion sur les évolutions de l'agriculture au Maroc et les succès et autres limites des expériences en cours démontre la complexité des phénomènes analysés et leurs aspects dynamiques. Au-delà de la simple évocation de l'augmentation des volumes produits, la réflexion doit également prendre en compte l'efficacité d'usage des moyens mobilisés, ainsi que la pérennité des choix opérés. De plus, l'appropriation des technologies et la maîtrise de leur utilisation par la profession agricole sont une condition préalable indispensable pour se prononcer sur les investissements consentis. Or, les diagnostics systémiques entrepris jusqu'ici dans de nombreuses exploitations démontrent que le saut quantitatif nécessaire pour des ressources humaines mieux formées, aptes à relever les multiples défis technologiques qui guettent l'agriculture marocaine, est encore loin d'avoir été accompli. Enfin, eu égard à la vulnérabilité de l'agriculture par rapport à l'aléa climatique et du fait de la complexité des variables qui en déterminent les performances, tant techniques qu'économiques, il est évident qu'elle ne peut être érigée comme la locomotive principale du développement harmonieux du pays. Ses rythmes de croissance instables ne peuvent garantir une création de richesse suffisante et continue, imposant de trouver des voies alternatives. Cela renvoie à la nécessité de choix courageux en termes d'enseignement et de formation pour que la population rurale au Maroc ait accès à d'autres sources de revenus que ceux, très aléatoires, de l'agriculture.

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7.

Small Farmers' Collective Action Problems in Crop Switching and Adopting Higher Food Standards: How Could the EU Help Foster Sustainable Development?

Omer Gokcekus and Clare M. Finnegan

INTRODUCTION

Small-poor farmers face a host of barriers to successful agri-business. Two of these obstacles – water stresses exacerbated by climate changes and the demanding higher health, quality and environmental standards of the EU – have proved particularly challenging for small-poor farmers in the Euro-Mediterranean area (McCarthy et al. 2001, Mendelsohn 2008, Padgham 2009, Maertens and Swinnen 2008, Gokcekus et al. 2014). As water shortages have decreased outputs, higher standards have increased production costs. Entrapped by these constraints, the poverty vulnerability of these farmers is increasing as they are progressively unable to access markets in the EU and other developed countries.

In order to mitigate the deleterious effects of climate change and water shortages, farmers can enact crop switching. However, successful crop switching requires the ongoing implementation of existing knowledge and technology by the farmers themselves. It is a highly technical solution and requires substantive amounts of adaptive capacity (Kurukulasuriya and Mendelsohn 2008, Leclère et al. 2013). Similarly, adapting to the EU's constantly changing, complex, and advanced production and food safety standards requires significant technical and scientific knowledge, as the farmers must establish effective control mechanisms, develop certification schemes, and validate food labels.

Individually, small-poor farmers lack the adaptive capacity required for both crop switching and adopting higher food production standards.

These adaptations are especially unobtainable to this group due to the interplay between the group's constrained resources and the collective action problem. The costs associated with the provision of public (or collective) goods tend to be prohibitive to individual actors. Thus, the procurement of public goods often requires collective action. However, not only does collective action have inherent challenges – such as those associated with limiting free-ridership and inspiring widespread participation across large groups – but in the case of small-poor farmers, even a relatively large collective may not have enough resources to accomplish the necessary public good provision (Olson 1965, Ostrom 1990, Nagendra 2011, Kameda et al. 2011).

We claim that small-poor farmers are acutely constrained by a lack of financial and technical resources, their large numbers, and the highly technical and complicated nature of both crop switching and product standard implementation. As such, they are particularly vulnerable to the classic collective action problem. We believe that the collective action problem plays an important role in determining small-poor farmers' adaptive capacity, yet is an often overlooked issue. Quantitative assessments and agricultural policy simulations generally neglect or take for granted adaptive capacity; in the case of small-poor farmers, inhibited adaptive capacity can constitute a serious constraint to development. Its improvement via programs that alleviate the collective action problem can lead to significant enhancements in small farmer responses to traditional policy parameters such as tariffs, technological improvements, investment in resources, etc.

Accordingly, in this study, we detail how the EU could help small-poor farmers in the Euro-Mediterranean area solve their collective action problems, enhance their adaptive capacity with crop switching and standard upgrading, and create sustainable development. Specifically, we analyse and derive lessons from two recent cases from Cyprus: the health, quality, and packaging standards upgrading performed by Turkish Cypriot beekeepers, and the switch to pomegranate farming by Turkish Cypriot citrus farmers. In both cases, third parties helped local actors overcome the collective action problem. They promoted training and educational programs, funded equipment upgrades, and ensured that development would be sustainable by supporting the adoption of quality-standards certificates. We discuss the many challenges these third parties faced – technical, political, social, and legal – and how domestic institutions such as producers associations, chambers of commerce, and cooperatives

were able to build on these third parties' initial inputs of adaptive capacity in order to overcome the collective action problem and create lasting economic development.

7.1 MAIN ISSUE: COLLECTIVE ACTION PROBLEM

Post-conflict developing countries, like Cyprus, provide the perfect environment for the classic collective action problem, since the financial and technical resources of local actors are often quite constrained. Thorp et al. (2005) elaborate upon the difficulties that the poor, who are often the majority group in post-conflict developing countries, face in overcoming this challenge. Specifically, they identify the following factors: 1) lack of assets; 2) lack of market access; 3) lack of rights; 4) absence of leadership; and 5) dependence on external intervention (Thorp et al. 2005:30-31). Poteete and Ostrom (2004:9) cite the lack of adequate information as being particularly problematic when trying to solve the collective action problem in regards to ecological issues, specifically forest management, although inadequate information could easily be an issue for any resource development. An extension of Olsen's (1965:36) argument suggests that groups with many members and few resources may have particular difficulty with providing "an optimal amount of the collective good" or "even a minimal amount of such a good".

Due to the aforementioned issues, the collective action problem proved particularly detrimental to the economic development of Turkish Cypriots living in the northern part of Cyprus (north Cyprus). Until Cyprus's ascension to the EU, north Cyprus faced severely limited market access due to the absence of legal rights stemming from the region's internationally unrecognized status. Following the Republic of Cyprus's EU membership, Turkish Cypriot agri-businesses were theoretically able to enter European markets after a 30-year hiatus. However, for some time they were not able to take advantage of this opportunity. Their products, such as honey, did not meet the EU's standards; and their main traditional exports, citrus products, were not cost competitive due to Cyprus's changed environmental conditions. They suffered from asset constraints, both monetary and educational, and a lack of institutions and leadership. Their limited resources constrained their ability to act unilaterally (without external assistance). To remedy these issues, external actors implemented a series

of programmes designed to bolster the adaptive capacity of the agriculture industry in north Cyprus.

7.2 BACKGROUND: CYPRUS & ITS GREEN LINE REGULATION

For 307 years, between 1571 and 1878, Cyprus was under Ottoman rule. In 1878 Cyprus was acquired by Britain, but it remained under the nominal sovereignty of the Ottoman Empire until its formal annexation in 1914. In 1925, Cyprus was officially declared a British crown colony.¹ Following World War II and the ensuing wave of decolonization, Cyprus gained its independence in 1960. Under the new Republic of Cyprus's constitution, the Greek and Turkish Cypriot communities (which had a history of inter-communal conflict) were supposed to participate in a governmental power-sharing (Ker-Lindsay 2011:25). Additionally, the three mother-states of Cyprus – Greece, Great Britain, and Turkey – were granted guarantor rights and tasked with prohibiting “all activity having the object of promoting directly or indirectly either the union of the Republic of Cyprus with any other State, or the partition of the Island” (No. 5475. Treaty of Guarantee Article IV).

Cyprus's mother-states were not impartial parties to the tension between the Greek and Turkish Cypriot communities and failed to uphold their commitment to an unaligned island. Both Greek and Turkey supported efforts to disenfranchise the other ethnic community. As a result of this societal divide and the ensuing violence, Cyprus has been partitioned by a UN buffer zone since 1974, which is often referred to as the “Green Line”.² The establishment of the Green Line effectively separated Cyprus into two *de facto* countries³ – the Republic of Cyprus and north Cyprus⁴ – which then pursued divergent development paths. The

¹ Abbreviated recent history of Cyprus is summarized from the BBC's web page, http://news.bbc.co.uk/go/pr/fr/-/2/hi/europe/country_profiles/1021835.stm.

² See “Cyprus country profile”, in *BBC News*, updated 23 December 2011, http://news.bbc.co.uk/2/hi/europe/country_profiles/1016541.stm

³ The Republic of Cyprus has *de jure* control over the entire island; however, the Turkish Republic of Northern Cyprus (TRNC) actually exercises control over the northern third of the island.

⁴ The part of Cyprus not under the *de facto* control of the Republic of Cyprus is referred to as either north Cyprus or the Turkish Cypriot Community (TCC).

Republic of Cyprus, under the control of Greek Cypriots and covering the southern two-thirds of the island, received international recognition and was the *de jure* government of the entire island. In the northern third of Cyprus, Turkish Cypriots established the Turkish Republic of Northern Cyprus, which remains internationally unrecognized and an unofficial sovereign state. At least until the recent Euro crisis, the Republic of Cyprus had the better economic outlook of the two due to its close relationship with the EU; in 2003, the average Turkish Cypriot per capita income was only 39% of the average Greek Cypriot income (Gokcekus 2008:15).⁵

7.2.1 The Green Line Regulation

The EU remains committed to increasing the Turkish Cypriot Community's (TCC's) economic development and reconciling the two sides even though previous reunification attempts have so far been unsuccessful. For instance, immediately prior to the Republic of Cyprus's 2004 ascension to the EU, the Greek Cypriot Community rejected an EU-sponsored referendum for reunification. Despite this setback, the EU has continued to support programmes that establish economic parity between the two sides. In 2004, the EU instituted the Green Line Regulation, a series of articles regarding the passage of persons, goods, and services between the divided states (Council Regulation EC No 866/2004). In addition to setting these regulations, the EU pledged to financially assist the Turkish Cypriot Community with developing trade across the Line.

While trade across the Green Line was expanding until the global economic crisis, even at its height it was only approximately 10% of its potential. According to Gokcekus et al. (2012), legal constraints accounted for 35% of this gap, extra transportation costs for about 5%, and unmeasurable and social-psychological barriers for the remainder. Some of these unmeasurable barriers stemmed from the Turkish Cypriot Community's international isolation. Unlike the Greek Cypriots in the Republic of Cyprus who were able to engage in international trade and join international institutions, the Turkish Cypriot Community was largely excluded from participating in international opportunities. Gokcekus et

⁵ The entire island is an EU member under the Republic of Cyprus. However, as the Republic of Cyprus is not the functioning authority in the north, the Turkish Cypriot Community is effectively excluded from EU membership.

al. (2014:21) detail how despite having access to EU markets through Turkey's Ankara Agreement with the EU, the Turkish Cypriot Community was generally unable to take advantage of this option due to bureaucratic obstacles.

The tensions between the two states of Cyprus place restraints upon the EU's activities in north Cyprus. Although it wanted to promote development among the TCC living in the northern part of Cyprus, tensions between the Greek Cypriot and Turkish Cypriot Communities often prevented direct EU intervention. Prior to 2013, the EU was "unable to set up a delegation in the Turkish-controlled half. Instead, it had to establish a headquarters-based task force in the south with a local programme support office in the northern part of Cyprus" (Nielsen 2012). However, this lack of manoeuvrability may have ultimately benefited the EU's development efforts in north Cyprus. As discussed by Thorp et al. (2005), external intervention can hinder the development of a sustainable solution to the collective action problem; in situations where the external actor is the primary leader, the problem tends to remerge once the external actor pulls back. Cyprus's delicate political situation, however, meant that the EU and other third parties had to design their development initiatives with a greater degree of local involvement.

7.3 CASE 1: BEEKEEPERS' DATED STANDARDS

The initial Green Line Regulation went into effect in 2004; however, beekeepers in north Cyprus were unable to participate in trade as the Regulation barred the movement of animal products across the Green Line "until sufficient information is available with regard to the state of animal health in the abovementioned areas" (Council Regulation EC No 866/2004, Art. 4). Trade in honey was officially addressed with the European Commission's May 2007 Decision regarding the movement of fish and honey across the Green Line. Provided the Turkish Cypriot Community's honey was able to meet certain EU quality tests, trade across the line could commence. However, meeting these quality checks proved to be beyond the limited resources the local beekeepers had at their disposal.

7.3.1 Turkish Cypriot Beekeepers and the Collective Action Problem

Due to the community's extended period of relative isolation, beekeepers in north Cyprus adopted significantly different beekeeping practices than those followed by their counterparts in the EU. Particularly detrimental to plans to initiate trade across the Green Line were their use of antibiotics prohibited in the EU and their inadequate storage practices, which contributed to levels of contaminants in the honey that were unacceptable within the EU. These issues were further exacerbated by the size of beekeeping operations in north Cyprus; there is a relatively large number of beekeeping operations that operate with substantially limited resources.

There are approximately 500 beekeeping operations dispersed throughout north Cyprus; however, 87% of the beekeepers have less than 70 hives, with 30 being the average. For most beekeepers, beekeeping is a side-occupation that supplements their primary jobs as public officials; in general, they have minimal background in apiary science. As detailed by Gokcekus et al. (2014:22): "According to the Turkish Cypriot Beekeepers Association's officials, beekeepers in the north harvest approximately 35 kilograms of honey out of each hive. Thus, given the retail price of \$12 per kilogram of liquid honey, and the scale of production in the north, beekeeping is not the primary occupation of the majority of beekeepers. Even if all sales are at retail price, the total annual revenue is only \$7,500: 30 hives X 35 kilograms of comb honey per hive X 0.6 kilogram liquid honey from 1 kilogram comb honey X \$12 per kilogram (Malaa et al. 2012). If the profit margin is as high as 40%, then the net profit is \$3,000 (which is only 26% of the average per capita income of \$ 11,700 in the north)".

Clearly the financial and technical resources of the Turkish Cypriot beekeepers were quite limited. They needed 1) information on the EU's health and quality standards, 2) training on how to meet these standards, and 3) financial assistance in order to adopt the updated equipment that would allow them to practice these standards. Individually, they were unable to obtain the necessary informational, educational, and monetary inputs. Additionally, they suffered from the collective action problem. To collectivize, groups need motivation and leadership. The Turkish Cypriot beekeepers lacked motivation as the history of animosity between the two communities cast doubt upon whether successful economic transactions could occur. Additionally, the then available institutions—the Turkish Cy-

priot Chamber of Commerce, the Beekeepers Association, and the Turkish Cypriot authorities responsible for agricultural affairs in the north – were unable to provide the leadership that would allow the beekeepers to collectivize and overcome these significant challenges. After decades of international isolation, the available Turkish Cypriot institutions lacked the necessary capacity to implement international standard harmonization. Input from an external actor was vital for change.

7.3.2 Building Adaptive Capacity and Creating Sustainable Development

An external actor, in this case the EU, fostered the adaptive capacity that the beekeepers needed to overcome the collective action problem. With Council Regulation (EC) No 389/2006 the EU reserved funds “to [encourage] the economic development of the Turkish Cypriot community” (Art. 2). These funds were to be used for “preliminary and comparative studies, training, activities linked to preparing, appraising, managing, implementing, monitoring, controlling and evaluation of assistance” (Art. 4). After assessing the needs of the Turkish Cypriot beekeepers, the EU 1) organized and funded a series of training and educational sessions, 2) implemented an equipment upgrade program that required some financial input from the beekeepers themselves, and 3) required the creation of a new collective institutional body that would provide leadership for the beekeepers. The EU also required that an independent party collect and test samples from at least 10 of the participating beekeepers in order to gauge the effectiveness of the aforementioned initiatives.

The EU’s training and educational programmes were quite comprehensive. The EU brought in a Belgian expert from the Institute for Agricultural and Fisheries Department of Food Safety to conduct the sessions, which covered numerous critical beekeeping topics. Among the sessions were lectures on 1) the prevention, diagnosis, and proper treatment of several common honeybee diseases, 2) EU veterinary drug legislation, 3) EU regulations concerning pesticides and the maximum EU accepted levels of contaminants, and 4) proper harvesting and storage procedures. All of these topics had a considerable degree of complexity; it is unlikely that the part-time beekeepers would have been able to obtain the necessary level of technical understanding on their own. Indeed, prior to EU intervention many of the beekeepers were using illegal (within the EU) veteri-

nary drugs as the only available handbooks on beekeeping were outdated and promoted their usage (Reybroeck 2012). The lectures on honeybee diseases were particularly educationally intensive, as some honeybee diseases (such as the American foulbrood) are extremely difficult to eradicate. The disease carrying spores of the foulbrood can remain viable for decades; proper containment requires either constant treatment or the destruction of the infected hives.

In addition to educating the beekeepers on the drugs that were causing them to fail EU quality checks, the beekeepers were taught how to properly store their harvested honey in order to reduce levels of contaminants. During the EU's initial quality tests, the TCC's honey had surpassed the EU's maximum accepted levels of heavy metals and hydroxymethylfurfural. The TCC beekeepers had been storing their honey in galvanized containers; however, as honey is acidic, it tends to react with the zinc in the galvanized container and become toxic. Hydroxymethylfurfural, which in high doses can also be toxic, is a consequence of inadequate temperature control. Beekeepers were informed on ways to mitigate the presence of both contaminants.

The EU assisted the beekeepers with equipment upgrades through a programme in which both parties, the EU and the beekeeper, made a financial commitment. One of these beekeepers, Kirata Kasapoğlu, used this program to obtain seven of the eight E- recommended beekeeping tools and machines. After mastering these (harvesting, uncapping, extracting, filtering, storing, and bottling) machines, he then enhanced the adaptive capacity of his fellow beekeepers by hosting a best beekeeping training session that was attended by 119 local beekeepers.

To ensure this programme was sustainable, the EU needed to develop local leadership among the beekeepers. Therefore, the EU made additional funding contingent on the establishment of a beekeeping cooperative. Accordingly, the beekeepers formed the Turkish Cypriot Beekeepers Cooperative. By collectivizing the beekeepers were able to reduce their production costs through new access to alternative material suppliers and increased bargaining power. By February of 2013, all honey samples complied with EU standards (Reybroeck 2013). Subsequent quality checks indicate that the farmers have been able to sustain the higher standards; the EU had successfully empowered local actors to overcome the collective action problem. Moreover, not only did this programme provide Turkish Cypriot beekeepers with increased market opportunities, it also positively raised the food security of the Turkish Cypriot Community. Al-

though the programme was designed to enable the export of honey, it simultaneously gave the Turkish Cypriot Community access to safer, more nutritious honey; indeed, until the honey trade actually commences, the Turkish Cypriot Community remains the primary consumer of this honey. As defined by the 1996 World Food Summit, food security is obtained “when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life”.⁶ While honey trade across the Green Line has yet to reach its potential, the programme has already had valuable development results.

7.4 CASE 2: CITRUS GROWERS’ DILEMMA⁷

Since the 1970s, Cyprus has had issues with water availability due to a combination of increased demand and changing weather patterns, specifically periods of prolonged drought (Zachariadis 2012). The scarcity of water has reverberated throughout the agricultural sector, as citrus fruits – which originated in wet tropics and require significant water deposits – compose a large part of agricultural production.⁸ With such stresses upon Cyprus’s water resources, solutions such as a pipeline between Turkey and north Cyprus will likely be only a temporary stopgap. Alternative means of adapting to environmental constraints and more efficient use of the available water resources are also necessary.⁹

Based on the environmental constraints of Cyprus and the accompanying demands of citrus, most of the available literature suggests that the Turkish Cypriot citrus farmers should engage in crop switching (Kurukulasuriya and Mendelsohn 2008, Lobell et al. 2008, Seo and Mendelsohn 2008, Huda et al. 2005). However, the Turkish Cypriot farmers, like the Turkish Cypriot beekeepers, suffered from a collective action problem. Al-

⁶ WHO, *Food Security*, <http://www.who.int/trade/glossary/story028/en>.

⁷ The information in this section not cited as a printed source came from interviews and personal correspondence with Berna Berberoğlu, the deputy project manager of the Economic Development and Growth for Enterprises (EDGE) programme, and İbrahim Kahramanoğlu, the managing director of Alnar Narcılık Ltd.

⁸ FAO, *Crop Water Information: Citrus*, http://www.fao.org/nr/water/cropinfo_citrus.html.

⁹ According to the WHO, food security is built on the following three pillars: 1) availability; 2) access; and 3) use. By switching to a crop that better uses the available water resources, Turkish Cypriot farmers would increase their food security.

though they realized that they could mutually benefit from a crop change, each individual farmer lacked the necessary resources to implement production. Without the assistance of an external actor, these farmers would have been unable to 1) organize and collectivize, 2) overcome significant technical knowledge barriers, and 3) obtain the full amount of the substantial capital needed to realize the project.

In 2005, USAID awarded consultancy firm BearingPoint a 6 million dollar contract to “increase private sector development in the Turkish Cypriot community (TCC)” through the Economic Development and Growth for Enterprises (EDGE) programme (EDGE 2008a:4). As stated in the EDGE programme reports, the creation of a “durable settlement” between the country’s Turkish and Greek communities was “the US Government’s primary policy objective in Cyprus” (EDGE 2008b:5). EDGE’s original focus was “to improve banking practices, to strengthen business associations and services, and to provide firm-level assistance to promote enterprise competitiveness” (EDGE 2008a:4). However, when its firm-level assistance programmes proved unable to have a “significant impact on improving overall TCC competitiveness”, BearingPoint implemented sector-level assistance plans (EDGE 2008a:6). These sector-level assistance plans encompassed several agri-business initiatives, including five alternative crop programmes;¹⁰ the 2007 development of commercial pomegranate farming was the first of these five programmes.

7.4.1 Climate Considerations

When faced with a water shortage, crop-switching from citrus fruits to pomegranates might not be the most intuitive adaptation. After all, the water requirements of pomegranate trees “are about the same as [those] for citrus” (Sheets et al. 2015). However, pomegranate trees can “endure greater water salination than citrus trees” (EDGE 2008a:16). For Cyprus, an island nation with limited freshwater resources, this distinction between the two is critical. Not only has Cyprus “severely stress[ed]” its groundwater resources, but its over-extraction of its groundwater has caused saline water intrusion (Anastasi 2012:14).¹¹ Thus, while this par-

¹⁰ The other identified alternative crops were capers, cactus fruit, salicornia, and passion fruit.

¹¹ For an overview of facts and projections related to climate change in Cyprus, see Zachariadis (2012).

tially salinated water is unsuitable for citrus farming, it can be used to grow pomegranates. Additionally, although pomegranate and citrus trees typically need the same amount of water, certain pomegranate varieties can be bred to require less. As part of the EDGE initiative, BearingPoint sought expert recommendations regarding pomegranate varieties that would be most suitable to Cyprus's particular environmental constraints. One of these experts, Shlomy Raziel, recommended that Turkish Cypriot farmers plant the *Wonderful* variety of pomegranates (EDGE 2008b:66). An American variety, *Wonderful* had flourished in Israel's dry climate and it was thought that the variety could have similar success in Cyprus.

Pomegranate farming in Cyprus was adopted as a climate change adaptation. According to EDGE, pomegranates were included in the alternative crops programme because they "were consistent with the TCC's climate, topography and marketing potential" (EDGE 2008a:33). In discussing the decline of Cyprus's citrus orchards, EDGE cited the "salination of the ground water", a concern that pomegranates would be able to overcome (EDGE 2008b:87). In the area where many of the pomegranate producers are based, the Guzelyurt (Morphou) region, the water salinity issue has become particularly acute due to the demands of the area's citrus orchards. İbrahim Kahramanoğlu, Managing Director of Alnar Ltd.,¹² also stated that "climatic conditions, especially decline in water reserves and [the] salinity problem" influenced the decision to crop-switch from citrus to pomegranates.

While climate and environmental conditions clearly played a role in the adoption of commercial pomegranate farming, the influence of market forces cannot be ignored. At the same time that Cyprus's competitive advantage in citrus was eroding due to its own environmental constraints and increased international competition, the market for pomegranates was rapidly expanding (EDGE 2008b:87). EDGE officials and local producers reported that pomegranates were selected both for their water-related advantages and because of international demand. Choosing pomegranates as the alternative to citrus has proved quite successful for the Turkish Cypriot farmers; demand for pomegranates grown by Alnar Ltd. is such that they "cannot supply one single first quality fruit to the local market", since all of their first quality fruit is designated for export (Berberoğlu). The adoption of pomegranate farming by the Turkish Cypriot

¹² Alnar Ltd. is the pomegranate producers' collective that was established at the behest of EDGE consultants.

Community can best be understood as a response to the intersection of market and environmental factors.

7.4.2 Overcoming the Collective Action Problem in Four Phases

Prior to USAID intervention, some Turkish Cypriot farmers did propose the idea of commercial pomegranate farming. Historically, there existed a tradition of pomegranate farming in Cyprus, and farmers had actually exported pomegranates in the early 1900s (Usanmaz 2013:2). However, the conflict between the Greek and Turkish communities halted this trade. By the advent of the 21st century, any pomegranate trees still remaining in north Cyprus were used primarily as wind barriers for the protection of citrus orchards (Usanmaz et al. 2014). Restarting the pomegranate industry in north Cyprus required significant technical acumen and financial input; the Turkish Cypriot farmers considering pomegranate farming were unable to act on their idea, as the project required resources beyond their individual means.

Community outreach programmes conducted by EDGE identified 22 Turkish Cypriot farmers interested in pursuing pomegranate farming, 17 of which committed to EDGE's **phase one** (the first planting and harvest). Agriculture in Cyprus is "a sector that is not known for the flexibility of its growers" (EDGE 2008b:86). To avoid resistance to the idea of replacing the traditional citrus crop with alternatives, EDGE personnel devoted considerable effort to identifying "unused, arid land" for use by the phase one farmers. This land was purchased by the farmers themselves; however, since it was arid, it required rather complex drip irrigation systems. EDGE supplied the farmers with both the necessary technical assistance for creating the irrigation lines and the funding to develop approximately half of these lines.

Once the land was acquired and suitable for planting, the farmers also needed assistance selecting the pomegranate variety with the phenology best-suited to the water constraints that had become so pressing in Cyprus during the second half of the 20th century. EDGE provided the farmers with access to pomegranate experts, like Israeli Agricultural Engineer Shlomy Razel, who identified the appropriate plant variety and visited the "growers every six to eight weeks in order to provide on-site technical assistance" (EDGE 2008b:86). In addition to the *Wonderful* variety, the

farmers planted *Herskovitz* and *Acco* (Alan 2013). EDGE also held a number of training sessions for the farmers that covered topics such as tree planting, fertilizer application, pest management, winter pruning, and flower thinning (EDGE 2008b:117-118). Together the farmers received over 500 hours of training (Cyprus Turkish Chamber of Industry 2012). During phase one, the 17 farmers planted 18,750 pomegranate trees on approximately 51 acres of land; during **phase two** (the extension of the programme), the number of farmers expanded to 22 and an additional 3,700 trees were planted on 11 more acres (EDGE 2008b:87).

USAID's financial input into the pomegranate programme was primarily used to hire EDGE's technical consultants and facilitate training programmes; monetary aid was generally not given to the farmers themselves. However, EDGE was instrumental in guiding the farmers to (eventually) successfully apply for EU grant funding. **Phases three and four** of the programme revolved around the establishment of a processing facility for pomegranate products and the development of the agribusiness's sustainability by expanding its profitability and reach. Nineteen of the pomegranate farmers decided to start a collaborative company (Alnar Narcılık Ltd.) and, using a €150,000 grant from the EU, were able to build a technically advanced storage and processing facility that is run by Alnar. Alnar's farmers actually started exporting their products from this facility to Sweden in 2011, and have since expanded their exports to England, Belgium, Germany, and the Netherlands.

7.4.3 Building Adaptive Capacity and Creating Sustainable Development

The success of pomegranate farming in north Cyprus is unquestionable. Productivity has increased from the farmers' initial harvest of 30 kg per tree in 2008 to 60 kg in 2013 (FreshFruit 2014). Alnar first exported 49 tons of pomegranate products to Sweden in 2011; by 2013, exports had increased to 232 tons and were being sold in five countries (Alan 2013). International demand for Alnar's pomegranates was such that, domestically, the company's only sold product is juice from second and third tier fruits. Additionally, all of Alnar's products are GlobalGAP certified, which requires Alnar to submit to independent auditing of its farming and production standards and is often a prerequisite for doing business in the EU. GlobalGAP certification was one of the means through which

EDGE ensured the sustainability of the pomegranate programme; the programme's consultants both suggested that Alnar obtain GlobalGAP certification and helped the producers answer the more than 350 questions that are part of the certification process.

These achievements are attributable to the building of adaptive capacity; an external actor provided the local participants with the necessary start-up resources to implement change, and the local participants accepted ownership of the project and worked to sustain the programme. Ensuring that the local actors were invested in sustaining the programme was actually part of EDGE's phase one. In order to participate in the programme, growers were required to do the following:

a) sign a Memorandum of Understanding (MoU) that outlined their responsibilities, b) put some of their own monetary resources into the project, which usually came in the form of purchasing the plants, and c) allow EDGE experts access to the alternative crops fields/orchards to inspect the crops and offer advice on how to achieve the best harvest (EDGE 2008b:86).

With these commitments, EDGE was able to ensure that the farmers involved in the project would be appropriately incentivized to work towards its completion and success. The funding that was provided by the farmers themselves was considerable; the total cost of building the Alnar processing and storage plant alone was €450,000. In addition to providing some grant writing assistance, EDGE also helped the pomegranate producers with developing a marketing and business plan; however, supplying the rest of the capital was the farmers' responsibility.

The creation of Alnar Narcılık Ltd. demonstrates the active interest of local farmers in the alternative crop programme. After receiving the initial impetus from EDGE, the participating farmers opted to collectivize in order to "solve their production and marketing problems themselves". Alnar originally had 19 pomegranate producers as members and has now grown to 23. By working through Alnar, the pomegranate farmers were able to increase their "competitiveness specifically for the purpose of increasing inter-island and international trade and produce high quality pomegranate juice and ready-to-eat pomegranate arils in a modernized processing factory" or, in other words, enact sustainable development (Alnar Narcılık Ltd 2012).

In addition to accepting ownership of costs, the local farmers also accepted local ownership to such an extent that they transferred Alnar's GlobalGAP certification to the Cyprus Pomegranate Producers Union,

which has 35 total producers. In fact, Alnar now manages the exportation of the Union's products as well as those of its own members.

7.5 LESSONS LEARNED

Ostrom (1990:27) claims that "all efforts to organize collective action, whether by an external ruler, an entrepreneur, or a set of principals who wish to gain collective benefits, must address a common set of problems". These problems are "coping with free-riding, solving commitment problems, arranging for the supply of new institutions, and monitoring individual compliance with sets of rules". The discussed cases suggest solutions to these problems; although they may appear to be rather niche instances, their lessons should have more general applicability.

As is evident from both cases, one of the simplest ways in which to inspire ownership is to require significant monetary commitments from local participants. Overcoming the collective action problem that often characterizes developing societies does require financial input by the external actor (in order to pay for the necessary technical specialists, equipment, and facilities); however, this input should be matched (within reason and considering circumstances) by local contributions.

Free-ridership was a virtual impossibility for participants in the pomegranate programme. The number of farmers involved in the programme was quite small; EDGE's frequent visits to the pomegranate farming sites ensured that all involved were fully participating. In the case of the beekeepers, the number of participants was substantially larger. To a certain extent the issue of free-ridership was partially addressed by the nature of the programme; if participants failed to update their standards and were selected for the annual sampling, their noncompliance would negatively impact all. The pomegranate farmers addressed noncompliance through their adoption of GlobalGAP certification, which requires an annual surveillance audit conducted by outside observers.

The establishment of new institutions ensured the longevity of both the beekeeping and the pomegranate programmes. Alnar Narcılık Ltd. and the Turkish Cypriot Beekeepers Cooperative helped the local actors collectivize their efforts and achieve greater levels of success than would otherwise be possible.

Both pomegranate farming and beekeeping in north Cyprus might ap-

pear to be a rather niche cases. However, they highlight real problems that developing countries face in creating a sustainable economic growth. As the evidence from Cyprus indicates, post-conflict developing countries need financial and technical intervention from an external actor in order to implement capacity building adaptations, like crop-switching and standard updating, and give small-scale entrepreneurs, like the beekeepers and the farmers, access to alternative markets. Additionally, post-conflict states are often hobbled by the classic collective action problem and need an outside impetus to inspire them to accept local ownership of a development programme. Sustainable development is therefore a function of external and local actor coordination; using its superior financial and technical resources, the external actor helps initiate the programme and, since the local actor also makes a significant contribution, the local actor commits to ensuring the programme's success.

In regard to specific actions the EU can take to promote sustainable agricultural development in the Euro-Mediterranean area, these cases highlight three components that should be integral to future EU development programs: 1) access to information and programme-related experts; 2) financial assistance; and 3) ongoing quality checks. Small farmers are often unable to implement adaptations due to their knowledge limits; the EU can mitigate this issue by providing these farmers with the necessary technical resources. The magnitude of this knowledge input clearly varies, yet remains vital even in relatively small-scale development initiatives. Equally vital is some form of financial assistance from the EU to aid development; however, as suggested by both cases, this assistance should be accompanied by significant financial pledges from the local actors. Finally, in order to provide for the sustainability of its programmes, the EU should incorporate some form of continuing quality testing. With this last component, the EU helps maintain the gains that local actors have already made, and helps further entrench positive change.

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Part III.

Agricultural Trade Liberalization

8.

The Effect of Trade Liberalization on the Sustainability of Agricultural Sectors in Egypt and Tunisia: A New Framework Based on TFP Growth Structure

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INTRODUCTION

The impact of agricultural trade liberalization on economic growth, poverty and inequality in developing countries has always been an important issue in the debate concerning international trade and development policy analysis. Several international development agencies and organizations involved in trade policy and poverty reduction have recently allocated substantial resources to analyse this issue (Ali and Talukder 2010).

In developing countries of the MENA (Middle East and North Africa) region, agricultural trade reforms could affect agriculture productivity in different ways according to the level of farmers' involvement in international trade. A number of studies have been carried out in the field of agricultural trade liberalization and its impacts; but the combined focus on policy measures, agricultural growth, food security and farmers' income distribution has not been clearly addressed.

Current poverty and vulnerability in the MENA dryland region has been exacerbated by low productivity of natural resources, including less

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favourable agro-climatic conditions. The consequent marginal status of these areas has led, most of the time, to their overall neglect reflected through permanent under-investment and generally inappropriate development interventions. Therefore, increasing agriculture productivity is considered as one of the most fundamental ways to ensure food security and promote farmers' income mainly in these marginalized areas.

Despite the fact that agricultural productivity in the MENA has been recently given extensive attention, few studies have examined the agricultural growth sustainability in these countries. Sustainability in agricultural growth is highly important to investigate future development of agricultural sectors in MENA countries. Moreover, whether trade openness and domestic investment (public and private) policy which, among other factors, are used to promote agricultural Total Factor Productivity (TFP) growth could also play a great role in the sustainability of such growth is rarely examined.

Sustainability of TFP is challenged by water shortages and climate change, suggesting that increasing irrigation to improve agricultural productivity is unfeasible. Drine (2011) analysed the impact of climate variables on agricultural productivity in the MENA region. His results suggest that lower precipitation, heat waves and drought are the main causes for decreasing agricultural productivity in the region. Thus, other pathways to increase TFP growth have to be investigated in order to increase agricultural production (Al-Said et al. 2012, Molden et al. 2010).

Analysis of TFP growth is the main focus of this paper, with Tunisia and Egypt serving as study countries. We collected data for these countries for the period 1961-2012, which we used to determine the factors that significantly affect agricultural productivity growth. Tunisia and Egypt represent countries that follow the classical transition from agriculture to industry (Kuznets 1955), in contrast with most of the oil-rich countries in the West Asia and North Africa region which have undergone some form of structural transition between traditional manufacturing sectors and a global energy sector stemming from oil abundance (Acar and Dogruel 2012).

TFP growth stems from two sources, technical efficiency and technical change (Hong et al. 2010). TFP growth pattern could be defined as the trade-off between these two sources. Although different growth patterns determine differentiated growth in TFP, the weight between the two sources of growth should be assessed and coordinated to achieve optimal TFP growth.

Under a certain level of technology, improvement of technical efficien-

cy is limited; holding technical efficiency constant, incentive of technology research and development is lacking, and applicability of new technology is restrained. This generally describes the situation in developing countries, a category that the majority of MENA countries fit into. Thus, the sustainability of TFP growth can suffer from over-dependency on either one of these sources. Indeed, it is the structure of TFP growth that embodies and decides the sustainability of the agricultural sector.

The remainder of this paper is divided into five major sections. Section 2 provides a literature review on the empirical approaches used to measure agricultural productivity in Tunisia and Egypt. Section 3 presents the methodologies used to measure TFP, and discusses the data used in Tunisian and Egyptian TFP growth. Section 4 presents results obtained from analysis of outputs, inputs and TFP measurements, and then describes and summarizes the key findings of the TFP determinants. Finally, Section 5 presents conclusions and policy implications.

8.1 LITERATURE REVIEW ON TFP GROWTH IN THE MENA REGION

Food insecurity in the MENA region is a recurring challenge related to several critical factors including scarcity of water and limited area for agricultural production. According to World Bank (2010), the MENA is the world's most water-scarce region. The region has a total area of about 14 million km², of which about 87% is desert. Agriculture in the region is highly climate-sensitive, while a large share of its population and economic activities are located in urban coastal zones. Furthermore, most people are city dwellers, not desert pastoralists.

The region annual water demand exceeds its supply. Rainfall is decreasing, river flows are shrinking, and groundwater resources are being depleted. Accordingly, availability of water and subsequent agricultural production are expected to diminish (UNDP 2009). By 2025, 80-100 million people in the MENA region will be exposed to water stress (Warren et al. 2006). By 2050 water availability per capita will fall by 50% and there is a high potential for food crises due to increasing demand (population) and declining supply factors (precipitation and yields). In addition, growing competition for water is expected to reduce the share of agriculture in total GDP to 50% by 2050.

The region needs to deal with food production inefficiencies which mainly result from inappropriate farming methods, and low levels of farmers' technical skills and education. Limited opportunities for financing and lending as well as inappropriate agricultural policies have resulted in an overall decline of agricultural production in many countries. On the other hand, harsher living conditions in rural areas, due to the above-mentioned factors including lack of agricultural and rural development strategies, are likely to lead to more rural-urban migration.

The degradation of agriculture is likely to increase unemployment in some countries where farm workers constitute about 30% of the total labour force. Gender inequality is likely to increase since the share of women in the agricultural labour force is relatively high in many countries of the region (for example, women represent 58% of the total unskilled workers in the agricultural sector in Tunisia). On the other hand, improving agricultural productivity will help to increase farmers' income and overall food supply, enhance farmers' resilience to expected future changes, and lower the reliance of the region on food importation.

The overall growth performance of the MENA region over the period 1960-2000 has been both mixed and characterized by a higher degree of volatility compared to other regions in the world (Esfahani 2006, Makdisi et al. 2006). In their review of overall economic growth patterns in the MENA region, Makdisi et al. (2006) found that capital is a less efficient factor, trade openness is less beneficial to growth, institutions are less efficient compared to the rest of the world, and the impact of adverse external shocks is more pronounced. Stock of human capital in the region is also modest due to the quality of education systems geared to the needs of the public sector (Makdisi et al. 2006; Pissarides and Véganonès-Varoudakis 2006). Accordingly, MENA countries have failed to deploy human capital efficiently for economic growth (Pissarides and Véganonès-Varoudakis 2006).

This low economic growth performance in MENA countries is particularly significant for their agricultural sectors. The MENA region is considered as among the driest in the world, while its population continues to grow and is projected to double over the next 40 years (CIESIN 2002). One of the major challenges in the MENA region is thus to increase agricultural production for the rapidly growing population. According to the Food and Agricultural Organization, water will be a crucial constraint in this respect. In fact, in MENA countries, renewable groundwater and surface water supply are limited while demand for water is growing rapidly (Hellegers et al. 2013). A high proportion of agricultural production in

the MENA region currently depends on unsustainably high groundwater use (Hellegers et al. 2013). Some countries, including Saudi Arabia, are already exploring the possibilities for making groundwater extraction sustainable in the future, for instance by reducing the area of land under wheat and by importing wheat (Hellegers et al. 2013).

Few studies in the literature have analysed TFP growth of agricultural sectors in MENA countries. Belloumi and Matoussi (2009) investigated the patterns of agricultural productivity growth in 16 MENA countries during the period 1970-2000. They used a nonparametric, output-based Malmquist index to calculate and decompose the agricultural TFP in the selected countries. Their results show that, on average, agricultural productivity growth in the region increased at an annual rate of 1% during the whole period (Belloumi and Matoussi 2009). They also show that technical change is the main source for this growth and that agricultural productivity in the region is decreasing, especially in countries suffering from political conflicts and wars.

Ben Jemaa and Dhif (2005) used a meta-frontier approach to provide calculations of TFP growth, technical efficiency and input productivity for 12 MENA countries and their potential European competitors. In that study, the authors corrected the technical efficiency scores by a coefficient of technical gap since technologies differ between the regions studied. Their results show technological gap to be the main factor favouring the set of European actors included in the study. However, they observed that a catch-up process is underway between the two regions, in terms of technical efficiency. Ben Jemaa and Dhif (2005) also found that literacy rate, irrigated area and agricultural exports (trade openness) have a considerable effect on efficiency alleviation in the MENA region. Dhehibi and Rached (2010) investigated the agricultural production structure and the sources of TFP growth of the Tunisian agricultural sector between 1961 and 2007. The main aim of the study was to analyse the impact of the agricultural sector adjustment programme on Tunisian agricultural total factor productivity. The authors used a Törnqvist index approach. Their results show that the output growth in Tunisian agriculture was volatile over the whole period of analysis. They also found that the agricultural output growth increased in the 1961-1970, 1971-1980 and 2001-2007 periods, but decreased during the 1981-1990 and 1991-2000 periods. Over the whole period, livestock, capital and intermediate inputs were the most important contributors to the output growth of Tunisian agriculture.

8.2 MEASURING AGRICULTURAL PRODUCTIVITY: AN APPLICATION OF THE TÖRNQVIST-THEIL INDEX

8.2.1 Theoretical Framework

There are basically two approaches to measure the TFP growth: the frontier and non-frontier approaches² (Figure 8.1). Each of these approaches is further divided into parametric and non-parametric techniques. In the frontier approach, best observed combinations of inputs-outputs are estimated and compared to the rest of the sample observations (cross sectional or time series). Frontier refers to an unobservable function that is said to represent the best practice function (Mahadevan 2004). Observations corresponding to the best obtainable output given constant inputs and prices levels are identified in order to compare the rest of the observations to the best obtainable output.³ TFP growth as obtained from the frontier approach consists of outward shifts of the production function resulting from technological progress, and from technical efficiency improvement, which are related to enhancements in farmers' technical skills through time.

The non-frontier approach assumes that firms are technically efficient, and therefore technological progress determines shift in the production function or TFP growth (Mahadevan 2004). Absence of technical efficiency in the non-frontier approach is justified by Kalirajan and Shand (1994) by arguing that in the long-run firms learn management practices to adjust costs and inputs, thereby approaching higher and higher levels of efficiency. The non-parametric frontier approach, which is typically statistical, evaluates firms to an average producer, and hence is characterized as a central tendency approach (Mahadevan 2004).

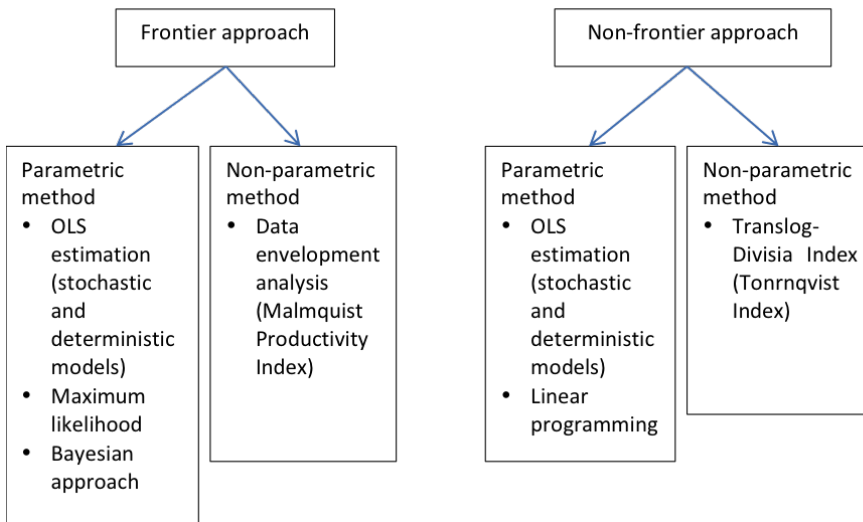
² Each of these approaches is further divided into parametric and non-parametric techniques. Parametric estimations need the specification of a functional form for the frontier and parameters are estimated through econometric techniques using sample data and outputs. One important implication of this issue is that the accuracy of the derived estimates is sensitive to the specified functional form. In contrast, this latter point is the strength of the non-parametric methods (such as data envelopment analysis DEA, or other mathematical programming methods), which are parameter-free and do not assume any functional form. However, one shortcoming of non-parametric approaches is that no direct statistical tests can be carried out to validate the estimates.

³ The frontier approach is different from the parametric non-frontier approach where the average function is estimated by the ordinary least square regression as the line of best fit through the sample data (Kathuria et al. 2013).

Frontier and non-frontier approaches can be estimated by parametric and non-parametric methods (Figure 8.1). The parametric method mainly uses econometrics. In this research we used non-parametric methods for the frontier and non-frontier approaches in a complementary way to estimate TFP. The main reason for using non-parametric methods is the ability of such methods to provide detailed information on the contribution of each of the inputs to output growth (Mahadevan 2004), thus shedding light on the weight of each production input in output growth. In addition, non-parametric approaches allow for inter-country comparison studies, which in our case becomes relevant to compare TFP growth in Egypt and Tunisia.

Non-parametric index number methods allow estimating TFP based on simple pre-defined formulas, and without need of econometric estimation. A common feature of the index number is that the empirical estimation of different indexes is based on different weighting methods of inputs and outputs. In most empirical studies regarding TFP measurement in the agricultural sector, the Malmquist and Törnqvist indexes have been used (Mahadevan 2004).

Figure 8.1. Approaches to Measuring Total Factor Productivity



Source: authors' elaboration adapted from Mahadevan (2004).

The increased use of inputs, to a certain extent, allows the agricultural sector to move along the production surface. The use of modern inputs may also induce an upward shift in the production function, to the extent that a technological change is embodied in them. TFP measures the extent of increase in the total output, which is not accounted for by increases in the total inputs. TFP is defined as the ratio of an index of aggregate output to an index of aggregate input. One of the most defensible methods of aggregation in productivity measurement is Divisia aggregation. Divisia indices have two important attractive properties: (i) they satisfy the time reversal and factor reversal tests for index numbers, and (ii) it is a discrete of the components, so that aggregate could be obtained by the aggregation of subaggregates. For discrete data, the most commonly used approximation to the (continuous) Divisia index is the Törnqvist approximation.

In this paper, we have used the Törnqvist-Theil index to estimate TFP across countries. This index was used to construct both the aggregate output and input indexes. According to this approach, growth in total factor productivity (TFP) is considered as equivalent to growth in technical change.⁴ The Törnqvist output, input and TFP index in logarithm form can be expressed as follows:

Output index:

$$\ln\left(\frac{Q_t}{Q_{t-1}}\right) = 1/2 \sum_j (R_{j,t} + R_{j,t-1}) \ln\left(\frac{Q_{j,t}}{Q_{j,t-1}}\right) \quad (1)$$

Input index:

$$\ln\left(\frac{X_t}{X_{t-1}}\right) = 1/2 \sum_i (S_{i,t} + S_{i,t-1}) \ln\left(\frac{X_{i,t}}{X_{i,t-1}}\right) \quad (2)$$

TFP index:

$$\ln\left(\frac{TFP_t}{TFP_{t-1}}\right) = \ln\left(\frac{Q_t}{Q_{t-1}}\right) - \ln\left(\frac{X_t}{X_{t-1}}\right) \quad (3)$$

Where:

- $R_{j,t}$ is the share of output (j) in total revenue in time (t)
- $Q_{j,t}$ is the output (j) in time (t)
- $S_{i,t}$ is the share of input (i) in total input cost
- $X_{i,t}$ is the input (i) in time (t)

The TFP Törnqvist-Theil index measures TFP changes by calculating the weighted differences in the growth rates of outputs and inputs. The growth rates are in log ratio form, and the weights are revenue and cost shares for

⁴ Further explanations of the theoretical properties and issues in measurement of productivity through the Törnqvist Index can be found in Diewert (1978, 1980), Christensen (1975), Capalbo and Antle (1988) and Coelli et al. (2005).

outputs and inputs, respectively. The TFP index as defined in the last equation can be used as an approximation of technological progress, assuming that producers behave competitively, production technology is input-output separable, and there is no technical inefficiency (Antle and Capalbo 1988).

8.2.2 Data and Variables Specification

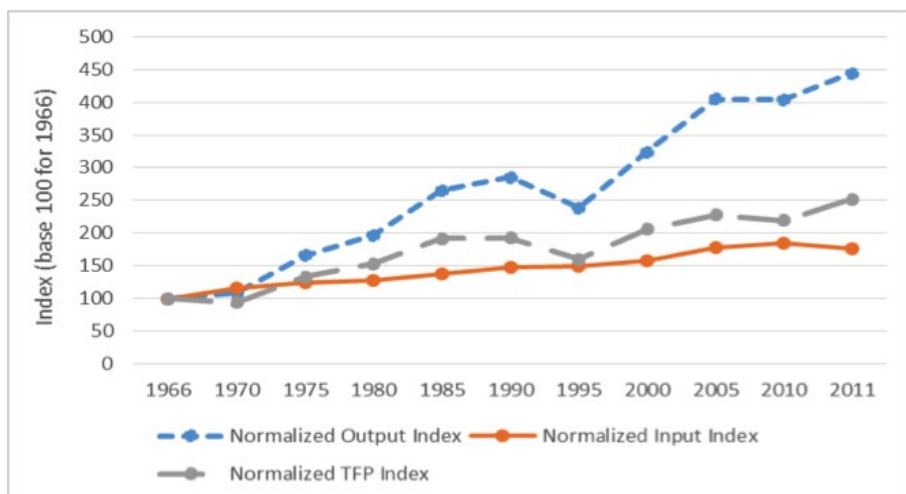
The FAO's annual time series (from 1961 to 2011) for all crops and live-stock products, land areas, labour, machinery, animal capital and fertilizer consumption were used to build databases representing agricultural outputs and inputs, which in turn were the sources to construct the Törnqvist index and its components for the two selected countries. Specifically, the FAO sourced data on Total Agricultural Output (value); Seeds (in quantity and value); Machinery (in quantity and value); Pesticides (in quantity and value); Feed (in quantity and value); Capital stock (in quantity and value); and Natural resources (water/land) (in quantity and value). These data were complemented with labour data (in quantity and value) collected from Egyptian and Tunisian national statistical institutes. Finally, we also collected data on the human development index from UNDP. Exhaustive lists of collected variables as well as their sources are presented in annexes (Tables 8.1 and 8.2).

8.3 EMPIRICAL FINDINGS AND GENERAL DISCUSSION

This section presents the results of the calculations of the Törnqvist productivity index for the Tunisian and Egyptian agricultural sectors between 1962 and 2012.

8.3.1 Outputs, Inputs and TFP Indexes

Based on equations 1-3, the annual average growth rates for the Tunisian agriculture sector in the total output index (TOI), total input index (TII) and total factor productivity index (TFPI) between 1966 and 2011 are presented in Figure 8.2 and Table 8.2. The Törnqvist TFPI (Figure 8.2 and Table 8.1) shows an important fluctuation over the analysis period. This fluctuating trend is mainly due to the fluctuation of the output index, which is primarily explained by the variability of rainfed agriculture in Tunisia due to highly variability in climate conditions over the years.

Figure 8.2. Törnqvist Output, Inputs, and Total Factors Productivity Indexes, for the Tunisian Agricultural Sector (1966-2011)

Source: authors' elaboration (2014).

Figure 8.2 and Table 8.1 also show an increasing trend of the output, inputs and TFP indexes in Tunisia. This clearly indicates that the technical change in both countries is not only affecting the TFP itself, but has an influence on the sustainability of TFP growth. However, these values lead us to a further analysis in order to investigate the different components of TFP growth and attribute specific shares to the different growth sources.

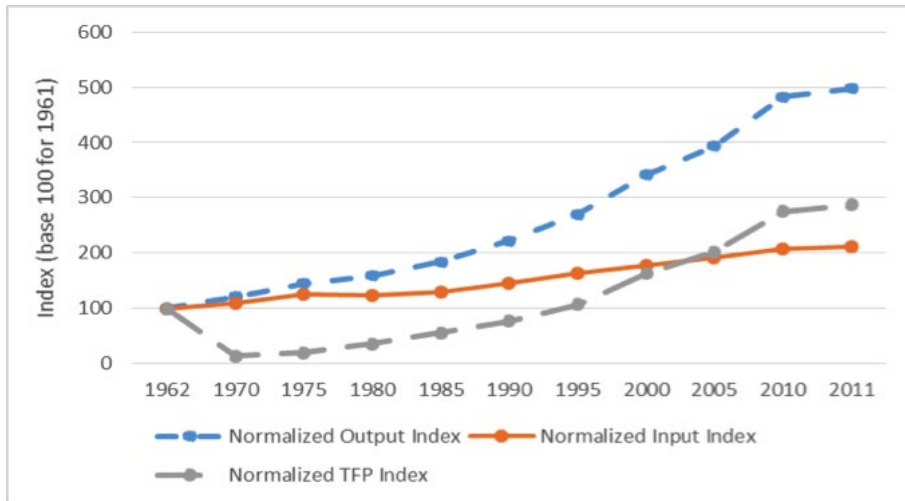
Table 8.1. Normalized (Base 100 for 1966) Values of Output, Input and TFP Indexes for Tunisian Agricultural Sector Calculated Based on the Törnqvist-Theil Method

	Normalized Output Index	Normalized Input Index	Normalized TFP Index
1966	100	100	100
1970	107.70	115.31	93.41
1975	165.57	124.31	133.19
1980	196.64	128.06	153.56
1985	265.10	138.11	191.95
1990	285.15	148.02	192.65
1995	238.66	149.09	160.08
2000	324.07	157.18	206.18
2005	404.77	177.73	227.74
2010	403.90	184.40	219.04
2011	444.42	176.24	252.16

Source: authors' elaboration (2014).

Estimation of equations (1), (2), and (3) for Egypt are presented in Figure 8.3 and Table 8.2.

Figure 8.3. Törnqvist Output, Inputs, and Total Factor Productivity Indexes, for the Egyptian Agricultural Sector (1962-2011)



Source: authors' elaboration (2014).

Furthermore, our results for the Egyptian case show that trends of agricultural, crop and livestock output values have increased faster since 1999-2000. The trends of labour, fertilizers, capital stock and seeds values have strongly increased since 1990. The crop revenue share in agricultural revenue fluctuated during 1961-2011. It decreased from 69.4% in 1961 to 61.6% in 1982, to 55.6% in 1984 and then increased to 71.5% in 1992. The share of livestock revenue in total agricultural revenue also fluctuated during the same period. It increased from 30.7% in 1961 to 38.4% in 1982, to 44.4% in 1984 and then decreased to 28.6% in 1992. These fluctuations justify the variability in the annual growth rates of the selected agricultural inputs and outputs.

The annual growth rates of the studied input and output variables range between 0.7% (e.g., natural resource quantity) and 18.2% (e.g., fertilizer values). The increase of agricultural output resulted from an increased use of traditional inputs. These were mainly cultivated areas and growth in TFP. On average, modern inputs (fertilizers and machinery) contributed little to the agricultural output growth and the difference between growth in output and the sum of total contributions by factor inputs and

TFP is about equal to growth in efficiency, which on average made the lowest contribution to growth in output.

Table 8.2. Normalized (Base 100 for 1962) Values of Output, Input and TFP Indexes for the Egyptian Agricultural Sector Calculated Based on the Törnqvist-Theil Method

	Normalized Output Index	Normalized Input Index	Normalized TFP Index
1962	100	100	100
1970	120.31	108.11	13.55
1975	144.37	125.07	19.29
1980	158.51	123.57	34.94
1985	184.17	129.21	54.95
1990	222.33	145.56	76.77
1995	270.29	163.66	106.63
2000	341.09	177.92	163.17
2005	393.48	191.52	201.96
2010	482.80	208.05	274.74
2011	498.16	211.21	286.95

Source: authors' elaboration (2014).

8.3.2 Factors Affecting Total Factor Productivity Growth

Recent developments in growth theory have stressed the importance of good institutions (North 1990, Hall and Jones 1999, Acemoglu et al. 2001) and sound policies in creating an environment that fosters economic development through accumulation of production factors and efficient use of resources. Several factors have been identified in the social science literature as the most important sources of productivity change in the agricultural sector: research and development, extension, education, infrastructure, government programs and policies, technology transfer and foreign R&D spillovers, health, structural change and resource reallocation, and terms of trade, among others. In the literature, there are several empirical studies exploring the impact of policies and institutions or these exogenous variables on the TFP growth of a number of less developed countries, including, among others, Telleria and Aw-Hassan (2011) and Dhehibi et al. (2014).

Productivity measures do not provide any information about the separate role of each of these factors. However, an understanding of the potential sources of productivity growth is important for formulating appropriate policy decisions to increase productivity and social welfare. The main

explanatory variables used as determinants of agricultural TFP growth are the following:

- **Research and Development:** The results of agricultural research include higher yielding crop varieties, better livestock breeding practices, more effective fertilizers and pesticides, and better farm management practices. Agricultural research is required not only to increase agricultural productivity, but to keep productivity from falling. For example, yield gains for a particular plant variety tend to be lost over time because pests and diseases evolve that make the variety susceptible to attack. Thus, a large share of agricultural research expenditure is devoted to maintenance research. Farmers benefit from agricultural research in the short run because of lower costs and higher profits. However, the long-run beneficiaries of agricultural research are consumers who pay lower food prices. Agricultural research also helps maintain the competitiveness of a given country in world markets. Agricultural research can also reduce inequality in incomes and living standards because lower food prices benefit low-income people more than high-income people (low-income people spend a larger share of their income on food than do high-income people). Moreover, the major portion of public agricultural research is paid for by taxes from middle-income and high-income people. Private agricultural research is mainly performed by manufacturers of farm machinery and agrochemicals, and by food processors. Public agricultural research is performed in national agricultural experiment stations and other universities. Both public and private research has positive effects on agricultural productivity, with public research having a greater impact than private research (King et al. 2012).
- **Extension:** Agricultural research expenditures affect productivity after a time lag. First, a particular research project may take several years to complete. Second, it takes time for farmers to learn about and adopt the innovation. The sooner the benefits from research are received by farmers and consumers, the higher the rate of return will be for that research expenditure. The agricultural extension system aims to reduce the time lag between development of new technologies and their adoption. Extension agents disseminate information on crops, livestock and management practices to farmers and demonstrate new techniques. They also directly consult with farmers on specific production and management problems.

Unlike research, it is reasonable to assume that extension has an immediate effect on productivity.

- **Education/Human Capital:** Education provides individuals with general skills to solve problems. Education is thus an investment in “human capital” analogous to a farmer’s investment in physical capital. Education hastens the rate of development of new technologies by training scientists. Education also speeds the rate of adoption of new technologies among farmers. Better educated farmers are more able to assess the merits of innovative technologies and adopt them quicker than non-educated farmers, as well as to successfully adapt a new technology to their particular situation.
- **Infrastructure:** Investment in public capital, and particularly in physical infrastructure, accounts for the largest budget share in many countries. The role of infrastructure is to expand productive capacity by increasing resources and enhancing the productivity of private invested capital (Munnell 1992). A few studies have found a significant positive relationship between infrastructure and agricultural productivity (Gopinath and Roe 1997, Yee et al. 2002). The most obvious example of how public investment in infrastructure might affect agricultural productivity is through investment in public transportation and in irrigation infrastructure. As an example, an improved highway system can allow for better market integration of farmers and can reduce costs of acquiring production inputs and of transporting outputs to market.
- **Government Programmes and Policies:** The role of government (at macro and micro level) in the agricultural sector is pervasive. Government programmes affect productivity by enhancing both resource allocation and output distribution through control of prices. Government farm programmes are the most common example of government involvement in agriculture. But other examples are numerous: Tax policy may be used to encourage private firms to invest in the development of innovations as well as to encourage farmers to adopt the innovations. Enhanced intellectual property rights protection may increase the incentives for private firms to engage in private agricultural research. Regulatory policies affect the rate at which new fertilizers and farm chemicals reach the marketplace. Although relatively little research has investigated the impact of government farm programmes on agricultural productivity, some of the few studies did find a significant positive relationship

(Huffman and Evenson 1993). For example, direct government payments (in terms of subsidies to acquire machinery) may encourage substitution of improved capital inputs for labour and increase the rate of new technology adoption (Makki et al. 1999).

- ***Technology Transfer: Foreign Research and Development (R&D) Spillovers:*** Isaksson (2007) indicated that knowledge is created by a small number of leader countries in technological terms. Because most countries do not produce state-of the-art technology themselves, it must be acquired from elsewhere. There are several ways in which knowledge can cross national borders. For instance, technology is often embodied in goods (e.g., irrigation materials, mechanization, etc.). Thus, imports of relatively high knowledge content can be exploited. Trade, in general, increases international contacts and can be a source of learning. Foreign R&D spillovers in the form of a research (new technologies and funding) in a foreign country can also entail technology transfers. Trade and foreign R&D spillovers, as carriers of knowledge, should probably be seen as having indirect effects on TFP, as the better they work, the stronger their impact, although with no intrinsic direct effect on their own.
- ***Structural Change and Resource Reallocation:*** Chanda and Dalggaard (2003) attempt to show that aggregate TFP is greatly influenced by the structure of the economy and here institutions are important for how the structure develops. Their main contention is that the correlation between institutions and TFP arises because the former determines the agricultural/non-agricultural composition of the economy. In economies where institutions are weak less funds are available for investment and, hence, capital accumulation. This in turn affects the output composition, since capital-intensive non-agricultural activities could offer higher wages and thereby attract labour from agriculture. It is here that human capital enters the scene. As long as human capital increases, the marginal product of labour in the non-agricultural sector will be more than in the agricultural sector, and labour will be diverted from the latter sector. Furthermore, as long as the relative productivity in agriculture is lower than that of the non-agricultural sectors, aggregate output per worker will increase.
- ***Terms of Trade:*** In the specialized literature, a number of studies have claimed that favourable agricultural terms of trade are a strategic necessity for enhancing technology adoption as well as mo-

bilization of higher investment levels in transforming agriculture (Dantwala 1976, De Janvry and Subbarao 1986). An alternate body of opinion claims that non-price factors (mainly technology, infrastructure, research and extension) are more significant for sustainable agricultural growth in world economies where prices are used as a policy instrument for obtaining a desirable allocation of resources. Changes in inter-sectoral terms of trade cause redistribution of income not only in sectors but also among income classes. Such redistributive flows of income affect the farmer's capacity for savings and incentives to invest, produce and sell. In the literature, agriculture exports and irrigation were found to have the greatest effects on technical inefficiency reduction (Ben Jemaa and Dhif 2005). Agricultural exports expose the producers in a country to an international competitiveness which stimulates efficient production technologies. Besides, agricultural imports are a sign of a low performing agricultural sector (especially when resources are not constrained). An increase in the terms of trade reduces inefficiency and consequently increases TFP. This implies that any increase of the export unit value (or similarly, any decrease of the import unit value) enhances TFP growth.

It is possible that the impacts of these factors on technical change are all positive, but to different degrees. In other words, some key determinants such as trade liberalization and domestic inputs (infrastructure, research and development, extension and technology transfer) may have a more significant impact on technical change or, conversely, on further TFP growth (TFPG). It has been a widespread belief that Tunisian and Egyptian agricultural TFPG stems from two major sources: one is the trade with foreign countries, and the other is domestic inputs aiming at research, development and extension (R, D&E) and efficiency improvement, simplified as trade liberalization and domestic inputs (Bahloul 1999, Galanopoulos et al. 2006, Dhehibi et al. 2014). In our case, trade openness is used as a proxy for trade liberalization, and domestic inputs is approximated by agricultural scientific input (scientists / year and scientists / crop land), resource reallocation, balanced territorial development and infrastructure.

To test the above hypotheses, we adopt a one-step estimation procedure where the TFPG is mainly explained by technological change (progress). We estimate the impact of a multitude of variables, including trade liberalization, domestic inputs and infrastructure, in order to get the in-

formation of contribution of each variable. In a stylized form, we used the following regression model (expected signs in parentheses):

$$\text{LnTFPG}_t = \alpha_0 + \alpha' Z_t (\text{BTD}_t, \text{IIC1}_t, \text{RR}_t, \text{TO}_t, \text{INF}_t) + \varepsilon_t \quad (4)$$

Where:

LnTFPG = Total Factor Productivity in the Tunisian (Egyptian) agricultural sector;

α_0 : Coefficient

Z_t : Variable vector, including:

BTD (+) = Balanced territorial development indicators: Rural GDP per capita

IIC1 (+) = Index of Innovation Invention Capital, IIC (Scientists/year)

RR (+) = Resource Reallocation: Agricultural employment share (%)

TO (+) = Trade Openness: (Import + export)/total production (%)

INF (+) = Infrastructure: Road density (expressed in km/km² agricultural land)

ε_t : Error term, including the rest of the factors that may influence TFP and are not considered in this equation.

The log-linear form of equation (4) allows for estimating coefficients that can be directly interpreted as elasticities. In addition, as pointed out in the pioneering work by Jud and Joseph (1974), equation (4) contains a weak residual variance relative to other functional forms for the same data set and adjusts the data better than the linear specification for both forecasted parameter signs and statistical significance. The standard Ordinary Linear Squared (OLS) method, if applied to non-stationary data series, can produce spurious regression. That is, the OLS regression can give high R^2 , low Durbin-Watson (DW) statistics, and significant t-values of the estimated coefficients, suggesting a significant relationship between dependent and explanatory variables, when in fact they are completely unrelated. Conventionally, the factors explaining TFP have been studied by expressing variables in logarithmic form. This is similar to the first differencing of variables in time series analy-

sis. Provided the original series are integrated of order 1, as is normally the case, expressing the variables in logarithmic terms ensures a stationary data series and means that the OLS method can be safely and directly used (Hendry 1995).

Tables 8.5 and 8.6 present the estimation results of equation (4) regressing the TFP on a set of economic and social variables for both Tunisia and Egypt. The results (Table 8.5) show that three (out of five) variables had significant effect on TFP in Tunisia during the period 1970-2012. These significant variables are: Trade Openness (+), Balanced Territorial Development (-) and Resource Reallocation (-), measured as agricultural employment share (% of the national employment). The indicators for estimation performance are quite satisfying. The R^2 is equal to 0.57, showing that 57% of the TFP variations in Tunisia, over the period of analysis, are explained by the regressed variables considered in our analysis. For the case of Egypt, only the infrastructure variable was significant, negatively affecting TFPG.

As expected, the estimation results indicate that trade openness has a positive impact on TFP in both countries, and consequently on technical change. However, the correspondent coefficient is significant for the case of Tunisia and neutral for the Egyptian case. The non-significance and the low magnitude of this coefficient may be due to the deterioration of the terms of trade that Tunisia and Egypt have experienced in the past 30 years.⁵ This means depreciation in the terms of trade, which compels the economy to decrease its final demand as the cost of imported goods increases, a development that does not favour TFP growth. Indeed, our results are in accordance with the findings of Schiff and Valdés (1992). These authors indicate that trade policies which serve to lower agriculture's terms of trade have been a major cause of the slow growth in developing countries – precisely the opposite of the intended effect of industry-led growth strategies. Cleaver's work in 1984 also points to this predominant view that in sub-Saharan Africa trade and exchange rate policies had a negative impact on agricultural production, though his analysis suggests that these were not the most important factors impeding agricultural growth.

In addition, the estimation results show that, for technical change, all

⁵ According to UNCTAD (2010) estimates, the value of the net barter terms of trade index (2000 = 100) is calculated as the percentage ratio of the export unit value indexes to the import unit value indexes, measured relative to the base year 2000. In Tunisia, this ratio decreased from 123.60 in 1980 to 89.65 in 2007.

the variables work negatively, and of the five variables, trade openness constitutes the most important (with positive and significant impact for the Tunisian case and positive impact for Egypt). Thus, trade liberalization promotes balance and sustainable productivity growth. By contrast, agriculture infrastructure, agriculture scientific inputs (proxied by Innovation Invention Capital) and balanced territorial development work negatively, undermining a sustainable growth in the two countries.

Table 8.3. List of Input and Output Variables Used for the Tunisian Agricultural TFP Calculation

Variables	Description	Source
Input/output variables		
Total agricultural output (in value)	This variable represents the total annual value (in current local currency) of the agricultural production in Tunisia. This variable is also disaggregated into crops and livestock outputs.	FAO database
Labour (in quantity and value)	Labour is an agricultural input. This variable represents the annual quantity (number of active persons) and value (in current local currency: LCU) of labour used in the agricultural sector. The total value is calculated based on average wages in Tunisia.	IEQ + INS Tunisia
Seeds (in quantity and value)	This variable describes the aggregated annual quantities (in tons) and values (LCU) of all crop seeds used in the agricultural sector. It does not take into consideration seedlings and saplings.	FAO database
Machinery (in quantity and value)	The machinery variable is reflected by the annual number and value (LCU) of new tractors in use. Other machinery was not considered in this input vector.	FAO database
Pesticides (in quantity and value)	The pesticide variable describes the overall annual quantities (in tons) and value (LCU) of pesticides and other treatment products used in the agricultural sector for different cropping activities.	FAO database + MARH
Feed (in quantity and value)	The feed variable describes the annual quantity (in tons) and value (LCU) of animal feed used for livestock activity in Tunisia.	FAO database + MARH
Capital stock (in quantity and value)	Capital stock is an important variable representing the annual value (LCU) of fixed inputs (land, head of livestock, tree plants, livestock infrastructure, etc.). For the quantity of this variable, we used an aggregated normalized index regrouping the annual values of the most important among these fixed capital assets.	FAO database + MARH
Natural resources (water/land) (in quantity and value)	The natural resource input vector regroups the remainder of inputs which are hard to account for. It usually includes land and water resources used for agricultural activities. The value of this input corresponds to the residual difference between the overall agricultural output value and the value of all the previous input vectors.	FAO database + MARH

Source: authors' elaboration (2014).

Table 8.4. List of Input and Output Variables Used for the Egyptian Agricultural TFPG Calculation

Variables	Description	Source
Input/output variables		
Total agricultural output (in value)	This variable represents the total annual value (in current local currency) of the agricultural production in Egypt. This variable is also disaggregated into crops and livestock outputs.	FAO database
Labour (in quantity and value)	Labour is an agricultural input. This variable represents the annual quantity (number of active persons) and value (in current local currency: LCU) of labour used in the agricultural sector. The total value is calculated based on average wages in Egypt.	MOP
Seeds (in quantity and value)	This variable describes the aggregated annual quantities (in tons) and values (LCU) of all crop seeds used in the agricultural sector. It does not take into consideration seedlings and saplings.	FAO database
Machinery (in quantity and value)	The machinery variable is reflected by the annual number and value (LCU) of new tractors in use. Other machinery was not considered in this input vector.	FAO database
Pesticides (in quantity and value)	The pesticide variable describes the overall annual quantities (in tons) and value (LCU) of pesticides and other treatment products used in the agricultural sector for different cropping activities.	FAO database
Feed (in quantity and value)	The feed variable describes the annual quantity (in tons) and value (LCU) of animal feed used for livestock activity in Egypt.	FAO database
Capital stock (in quantity and value)	Capital stock is an important variable representing the annual value (LCU) of fixed inputs (land, head of livestock, tree plants, livestock infrastructure, etc.). For the quantity of this variable, we used an aggregated normalized index regrouping the annual values of the most important among these fixed capital assets.	FAO database
Natural resources (water/land) (in quantity and value)	The natural resource input vector regroups the remainder of inputs which are hard to account for. It usually includes land and water resources used for agricultural activities. The value of this input corresponds to the residual difference between the overall agricultural output value and the value of all the previous input vectors.	FAO database + CAPMAS

Source: authors' elaboration (2014).

Table 8.5. TFPG Determinants in the Tunisian Agricultural Sector (1980-2012)

Parameters	Dependent variable $LnTFP_t$		
	Estimated coefficients	t-ratios	p-value
Constant	0.42	0.93	0.35
LBTD _t (Balanced Territorial Development Indicators)	-0.63	-1.75	0.09
LIIC1 _t (Index of Innovation Invention Capital, IIC, # scientists/year)	-0.09	-0.50	0.61
LRR _t (Resource Reallocation: Agricultural employment share)	-2.66	-2.17	0.03
LTO _t (Trade Openness)	0.80	3.46	0.00
LINF _t (Infrastructure)	-0.01	-0.11	0.90
T	33		
R ²	0.45		
F-statistic	4.45 (p<0.0043)		
Log likelihood	21.99		

Source: author's calculation based on coefficient estimates of the linear regression model (2014).

Table 8.6. TFPG Determinants in the Egyptian Agricultural Sector (1980-2012)

Parameters	Dependent variable $LnTFP_t$		
	Estimated coefficients	t-ratios	p-value
Constant	-0.12	-0.17	0.86
LBTD _t (Balanced Territorial Development Indicators)	-0.07	-1.35	0.18
LIIC1 _t (Index of Innovation Invention Capital, IIC, # scientists/year)	0.09	0.36	0.71
LRR _t (Resource Reallocation: Agricultural employment share)	0.005	0.01	0.99
LTO _t (Trade Openness)	0.04	0.65	0.51
LINF _t (Infrastructure)	-0.05	-1.60	0.12
T	33		
R ²	0.14		
F-statistic	0.81 (p<0.51)		
Log likelihood	66.65		

Source: author's calculation based on coefficient estimates of the linear regression model (2014).

CONCLUSIONS AND POLICY IMPLICATIONS

The currently analysis provides relevant results which might help us understand the structural trend of the agricultural sector in Tunisia and Egypt, as well as the most significant variables affecting this trend. The analysis was based on the calculation of the Total Factor Productivity of

the agricultural sectors in both countries. Once calculated, we regressed these TFP scores on a set of potential explicative variables, including a trade variable, in order to detect the ones that most affect the productivity of agriculture in these South Mediterranean countries.

Empirical findings suggest that farming activities in Tunisia and Egypt still need much technical support, better extension, and enhancement of the comparative skills of farmers. A clear vision to promote and encourage a new generation of well-educated and specialized farmers is needed. Knowing that efficiency change had no effect on TFP means that most of the TFP growth in both countries was generated through technical change, making reference to the acquisition of new technology for farming activities. The second main result is related to the important fluctuation of the TFP in Tunisian agriculture compared to Egypt. This fluctuation in Tunisia is mainly due to the important fluctuation of the agricultural output index, which is also explained by the dominance of rainfed farming, highly dependent on climate variability. This indicates that the efforts made in Tunisia during more than 40 years to develop irrigated agriculture have not been sufficient to decrease the dependency of Tunisian agriculture on climate. It also indicates that more focus should be given to rainfed agriculture in Tunisian agricultural development strategies for the next decades. Rainfed agriculture offers important development opportunities, and around the world there are currently many calls for clear strategies to intensify this type of farming and adapt it to the challenge posed by climate change.

These findings have important policy implications for promoting further growth in the agriculture sector in both countries. Increased productivity is important for competitiveness as the countries seek to take further advantage of existing bilateral and multilateral trade partnerships (e.g., WTO, Euro-Med Free Trade Area and the Arab Maghreb Union).

Concerning TFP determinants for agricultural sectors in both Tunisia and Egypt, many important issues can be raised. First, it is clear that TFP is context-specific and its drivers are different from one country to another. In fact, the results show that the significant variables affecting TFP in Tunisia are completely different from those in Egypt. Furthermore, in Tunisia, which is a rainfed-dominated agriculture (compared to Egypt), rural development variables were found to significantly and negatively affect agricultural productivity. Put differently, when the rural GDP per capita increases, the agricultural productivity growth of the agricultural sector decreases. This also means that the productivity of the agricultural

sector increases when the percentage of people employed in this sector decreases. This demonstrates that agricultural activity is still a marginalized activity which is linked to low levels of income and is a source of employment for low productive labour. This type of structural problem cannot be handled solely within the framework of an agricultural development strategy but implies a wider vision of integrated rural development where agriculture is developed in parallel/synergy with other economic sectors.

A second issue related to TFP determinants is the significance of trade openness in explaining TFP growth in Tunisia. This variable was found to be positively related to productivity gains of Tunisian agriculture, which means that enhanced agricultural trade agreements with the rest of the world are actually beneficial to the agricultural sector as a whole. However, this conclusion should not be considered in an absolute sense and more analysis should be undertaken to identify the distribution of the extra revenues generated by this trade, especially if we know that many foreign direct agricultural investments have been made in Tunisia during the last two centuries. A final issue is related to the negative significant effect of the infrastructure variable on the productivity gains of the agricultural sector in Egypt. If the coefficient of this variable was negative, this might indicate a form of low integration of farmers within large neighbouring markets. However, the positive sign of this variable could indicate the high level of fragmentation of agricultural lands due to the development of more roads and unpaved rural roads. It is again important that policy makers take a deeper look at their rural infrastructure strategy, knowing that it may affect the productivity of the agricultural sector as whole.

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9.

Revisiting the Effect of Trade Preferences Granted to Morocco in the Light of an Export-Oriented Approach for Food Security

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INTRODUCTION

The Green Morocco Plan is the policy option chosen by the Moroccan government to modernize its agriculture and achieve food security. Among its pillars, the government is encouraging investment in several sectors that benefit from comparative advantages. The rationale behind the policy is that modernized supply chains can fully benefit from the comparative advantages in foreign markets and generate added value in the country.

In parallel, Moroccan authorities have undertaken an aggressive trade liberalization agenda, including bilateral trade agreements with main players such as the EU or the US. In these agreements Morocco has pushed hard to obtain significant trade preferences in some competitive sectors, allowing in turn market access concessions in other sectors such as sugar or cereals. These preferences may be relevant in economic terms due to the relatively high level of custom duties for agro-food products, resulting from a trade liberalization process that is lower than for other goods. Therefore, the strategy is that economic gains in terms of export revenues and jobs created could help to enhance the food security in the

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country, accompanied by other reforms in traditional sectors that are also undertaken in the Green Plan.

This paper aims to shed light on the effects on Moroccan exports of the preferences obtained in agricultural goods.² To do so, we focus on trade preferences granted by the EU. As a general consideration, analysing agri-food exports from the Southern and Eastern Mediterranean Countries (SEMCs) to the EU is a challenging task. One challenge stems from the commercial policies with which the EU protects its domestic production for a set of fruits and vegetables (F&V) of main interest to the SEMCs. It applies the Entry Price (EP) system, together with seasonal variations and tariff-rate or EP quotas. A second challenge emerges from the trade preferences mutually granted among the EU and each SEMC in the framework of Euro-Mediterranean Association Agreements. These preferences result in a wide array of different situations regarding tariffs and other levied barriers to trade. With this background, in this paper we consider the different border treatments including trade preferences, the EP system, seasonality and quotas.

Last but not least, the geographical and political implications of these trade relations on both shores of the Mediterranean Sea cannot be neglected. Actually, in certain Southern EU regions the productive patterns partially coincide with those in SEMCs. Therefore, preferences granted by the EU and subsequent imports from SEMCs are sometimes accused of undermining the Community Preference (see discussion in the last sections of García-Alvarez-Coque et al. 2012). On the other side of the Mediterranean Sea, some argue that the Association Agreements do not contribute to mitigating food dependency in SEMCs. Particularly, Akesbi (2002) states that after several years of successive Moroccan-EU agreements, Morocco showed fragility due to its dependence on the EU as the main destination market, with concentration on a limited number of goods, and the export revenues were not enough to balance the agricultural trade balance. Besides, the agreements contributed to dismantling protection for several key agricultural sectors (Akesbi 2011). This same author also points out the lack of articulation between food security ob-

² Kohl et al. (2013) provide information on the number of provisions in trade agreements that confirm countries' existing multilateral obligations and that may also deepen such commitments (WTO+ provisions). Agriculture provisions to liberalize trade in agricultural commodities by reducing barriers to trade such as tariffs, quotas and subsidies are covered (and legally enforceable) in the EFTA-Morocco (1999), the EU-Morocco (2000), the US-Morocco (2004) and the Turkey-Morocco (2004) trade agreements.

jectives, trade policies and the Green Morocco Plan (Akesbi 2014:26, 33).

In consideration of this panorama, this paper aims to assess whether the different trade preferences granted to Morocco by the EU foster Moroccan exports of these goods. For the empirical application, we focus on monthly exports of four F&V (cucumbers, tomatoes, oranges and clementines) from Morocco to a number of EU countries, which account for the majority of Moroccan exports in the period 2005 to 2012.

Methodologically speaking, we use a gravity model of trade that considers both sectoral and monthly variability of trade preferences (the reduced EP and the preferential tariffs), as well as quantitative limits for these preferences. We contribute to the existing literature in that we construct new indicators for trade preferences and introduce them into gravity models. Furthermore, the models are estimated by following the most recent literature that deals with the problem of endogeneity. Particularly, we estimate two different specifications, fixed effects (FE) and first-differences (FD).

This article is divided into four sections: after this introduction, Section 1 describes the trade policy and preferences applied to the products affected, critically discusses the contrasting results of the literature on trade liberalization and explores the different approaches undertaken to deal with trade preferences in F&V. Then, the Section 2 describes the data used in the empirical analysis. Model specification and main results are presented in Section 3. Finally, the last section concludes with a discussion of policy implications.

9.1 TRADE POLICY AND LITERATURE REVIEW

Since the conclusion of the Uruguay Round, the EU protects some of its F&V through the EP system, which consists of a two-tiered tariff.³ When the border price of exports to the EU is above the EP level – also called trigger EP, which is set in EU regulations – the consignment is levied by an ad valorem tariff; exports priced below the trigger EP are levied with a supplementary specific tariff after being levied with the ad valorem tariff. The amount of the specific tariff depends on the relationship between the

³ The fresh F&V for which the EP applies are tomatoes, cucumbers, globe artichokes, courgettes, oranges, clementines, lemons, table grapes, apples, pears, apricots, cherries, peaches and plums. In addition, wine and fruit juices are also protected with this system.

trigger EP and the border price for the shipment: the cheaper the product, the higher the specific tariff applied, with the aim being to prevent the entry of cheap products that may undermine market competitiveness of EU production. Thus, when the rate (border price to trigger EP) ranges between 92% and 100%, the specific tariff equals the difference between them (rounded in 2% steps). If the rate is lesser than 92%, the tariff is the maximum tariff equivalent (MTE) for the product according to WTO commitments. Finally, it must be taken into consideration that the trigger EP varies seasonally for every product, as the preferences linked to it do.

The EP system may be understood as a *de facto* minimum import price. Empirical analyses of the trade flows for products affected by the system appear in several papers (see some recent discussions in Agrosynergie 2008, Goetz and Grethe 2009, 2010, Cioffi et al. 2011, Santeramo and Cioffi 2012, Santeramo et al. 2014), which generally coincide in that the system is more relevant for vegetables than for fruits. The system also differently affects the EU trade partners, with the limitative effects being most notable for SEMC exports. Recently, a review of the implementation of the system has been approved, aiming at better accounting for qualitative differences across goods, and also aiming at preventing opportunistic behaviour of some operators to circumvent the payment of the specific tariff. This behaviour was documented by the European Anti-Fraud Office (2008).

Trade preferences granted by the EU to the SEMCs are negotiated on a bilateral basis and thus are not identical across SEMCs. They do however tend to follow a similar pattern consisting of different concessions. For a certain set of goods, free access is granted without quantitative restraints. For other goods, the free access is limited to a specified quantity, over which a tariff reduction usually applies. For some other products where the EP applies, the EU has agreed a reduced EP, commonly together with a quantitative limit.

Analysis of the trade flows in this context of specific trade policies, preferences and seasonality can be made following different lines of research. On the one hand, the indicators based on trade flows allow for summarizing in a set of figures the scope of trade preferences. Along this line, the studies done by Harald Grethe and Stefan Tangermann (1998, see also Grethe et al. 2005) analysed the value of preference margin (VPM) for SEMCs. Martínez-Gómez (2008) added a specific procedure to calculate the VPM when a reduced EP is granted. All these cases show that Morocco has been substantially benefitted by the preferences granted by the EU, with the reduction of utmost importance in monetary terms being for to-

matoes. Emlinger et al. (2010) calculate that the preferences granted to Morocco are the highest among SEMCs. Ouabouch (2013) estimates that the VPM granted to Morocco for four F&V accounted for 37 million Euros annually (average 2007-2009), or 11% of total trade in these goods.

A different line of analysis corresponds to the *ex-ante* simulation models. Among them, partial equilibrium models are well suited in this context where detailed definition of policies may be required. Some recent analyses for this geographical area may be found in García-Alvarez-Coque et al. (2009, 2010) and in Zhao and Hofreither (2011). While only the first two articles refer to Euro-Mediterranean trade, all three works simulate different policy changes, use monthly data and take the EP system specifically into account.

García-Alvarez-Coque et al. (2009) simulate multilateral trade liberalization processes in the EU fresh tomato market, considering different options ranging from a tariff reduction to the elimination of the EP system. Their results have implications on the two shores of the Mediterranean Sea: as for the EU producers, they would suffer a certain (although not dramatic) impact in terms of reduced prices and intra-EU sales. Conversely, the most of the gains stemming from the liberalization are accrued by Moroccan exporters, as volumes exported and export prices would clearly rise.

García-Alvarez-Coque et al. (2010) simulate the phasing out of the EP system for several F&V, considering all the particular trade policies applied. For the different products considered, the phasing out of the EP would particularly affect the vegetables considered rather than the fruits, showing results for tomatoes that are in line with those indicated in the previous paper. Additionally, these authors particularly highlight that eliminating the EP system would affect markets differently according to the season considered.

Another branch of *ex-ante* simulation models corresponds to the different analyses that apply the Computable General Equilibrium (CGE) techniques to capture the overall effects of trade liberalization, as CGE models permit dealing with the linkages among sectors and income and employment effects. Hence, their results crucially depend upon the underlying assumptions such as capital and labour adjustment, and the sector definitions.

Some of these models have simulated different degrees of trade integration in the Mediterranean area. According to Kuiper (2004), the results of such models generally support the theoretical notion that liberal-

izing trade increases overall welfare, with uneven effects across sectors. The increase in aggregate welfare is attained through a restructuring of the economy, with possible painful effects for certain economic sectors or parts of the population. As results from Bayar et al. (2000) illustrate, the definition of scenarios may also significantly alter the modelled outcomes. As an example, a thorough IFPRI assessment on the Near-East North African Countries agricultural trade liberalization indicates that full liberalization of cereal imports in Morocco would increase poverty, while the same study leaves room for eventual improvements if a total liberalization takes place (Minot et al. 2007).

Chemingui and Thabet (2008), in a very detailed analysis for Tunisia, highlight modest expected Gross Domestic Product (GDP) gains after different liberalization scenarios, with reduction in poverty levels mostly for Tunisian rural households. Nevertheless, these authors point out that this would happen after a restructuring of the agricultural sector, switching resources from protected sectors such as cereals to export-oriented sectors such as fruits or olives. A pre-requisite for such restructuring would then be public action in the form of farmers' extension, training or infrastructures. Changes in productive patterns are also a finding for the countries in the region covered by the IFPRI study mentioned above (Minot et al. 2007).

The third line of analysis considers the *ex-post* analysis of trade figures. The workhorse of this approach is the gravity model which, in its basic form, assumes that trade between countries can be compared to the gravitational force between two objects: it is directly related to countries' size and inversely related to the distance between them. Exports from country *i* to country *j* are explained by their economic size, their population, direct geographical distances and a set of dummies incorporating some characteristics common to specific flows.

Theoretical support for the research in this field was originally very poor but since the second half of the 1970s several theoretical developments have appeared in support of the gravity model. Anderson (1979) made the first formal attempt to derive the gravity equation from a model that assumed product differentiation. Bergstrand (1985, 1989) also explored the theoretical determination of bilateral trade, in which gravity equations were associated with simple monopolistic competition models. Deardorff (1998) has proven that the gravity equation characterizes many trade models and can also be justified from standard trade theories. Anderson and van Wincoop (2003) support the idea that the key aspect of

the gravity model is the dependence of trade on a bilateral and multilateral resistance factor. These authors refer to price indices as “multilateral resistance” (MR)⁴ variables, since they depend on all bilateral resistances, including those not directly involving the exporting country.

The gravity equation has a very high empirical explanatory power. For this reason, it has been established as a basic tool in analysis of international trade and we now know that gravity estimates can be combined with trade policy experiments to calculate implied welfare changes (Head and Mayer 2013).⁵ Within the gravity framework, we can analyse the effect of, for example, the *ex-ante* and *ex-post* effect of a free trade agreement, the use of a common currency, etc. In this paper, we focus on the *ex-post* analysis of trade preferences granted to Morocco, and then this effect is reflected in the marginal effect, i.e., the marginal effect of X on Y is the change in Y when X changes by one unit, which can be estimated with econometric techniques.

Using a gravity framework, several papers have dealt with the specificities of Euro-Mediterranean F&V trade. These include Cardamone (2011), Emlinger et al. (2008) and Martí Selva and García-Alvarez-Coque (2007). There are a number of differences between these studies.

Martí Selva and García-Alvarez-Coque (2007) analyse F&V import flows to the EU-15 from eight SEMCs over the period 1995-2004. In this paper, the coefficient of the dummy variable for Algeria, Morocco and Tunisia is found to be negative and significant, thus these countries tend to export less F&V than other countries in the sample. According to the results obtained in this paper, although the Association Agreements are important to boost F&V exports (the estimated coefficient for the dummy variable that equals 1 if the exporting country has an Association Agreement in force is positive and significant from 2000), they fail to compensate for the disadvantage of belonging to this region. Nonetheless, it is

⁴ The type of remoteness variable included in traditional gravity equations to proxy average trade barriers relies solely on distance and does not capture other factors impeding bilateral trade flows. To overcome this problem, Anderson and van Wincoop (2003) proposed to include MR, defined as country-specific price indices associated to trade among countries having in common a geographical remoteness with respect to the rest of the world.

⁵ For example, Felbermayr et al. (2014) calculate the changes in trade flows and welfare (i.e., real GDP per capita) in the situation with and without a Transatlantic Trade and Investment Partnership (TTIP). These authors rely on the parameter estimates to calculate welfare changes (see p. 13-14 for a summary of their quantitative strategy).

important to note that these authors neither control for MR nor use panel techniques to deal with the endogeneity of the trade policy variable and hence, obtained coefficients might be biased.

Emlinger et al. (2008) evaluate the role of tariffs faced by Mediterranean countries that export F&V to the EU, taking into account tariff seasonality. To do so, tariff protection measures are taken into consideration in their model through ad valorem equivalents calculated at the product level. These authors include country- and product-fixed effects to proxy for the “remaining trade resistance”. Their results show that the impact of tariffs varies by country, and they state that this result can be explained by country’s product specialization. Specifically, the obtained Moroccan tariff elasticity suggests that tariffs remain an important barrier for Morocco’s exports. However, tariff barriers are not the only obstacles to trade and, as the impact of tariffs and non-tariff barriers on trade varies considerably from one exporting country to another, the impact of EU-SEMC liberalization must be discussed country by country and on a product-by-product basis. This conclusion was recently confirmed by Márquez-Ramos et al. (2012), who ran regressions for different exporters and different sectors, including tariffs and non-tariff barriers. In fact, Márquez-Ramos et al. (2012) found that trade facilitation variables are more important than tariffs and, more specifically, their results show that tariff barriers are non-significant for food products in a sample of 13 exporting countries, while trade facilitation procedures are highly significant. Therefore, additional trade liberalization measures, aside from tariffs, should be considered in a gravity specification that aims to analyse the effect of trade preferences granted to a particular country in a number of agri-food products.

Cardamone (2011) uses monthly data disaggregated at the product level, as we do in the present research, to assess the effect of preferential trade agreements on monthly exports of a number of F&V (fresh grapes, pears, apples, oranges and mandarins) to the EU during 2001-2004. This author analyses the effect of all EU preferential schemes operating during this time period and takes not only tariffs into account but also the EU entry price system and quotas. According to her results, regional trade agreements appear effective in expanding EU-bound exports from developing countries for all fruits except oranges. Nonetheless, Cardamone (2011) does not isolate the effect of trade preferences granted to SEMCs on exports addressed to the EU, as her sample uses the 191 exporters for which trade statistics were available.

Regarding seasonality, to our knowledge Cardamone (2011) is the first study to assess the effect of preferential trade agreements on monthly exports of F&V to the EU by using a gravity model. Interestingly, this author considers whether the quotas are exceeded. Emlinger et al. (2008) used quarterly periods and Martí Selva and García-Alvarez-Coque (2007) considered annual data. As trade and preferential policies vary throughout the year, decomposing in shorter periods allows for better capturing of differential effects.

Martí Selva and García-Alvarez-Coque (2007) added a dummy variable to capture the effect of the Association Agreements, while Emlinger et al. (2008) introduced the applied tariff into the gravity equation. Cardamone (2011) captured preferences in the EP as a dummy variable, and the preferences in tariffs applied were measured as the difference between most favoured nation (MFN) and preferential tariffs. Analysis of trade integration using the gravity approach typically includes a dummy variable among the list of explanatory variables (Bensassi et al. 2012, Baier and Bergstrand 2007).⁶ This type of variable has been recently questioned, as it might be argued that the reality of a trade integration agreement is poorly represented (Florensa et al. 2014). This is especially the case for F&V, due to the complexities in the trade policies discussed above.

This paper contributes to the existing literature by suggesting an approach that allows a more precise estimation procedure in the case of F&V, also taking into account the most recent developments in gravity literature to consider the problem of endogeneity of trade liberalization measures.

9.2 DATA AND DESCRIPTIVE ANALYSIS

This paper focuses specifically on the Euro-Mediterranean liberalization process. To this end, we analyse to what extent monthly exports from Morocco to key important trading partners in the EU are affected by preferential schemes for F&V. Exports are considered on a monthly basis, due to the different seasonal border treatment applied to them – in some cases, the EP level varies even within a month and also due to the marked sea-

⁶ A trade integration variable might also be measured through a polychotomous index that takes discrete values according to the level of regional integration achieved between two countries.

sonality of trade flows for the goods considered.⁷ These monthly trade flows have been collected from Eurostat-Comext Database.

Morocco has been chosen as it is an interesting case to study. First, it has been granted by the EU the highest number of preferential EPs among SEMCs; second, quantitative restraints limit such concessions and, over those levels, additional tariff reductions apply as well. Third, those restraints are binding in some goods. In addition, the EU is the main destination market for Moroccan F&V. Finally, some of the aforementioned papers highlighted that Moroccan goods were among those most affected by the EP system (Goetz and Grethe 2009, Cioffi et al. 2011).

As for the products considered, two fruits were selected (CN 080510 sweet oranges, fresh, and CN 080520 clementines, fresh) as were two vegetables (CN 070200 tomatoes, fresh or chilled, and CN 070700 cucumbers, fresh or chilled). All of them are relevant products in the agro-food exports from Morocco to the EU, and also considering Moroccan market share in extra-EU imports. Some aggregate data on trade figures for the period are shown in Table 9.1 below. Besides, for the four products Morocco benefits from a preferential EP and, in almost all the period considered, that concession is limited to certain quotas. Only in the case of oranges did the last revision of the agreement eliminate the EP quota. In the period considered, the quotas were filled only in the case of tomatoes. In the periods when the EP is not in force or no preferential EP is granted, Morocco benefits from an *ad valorem* tariff reduction for the four products.

As destinations within the EU, we have selected nine countries,⁸ rather than the EU itself. We proceed this way for theoretical reasons and because of adequate monthly data availability. Among the countries selected we aimed to include different instances regarding their own features and relations with Morocco. France has traditional political, social and commercial links with Morocco, illustrated by the relevance of their bilateral trade flows. Other countries such as Germany and the United Kingdom are large net importers of F&V; Italy and Spain are also big importers and show a noticeable domestic F&V production as may be the case as well for Belgium and the Netherlands, which have a smaller domestic market. In the other two cases, both Hungary and Slovakia belong to the Eastern EU

⁷ In fact, the vast majority of exports from Morocco to the countries selected are concentrated between October and April.

⁸ Belgium and Luxemburg are reported together in Comext statistics and hence treated here as a single destination market. The other countries selected are Germany, Spain, France, the United Kingdom, Hungary, Italy, the Netherlands and Slovakia.

members, whose accession took place in 2004. In three of the four products, the aggregated market share of the countries selected is close to or greater than 80% of total extra-EU imports (see Table 9.1).

Our analysis extends from 2005 to 2012, so that all the countries considered were EU members at that time. The preferential agreement with Morocco was modified to enlarge the quotas because of the EU enlargement on May 2004. Its subsequent revision entered into force in October 2012, hence affecting the end of the period covered in the analysis.⁹

Table 9.1 summarizes some trade data for the product and periods considered, in value terms.

Table 9.1. Trade data for the selected Moroccan F&V at EU markets, 2005/2012

	EU-27 share of total Moroccan exports (%)	Moroccan share of total extra-EU imports (%)	Aggregate share in extra-EU imports of the selected EU countries (%)
CN 070200 tomatoes	91.53	64.74	78.79%
CN 070700 cucumbers and gherkins	80.73	13.13	49.55%
CN 080510 oranges	49.39	11.49	86.35%
CN 080520 mandarins	34.64	25.87	81.79%

Source: Authors' calculations from Comtrade and Comext databases.

9.3 EMPIRICAL ANALYSIS

The present article is based on the model specification provided in Baier and Bergstrand (2007) and Baier et al. (2014) for total bilateral exports, which we adapt to measure the effects of sectoral trade preferences on monthly exports. They begin with the following gravity model:

$$\ln \left(\frac{X_{ijt}}{Y_{it}Y_{jt}} \right) = \beta_0 + \beta_1(\ln DIST_{ij}) + \beta_2(CONTIG_{ij}) + \beta_3(COMLANG_{ij}) + \beta_4(EIA_{ijt}) - \ln \Pi_{it}^{1-\delta} - \ln P_{jt}^{1-\delta} + \varepsilon_{ijt} \quad (1)$$

⁹ Regarding the goods considered in this paper, the last revision eliminated the quota for oranges (CN 080510), and enlarged the quotas for tomatoes (CN 070200), cucumbers (CN 070700) and mandarins (CN 080520). Otherwise, the value and periods of the preferential EP were not changed.

Where \ln denotes natural logarithms; X_{ijt} is the value of the aggregate export flow from country i to country j in year t ; Y_{it} (Y_{jt}) is GDP in country i (j) in year t ; $DIST_{ij}$ is the bilateral distance between the economic centres of i and j ; $CONTIG_{ij}$ is a dummy variable assuming a value of 1 if the two countries share a common land border (and 0 otherwise); $COMLANG_{ij}$ is a dummy variable that takes a value of 1 if the two countries share a common language; EIA_{ijt} is a variable indicating the level of integration between the two countries in year t ; and $\ln \Pi_{it}^{1-\delta}$ ($\ln P_{jt}^{1-\delta}$) is exporter i 's (importer j 's) non-linear and unobservable MR price term.

When estimating the effects of the economic integration agreements, or EIA (β_4), if this variable is correlated with the error term, it is econometrically endogenous and Ordinary Least Squares (OLS) can lead to biased and inconsistent coefficient estimates for β_4 . In order to eliminate endogeneity bias from the variable EIA, Baier and Bergstrand (2007) and Baier et al. (2014) propose using panel techniques and estimation by FE of the following equation:¹⁰

$$\ln X_{ijt} = \beta_0 + \beta_1 EIA_{ijt} + \eta_{ij} + \delta_{it} + \psi_{jt} + \varepsilon_{ijt} \quad (2)$$

Where η_{ij} is a country-pair fixed effect to capture all time-invariant bilateral factors influencing nominal trade flows;¹¹ δ_{it} and ψ_{jt} are exporter-time and importer-time fixed effects, respectively, to capture time-varying exporter and importer GDP, as well as all other time-varying country-specific effects that are unobservable in i and j and influence trade, including the exporter's and importer's MR terms.

Furthermore, Baier and Bergstrand (2007) and Baier et al. (2014) proposed using FD techniques to avoid the problems stemming from potential serially correlated errors and unit-root processes for RHS variables in equation (2). Although the FD transformation eliminates the unobservable pair-specific changes over time (η_{ij}), the unobservable ij might be still playing a role. Therefore, Baier et al. (2014) suggest introducing pair-specific fixed effects after FD transformation of equation (2):

¹⁰ Florensa et al. (2013) estimate equation (2) by both fixed effects and random effects and use the Hausman test. Their results confirm that the fixed effects estimation is preferable to random effects, and thus, we rely on the fixed effects estimation.

¹¹ Note that the fixed effect terms absorb all effects that are country-pair specific, namely distance, common border and language. Thus, these country-pair-specific variables do not appear in equation (2).

$$\Delta \ln X_{ijt} = \beta_0 + \beta_1 \Delta(EIA_{ijt}) + \eta_{ij} + \delta_{it} + \psi_{jt} + \Delta \varepsilon_{ijt} \quad (3)$$

In the empirical analysis, we deal with the abovementioned problem of endogeneity by using panel techniques. We estimate two different specifications. First, equation (4) by FE and second, equation (5) by FD:

$$\ln X_{jks} = \beta_0 + \beta_1 \text{var}_{ks} + \psi_{jt} + \pi_{kt} + \mu_{jk} + \sigma_m + \varepsilon_{jks} \quad (4)$$

$$\Delta_{12} \ln X_{jks} = \beta_0 + \beta_1 \Delta_{12}(\text{var}_{ks}) + \psi_{jt} + \pi_{kt} + \sigma_m + \Delta_{12} \varepsilon_{jks} \quad (5)$$

Where j is the importing EU country; k is the traded sector; s refers to each month Jan-Dec during the period 2005-2012; m refers to monthly (Jan-Dec) variability and t to yearly (2005-2012) variability; Δ_{12} is twelve-month (annual) FD; var_{ks} are var_1 , var_2 and var_3 ; ψ_{jt} , π_{kt} and σ_m denote importer-year, sector-year and monthly fixed effects, respectively. Finally, μ_{jk} is the unobservable heterogeneity that does not vary over time but might vary depending on importers and products. This term is dropped from the equation in FD, while ε_{jks} is the error term.

In our sample, the frequency with values equal to 0 is 1,998 observations, i.e., 57.8% of a total of 3,456 observations (4 sectors*8 years*12 months* 9 destinations). Previous literature has used Poisson Pseudo Maximum Likelihood (PPML) to deal with heteroskedasticity and to take into account those observations of the dependent variable that are equal to zero (Santos-Silva and Tenreyro 2006, Martínez-Zarzoso and Márquez-Ramos 2008, Burger et al 2009, Martínez-Zarzoso 2013). To our knowledge, the first research that used PPML in a gravity assessment by using a sample with sectoral variation was Márquez-Ramos (2007). Nonetheless, there is a lack of studies in the related literature that compare the performance of different specifications of the gravity model when the seasonal variation of F&V is taken into account (i.e., using monthly trade flows of specific sectors).

In favour of the methodology proposed in the present research, it can be argued that although those records that equal zero are not taken into account when taking logarithms in the estimated regressions, when we take first differences (our preferred specification) to control for the endogeneity of our variables of interest we might have either positive or negative values. For example, if in a particular month, say in 2007, Morocco exports the sector k to country j , but in the same month of the previous

year (2006) it exported less, this results in a positive value of the dependent variable when using the FD methodology. We can also have negative values of the dependent variable in FD if, for instance, in a particular month in 2007 sector k was exported to j , and in the same month of 2006 exports were higher, and hence the dependent variable takes a negative value. PPML is used with count variables and is suitable when the dependent variable takes non-negative integer values. It is especially suitable when excluding zeroes leads to a very low number of observations reducing the efficiency of the estimator, but as we have monthly data, this is not the case.¹²

Turning now to the specification of preferences, as we aim to capture the relevance of trade preferences for Morocco, we construct three variables that consider different perspectives of trade preferences stemming from the application of the agreements. The first variable (*var1*) indicates the EP reduction granted for Morocco in the four products, calculated as the agreed reduction of the MFN EP. When no preferential EP or no EP is applied, this variable equals 0. In regressions that include this first variable (*var1*) we use a relative measure instead of the absolute difference between the MFN EP and the reduced EP, i.e., the granted percentage reduction in the MFN EP $[1 - (EP \text{ Pref} / EP \text{ MFN})]$. However, the absolute difference is the variable taken into account to compute a synthetic indicator of the preferences reflected by means of *var1* and *var2*.

The preferences are limited in two ways: on the one hand, a preferential EP often applies only to a certain quantity; over this quantity, a tariff reduction is usually applied. On the other hand, in periods with no EP in force or no preferential EP agreed, there is an ad valorem tariff reduction that may also be limited to a certain quota or reference quantity. Therefore, we define a second variable (*var2*), which corresponds to the ad valorem tariff reduction and captures the effects of the quantitative constraints. The variable is calculated as the percentage of reduction in regard to the MFN ad valorem tariff.

Finally, we develop a third indicator (*var3*) to be included in a unique

¹² By dropping the zero trade flows, we follow Santos-Silva and Tenreyro (2006) by assuming that zero trade flows are statistical zeros, i.e., they are generated by measurement errors. An alternative assumption which is equally consistent with our approach is to assume that zero trade flows are generated by a different statistical process than the non-zero trade flows. Then, we can consistently estimate the coefficients for the intensive margin by using the non-zero trade flows only. The same two-part model approach is used by Egger and Larch (2011) and Egger et al. (2011).

model specification that encompasses the impact of the two abovementioned trade policy instruments, i.e., it focuses on both the preferential EP and the tariff reduction. Specifically, var3 is constructed as the sum of the standardized¹³ value of var1 and the standardized value of var2. The effect of the three variables on Moroccan F&V exports is expected to be positive, as the higher the preferences granted to Morocco, the higher the Moroccan exports are expected to be. Table 9.2 summarizes the values of the three variables and the cases where they occur.

Table 9.2. Cases in the preference variables

Cases	Var1	Var2	Var3
No EP in force, or no preferential EP	0	Granted % reduction in the MFN ad valorem tariff	Granted % reduction in the MFN ad valorem (Standardized)
Preferential EP in force and no quota or quota not binding	1-(EP Pref/ EP MFN)	0	EP MFN- EP Pref (Standardized)
Preferential EP in force and quota binding	1-(EP Pref/ EP MFN)	Granted % reduction in the MFN ad valorem tariff	EP MFN- EP Pref (Standardized) + Granted % reduction in the MFN ad valorem (Standardized)
Expected sign	+	+	+

In the obtained results, we first observe that the variable that measures the reduction in the EP positively affects monthly exports from Morocco (var1, see columns 1-2 in Table 9.3).¹⁴ Columns 2 and 4 in Table 9.3 show the results related to var2, which takes into account the tariff reduction linked to quotas. The results show that var2 is positive and significant at the 10% significance level in equation (4) (column 2), although it is positive and significant at the 1% level when using FD. The var3 is positive and significant in both FE and FD specifications (see columns 3 and 5 in Table 9.2). The most conservative results obtained for the synthetic indicator, i.e., var3, show that *ceteris paribus* a one-unit increase in the index of preferences granted to Morocco is estimated to increase monthly exports of F&V by about 12% (column 5). Finally, as each variable is mea-

¹³ Mean equal to 0 and standard deviation equal to 1.

¹⁴ This variable does not vary enough to estimate β by FD. When we run FE regressions, var1 is introduced alone in the regressions (column 1) and with var2 (column 2).

sured in different units, we calculate beta coefficients to be able to compare the magnitude of the effects in terms of standard deviations¹⁵ in the model presented in column (2): for var1, the beta coefficient equals 0.26, while it is equal to 0.05 for var2. According to these results, an increase in var1 seems to increase Moroccan exports to a higher extent than a similar increase in var2.

These results indicate that preferences matter and that the two types of trade preferences granted to Morocco by the EU have a positive and significant effect on Moroccan monthly exports of F&V. Furthermore, the type of preferences applied is also relevant and, in particular, we have found that the preferential EP granted to Morocco is a more effective strategy to increase Moroccan exports than the reduction in the MFN ad valorem tariff.

Table 9.3. Main results

Model (column)	FE1 (1)	FE2 (2)	FE3 (3)	FD2 (4)	FD3 (5)
var1	3.301*** (9.036)	3.462*** (9.233)			
var2		0.613* (1.873)			
var3			0.227*** (4.923)		
$\Delta_{12}(\text{var2})$				0.676** (2.246)	
$\Delta_{12}(\text{var3})$					0.120** (2.218)
Observations	1458	1458	1458	1254	1072
R2	0.3360264	0.3377683	0.3079569	0.2051651	0.1640389
RMSE	1.283504	1.2823	1.310353	1.129407	1.145855

Notes: ***, ** and * indicate significance at 1, 5% and 10%, respectively. T-statistics are provided in brackets. FE1, FE2 and FE3 show results of the effect of var1, var2 and var3, respectively, on Moroccan monthly exports when using equation (4). FD2 and FD3 show results of the effect of var2 and var3, respectively, on Moroccan monthly exports when using equation (5).

¹⁵ Beta coefficients make the scale of the regressors irrelevant, as they are measuring effects not in terms of the original units of the variables, but in standard deviation units (Wooldridge 2009).

CONCLUSION AND POLICY IMPLICATIONS

By using panel techniques and first differences to deal with endogeneity problems that are inherent to trade policy variables – as is the case with Preferential and Free Trade Agreements – we analyse the effect of different measures of trade preferences granted to Morocco. We focus on monthly exports from Morocco to a set of EU countries, aiming to analyse the sectoral and monthly variability of trade preferences in four F&V. In addition, with this exercise we have designed a set of variables to account for the wide array of different preferential concessions in a more detailed way than previous research. The paper shows that these variables can be included in a gravity approach to quantify and compare the effect that different types of preferences have on exports.

Our results indicate that trade preferences granted to Morocco by the EU have a positive and significant effect on Moroccan monthly exports of F&V. These results are in line with previous research based on the gravity framework to deal with the specificities of Euro-Mediterranean F&V trade. Specifically, the preferential EP is significant and positive for Moroccan exports, as is the ad valorem reduction in tariffs over EP quota or when no preferential EP applies. Additionally, the preferential EP granted to Morocco seems to increase Moroccan exports to a higher extent. This fact could have political implications in subsequent revisions of the agricultural protocol between the EU and Morocco.

Overall, our results contribute to the debate on the political approach chosen by the Moroccan government to foster food security. Indeed, they indicate that the Moroccan policy option of negotiating trade preferences in key competitive sectors has been translated into export increases. Nevertheless, the topic of food security encompasses very relevant aspects that are not dealt with in this paper, such as the rural/urban divide or the sustainability of agricultural production in SEMCs.

Also impacting the export/import debate, there are several elements that deserve special attention from policymakers. Among them, we can highlight the distribution of preferential rents, the ability of rural producers to insert themselves in the value-added chains, transitional relief measures for affected rural households, and the modernization of the supply chains to fully reap the potential benefits of comparative advantages. Strong action in these fields seems a precondition for the benefits of the export specialization strategy being accrued by the whole country. Some of these elements are discussed in other papers in this volume.

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10.

The European Union's Common Agricultural Policy Reforms and the Sustainability of Agro-food Systems in the Euro-Mediterranean Region: How to Get Trade and Development Back on the Agenda?

Marko Lovec

INTRODUCTION: THE EUROPEAN UNION'S COMMON AGRICULTURAL POLICY AS OBSTACLE TO EURO-MEDITERRANEAN INTEGRATION

The strategic opportunities for a better integration between the two shores of the Mediterranean have been recognized by the Barcelona Process launched in 1995 with the intention of liberalizing trade in the region and, based on the recognition of certain development asymmetries, moderating the reciprocity principle and introducing specific development programmes (Barcelona Declaration 1995). The process has failed to meet the expectations and fingers have been pointed at (among other things) agriculture and the European Union's (EU's) Common Agricultural Policy (CAP), which defines support for the producers in the EU member states. Since the reduction of trade barriers would increase competitive pressure on Mediterranean producers, Southern EU member states, where most of these products originate, have been opposed, pointing out that the scope of CAP support for Southern products is already relatively low. On the other hand, the Northern countries, net contributors to the community budget, have been unwilling to finance additional compensatory and support programmes, thus stalling the process (García-Alvarez-Coque 2002, Dell'Aquila and Velazquez 2002). However, apart from this general explanation, there has been no systematic engagement in analyses of

how the substantial changes that CAP has undergone since the 1980s, as well as the mechanisms facilitating those changes, have affected CAP as an obstacle in the way of Euro-Mediterranean integration. Such an analysis could bring about a more specific understanding of the opportunities for development of sustainable agro-food systems in the region.

This paper would like to argue that the changes in the institutions of representation and decision making on CAP reform which have occurred since the 1980s, namely (a) the development of a multilateral regime on trade and agriculture (Coleman and Tangermann 1999, Daugbjerg and Swinbank 2008, 2009); (b) the shift from production-based towards multifunctional policy objectives, which include product quality, environment and rural development (Skogstad 1998, Garzon 2006); (c) the change in policy network, where non-production-concerned interest groups have gained ground (Daugbjerg 1999); (d) the introduction of qualified majority vote (QMV) in the decision-making procedures; and, based on the change in the European Commission nomination procedure and introduction of QMV, (e) the strengthening of the European Commission, which has traditionally been a pro-reform actor (Pokrivcak et al. 2006, Swinnen 2008), by constraining the use of trade-distorting measures, facilitating mechanisms specifically targeting sustainable development and strengthening representation of interests related to trade and development, have positively influenced the solving of the “CAP problem” as obstacle to creating Euro-Mediterranean integration. However, since new support measures have been financed from the budget, pressure from net contributors to curb CAP budget costs has strengthened as well, thus slowing down the positive trends in policy change (Lovec and Erjavec 2012, 2013). The Lisbon Treaty (2009) which granted co-decision powers to the European Parliament, whose preferences have been relatively conservative, has been a further inhibitor of policy change (Crombez et al. 2012).

CAP reforms are complex and unique historical processes, which are shaped by particular institutional mechanisms (Moyer and Josling 2002, Garzon 2006, Daugbjerg and Swinbank 2009). Through assessment of the role of the mechanisms (or their combinations), this paper aims to recognize windows of opportunity for policy change that would support Euro-Mediterranean integration. In order to test the argument, the paper engages in a comparative analysis of the process of CAP reforms and the evolution of Euro-Mediterranean relations in the field of agriculture, and tries to identify direct and indirect indications that could point to how the mechanisms facilitating the former could have influenced the latter.

10.1 FRAMEWORK FOR ANALYSIS: MECHANISMS FACILITATING THE EU'S COMMON AGRICULTURAL POLICY REFORMS AND EURO-MEDITERRANEAN AGRICULTURE

There are three main reasons why agriculture is considered an especially sensitive and strategic sector in the Euro-Mediterranean region: firstly (a), it is relatively important in economic terms, especially in rural areas; secondly (b), agricultural production structures are relatively underdeveloped, there are many small farms, and production is labour intensive and undercapitalized; and thirdly (c), agriculture faces various natural constraints such as water scarcity and degradation of soil. Although these three concerns are relevant on both shores of the Mediterranean, they are particularly pressing in the North African and Middle-Eastern region (MENA) (García-Alvarez-Coque 2001:39-40).

As the most important partner in agricultural trade, the EU has an important influence on the development of agriculture in the region. The share of imports and exports to the EU in the external trade of non-EU Mediterranean countries is much larger than the share of the EU's exports to and imports from these countries, which means they depend asymmetrically on the EU. In the EU, trade in agricultural products is influenced by CAP, which defines the scope and type of support for different product groups. Traditionally, CAP has been based on the "Community Preference" principle, meaning that support to domestic producers has been provided through various protectionist measures and production supports (Skogstad 1998, Garzon 2006). The application of these measures has put producers from different shores of the Mediterranean in an unequal position, since member state producers have been granted full access while producers from the non-EU countries depend on preferential agreements negotiated on a bilateral basis (Tangermann 1997). Initiatives in the opening up of trade and introduction of specific agricultural support programmes have faced CAP-related problems. In the EU, the scope of supports granted to Mediterranean products was somehow lower than that of supports granted to Northern products. Since the countries in the MENA region were competitive in Mediterranean products, the liberalization of trade was expected to increase pressure on producers of these products, which triggered a sense of unfairness among EU producers. The Southern EU member states, those most affected, conditioned the liberalization with sufficient compensatory measures and argued in favour of supports to Euro-Mediterranean agri-

culture that would be based on development programmes (Dell'Aquila and Velazquez 2002, García-Alvarez-Coque 2002:401, Aghrout 2007). However, the Northern EU member states, which have already been strong net contributors to the CAP budget, refused to increase their expenditures, which created a stall (García-Alvarez-Coque 2002:410).

Since the 1980s, several changes in institutions of representation and decision-making have contributed to CAP reforms in a way that is expected to reduce the "CAP problem" for the Euro-Mediterranean integration. Firstly (a), agriculture became a matter of multilateral trade negotiations, which resulted in introduction of constraints with regard to the employment of trade-distorting measures, thus pressuring for their phasing out and replacement with measures targeting income and structural concerns more directly and by more specific means (Coleman and Tangermann 1999, Daugbjerg and Swinbank 2007, 2008, 2009). Secondly (b), the "production oriented" policy produced negative externalities such as environmental damage and economic pressures on small farmers and rural areas, which is why it was replaced with a "multifunctional paradigm" aimed at addressing the quality of the product and production processes instead of production quantity, for example by supporting farming practices that were animal and environment friendly and stimulating the development of rural areas through programmes based on diversification and bottom-up initiatives, thus favouring smaller and more labour-intensive systems (Garzon 2006:64-66).

Thirdly (c), the policy network was no longer dominated by the agricultural lobby groups where interests of big farmers were overrepresented, but was defined by differentiation of farmers' interests, for example through individual organization of small farmers, as well as by engagement of non-farmer interest groups such as environmental and developmental NGOs and, to a limited extent, the food processing industry and consumer organizations which also gained ground in the process (Daugbjerg 1999, Garzon 2006). The fourth institutional change (d) influencing the reforms was created by the fact that once new objectives and principles were set, they have as such become a driver of further reforms. The fifth change (e) was introduced by the changes in decision-making procedures, where veto-based procedure was replaced with QMV, which strengthened the opportunities to move away from the status quo. The introduction of QMV, together with changes in the European Commission nomination procedure that increased the opportunity for strong Commissioners to be appointed, strengthened the role of the Commission which

has the exclusive right to propose legislative change and which has traditionally been a pro-reform actor (Pokrivcak et al. 2006, Swinnen 2008). Some of the Commissioners and their teams have made personal quality a specific factor of CAP reforms. The stronger role of the Commission has been the sixth (f) mechanism facilitating the reforms.

As summarized in Table 10.1, apart from reducing trade distortions that constrained the competitiveness of non-EU Mediterranean countries, institutional changes were expected to facilitate support programmes and mechanisms more specifically targeting objectives such as sustainable and balanced development, which could be copied to their own environments. Furthermore, institutional changes would – implicitly or explicitly – strengthen the overall representation of interests of countries from the MENA region in the CAP reform process and support cooperative (value creating) over conflict (value claiming) strategies. However, not all institutional changes can be considered to have positive effect. The support programmes, which replaced protectionist measures, were fully financed from the budget, meaning that transparency of the costs increased, triggering distributional issues. Since the late 1980s, budget expenditures have been determined by Multiannual Financial Frameworks (MFFs) decided upon veto, thus strengthening the distributional status quo bias, slowing down policy change and undermining the solidarity principle. Secondly, the Lisbon Treaty (2009) granted co-decision powers to the European Parliament. Since Parliamentary preferences were relatively conservative in comparison to preferences that could gain the support of a qualified majority in the Council, this procedural change was another factor in strengthening the status quo bias and slowing down reform (Crombez et al. 2012, Lovec and Erjavec 2015).¹

Since the changes in institutions of representation and decision-making seem to have contradictory effects, there is a need to analyse the concrete role played by individual mechanisms in order to be able to determine their relative and/or combined effects and recognize opportunities for further policy change which could diminish the role of CAP as an obstacle to stronger Euro-Mediterranean integration.

¹ There is an on-going debate over the influence of individual factors (or combination of them) related to CAP reforms (see Moyer and Josling 2002, Garzon 2006, Swinnen 2008, Daugbjerg and Swinbank 2009, Lovec and Erjavec 2013, 2015) that we cannot enter into here; suffice it to say that the sequence of mechanisms listed corresponds to the views of the theory on their relative importance, with the exception of budget being considered as the second most important factor.

Table 10.1. Mechanisms influencing sustainable development of agriculture in the non-EU Mediterranean countries through influence on CAP reforms

Mechanisms	Effects
- (a) Multilateral trade negotiations	- Reduction of trade-distorting measures
- (b) Turn from productivist towards multifunctional paradigm	- Development of more specific programmes
- (c) Opening of policy network	- Stronger implicit/explicit representation of interests
- (d) Path dependency	- Support for cooperative (value creating) over conflicting (value claiming) strategies
- (e) Introduction of QMV	
- (f) Stronger Commission	
- (a') Stronger budget expenditures and distributional issues	- Stronger status quo bias and slower reform pace
- (b') Co-decision powers in combination with conservative preferences	- Conflict (value claiming) strategies

Source: Author's elaboration.

10.1.1 Note on the Method

CAP reforms are unique historical events which are shaped by (a particular combination of) several institutional mechanisms, which is why the methods that have been commonly applied to studying them are process-based case studies and comparative analyses that try to grasp which factors influence the reforms by reconstructing them in terms of identifying key issues, actors, rules, procedures and decisions, and making comparisons between different stages of the process and/or different reforms (see for example Moyer and Josling 2002 or Garzon 2006). Such an approach has been criticized for being too descriptive, and it has been suggested that more robust analytical models and methods based on more standardized indicators should be applied. However, these kinds of approaches risk flattening the complexity of the reforms, producing partial out-of-context explanations that suffer from limited analytical and applicative value. With the intention of avoiding both the Scylla of descriptivism and the Charybdis of reductionism, this paper tries to be exact as possible in definition of mechanisms, and inclusive when it comes to research methods.

Analysis of the influence that changes in institutions of representation and decision-making have had on sustainable development of agriculture in the region will be conducted through a parallel analysis of the development of the process of CAP reforms and the process of establishing Euro-Mediterranean integration, specifically focusing on direct or indirect indications of how the mechanisms shaping the former could have influ-

enced the latter. In practical terms, the research will be based on academic papers, reports and primary documents.

10.2 RESULTS OF PARALLEL ANALYSIS OF COMMON AGRICULTURAL POLICY REFORMS AND THE EURO-MEDITERRANEAN INTEGRATION PROCESS

10.2.1 New Global Regime on Trade and Agriculture and the Launch of the Barcelona Process

The first and most profound changes to CAP were introduced in the 1980s as a response to the growing surplus of “northern” products, being a consequence of product-based price supports that filled storage capacities and – since interventionist measures were financed from the budget – increased policy costs, thus triggering pressures from the net contributors to the budget to introduce policy changes. The early reforms introduced milk quotas, quantity limitations to interventions and, by the end of the 80s, constraints on growth of budget expenditures. These changes were not very successful in solving the problem of overproduction. Furthermore, since excessive products were dumped on world markets through export subsidies, these resulted in further decrease in world prices and growth of policy costs (Ritson and Harvey 1997). Other exporters reacted by increasing their own support measures, which made the situation worse. In order to deal with the problem, agriculture was made an issue of the Uruguay round of trade negotiations under the auspices of General Agreement on Tariffs and Trade (GATT) that was launched in 1986 (Ingersent et al. 1994).

In 1992, when the trade agreement was taking its final shape, the EU Council of Ministers of Agriculture agreed on a CAP reform which decreased the scope of the price supports in some of the main product groups such as grain and beef, and compensated farmers by introducing direct payments based on historical levels of production and support. In order to receive direct support, farmers had to set aside part of the production area. Besides being influenced by the trade negotiations, the reform was shaped by budget negotiations and the introduction of MFFs which created additional pressure to stabilize expenditures, as well as by pressure to reorient policy objectives towards environment and rural development, by the weaker voice of farmers’ lobbies and arguments

in favour of smaller farmers and by the ambition and personal qualities of the Irish Commissioner of Agriculture Ray MacSharry, which is why the reform became known as the ‘MacSharry Reform’ (Moyer and Josling 2002). In 1994, the Uruguay Round Agreement on Agriculture (URAA) was signed, introducing constraints on price and production support² (Coleman and Tangermann 1999, Daugbjerg and Swinbank 2009). Since by the end of the 1990s when the URAA was being implemented, production was still growing, and since the EU realized it was better to be a few steps ahead of the trade negotiations in order to be able to shape the agenda, the decision was made to continue with the reform (EC 1998, Garzon 2006). Additional reason for further reform was the “big bang” enlargement towards Eastern Europe (Lovec and Erjavec 2012); since in the new member states agricultural supports were on average lower, the scope of production and net budget deficit of the Northern member states were expected to grow. Thus in 1999, the European Council agreed on the Agenda 2000 reform which further reduced the scope of price supports such that intervention prices in some of the main product groups reached world price levels. Direct payments were increased accordingly. The Agenda 2000 was basically an agreement on the MFF for the period 2000-2006. There was much talk of paradigmatic shift in agricultural policy, which became the subject of a conference organized by the Commission in 1996 in Cork (Garzon 2006). There was also an obvious change in policy networks, with the dominance of farm lobby groups being challenged by internal divisions, and by environmental and developmental NGOs (Daugbjerg 1999, Garzon 2006). However, in the context of failed Seattle WTO talks, the reform turned out to be no more than a complement to the 1992 reform, responding to the pressing trade- and budget-related issues (see Daugbjerg and Swinbank 2009 for a detailed analysis).

By the time the CAP reforms began, most of the Mediterranean countries had been granted (limited) preferential access to EU markets for (at least some of) their agricultural products. Even though the reforms reduced the scope of trade-distorting measures and introduced direct income supports, the influence of the URAA for the Mediterranean coun-

² The URAA prohibited direct subsidies for production inputs (“red box”), constrained price support (“amber box”), allowed for certain supports meant to reduce the scope of trade-distorting measures such as the EU’s direct support (“blue box”) and set no constraints for other types of support that were considered to have no direct influence on price and production (“green box”). The agreement provided for the continuation of trade negotiations until price and production supports were eliminated completely.

tries was expected to be negative since it was estimated that due to reduced price supports, the value of preferential treatment of their products would be reduced by 17% (Tangermann 1997). In addition, higher world prices of imported Northern products would reduce fiscal revenues coming from levies on import of these products. However, a year after the URAA was signed, the Barcelona Process was launched with the objective of creating a Euro-Mediterranean Partnership (EMP), which aimed at “sustainable and balanced economic development, with a view of creating an area of shared prosperity, taking into account different degrees of development across the Mediterranean region” (Barcelona Declaration 1995). The EMP provisioned the establishment of the Euro-Mediterranean Free Trade Area (EMFTA) by 2010, which was to be achieved on the basis of (a) bilateral association agreements between the EU and the Mediterranean Partner Countries (MPCs) in which, based on the recognition of development asymmetries, the reciprocity principle would be moderated, as well as on the basis of (b) the so called “South-South” agreements between the MPCs. In agriculture, the EMP aimed at “modernisation, restructuring, integrated rural development, promotion of environmentally friendly practices, water management and fight against diversification”. These objectives were to be pursued through the “exchange of experiences, know-how, technical assistance and training”. In 1996, the Mediterranean Development Aid (MEDA) facility regulation was adopted. Funds available for the MPCs in the period 1996-1999 were increased by 100% to approximately 1 billion ecus per year.

The development of the multilateral trade regime was a push factor for the trade and development initiative in the Mediterranean. What is more, more specific sustainable development objectives, which were discussed in the Cork conference, had already been included in the Barcelona Agreement. However, from the very beginning, ambitions in the field of agriculture were met with scepticism. In the EU, producers of Mediterranean products argued that supports for their products were already relatively low (horticultural products which accounted for 16% of the final production received 3.5% of supports, whereas cereals accounting for 11% received 40% of supports) and that liberalization would put them in an unfavourable position compared with the producers of Northern products, since they would have to compete with the MPCs for the “Northern market”, whereas the demand for Northern products would, due to reciprocity in trade agreements, be increased (García-Alvarez-Coque 2002:410-411). Thus, the Southern EU member states argued for

specific financial aids to farmers in the MPCs. Northern member states, which were supposed to financing these supports, were more in favour of “trade for aid”. In 1995, the following passage was published in the Financial Times: “In the case of North Africa, South Europeans tend to stress the need for financial support, knowing this would come from Northern Europe, while North Europeans stress the importance of market access, knowing that it is the South European farmers who would suffer most from North African competition” (García-Alvarez-Coque 2001:46).

10.2.2 Towards Multifunctional Policy Paradigm and Re-engagement in the Barcelona Process

After the early difficulties, the Doha Development Round (DDR) of trade negotiations under the auspices of World Trade Organization (WTO) was launched in 2001 in Qatar. Among its ambitions were to put export subsidies in agriculture on the list of prohibited measures, to further reduce domestic supports for agricultural products and to improve market access (Daugbjerg and Swinbank 2009:165). Negotiations were expected to conclude by 2003. In the EU, member states disagreed on what the post-enlargement CAP would look like, with the Northern countries claiming that direct supports should not be extended to the new members (thus making their net budget position worse), since there was nothing to compensate for. Southern member states were opposed, fearing that with the acceptance of this argument, direct supports would be eventually phased out. Subsequent to the decision that direct payments to the new members would be phased in over a ten-year period, the 2002 Chirac-Schroeder agreement, later endorsed by the European Council, set the 2006 expenditures on market measures and direct payments (CAP Pillar I) as an MFF ceiling for the 2007-2013 period. In combination with the gradual phasing-in of supports, this meant that further reforms would be required (Lovec and Erjavec 2012). In this context and in spite of the failure of the first attempt to conclude the DDR, due (among other things) to the general dissatisfaction with provisions in agriculture, the Commissioner of Agriculture, Austrian Franz Fischler (who had been, based on the changes to the Commission nomination procedure, nominated against the opposition of France) was able to build on new expertise with the “multifunctional” agricultural policy paradigm and on alliance with the NGOs, to take advantage of QMV-based decision-making to convince

the majority of member states of the need for a relatively radical reform. The 2003 “Fischler Reform” decoupled supports from production,³ conditioned direct payments on compliance with management requirements and good environmental practices and introduced a modulation mechanism that transferred 5% of individual direct payments higher than €5,000 to the CAP Pillar II fund, which was used for co-financing national rural development programmes, thus releasing the pressure of the Pillar I financial ceiling (EC 2003; see Garzon 2006 and Swinnen 2008 for a detailed overview).

In the following years, price supports for Mediterranean products such as cotton, tobacco, olive oil, sugar, fruit and vegetables and wine were, to a large extent, replaced with direct payments. The 2005 agreement on the new MFF merely weakened Pillar II, pointing to the status-quo and lowest-common-denominator bias of the veto-based decision-making on MFF. In 2008, the year of another attempt to conclude the DDR, this time coming close to what could become an agreement (but nevertheless failing in the last instance) (Daugbjerg and Swinbnak 2011), the 2003 reform was upgraded by the Health Check reform, which provisioned for the end of milk quotas by 2015, increased modulation by 100% and introduced a “degressive capping” mechanism, transferring 4% of individual payments above €300,000 to CAP Pillar II. Changes brought by the 2008 reform were a response to the financial ceiling and to publication of the names of the 20% of recipients who received 80% of CAP payments (Lovec and Erjavec 2013).

The degree of progress delivered by Euro-Mediterranean agreements on agriculture was limited. There were delays due to the refusal of certain member states to implement certain agricultural provisions.⁴ The European Parliament’s Agricultural Committee blocked the agreements in order to ensure that the “EU’s markets [were] not flooded with cheap products from the non-EU Mediterranean countries” (García-Alvarez-Coque 2002:410). Whenever supplies from the South increased, the European Commission took advantage of administrative requirements such as issuing import licences in order to intervene on the markets. Producers

³ In order to receive payments, farmers were no longer required to produce. Member states were able to apply historical, regional (area-based) or mixed distribution schemes.

⁴ Since 1995 Turkey and the EU have been in a customs union; the EMP agreement with Tunisia has been operative since 1998, with Israel and Morocco since 2000, and with Jordan and Lebanon since 2002. An agreement was signed with Algeria in 2001 and with Egypt in 2004. In 2004, Cyprus and Malta entered the EU.

from MPCs had difficulty meeting various certification standards and administrative requirements (García-Alvarez-Coque 2002:405). Following Tangermann and Josling (1999), the ambition of the agreements seemed to be limited to “strengthening the traditional trade flows”. MPCs were themselves unwilling to give up preferential treatment they enjoyed in certain commodity groups (García-Alvarez-Coque 2002:412). The bad start of the new round of world trade negotiations certainly negatively influenced the Euro-Mediterranean negotiations, since the WTO agreement was expected to introduce a more comprehensive, universal and transparent regime (García-Alvarez-Coque 2002:407).

The fact that the EMP failed to reach expectations was endorsed by the political elites. Since the early 2000s, new initiatives for stronger trade liberalization and development programmes had begun to appear. The 2003 Euro-Mediterranean Ministerial Conference concluded that the negotiations on DDR, the enlargement and CAP reform provided the right timing to form “stronger agricultural ties” and that it was “worth recalling that the EMP contains provisions on areas of bilateral cooperation in agriculture and involve the progressive and reciprocal liberalisation of trade in agricultural products by 2010” (Euro-Mediterranean Ministerial Conference on Agriculture 2003). Various parallels were made with the approach taken by CAP reform in terms of turn towards quality, environment and rural development. At the 2005 anniversary conference in Barcelona, a new 5-year work plan was adopted for the liberalization of agricultural trade, excluding some of the sensitive products. Various analyses were made which demonstrated that the proposed agreements “would not leave the MPCs any worse off but also not significantly better off” and that the effects would be mostly based on trade diversion and not trade creation, meaning that the problem of competitiveness would remain. In comparison, the effects of multilateral trade agreement would be, generally speaking, more positive (Grethe et al. 2006, Kavallari 2008:171-3). However, in spite of the fact that “South-South” agreements did advance,⁵ with too little confidence in successful conclusion of the multilateral trade negotiations as a push factor the EMP process soon faced the old issues. In the EU, producers of Mediterranean products were unwilling to accept additional pressures

⁵ In 2004 the Agadir Agreement was signed between Tunisia, Morocco, Jordan and Egypt, Israel and Jordan agreed on an FTA and bilateral trade agreements were reached between Turkey and several other MPCs.

and the MPCs were not willing to give up tariffs-based fiscal revenues and preferential treatment in return for a “controlled liberalization”. In the 2000-2006 period, twelve MPCs received approximately €5 billion, which is approximately one sixth of the amount that the new member states received in the period 2004-2006 (García-Alvarez-Coque 2002:414). Only a fraction of these funds was devoted to agriculture. In the 2000s, the EMP became part of the newly established European Neighbourhood Policy (ENP) and in the 2007-2013 MFF MEDA was replaced with an ENP Instrument (ENPI). In the 2008 French proposal of the Union for the Mediterranean, agriculture and rural development were eliminated from the final package due to the more pressing issues (Petit 2009).

10.2.3 Status Quo Bias of the 2013 Reform and the Crisis in the Middle East and North Africa

After 2008, perspectives for the DDR to be concluded remained blunt (Swinbank 2012). Pressures for CAP reform came from the end of the old MFF and the need to agree on the new 2014-2020 MFF. The European Commission proposed to continue the CAP reform by replacing existing historical payments with regional supports and binding these supports to certain environmental actions, meaning that the main support mechanisms would now involve a green component. Due to the veto-based voting procedure that favoured the status quo, the budget negotiations resulted in only a slight decrease in CAP funds, which was stronger under Pillar II, and member states were granted flexibility to switch part of the funds between the two pillars, meaning additional pressure on rural development programmes, which required specific planning, targeting and national co-financing. Later the Agricultural Council substantially relaxed both the regionalization of payments and the greening requirements by introducing various optional redistributive mechanisms, exempting certain groups of farmers, reducing the requirements and introducing equivalent measures (Lovec and Erjavec 2015). The European Parliament, which was able to co-decide CAP for the first time, meaning it was able to veto and amend the reform (Pokrivcak et al. 2012), defended relatively conservative preferences and prevented the formation of a more reformist qualified majority in the Council (Lovec and Erjavec 2015).

Limited success of the EMP process resulted in a certain pessimism and frustration. Turkey, whose agriculture would benefit substantially from EU accession (compared with the limited gains of trade liberalization), was becoming impatient due to the slow progress of the accession process. The direct payments introduced in 2001 were abandoned in 2009, and subsidies targeting production were reintroduced (Cakmak 2013:23-4).⁶ Starting in 2011 several North African and Middle Eastern countries faced the economic and political crisis that has become known as the “Arab spring”, and that was influenced by growing food prices in the urban areas and rural poverty. In 2011, the negotiations were launched to establish Deep and Comprehensive Free Trade Areas (DCFTAs) with Egypt, Jordan, Morocco and Tunisia, that would also cover regulatory issues relevant to trade. The agreement with Morocco faced the opposition of the European Parliament, whose Agricultural Committee rejected it. In 2012, under pressure due to the Arab spring, the plenary gave the agreement a green light. Nevertheless, it also called upon the Commission to strengthen controls over market supplies (López et al. 2013b:7-8). Under the renewed ENP, an European Neighbourhood Programme for Agriculture and Rural Development (ENPARD) was established that would run till 2020. ENPARD included two axes corresponding to the two CAP pillars (modernization and rural development) as well as a horizontal component (López et al. 2013b:15). However, this was again only a basis for what could become a proper development policy. Furthermore, following López et al. (2013b:15), although supports to MPCs are important, a sense of moderation is required, since their scope is incomparable to the supports received by the EU farmers. Simultaneously, the elements of the CAP reform, such as regionalization and greening, which would improve the relative position of the producers in the MPCs, were substantially relaxed. If there were one term to describe CAP 2020 reform, it would be status quo.

⁶ Following Cakmak (2013:25): “the current and extremely primitive way of assigning commodity preferences through bilateral trade agreements (such as fish and tomato to Morocco, onion to Egypt, tomato and melon to Turkey, olive to Tunisia), is far from achieving higher level of competitiveness in the exporting countries; au contraire, this approach may even decrease future export capability by enforcing unsustainable use of natural resources”.

DISCUSSION AND RECOMMENDATIONS: HOW TO GET TRADE AND DEVELOPMENT BACK ON THE AGENDA

One of the central problems of development of sustainable agriculture in the Euro-Mediterranean region, and especially in the non-EU countries in the region, is the CAP which constrains the equitable participation of producers from these countries in the EU markets. Since EU producers of Mediterranean products already feel that supports for these products are relatively low, they are unwilling to accept additional price competition, whereas the Northern EU member states, who already are net contributors to the budget, are unwilling to finance additional compensatory and support programmes in the Southern countries, ultimately creating a gridlock in the Euro-Mediterranean integration process and hindering sustainable development of agriculture in the Euro-Mediterranean region, especially on its Southern shores (García-Alvarez-Coque 2002, Dell'Aquila and Velazquez 2002). In order to determine specific institutional opportunities for CAP reform that could break the gridlock, this research aimed at assessing the influence of particular institutional mechanisms that have affected CAP reform since the late 1980s. The paper suggested that mechanisms such as multilateral trade negotiations, the move from a "productivist" towards a "multifunctional" policy paradigm, the change in policy network, path dependency, introduction of QMV and a stronger Commission have all supported the liberalization of trade and introduction of objectives and mechanisms specifically targeting sustainable development, whereas the budget negotiations which gained importance due to the growing need for budgetary resources and the introduction of co-decision powers for the conservative European Parliament have slowed down the process.

Parallel analysis of the processes of CAP reform and Euro-Mediterranean integration demonstrated that the Uruguay round of trade negotiations, which resulted in the 1994 agreement on regulation of trade-distorting measures in agriculture, including provisions for continuation of negotiations until all the trade-distorting mechanisms were abolished, influenced the replacement of price and production supports with direct payments to farmers during the 1992 and 1999 reforms (Coleman and Tangermann 1999, Daugbjerg and Swinbank 2009). Even though, as demonstrated by Tangermann (1997), policy change negatively affected the value of preferences for exports from the Mediterranean partner countries and diminished fiscal revenues based on import levies, it sup-

ported the 1995 launch of the Barcelona Process that aimed at liberalizing trade in the region and setting up a development policy. The turn was supported by the paradigmatic shift towards rural development, change in policy network, path dependency and a stronger Commission. However, at the time when partnership agreements were being negotiated, multilateral trade negotiations were facing a crisis which resulted in failure of the 1999 Seattle Ministerial Conference, while the planned Eastern enlargement increased pressures to curb expenditures on agriculture (Lovec and Erjavec 2012), thus weakening the incentives for Euro-Mediterranean integration.

The 2000s saw the launch of the DDR which was expected to phase out export subsidies, reduce domestic supports and improve market access. The 2003 Fischler Reform and 2008 Health Check decoupled supports from production, introduced new objectives and attempted to improve the targeting of supports (Daugbjerg and Swinbank 2007, 2009). The reforms were supported by the new multifunctional policy paradigm in combination with QMV and the strong role played by the Commission (Garzon 2006, Swinnen 2008). In this context, the Barcelona Process got a new impetus and the turn towards quality, environment and rural development was recognized as an opportunity for integrated development of agriculture on both shores of the Mediterranean. However, since the enlargement towards the East, the importance of budget negotiations has grown and the old member states have dug in into their current budget positions. Successive failures to come to a trade agreement have weakened ambitions to replace the production and income supports with environmental and rural development programmes and have strengthened the role of budget negotiations for the CAP. After 2008, the optimism with regard to liberalization of trade in agricultural products was gone. Even though the crisis in the MENA region did trigger some amount of bad conscience in the EU and push forward some of the trade and development initiatives, the 2013 CAP reform was all about keeping the distribution of funds unchanged (Lovec and Erjavec 2014). Attempts to strengthen some of the new objectives and better target payments were further disabled by changes in decision-making procedures that granted the conservative majority in the European Parliament the rights to veto the CAP reform (see Table 10.2 below).

Table 10.2. CAP reforms and Euro-Mediterranean integration in agriculture

CAP reforms / mechanisms facilitating reforms	1992 MacSharry, 1999 Agenda 2000 reforms: replacing trade-distorting supports with direct payments	2003 Fischler, 2008 Health Check reforms: turn towards new objectives and better targeting of supports	2013 CAP towards 2020 reform: slow progress towards the new objectives
Trade	Successful conclusion of Uruguay round of trade negotiations: phasing out of trade-distorting supports	Attempts to conclude Doha round of negotiations and to continue with phasing out trade-distorting measures	
Budget		Pressures to curb budget expenditures and net deficits	
Paradigm shift		Towards better targeting of the new objectives (competitiveness, product quality, environment and rural development)	
Institutional change	Change in policy network, path dependency, introduction of QMV and change in Commission nomination procedures		European Parliament granted co-decision powers
Euro-Med integration in agriculture	Barcelona Process launched: objective of liberalization of trade and development programmes	Barcelona Process reengaged: towards further liberalization and quality-intensive development	Particular trade and development initiatives as a response to the crisis in the Middle East and North Africa

Source: Author's elaboration.

The strong correlation between the success of multilateral trade negotiations and the kind of CAP reform that supports trade liberalization in the Euro-Mediterranean region and the establishment of agricultural policy specifically targeting sustainable development, suggests that multilateral trade negotiations are essential for overcoming the power and dependence asymmetries, insufficient representation of interests and value-claiming strategies which hinder the development of such a policy on a basis of regional integration process. Even though liberalization of trade might bring pressures on certain groups of producers in the Euro-Mediterranean region, increase prices of agricultural products and pressures on the environment, thus threatening food security, environmental sustainability and socio-economic development in the region, it would, generally speaking, support improvements in terms of competitiveness and trade creation and provide for higher incomes which can be used in order to assure balanced and sustainable development. In addition, multilateral trade framework provides for incentives for introduction of better targeted supports programmes with potentially strong spill over effects.

Introduction of new support mechanisms resulting from the changed trade context served to strengthen the role of budget negotiations and

value-claiming strategies. However, these strategies seem to be particularly strong in the context of failing multilateral trade talks. Furthermore, there is a substantial manoeuvring space in terms of how agricultural supports are spent, with the multilateral trade regime exerting influence on improvements in targeting of supports. In spite of their dependence on the context of trade and budget negotiations, other institutional changes facilitating CAP reforms played an important role as well. The role of the multifunctional paradigm, change in policy networks and the role of Commission can be further strengthened through better definition of policy objectives, more research on impact of individual policy mechanisms and greater involvement of environmental and developmental NGOs in the process. Much can also be done in terms of planning the timing of reforms: the positioning of Agenda 2000 and 2013 reforms in parallel to negotiations on the new MFFs turned out to be particularly weak. As demonstrated by the EU-Morocco agreement, the impact of recent changes in decision-making procedures that brought co-decision powers to the European Parliament with its relatively conservative preferences, could be neutralized by strengthening the transparency of the process, raising awareness among the general public and reducing information asymmetries.

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Part IV.

Policy Options to Foster
Sustainable Agricultural Systems
in the Euro-Mediterranean Area

11.

Sustainable Mediterranean Agriculture for Food Security? Challenges for the Euro-Mediterranean Relationship

Michel Petit

INTRODUCTION

Southern and Eastern Mediterranean countries (SEMCs) face daunting challenges in the field of agriculture and rural development because of a nexus of problems concerning rural poverty, import dependency, deterioration of natural resources, worrisome demographic trends, etc. The problems to be solved have been well identified and a broad consensus on their nature and magnitude has emerged in recent years. Yet, recent empirical evidence, while confirming this general diagnosis and showing that significant public policy efforts have led to major improvements in recent decades, suggests that a greater sense of urgency than generally perceived is warranted. Current public policies and recent trends are simply not sustainable, because of escalating costs to public budgets, growing scarcity of water, continued deterioration of soils and biodiversity and demographic projections.

Such a diagnosis calls for a deep reassessment of domestic public policies in SEMCs but also of the aid policies of external partners, notably that of the European Union, which is the main public aid provider in the region and which itself stands to be directly affected on many fronts by how these issues will be handled in its immediate neighbourhood. Analysing the implications for the Euro-Med relationship of these sustainable development issues in Southern and Eastern Mediterranean countries is the main purpose of this paper.

First, a brief but comprehensive summary of the situation and trends in SEMCs will be presented. The rest of the paper will then be devoted to the implications of this serious situation in the SEMCs for the whole Euro-Mediterranean relationship. We first suggest that too much atten-

tion has been given in the past to trade liberalization, from the hope in Barcelona in 1994 to create a fully free trade Euro-Med area by 2010 to the current goal of negotiating bilateral “deep and comprehensive free trade agreements” with as many SEMCs as possible. We will argue that the 2010 goal of a free trade area was utopian, and that the focus on trade liberalization has been distractive both within individual SEMCs and in the construction of the Euro-Med relationship, particularly for agriculture and rural development.

11.1 CURRENT DOMESTIC POLICIES AND RECENT TRENDS ARE NOT SUSTAINABLE

A statement from the meeting of the CIHEAM Ministers of Agriculture held in Malta in September 2012 (CIHEAM 2012:50) summarizes in five lines all the ingredients of the historical challenges faced today in the field of agriculture and rural development by Southern and Eastern Mediterranean countries (SEMCs)¹: “Current food consumption and production patterns are not sustainable in the Mediterranean basin due to biodiversity loss, degradation of natural resources, pesticide contamination, climate change, high energy and water consumption, dietary patterns and eating habits changes, and high dependency on imports, as well as poverty and vulnerability of many rural and urban Mediterranean communities, and particularly the erosion of the Mediterranean diet”. It represents a broad consensus view among government circles in these very diverse countries, and that view is supported by numerous academic publications (see for instance Bessaoud and Montaigne 2009, and Bessaoud 2013:13, who speaks of a “crisis of peasant agricultures, poverty and fragility of rural societies, advanced degradation of natural resources, major inequalities in the access to resources: land, finances and material”). We come back to each one of these main challenges, trying to be brief and specific on the

¹ This grouping of countries refers to countries belonging to the Mediterranean geographic area, characterized mainly by its climate and flora, located on the Southern and Eastern shores of the Mediterranean Sea. It is made up of nine so-called Mediterranean Arab countries (MACs: Morocco, Algeria, Tunisia, Libya, Egypt, Palestine territories, Jordan, Lebanon and Syria), plus Israel and Turkey. Situations vary much among these countries, which limits the validity of any general statement; yet, there are common elements and they all face more or less similar challenges.

nature and magnitude of the problems, relying mainly on the results of a recent comprehensive research project called SUSTAINMED.

11.1.1 Import Dependency

Import dependency is a major structural feature of many countries, and it is also the starting point of most projection and foresight analyses of the region (Cheriet 2013, Abis 2012, Cheriet et al. 2012). The main concern expressed then is that of a region depending on outside suppliers for the provision of its basic foodstuff. Actually, the region depends heavily on imports for only a few commodities: cereals, sugar, oils and oilseeds, as well as dairy products. It is for cereals that the total import bill for the whole region is the largest (more than \$12 billion in recent years) in spite of Turkey often being a net cereal exporter. Given the importance of cereals in the diet of most people, particularly the poorest, this cereal import dependency is the source of a major concern with economic, social and political ramifications. All are aware that the demand for cereals has been growing and will continue to do so – due mainly to demographic and economic growth – while there are serious constraints limiting the growth of domestic production.

Accordingly, IPAMED experts (Rastoin et al. 2012:4) wrote: “In 2008, the agricultural and food import bill of the SEMCs reached the abyssal figure of \$57 billion, that is almost three times as much as in 2000. [...] Food insecurity in the region unfortunately keeps growing and constitutes one of the factors of the unprecedented political crisis the SEMCs are going through”. Similarly Abis, a keen observer of the geopolitical situation in the region, wrote: “The dependency of the Mediterranean Arab countries on international markets is growing, as a consequence of a multidimensional regime of constraints (ecological, demographic, logistical) and of a stronger and stronger purchasing power of the population, having led to a major diversification of food demand. Between 1990 and 2010, the volume of agricultural imports of the four North African countries (Algeria, Egypt, Morocco and Tunisia) trebled, from 9 to 27 billion Euros. These sums represent a considerable share of public budgets” (Abis 2012:152).

These citations reflect the fact that food import dependency has several important economic and political consequences. Firstly, there is a security dimension: with the Middle East and North African regions being the most food import dependent regions of the world, officials legitimately worry about their ability to secure supplies in times of crisis. Indeed, the experience of the 2008 crisis showed that governments of the region

were willing to go to great lengths in order to ensure a reasonable degree of food supply security at the national level (Lerin et al. 2009). This leads immediately to the next dimension: the huge costs of that security, in terms of both balance of payments and public budgets. Finally, the fact that most governments of the region intervene massively on the markets for basic foodstuff illustrates the high political sensitivity of the food security issues resulting from that import dependency.

Given the magnitude of this concern, one wonders whether or not something can be done about it. Two challenges are thus identified: 1) Can domestic production be increased? and 2) Can agricultural and food imports be better managed?

The common wisdom on production is that natural resource constraints are so limiting that little can be done to increase domestic agricultural production. Yet, a look at past trends over several decades suggests that the performance of agricultural growth in the region was not as dismal as commonly believed. According to the Agrimonde exercise (Paillard et al. 2010), which examined scenarios for world agriculture until 2050, based on past performances between 1961 and 2003, total agricultural production – measured in Kilocalories (an energy equivalent) – in the Middle East and North Africa regions, where SEMCs have a very important weight, increased at a faster rate than the world average, less rapidly than in Asia and Latin America but faster than in the former Soviet Union and even in the OECD countries. Similarly, according to Belghazi (2013), the share of SEMCs (minus Palestine and Libya) in world agricultural production remained constant at 5.5% throughout the 1994-2007 period.² Again here, there were significant differences among countries: “In 2005-2007, five countries, Turkey, Egypt, Morocco, Algeria and Syria, made up more than 91% of the total agricultural production of the SEMCs (minus Palestine and Libya). During the same period, Turkey accounted for about 39% of the SEMC-9 agricultural GDP, Egypt for 25.5%, Morocco for nearly 10%, and Algeria for slightly more than 9%. The average growth of agricultural output between 1994-1995 and 2005-2007 was the highest for Algeria and Syria, slower for Egypt, Israel and Tunisia and the slowest for Morocco, Jordan, Turkey and Lebanon” (Belghazi 2013:3). In the same vein, available evidence suggests that most of the production growth can be attributed to productivity growth. Thus, the average land

² For the sake of comparison, this 5.5% figure should be compared to the share of world population in the SEMCs, which is about 4%.

productivity increased by a factor of about 3 in four decades, but at about 15,000 Kcal/day, and per hectare it remained well below that of Asia and Latin America (Paillard et al. 2010).

Of course, cereals are but one among many categories of agricultural products, albeit a major one, and their relative importance, both in production and consumption, is declining. Many past debates have focused on the appropriate level of diversification of agricultural production, particularly on how much SEMCs should give up on cereals and specialize in fruits and vegetables, products for which they have a clear comparative advantage on international markets. Of course, such a choice would risk increasing the import dependency for cereals and, as further discussed below, it would have implications for the many poor semi-subsistence farmers located in dry remote areas, who are producers and sellers of cereals. Given all these considerations, it should be clear that accelerating the rate of growth of domestic production involves many challenges for public authorities in SEMCs.

The second question raised above, whether or not agricultural and food imports could be better managed, has not received much attention by analysts and observers, as reflected by the small number of references on this topic in the literature. Yet, the question is important. As already indicated, governments of the region took far-reaching decisions in response to the 2008 crisis. Analysing those decisions, their rationale and their impacts would be both interesting (to understand how governments behave) and useful for decision makers (to assess whether or not decisions of this type could be improved, in terms of public welfare, in future crisis situations). This is an interesting agenda for research, which however has not been addressed. Another dimension of the management of food imports has to do with infrastructure and logistics. This also was not investigated in the SUSTAINMED project. For interesting reflections on this topic, see Abis (2012).

11.1.2 Stubborn Rural Poverty

Poverty, particularly rural poverty, has been and remains a major issue in SEMCs. In this respect, Israel and Turkey face a set of specific problems, less acute than those faced by most Mediterranean Arab countries, even if they are at times politically important. Thus, the focus of this section will be mainly on the Arab countries. For them, the challenges associated with increasing agricultural production, which we just discussed, are

compounded by those arising from the need to fight rural poverty, which makes the choice and pursuit of an appropriate agricultural and rural development strategy particularly difficult. Rural poverty situations vary greatly from one country to another. So, to be meaningful, discussions in this section will be conducted at the national level. To illustrate the problems and the progress made in recent decades, we will focus here on four key countries: Egypt, Morocco, Tunisia and Turkey. Those are the countries which received particular attention in the SUSTAINMED project. First a few figures for each country will illustrate the magnitude of the problem and the real progress made in recent decades (CIHEAM-IAMM 2014):

- In Egypt, the real expenditures per capita (as measured by household expenditure surveys, i.e., a robust indicator) increased by 93% in urban areas between 1975 and 2009, whereas they increased by 78% in rural areas during the same period. Admittedly, this represents a slow and uneven growth, but still a significant achievement.
- In Morocco, the same indicator, real average expenditures per capita, increased by 66% between 1990/91 and 2006/07, the year of the most recent household survey, the average rate of growth being slightly higher in rural areas – which however, as further discussed below, continue to lag behind urban areas.
- Tunisia has had an impressive record of poverty reduction over the years, cutting the level of poverty (using the national poverty line) from 40% in 1960 to 2.8% in 2010, according to official figures. At the same time, the growth rate of population declined and life expectancy increased markedly while improvements were achieved in education programmes, access to health care and basic infrastructure. The distribution of income also improved: the GINI coefficient for income per capita fell from 0.434 in 1985 to 0.408 in 2008 (UNDP 2010), and average per capita expenditures for the country as a whole increased, reaching \$3,872 (PPP) in 2008.
- In Turkey there has also been great progress in the fight against poverty during the last five decades. The poverty ratio, defined as the proportion of people with income less than 50% of the median income, decreased from about 49% in 1968 to 34% in 1987 and 16% in 2008. The GINI coefficient for income per capita decreased from 0.56 in 1968 to 0.43 in 1987 and to 0.38 in 2005.

Yet poverty, particularly rural poverty, remains a major issue in all four countries. The greatest challenge is probably faced by Egypt where the population density is generally very high, even in rural areas, particular-

ly in the Nile delta (more than 900 persons per square Km in 2007 in rural “Lower Egypt”, not including the four urban governorates of Cairo, Alexandria, Suez and Port Said). Generally speaking, the poor are concentrated in rural areas and particularly those in Upper Egypt. Rural poverty is also a major problem in Morocco, as reflected in the average monthly household income of 3,900 DH (i.e., around €350 at the official exchange rate, which is probably overvalued) in rural areas, with nearly 20% of households having a monthly income of less than 1,930 DH. In spite of real progress in the last 30 years, the UNDP human development indicator ranked Morocco the 130th country in the world in 2010, because of a high incidence of poverty in internal rural regions, poor literacy rates and poor performance of the public health system, as reflected for instance in high levels of infant mortality (CIHEAM-IAMM 2014).

The poverty situation in Tunisia is generally less acute than in most other Arab countries. According to the UNDP Human Development Index, Tunisia was ranked 81st in the world in 2010, the value of the index for the country having increased from 0.436 in 1990 to 0.683 in 2010, whereas the average for Arab countries increased from 0.398 to 0.590 during the same period. In addition, poverty seems to be mainly concentrated in urban areas, which account now for about three quarters of the poor population, as compared to about half in 1975. As a result, the rural poor accounted in 2007 for only 27% of the total poor population. Yet, as the dramatic events of Sidi Bouzid showed, rural poverty remains a major problem. Sidi Bouzid, where the 2011 revolution started, is a town of some 50,000 inhabitants located in the interior of the country, in a region where the economy depends heavily on agriculture.

Everywhere, the main problems facing rural areas are similar: a poorly educated and unskilled workforce; an ineffective institutional structure and a lack of efficient farmer organizations; a scattered pattern of settlement in some regions; insufficient development and maintenance of physical, social and cultural infrastructure; a high rate of dependence on subsistence agriculture; unequal access to soil and water resources; inadequate diversification of agricultural and non-agricultural income-generating activities; a high rate of hidden unemployment and low income levels; increasing migration; and the ageing character of the rural population.

The challenge for public policies is how to face that complexity. Among poverty alleviation policies, prime place has been given to food policies in many countries, notably in Algeria, Egypt, Morocco and Tunisia. The di-

lemma faced by public authorities for decades has been striking. The budget share of food is very high among the poor. Thus, keeping the price of food as low as possible is an effective way to protect the poor. But in North Africa, many farmers are also poor and their welfare is negatively affected by low prices for the products they sell. Hence, in many countries of the region, public authorities have put in place a complex system of market interventions, setting a wedge between producer and consumer prices. Specific measures have varied through time and from country to country; they have generally included border interventions (e.g., import taxes and physical import controls, or, mostly in the past, public monopolies) and subsidies of various sorts. The difference between producer and consumer prices has mainly been borne by the public budget. Admittedly, many of these public interventions were relaxed during the process of domestic liberalization in the 1980s and 90s. But this liberalization has only been very partial and the cereal markets, in particular, remain heavily regulated (CIHEAM-IAMM 2014). As a result, public budget costs have escalated and will continue to do so in the future if the policy mix is not radically changed. One can seriously doubt that such levels of public expenditures will be sustainable in the long term.

This illustrates one of the thorniest interactions among policy challenges faced by countries in the region: What is the most appropriate market intervention, given the import dependency discussed above? And what should be the rural poverty alleviation policy, given the major role given to market interventions in this domain? The link between these two challenges is critical because agriculture remains the main source of income for many rural poor. This is true even in cases where many of them have no, or only limited, access to land and water. Access to these two key inputs for agricultural production has been a source of major problems in all the countries under study. And past public policies have not been very effective in this area.

11.1.3 Deteriorating Natural Resources

Soil, water and biodiversity, the main natural resources of interest here, are under threat in many parts of the world. The pressures are particularly acute in the Southern and Eastern Mediterranean region for a variety of reasons. In addition, these pressures will only increase with global warming. Great challenges result for the countries of the region. We will first briefly review here the threats to each one of these resources.

Soil erosion seems to be rapidly increasing in many dry and remote regions because the poor rural population cannot afford the investments which would be necessary for prudent sustainable management of the resource. Short-term pressures resulting from poverty and demographic growth lead to over-consumption (cultivating marginal lands, overgrazing, excessive collection of fuel wood). Besides, uncertain land tenure, poor literacy, and limited access to credit constitute additional obstacles to long-term investments. In more well-endowed regions, particularly on the plains, soils are more fertile and often irrigated. Several types of degradation can however be observed: soil salinization in some places, pollution by excessive use or inappropriate application of pesticides and chemical fertilizers. But the greatest threat to agricultural soils is urbanization, and particularly in coastal areas. In spite of the magnitude of these problems, sustainable management of soils does not carry the urgency it warrants, in public debates and concerns. One reason may be the difficulty of finding appropriate indicators of land degradation, that could be broadly understood by non-specialists and that could communicate the seriousness of the degradation, thereby becoming effective to generate policy action. This is reflected in the limited number of synthetic publications on the subject. One notable exception is a report from the Plan Bleu based on an extensive review of the literature, but dating back to 2003 (De Franchis; it is worth noting that in our literature search, we did not find anything comparable that was published more recently).

The De Franchis (2003) report makes it clear that soil degradation takes many forms and results from a multiplicity of causes. But, as just indicated, few meaningful quantitative indicators are available. For instance, the report quotes an estimate from FAO indicating that 15% of agricultural soils are under an erosion threat in the Mediterranean region. Is this very little or very serious? Several other experiences quoted in the report invoke both a sobering humility concerning the solidity of past diagnoses and a sense of urgency in spite of past mistakes and failures in efforts to conserve soils. First, the multiplication of catastrophic floods in cities around the Mediterranean basin, e.g., Nîmes (1988), Genoa (1993/94), Algiers (2001), point to the urgency of coping with huge increases in runoff water volumes following the construction of buildings and roads on large tracts of land. Secondly, the example of Israel (Gradus and Lipshitz 1996) illustrates how extensively fertile agricultural soils can be, and have been, diverted to other uses, particularly in the early 1990s when the country absorbed more than 600,000 mi-

grants from the former Soviet Union in just a few years. Land use planning rules were not strong enough, or not forcefully enough implemented, to prevent an anarchic development of construction and to protect agricultural areas.

Finally, the relative failure of soil conservation efforts in Algeria over several decades has been well documented (Roose et al. 1998): "Over a total of 350,000 hectares treated by the DRS [Defence and Restoration of Soils], 60% were found to be degraded, 20% had disappeared and it is not clear that erosion was ever a threat on the rest of the surface, where terraces were well maintained". This disappointing impact is attributed to a complex set of interrelated causes: started during the colonial period, the projects were not always well designed, rarely well monitored and followed up, and did not involve the participation of the local populations.

These criticisms illustrate the complexity of soil conservation problems, which involve the interaction of several natural and social processes. Taking these limitations into account, new methods of intervention, more inclusive and targeting together the management of soils, water and biodiversity, have been suggested and experimented with in recent years. Not enough evidence is available yet to assess their effectiveness. But one thing is sure: the complexity which these methods attempt to tackle will continue to be a major source of challenges.

Water resources are well recognized as a source of major challenges in the Mediterranean region, which is often presented as a world "hot spot" in this domain (UN Commission on Sustainable Development 1997). Much has been written on the water problems in the press, in official documents from governments and various international organizations and also in the scientific literature. A brief synthesis, focusing on fundamentals, will be sufficient for our purpose here. The starting point has to be the concept of water balance, in spite of its limitations briefly discussed below. The basic idea is simple: since water is critical to life, will there be enough water resources to cover water needs? And under what conditions? This indicator reveals for instance the magnitude of one of the water management challenges faced by SEMCs: in 2009, 108 million people in the region were in a situation of "water stress" (less than 1,000 m³/hab/year available), 58% of whom had even less than 500m³/hab/year (a situation defined as "water scarcity") (Blinda and Thivet 2009).

All projection works indicate that this situation can only worsen in the future. Looking first at water needs, it is clear that they will increase

with demographic, urban and economic growth. Besides, with irrigated agriculture being by far the largest user of water, much will depend on whether or not irrigated areas increase and by how much. Two additional considerations regarding water needs or water uses must be taken into account: How much can water wastes be reduced or eliminated? How much can water use efficiency be improved? Reducing wastes and improving water use efficiency are both obviously desirable because this would improve the water balance by reducing water consumption. But achieving either one is challenging because it implies significant changes in the collective behaviour of water users, including new investments, new institutional rules and often a redistribution of benefits. This is difficult everywhere in the world.

On the supply side, there is no simple solution either. Not much can be done about increasing rainfall. Besides, all the available model simulations of the impact of global warming indicate that total rainfall will decrease in most regions of the SEMCs. Rainfall patterns will become more erratic and less evenly distributed, which will make rainfall harvesting and storage more challenging. In some parts of the region groundwater resources are relatively abundant. But many of these are not renewable and some are already overexploited, as is being done on a large scale in Libya. Several countries rely also on so-called “non-conventional” resources, such as the treatment and reuse of waste water, reflecting the high degree of water stress in the region. Generally speaking, it is the poorest people, in rural areas and also in urban ones, who suffer most from water scarcity. In several countries, the proportion of the rural population without access to drinking water is high by international standards.

What is the public policy agenda resulting from this difficult water situation? Interesting answers to this question can be derived from a comprehensive assessment of water resource availability and use in the region, conducted by the Plan Bleu in 2005 (Benoît and Comeau 2005). Two scenarios were considered: According to the first one, based on the extension of past trends, water use would increase significantly by 2025, several countries would increase their use of fossil, non-renewable resources and more than 80 million people would find themselves in a situation of “water scarcity”, compared to 63 million in 2005. The second scenario, based on reducing wastes by 50% and increasing water use efficiency in agriculture (to 80%) would radically change the water balance situation. In other words, public policies must target water demand. This does not mean that the supply side should be given up: increasing water storage capacity re-

mains desirable. However, much more can be gained on the demand side.

But that, as already indicated, is extremely challenging. Reducing waste and increasing water use efficiency would require major changes in behaviour by a variety of water users. Social constraints of various sorts must be overcome. The most important obstacle to the necessary changes in behaviour is probably the social and political reluctance to resort to economic policy instruments. Water being scarce, the obvious economic tool to use is to raise the price of water paid by its users, be it for irrigation purposes or for domestic use. But the social, cultural, religious, ethical and ultimately political obstacles to do so are overwhelming, particularly in this region. For instance, charging poor people, with a price reflecting costs, for urban water services, or farmers for irrigation water, is socially and politically very difficult. In addition, the social and political obstacles to overcome, when deciding to build new dams, particularly large ones, are also huge. As a result, the sustainable management of water resources has been, and will continue to be, extremely challenging. This challenge will be compounded in years to come by new uncertainties and complexities. Returning to the concept of water balance will help us to illustrate these uncertainties and complexities. Water balance assumes both a space and time scale, e.g., how much water is available and how much is consumed³ in a given space (be it a country, a region, a watershed, etc.) during a given period (say one year, one season, etc.). But most water management decisions (e.g., building a dam, deciding what prices to charge for water uses, choosing a pattern of devolution of maintenance responsibilities to water users, etc.) involve combining several space and time scales. These combinations are always complex in real situations. As a result, to the uncertainties regarding how much water is available at a given place during a given time period, uncertainties which will increase with climate change, must be added those associated with complex social processes involving many actors: Who is going to do what? Where? And when?

Past and current public policies have addressed these issues which are well recognized in most SEMCs. But the main point to be stressed here is

³ A further complication must be acknowledged here. The concept of consumption may not be fully adequate for water, since water use, be it by the human body or by domestic animals or by crops, does not really destroy the water, which is returned to the atmosphere or to the soils or to water streams after use. However, managing the resource for subsequent use most often requires new human efforts and investments. As a result, reasoning in terms of consumption and of demand is appropriate in many instances.

that these water management policies have not been sufficient to reverse the worrisome trends discussed above.

Biodiversity is also under threat in the region. The threat is serious because, in the words of the Critical Ecosystem Partnership Fund (CEPF), a prestigious coalition of actors at the world level: “The Mediterranean Basin Hotspot is one of the most extraordinary places on Earth and is remarkable for both its high level of biological diversity and its spectacular scenery. [...] Approximately 13,000 of its 30,000 plant species are endemic, or unique, to the hotspot, and many more are being discovered every year” (CEPF 2010:3). Similarly, Médail and Quézel (1997:116) pointed out that about 10% of the known higher plant species were found in the Mediterranean region on a surface only equal to 1.6% of the world total land area.

There is a surprisingly wide and strong consensus on the causes behind the threats as well as what should be done to protect and conserve biodiversity. Population growth and the strong pressures exerted by tourism, which is massive and still growing, particularly in coastal areas, are seen as the main culprits, straining the limited resources, particularly water, leading to overexploitation and degradation, even destroying natural habitats. Here again, it is expected that climate change will exacerbate these negative pressures. Thus, the link with the degradation of other natural resources is strong. The same is true for the solutions which are proposed. Thus, the first two strategic directions of the CEPF are formulated as follows:

- To promote civil society involvement in integrated coastal zone management; and
- To establish the sustainable management of water catchments and the wise use of water resources.

For the IUCN, protecting species and protecting ecological sites requires the integrated management of the environment (ecosystemic approach) as well as major communication and training efforts (Cuttelod et al. 2009). In other words, the challenges faced to conserve biodiversity are very similar to those resulting from the imperative obligation to sustainably manage soil and water.

11.1.4 Worrisome Demographic Trends

All the challenges identified above, regarding national food security in a situation of growing import dependency, stubborn rural poverty, and

degradation of natural resources, are compounded by very worrisome demographic trends. Indeed, in spite of the demographic transition in which several SEMCs are definitely engaged, total population continues to increase, many young people are entering the labour market, creating a huge gap between national labour demand and supply, and – most importantly for our purpose – the total rural population continues to increase in most of the region. We will briefly review these trends before drawing implications for agricultural and rural development policies.

All the demographic parameters of importance for agriculture and rural development were reviewed in *Mediterra 2008*, the tenth annual report of CIHEAM (2008), devoted to a prospective exercise on food and agriculture in the region. Although conducted several years ago, the analysis remains valid and relevant. The following paragraphs are directly drawn from that report. In 2005, the total population of the Mediterranean Basin reached 454 million, i.e., 7.0% of the world population, well on track to a doubling in 50 years (1970-2020). But most of the recent growth took place on the Southern and Eastern shores of the Basin, and this trend is expected to continue in the foreseeable future. Between 1990 and 2020, the population is expected to increase by 14 million inhabitants in the North and by 130 million in the South and the East. Another mega-trend is urbanization. Between 1970 and 2005, total urban population doubled; between 1990 and 2020, urban population in the South and East is expected to increase from 108 to 214 million people, a rate of growth placing the Maghreb countries (i.e., North Africa) on top of all regions in the world on this score. Yet, rural population continues to increase, even if its share in total population declines. And this, of course, has major implications for agriculture: What are the employment perspectives? And, given the particular conditions of access to land and water resources, for what level of income?

Yet the demographic transition, primarily based on lower infant mortality and lower birth rates, is well engaged in several countries. For instance, in Egypt and Morocco, two countries where poverty remains a tremendous challenge, infant mortality rates are expected to decrease by two thirds between 1990 and 2020. Life expectancy is also increasing and is expected to reach 75 years in all SEMCs. Fertility rates have begun to decline, particularly in the Maghreb countries where the number of children per woman is near 2.1, whereas it is still much higher in Egypt, Syria and Israel. Another striking feature of this demographic transition in SEMCs is that it is taking place very quickly, portending major shifts

in the age composition of the population. Yet, because of the strong demographic growth in recent years, the population of working age has increased very rapidly and job creation linked to economic growth has not kept pace with demographic growth. This trend will continue in the coming decades. Thus, it is estimated that the number of net entries into the labour market in the Arab Mediterranean countries between 1995 and 2025 will be between 80 and 85 million, a huge increase in the supply of labour.

As already indicated, these demographic trends and perspectives have major implications for agriculture and rural development. Contrary to what happened in Europe and other developed countries during the past century, the modernization of agriculture cannot be driven in SEMCs by a rapid decline in agricultural employment and a massive substitution of capital for labour, with the size of farms increasing. In this region, the number of hectares per agricultural worker, already very small, will continue to decrease, which will make any increase in the average productivity of labour very difficult and will dampen the possibility of improved agricultural income per person working in agriculture. Hence, it will be important to diversify the sources of income for rural households, thereby increasing the urgency of non-agricultural job creation in rural areas – a great challenge indeed, given what has just been noted about the huge increase in the total supply of labour in the whole economy.

11.2 IMPLICATIONS FOR THE EURO-MEDITERRANEAN RELATIONSHIP

Events on the Southern and Eastern shores of the Mediterranean Sea have rapid and direct consequences for Europe. Thus, it is not surprising that Euro-Med relationships have a long history and are both intense and very diverse, covering many fields from political and security issues to cultural cooperation. In addition, following the Barcelona conference which launched the Euro-Mediterranean Partnership (or “Barcelona Process”) in 1995, a very elaborate institutional structure has been put in place between the European Union and 12 “Mediterranean Partner Countries” (MPCs) to orchestrate a wide range of collaboration activities (Philippart 2003).

Yet on the economic front trade liberalization has played, and con-

tinues to play, a unique role as the linchpin of efforts to strengthen the relationship. Today, it appears that this critical role given to trade liberalization has had major drawbacks, leading to frustrations and leaving in the background other areas of collaboration which could be more fruitful. We will first substantiate the claim that trade liberalization has been put at the forefront of the collaboration agenda and then suggest a few directions for an alternative agenda which could lead to a more productive relationship.

11.2.1 Trade Liberalization at the Centre of the Relationship for Decades

Even though the relationships between Europe, notably several of its member States, and Southern and Eastern Mediterranean countries are very old, it is in Barcelona in 1995 that a new, common and comprehensive strategy was formulated. The final agreement at the end of the conference included a Declaration and a work programme covering three domains: a) political and security, b) economic and financial, and c) social and cultural. Admittedly, geostrategic and political considerations were of great importance in launching this ambitious initiative; as stated in the Declaration, “the first objective of the partnership is to promote the emergence of a common area of peace and stability in the Mediterranean”. And political means (through “multilateral political dialogue”) were to be used for that purpose. But it is clear also that economic means, particularly trade liberalization, were seen as key instruments of this political objective. Thus, the Declaration stresses the complementarity among the three dimensions of the partnership: “convinced that the general objective of turning the Mediterranean basin into an area of dialogue, exchange and cooperation guaranteeing peace, stability and prosperity requires a strengthening of democracy and respect for human rights, sustainable and balanced economic and social development, measures to combat poverty and promotion of greater understanding between cultures, which are all essential aspects of partnership”. In the economic sphere, trade liberalization appears as the main instrument of multilateral collaboration.

According to a broad acceptance of what was then the “Washington consensus”, trade liberalization was seen as a powerful tool in the promotion of economic growth and, as a consequence, of poverty alleviation. In addition, the example of the European common market, relying on the

free flow of goods and services within the European economic space, was viewed as a great success to be emulated. The resulting economic integration would bring within reach the objective of building a space of “shared prosperity”, to use the terminology of the Declaration.

Trade liberalization was not the only component of the economic package. Other activities were undertaken to support domestic policy reforms in MPCs, enhancing investments, notably foreign direct investment. And the amount of European financial aid was significantly increased, particularly loans from the European Investment Bank. Yet, the objective of creating an entirely free trade zone by 2010 was seen in 1995 as the main engine of the new and enhanced partnership.

Although the general objective of the Barcelona Process is clearly regional, SEMCs negotiate individually on trade matters with the European Union. Indeed they are far from a unified trading block. Following the launch of the Barcelona Process in 1995, a new set of bilateral agreements with the partner states were negotiated, to replace the former cooperation agreements with much more extensive and ambitious “Association Agreements”. And indeed, agreements with all the MPCs, except Syria, were signed between 1995 and 2002. This was a major achievement even if the implementation of some of these agreements has been far from smooth.

The need to negotiate bilateral trade agreements instead of regional ones, imposed by the absence of a common organization for SEMCs, led to a somewhat paradoxical result in terms of trade liberalization: the creation of trade distortions among SEMCs, with each one negotiating specific conditions for its access to the EU market. Another exception to the principle of achieving a fully free trading zone has been the special treatment given to agriculture. As discussed below, this is quite understandable but it does illustrate the fact that the goal of full trade liberalization by 2010 was clearly utopian for reasons which are mainly of a political nature.

In spite of these difficulties, which became more and more obvious with time, the promotion of trade liberalization has ostensibly remained to this day the central component of the attempt to build a stronger Euro-Med relationship. The conference held in 2005, also in Barcelona, to “celebrate the tenth anniversary of the Barcelona Declaration” reaffirmed the centrality of trade liberalization, as it committed to “fulfilling the undertaking to achieve a Euro-Mediterranean free trade area by 2010” (Chairman’s final statement). The terminology may look somewhat con-

trived, probably reflecting the uneasiness of the authors faced with the disappointing performance of the previous ten years but clinging to economic instruments in order to foster a partnership among countries divided by major geo-political conflicts. Indeed, the tensions were such that among heads of state or government of the SEMCs only the President of the Palestinian Authority attended the meeting, even though the conference had been touted as the “Barcelona Summit”. It was characterized by some observers as “one of the most fractious of the EMP’s history” (Menéndez and Youngs 2006).

The following quotation illustrates the importance given to trade liberalization: “Ten years after the launch of the Barcelona Process, the liberalization of trade in industrial goods is a reality. All industrial products originating in Mediterranean countries can enter the EU market duty free. Reciprocally, the Mediterranean partners (MPs) are progressively dismantling their tariffs over transitional periods of approximately 12 years. The liberalization of trade in agriculture is also largely achieved. More than 80% of agricultural products imported from the Mediterranean countries enter the EU market duty free or at reduced rates. Reciprocally, one third of the EU exports of agricultural products benefit from preferential treatment in the Mediterranean countries” (Montalbano 2007:48, Leandro 2005).

Accordingly, in the five-year work programme adopted at the Summit and covering a very wide range of common activities, a committee of Senior Officials was charged with the task to “design and implement a road map, for the creation of a Free Trade Area by 2010”. And this was to include a ‘progressive liberalization of trade in agriculture’, the sector continuing to be seen as a drag in the liberalization process. The next step in this effort was to adopt a “negative list” approach whereby trade in all agricultural products, excluding those put on a small list of exceptions, was to be liberalized. The aim was to negotiate so-called “deep and comprehensive trade agreements” with individual partner countries, the terminology reflecting clearly the continued search for trade liberalization. At that time, the Euro-Med process was, for the EU, integrated into the new European Neighbourhood Policy, initiated in 2002 and covering both SEMCs and Eastern Europe and beyond (e.g., Armenia). Even though Morocco was granted “advanced status” in this process in 2008, the trade agreements signed with Mediterranean countries were judged to be quite “shallow” by independent observers a few years later (Dreyer 2012). In other words, trade liberalization continued to be put at the top of the

Euro-Med partnership agenda but trade relationships remained fraught with many obstacles.

Developments in recent years, following the “Arab Spring”, confirmed the importance of political considerations in the attitude of the EU toward SEMCs. This is explicit in the first sentence of a summary of the Communication from the European Commission of March 2011, entitled *A Partnership for Democracy and Shared Prosperity with the Southern Mediterranean*. The first sentence reads: “A new strategy for cooperation should enable the European Union (EU) to strengthen its support for those Southern Mediterranean countries undertaking political and economic reforms”.⁴ The weight given to those political considerations is fully understandable. It must however be borne in mind when assessing the significance of trade liberalization in the Euro-Med partnership. The Communication reasserts the role given to trade liberalization: “the renewed partnership should lead to the negotiation of Deep and Comprehensive Free Trade Agreements with the aim of creating free trade areas”. At the same time, the very fact of setting “conditionalities” introduces differences among partner countries, differences which are in contradiction with the pursuit of free trade. In other words, the pre-eminence of political considerations over the ostensible objective of trade liberalization is clear.

11.2.2 Unintended Consequences of the Role Given to Trade Liberalization

In spite of the rhetoric, one must first stress that Euro-Mediterranean trade is far from liberalized 19 years after the first Barcelona Conference. The political obstacles to overcome have proven to be numerous and forbidding. This is particularly the case in agriculture. On purely economic grounds SEMCs, being massive importers of cereals, could be expected to have limited barriers to entry on their domestic markets for these products. Yet, this is not at all the case and nobody ever suggested such a liberalization of grain imports. The very fact that the move in some countries to let private traders, instead of State monopolies (i.e., “Offices”), be active in grain imports was hailed as a major liberalization step illustrates how far these countries are from free trade in this sector. The main point here

⁴ For the Communication summary see: http://europa.eu/legislation_summaries/external_relations/relations_with_third_countries/mediterranean_partner_countries/rx0024_en.htm.

is not to lament the lack of liberalization but to stress the importance of the political obstacles, however legitimate they may be.

In a somewhat symmetrical fashion, the obstacles to free entry on European markets of fruits and vegetables from SEMCs remain formidable. Yet, it is commonly accepted that SEMCs have a clear comparative advantage for these products. In a free trade perspective, this trade flow should be welcome. Our research (EUMED AGPOL and SUSTAINMED projects) has clearly shown that the economic stakes involved, although significant for specific producers, are minor if one assesses them from a broad European perspective. In this case again, major political obstacles stand in the way of free trade. More broadly, the very limited volume of South-South trade suggests that many obstacles prevent the growth of these trade flows. Admittedly, not all these obstacles are of a political nature but many are. Perhaps the most glaring example of such obstacles is the existence of a completely closed border between two SEMCs (namely Algeria and Morocco), which makes the objective of creating a fully free trade regional area totally utopian.

This contradiction between the call for trade liberalization and the constraints of hard political realities has had serious negative consequences. It has generated disappointment, frustration and acrimony, all of which standing in the way of a more realistic and productive relationship. For instance, French cereal farmers, supported by some intellectuals (Rastoin et al. 2012) lament that they do not have better access to SEMC markets. Similarly, the obstacles to SEMCs' access to the European markets for fruits and vegetables create many frustrations in these countries. And recent events have shown that the political obstacles remain very strong, as revealed in 2012 by the acrimonious debate in the European Parliament for the ratification of the Association Agreement with Morocco. The controversies in 2014 around the fishing agreement represent another example of conflicts and controversies raised by trade issues. More serious yet, the need for hard-to-obtain visas to enter Europe, a major obstacle to the free flow of labour which would normally be the rule in a fully free trade zone, is the cause of many frustrations in SEMCs, notably among young people.

But the most damaging consequence for the Euro-Med partnership of asserting and pursuing the utopian goal of full trade liberalization has been the neglect of other potential areas of collaboration, which could have been very fruitful for the partnership. For the agricultural sector broadly defined, this is true of support for rural development, for re-

search and for agricultural education, in particular. Admittedly, rural development has not been totally neglected but it did not receive the priority it should have, given the magnitude of the rural poverty described in the first part of this paper. Only 2% of the MEDA I and II credits, covering the 1995-2006 period, were devoted to rural development. In the same vein, there is a long history of effective collaboration in the fields of agricultural research and higher education, and that history began well before the Barcelona Process was launched in 1995. Yet, in many SEMCs, the corresponding institutions have glaring weaknesses, well identified by professionals from both the North and the South familiar with the situation, and often associated with bureaucratic obstacles to efficient functioning, etc. Obviously, many of these shortcomings can only be addressed at the national level. But closer international collaboration, entailing long-term activities beyond the usual short-term horizon of common research projects, could have strengthened those institutions, as proven by the past record of a few success stories, which incidentally were quite diverse in nature.

11.3 A NEW STRATEGIC DIRECTION IS NEEDED

Rather than building the North-South relationship on an elusive agricultural trade liberalization, the primary focus should, I believe, be placed on support to strengthen agricultural and rural development institutions in SEMCs.

The promotion of rural development is of course critical for all SEMCs and it is comforting in this respect that awareness of this need has made great strides in recent years, both within SEMCs and abroad. In this connection the launch of the ENPARD initiative is welcome. Thus, one may hope that the weight of the traditional "urban bias", leading to the neglect of agriculture and rural development in many countries of the region, as well as elsewhere, may be corrected. One acid test of the new commitment in favour of agriculture and rural development will be the amount of financial resources which SEMC governments are willing to devote for this purpose. In this domain, an external actor such as the EU cannot substitute for domestic commitment. So, the EU support to agricultural and rural development in SEMCs should not be primarily financial. It is long-term commitment to institutional support which is called for, as further discussed below.

In the past, the key organizational concept of development assistance has been the project. For decades, the World Bank and similar aid institutions have been organized to provide financial support to development projects, as illustrated by the classical project cycle (identification, preparation, appraisal, implementation, ex post evaluation) around which these development aid institutions function. Unfortunately, throughout the world, rural development projects have generally failed or faced enormous difficulties. As a former Director of Agriculture and Rural Development in the World Bank, I can testify that this is true of most so-called “integrated rural development” projects, of most agricultural credit projects, of practically all agricultural extension projects and of many others, for instance in agricultural research and in irrigation. Admittedly, some positive results have generally been obtained but, in most cases, the initial objectives justifying funding have not been reached, notably because the development of the relevant institutions has not been sufficient. Institutional development takes time and projects have too short a time horizon. Indeed and even worse, when projects are extended over a longer period than planned, it is often because they are not performing satisfactorily.

Experience in SEMCs and in many other countries of the world, both developed and developing, shows that rural development requires well-functioning institutions of many types: municipal and other local authorities; genuine farmer cooperatives capable to mobilize local resources and effectively controlled by rank and file members; similar institutions, such as water user associations, ensuring the wise management of natural resources for the benefit of the majority of local residents; and local credit institutions (notably microcredit). Civil society organizations (CSOs) can be very useful in directly playing these roles which serve the common good, as well as in fostering institutions specifically designed to play such roles. In addition, experience shows that to be successful rural development must entail many complementary components and hence strong coordination mechanisms involving a diversity of actors at the local level. Given the richness of the European experiences with local institutions of all sorts, there is a wide scope for potential cooperation in this domain, provided everyone involved fully understands that social situations vary widely in time and space and that a solution which may be appropriate somewhere may be inadequate elsewhere. Each local situation requires a specific set of institutions and of relationships among these institutions. EU support for such a development process could be very useful. It will however require a lot of local intelligence because the

process is very delicate. One may wonder whether the current EU aid delivery apparatus and mechanisms are nimble enough for such a task.

In the field of higher education, the standard institutional model to be emulated is that of the university. Not many universities in the world can hope to be like Harvard, but fortunately many universities perform very useful tasks, even if they command less resources than Harvard. A case in point is that of the American “land grant” universities, which have done wonders for the agricultural and rural development of the United States but also have contributed a lot to the development of agriculture in the rest of the world. In fact, there are many variations among universities in the world and many are quite productive. Other models can also be effective, such as that of the “Grandes Ecoles” in France. But the sad reality is that in many countries, universities and other higher education institutions are afflicted by serious structural weaknesses (insufficient financial and human resources, excessive bureaucracies, insufficient mobility and skewed age distribution of academic staff, low quality of incoming students, etc.). As a result, teaching tends to be bookish and graduates are ill-prepared for creative professional careers.

Many of these weaknesses can be found in SEMCs. It is mainly at the national level that effective action can be taken to remedy such situations. But international cooperation geared to institutional strengthening can also be very useful, as demonstrated by past experiences that were very successful. A few such experiences can be quoted here. When the IAV was created in Rabat, French professors from INA Paris and other agricultural “Grandes Ecoles” played a key positive role as mentors of young Moroccan academic staff. A few years later, IAV benefitted greatly from a special arrangement with the University of Minnesota for the formal training at the PhD level of several of its agricultural economists. Similarly, the agricultural economics department of INA Tunis benefitted from the institutional support it received from the Ford Foundation over several years, beginning in the late 70s. In this case, the Foundation mobilized academic professionals from various foreign institutions but closely managed the cooperation process using its own staff. This latter example illustrates that various institutional models can be effective. In India, the twinning arrangements, associating a state agricultural university with an American land grant university, supported by USAID, have sometimes been very successful. The many failures however suggest that domestic conditions remain critical for the success of institutional development.

EU support to higher education in SEMCs has been active on several

fronts for many years. And agricultural institutions have benefitted from that support. But my impression is that the main benefits have been derived by individuals who were thereby able to play their academic roles better, while whole institutions generally remain very weak. Thus, one cannot escape the feeling that much more could be done. But institutional support in this case is also extremely delicate and requires much intelligence, perhaps more than existing collaboration mechanisms can muster.

The case of agricultural research is similar to that of higher agricultural education. In most SEMCs, agricultural research is not mainly the task of universities but that of specific research institutions. These however generally suffer from the same weaknesses as those described above. Here again, the main action to remedy this situation has to be taken at the national level but international cooperation can be very useful. An illustration of such productive action is the case of the international agricultural research centres, supported by the CGIAR. These were created *ex nihilo* at the beginning by two American Foundations (Rockefeller and Ford). They now receive most of their financial support from development assistance budgets and are today major instruments of international collaboration in their field, including support to national agricultural research institutions in developing countries. The EU as a whole, including member states, is the major “donor” of the CGIAR. In addition, specific resources have been devoted by the EU to agricultural research in SEMCs for many years. Generally speaking, such support has been useful. But here again, it appears that much more could be done. In recent years, a lot of attention has been given to coordination networks, including often financial support to specific projects selected on a competitive basis through “call for proposals” procedures. The time may have come for large common programmes, with ambitious objectives and long-term commitments.

CONCLUSION

The urgency of the sustainable agricultural and rural development problems faced by SEMCs calls for a dramatic reassessment of current public policies, in spite of the real achievements of these policies in the past. This reassessment must include a re-examination of the intellectual foundations of these policies. The same is true for the design and implementation of supporting activities by external actors, principally the EU. I have

argued that too much emphasis has been placed on trade liberalization as an instrument for the construction of a deeper Euro-Med relationship in past decades. Perhaps, this emphasis on trade liberalization resulted from obstacles to other collaboration activities, such as the freer movement of people or the inability to jointly manage regional conflicts. But, whatever the reasons, it appears today that the undue emphasis on trade liberalization has been counterproductive in the field of agriculture and rural development. It has generated disappointments and frustrations and has led to the neglect of other potential areas of collaboration.

The promotion of rural development in SEMCs is an absolute necessity if these countries are to tackle the urgent problems identified in the first part of this communication: alleviating rural poverty while wisely managing natural resources, bearing in mind that this must be done within the hard constraints imposed by the need to limit public finance deficits and to prepare for the arrival on the labour market of large cohorts of young people.

We believe that the EU can play a specific but very useful role to help SEMCs face these challenges through support to institutions needed for fostering rural development. The same is true for agricultural research and higher education, two fields of activity which are critical in the promotion of agriculture and rural development, agriculture remaining an essential component of most rural economies. And here again, the EU and many EU member state institutions can play very useful roles. But to be successful, institutional support requires much intelligence of the local situations. And the existing cooperation apparatus and mechanisms may not be nimble enough to muster that intelligence. Many actors beyond public assistance organizations will need to be involved. New mechanisms must be invented. This will be a major challenge for the future Euro-Med relationship.

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12.

The Cross-national Coordination of Urban Food Policies in the Euro-Mediterranean Area: The Urban Food Policy Pact Initiative as a Model for Enhanced Food Security in the South Mediterranean Region

Lorenzo Kihlgren Grandi and Cecilia Emma Sottilotta

INTRODUCTION

“Food security” is a multifaceted concept, lying at the crossroads of different fields. In the last few decades, it has come to the fore as a major source of concern for international, national and local policy-makers and scholars worldwide. In the wake of the Arab uprisings of 2010-11, food security has also gained further relevance in the context of Euro-Mediterranean relations (e.g., see IPEMED 2010, Hadj Nacer et al. 2013, Ayadi and Sessa 2013:4). In fact, as we shall see shortly, building sustainable agriculture for food security in the southern Mediterranean is (or rather, should be) a strategic top priority for domestic governments in the region as well as for the European Union. Before outlining the specific challenges which lie ahead within the framework of Euro-Mediterranean relations, however, it is timely to provide some preliminary conceptual clarifications. The objective of the first Section is to circumscribe the subject of the analysis by clarifying what it is meant here by “food security” and reviewing the main indicators used to assess micro and macro food security. The second Section explores the relationship between urbanization and food security. The third Section provides a snapshot of the current situation of urbanization and food security in the Southern Mediterranean region, with an eye to the main strategies implemented so far to cope with food insecurity at the urban level. Sections 4 through 6 describe the Urban Food

Policy Pact, the City of Milan's strategy in promoting wide participatory networks of municipalities for building sustainable food security. Section 7 explores the challenges and opportunities for the development of an enhanced form of decentralized cooperation directly engaging cities along the Northern and Southern shores of the Mediterranean.

12.1 CONCEPT AND MEASUREMENT OF FOOD SECURITY: AN OVERVIEW

A multidimensional and somewhat elusive concept, according to the definition adopted by the 1996 FAO World Food Summit Plan of Action, food security “exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life”.¹ Thus, there are at least four dimensions to food security as defined by FAO: 1) availability of food; 2) stability of food supply over time; 3) access to available food; and 4) safety/quality of the available food supplies. Maxwell and Slater (2003:532) attribute the paternity of the contemporary concept of “food security” to Sen's work on poverty and famines (1981), which for the first time switched the attention from “food policies” in general to the issue of access/entitlement. In tracing the evolution of the concept, they recall three more definitions of food security: 1) “A basket of food, nutritionally adequate, culturally acceptable, procured in keeping with human dignity and enduring over time” (Oshaug 1985); 2) “Access by all people at all times to enough food for an active, healthy life” (World Bank 1986); and 3) “A country and people are food secure when their food system operates efficiently in such a way as to remove the fear that there will not be enough to eat” (Maxwell 1988). Apparently, the definitions recalled epitomize the very diverse approaches vis-à-vis the establishment of conceptual boundaries for food security: for some, this catch-all term also encompasses culture and human dignity, others focus on the aspect of empowerment in terms of active, healthy life for the individual, while another crucial distinction also emerges, that between “micro” and “macro” food security, depending on whether the analysis hinges on the household or national level. Conceptual conundrums inevitably translate into

¹ For the full text of the Plan of Action see <http://www.fao.org/docrep/003/W3613E/W3613E00.HTM>.

problems of measurement, as there are indeed many different ways to measure food security. As Pinstруп-Andersen (2008:5) points out, while measures of food security on the macro (i.e., national and global) level tend to look at the “supply side of the food equation”, with the risk of overlooking the fact that measuring availability is not the same thing as measuring access, on the micro level problems arise when it comes to accounting for different preferences of households with a given level of income and facing a certain set of food prices.

Macro food security is normally framed in terms of domestic demand, supply and market prices. As we shall see in the next section, proxies used to measure vulnerability in terms of macro food security include food-balance-sheet-derived indicators such as the value of food imports over total merchandise export, the cereal import dependency ratio, food and live-stock production indices, variability of food prices, dependency on food aid, political stability and absence of conflict (for a comprehensive overview, see Pangaribowo et al. 2013). However, food security in this sense should not be confused with food self-sufficiency, although the two terms are obviously intertwined. In fact, while the first is a broader concept, referring in particular to the overall availability and stability of food resources (e.g., also including those deriving from external trade and aid), the latter looks at the ability of a given country to produce food domestically. In some cases increasing food self-sufficiency can boost food security.² India, for instance, reduced its food insecurity by developing its domestic food grain production from 130 million tonnes in 1980 to over 240 million tonnes in 2010 (FAO 2011b:1). Nonetheless, it must be stressed that increasing domestic production is just one among various strategies available. According to the specific situation of a given country, for instance, it could be preferable to switch national resources from the production of food to that of goods for which that country has a comparative advantage on the global markets,³ or to implement a mixed strategy.⁴

² It should be noted, however, that there is a considerable difference between promoting food self-sufficiency by raising trade barriers to shield domestic production and, e.g., boosting domestic production to improve productivity. On the subject see Warr (2011).

³ Looking at the case of Egypt, Scobie (1981) finds that subtracting arable land from the cultivation of exportable cotton and switching it to the cultivation of wheat would increase food self-reliance but indeed decrease food availability, because the country has a comparative advantage in the cultivation of cotton.

⁴ Discussing the case of Bangladesh, Deb et al. (2009) suggest that the country should target self-sufficiency in rice production to satisfy domestic demand in normal production

The focus of “micro” food security is on the individual households, rather than on the country as a whole. Frankenberger (1992) draw a distinction between “process indicators” and “outcome indicators”, whereby the first refers to food supply and access, while the second tries to capture food consumption (see Table 12.1 below). Indicators derived from household expenditure surveys (HES) are widely used and include household daily food energy availability per capita, household diet diversity, and share of total household expenditure on food (Smith and Subandoro 2007). Measuring household food security is challenging in many respects, e.g., in terms of availability, adequacy and comparability of the data collected. It is indeed difficult to find a single template for a comprehensive assessment of food security to be applied to conduct cross-country comparisons.

Table 12.1. Indicators for micro (household) food security

Process Indicators		Outcome Indicators	
Reflecting Food Supply	Reflecting Food Access	Direct	Indirect
Meteorological data, information on natural resources, agricultural production data, agro-ecological models, food balance sheets, information on past management, information on markets and institutions, regional conflict and its consequences.	Strategies to cope with stress (assets, risk-minimizing strategies to assure some level of production, loss management, community inequalities, coping strategies patterns).	Household budget and consumption surveys, household perception of food security, food frequency assessments.	Storage estimates, subsistence potential ratio, nutritional status assessments.

Source: Authors' elaboration based on Frankenberger (1992).

Customized methods and indicators are needed in order to meet the specific challenges posed at the sub-regional or local level. For instance, in analysing three food-security case studies, Egypt, the Occupied Palestinian Territories and Tunisia, Smulders et al. (2013:33) call for the use of sub-national data-sets to ensure a thorough understanding of local contexts.

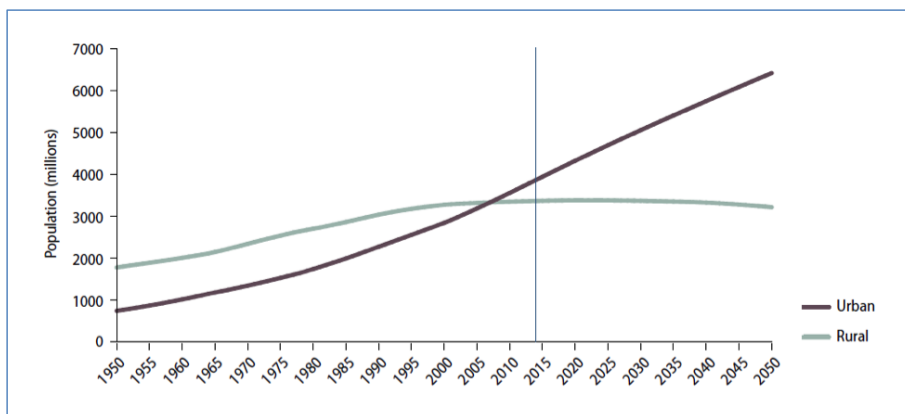
years, while in case of natural disaster or any other major events disrupting production, food security will depend on the international market and buffer stocks.

12.2 FOOD SECURITY AND URBANIZATION

Today, more people live in cities than in rural areas globally. Urbanization, defined as the share of a nation's population living in urban areas, has been growing constantly worldwide since the 1950s (see Figure 12.1). While currently 54% of the world population is made of urban dwellers, according to UN projections by 2015 only one third (34%) of global population will be rural, while two thirds (66%) will be urban. It is indeed an impressive shift, considering that the figures in the mid-20th century were approximately the reverse (UN Department of Economic and Social Affairs 2014).

Cities are hubs of trade, industry, growth, knowledge-sharing and innovation. As stressed in the Medellin Declaration of the Seventh World Urban Forum, "Cities, as economic and productive innovation spaces, provide opportunities for improving access to resources and services, as well as options in the social, legal, economic, cultural and environmental fields" (United Nations 2014). Yet, the negative impacts of urbanization on agriculture and food security often receive more attention than the potentially positive ones. In this respect, it must be stressed that the source of possible negative externalities is not urbanization *per se*, but rather its mismanagement and the general lack of good "urban governance" (Pierre 1999).

Figure 12.1. Urban and rural population of the world, 1950-2050



Source: UN Department of Economic and Social Affairs (2014:7).

The impact of urbanization on food security is manifold. A first aspect to highlight is the complex interaction between urbanization, poverty and socio-political unrest. As the share of poor urban residents has increased

over time (Ravallion et al. 2007), it comes as no surprise that the “food riots” that erupted in more than 20 countries worldwide in 2007-2008 were a predominantly urban phenomenon (Bush 2010:121). The positive correlation between a country’s level of urbanization and the odds of food riots was confirmed by empirical analyses (e.g., Berazneva and Lee 2013). Second, the social structure of households is generally different in the urban context vis-à-vis the rural one, with a normally higher ratio of children to adults, which puts more pressure on an income earner’s capacity to guarantee food security (WFP 2002:6). Third, in the urban context food is mostly purchased rather than produced directly, which makes urban dwellers more vulnerable to food price volatility and to negative variations in the employment rate: in order to afford food, urban residents need stable sources of income, yet they often work for low wages in informal or temporary jobs (IFPRI 2002, Satterthwaite 2004). Fourth, as widely recognized by policy-makers and scholars (IFRC 2007, World Bank 2010, Ziervogel and Frayne 2011, Verbyla et al. 2013), food security in urban areas critically depends also on the existence of adequate infrastructures such as piped distribution/transportation networks, and the provision of services such as health, education and shelter. Fifth, in the urban context where informal, community-based safety nets are weaker, access to official safety-net programmes plays an important role in ensuring food security (Ruel et al. 1998). Sixth, as cities expand, agricultural land is converted to residential or industrial use, which results in the crowding out of peri-urban agriculture and shift of agricultural production to less productive areas (Matuschke 2009:5). In this sense, it should also be considered that urban expansion produces changes in land value around the city, which in turn often results in land left vacant as the owners anticipate possible future gains from selling it or devoting it to non-agricultural uses (Satterthwaite et al. 2010:2815). Seventh, local authorities generally play a crucial role in urban waste management, a major problem in developing countries (Sefouhi et al. 2010) and one whose negative impact on agriculture and the environment is certainly relevant.⁵

⁵ Acknowledging the relevance of this issue, in the last few years the World Bank has intensified efforts in terms of financial support for solid waste management projects, e.g., with an Integrated Solid Waste Management Project in Tunisia (2007) and a Municipal Solid Waste Sector Development Policy Loan in Morocco (from 2008 onwards). A World Bank-backed Municipal Waste Management Project in Algeria was planned in 2003 but was subsequently dropped, while a Regional Solid Waste Management Project in Mashreq and Maghreb Countries launched in 2003 was financed by the European Commission, exe-

An in-depth analysis of each of the dimensions mentioned above would go beyond the scope of this paper. Yet, the complexity of the challenges they imply clearly emerges even at a superficial glance, suggesting that local authorities can play a pivotal role in the elaboration and implementation of food policies. In fact, the peculiarities of the urban dimension of food security call for a more integrated management of food policies, recognizing the specificities of each context but considering urban, peri-urban and rural systems as a *continuum* rather than separated realities. In promoting such a holistic approach to food, agriculture and cities, the FAO recommends the diffusion of “multi-level food system governance” (FAO 2011a), which means introducing innovative forms of participation in the elaboration and implementation of local food policies. As urban food demand is often satisfied through the external market rather than local supplies, local policy-makers can help shape alternative supply routes relying on supply chains which involve all the relevant stakeholders on the territorial level (municipalities, businesses, farmers, civil society in general).

Montague (2011) identifies four major clusters of activities by which local government can address the barriers to food security: a) urban planning in terms of land use, business mix and built environment; b) urban food production, including urban farms, community garden initiatives and domestic food production; c) peri-urban agriculture, e.g., boosting the preservation or retention of agricultural land in the peri-urban areas; and d) regulatory and fiscal powers, meaning that the local authorities can shape and apply byelaws in many spheres, from urban and peri-urban agriculture to food safety and marketplace outlets.

The growing shift in the attention of international policy makers toward the urban dimension of food security is epitomized by the recent launch of several initiatives in this sense, such as the 2012 United Nations Standing Committee on Nutrition (UNSCN) Statement on the Nutrition Safety of Urban Populations,⁶ the FAO’s Food for the Cities Multidisciplinary Initiative,⁷ the World Health Organization (WHO) Healthy Cities Project, and the UNDP ART Initiative (Articulation of Territorial Networks for Sustainable Human Development).⁸

cuted by the World Bank and hosted by the Tunisian Solid Waste Management Agency (ANGED).

⁶ See UNSCN statement on *Nutrition Security of Urban Populations*, September 2012, http://www.unscn.org/en/announcements/other_announcements/?id=804.

⁷ See <http://www.fao.org/fcit>.

⁸ See http://europe.undp.org/content/geneva/en/home/partnerships_initiatives/

The trend towards the devising of holistic solutions combining issues such as urbanization, migration and food security is also epitomized by localized initiatives such as the one proposed by the World Vegetable Center research institute and funded by the Australian International Food Security Research Center and involving four African cities, namely Dar es Salaam, Addis Ababa, Lilongwe and Maputo, with the creation of “peri-urban corridors” of production outside the cities.⁹ Another relevant example is the four-year “Cities Farming for the Future” programme run by the RUAF Foundation with the specific purpose of changing the attitudes of the local stakeholders and authorities of the cities involved vis-à-vis urban agriculture, for better policy-making.¹⁰ What is important to underscore here is that a fruitful implementation of all of the activities mentioned can be boosted by means of city-to-city decentralized cooperation, whose potentialities in terms of knowledge dissemination and best-practice diffusion have started to be recognized over the last few years. In 2002, for instance, following the signing of an agreement with the Italian Ministry of Foreign Affairs, the FAO launched its Decentralized Cooperation Program (DCP), which found immediate application with encouraging results.¹¹ The activities carried out by the Municipality of Milan (see Section 4) represent a notable example of how this kind of cooperation can contribute to setting up a sharing “learning environment between and across local/regional jurisdictions and their respective associations, both urban and rural” (FAO 2011a:32-3).

To sum up, considering that the complex and intertwining issues revolving around food security require multilevel governance, there are many ways in which the role of local authorities can be pivotal. However, this in turn requires that they have the capability, resources and legitimacy to enact this role. The formal allocation of powers and competences to local authorities largely depends on the constitutional and administrative arrangements of a country, aspects which are not easy to modify in the short term. Yet, it cannot be excluded that a *de facto* empowerment of

art-initiative.

⁹ For a description of the project, see van Vark (2013).

¹⁰ For the full text of the project’s final report, see <http://www.ruaf.org/projects/cities-farming-future-programme-cff>.

¹¹ For instance, in the cases of the Rome-Kigali Alliance for horticulture, Milan-Dakar’s Cooperation on micro-gardens, and the partnerships developed by the City of Montreuil (France) with the Yelimané area in Mali and the Hai Duong province in Vietnam. See <http://www.fao.org/tc/tcp>.

local authorities and substantial policy change can be conveyed by means of targeted decentralized cooperation projects that build awareness and fill knowledge gaps among local and even national policy-makers.¹²

12.3 URBANIZATION AND FOOD SECURITY IN THE SOUTHERN MEDITERRANEAN AREA

Having outlined the main issues on the subject of food security and how it can be framed in terms of urban challenges, it is timely to turn our attention to the current situation in the Southern Mediterranean area. As highlighted in the first Section, building accurate tools to measure micro-food security is not an easy task, especially when the purpose is to carry out a cross-country comparison. Following Breisinger et al. (2010), we use the Global Hunger Index (GHI)¹³ to provide a rough idea of household food security in the Southern Mediterranean countries. Looking at the evolution of the GHI as an indicator of household food security, it is possible to notice an improvement in 2013 with respect to the past, with all of the countries under analysis scoring less than 5 along the dimension considered (see Table 12.2 below).

Still, it must be stressed that, as the GHI is a raw indicator of food security, more in-depth analyses may yield different results. In fact, the share of food expenditure in total income in Southern Mediterranean Countries (SMCs) is relatively high, i.e., 35 to 55%, which evokes exposure to food crises, such as in 2007-08, and price volatility (Camanzi et al. 2013). Indeed, a much less reassuring picture emerges also when we look at indicators of macro food security such as the cereal import dependency ratio or the value of food imports over total merchandise export.

¹² See for instance Hooton et al. (2007), a study on local policy change in Uganda showing that policy change at the local level ended up stimulating change at the national level.

¹³ The GHI presents a multidimensional measure of national, regional and global hunger based on the combination of three sub-dimensions: Proportion of Undernourished, Prevalence of Underweight in Children and Under-five Mortality Rate. The average of these three sub-dimensions results into a 100-point scale on which zero is the best score (no hunger) and 100 the worst. Values lower than 5 reflect low hunger, values between 5.0 and 9.9 reflect moderate hunger, values between 10.0 and 19.9 indicate a serious situation, values between 20.0 and 29.9 are alarming, and values of 30.0 or higher are considered extremely alarming. See von Grebmer et al. (2012).

Table 12.2. Global Hunger Index for Southern Mediterranean countries 1990-2013

	1990	1995	2000	2005	2013
	(data from 1988-92)	(data from 1993-97)	(data from 1998-02)	(data from 2003-07)	(data from 2008-12)
Algeria	7.0	7.7	5.3	<5	<5
Egypt	7.0	6.2	5.2	<5	<5
Libya	<5	<5	<5	<5	<5
Morocco	7.8	6.9	6.2	6.5	<5
Tunisia	<5	<5	<5	<5	<5

Source: von Grebmer et al. (2013).

Figure 12.2 (in the Appendix) provides a snapshot of the cereal import dependency ratio in the Euro-Mediterranean area. Libya, Algeria and Tunisia fare particularly poorly, with Morocco and Egypt doing better especially in the last few years and clustering around a 30-50% ratio together with other Northern Mediterranean countries, among which France unsurprisingly scores the lowest.

The value of food imports over total merchandise export reflects another facet of macro food security, conveying information about a country's overall ability to pay for food imports through the export of merchandise. Figure 12.3 (in the Appendix) summarizes the situation of Algeria, Egypt, Morocco and Tunisia between 1992 and 2011.

It is interesting to contrast this indicator with the cereal import dependency ratio. First of all, it is possible to notice a trend towards convergence in the last few years. Moreover, Algeria and Tunisia fare better than Egypt and Morocco.

It must be noted that, especially for Algeria, a low score reflects high reliance on exports of gas and oil to pay for food imports. In this respect it should also be recalled that, while under most circumstances oil-exporting countries are more insulated from increases in food commodities than non-exporters, if oil prices decrease and food prices increase (e.g., in the case of a major drought at a time when oil prices are particularly low), oil-exporters will be less able to finance imports in case of future price shocks (World Bank, FAO and IFAD 2009).

Considering that today the Southern Mediterranean area, one of the most water-scarce and dry regions in the world, is extremely exposed in terms of climate change, the overall picture is one of definite vulnerability. Against this backdrop, a first glance at the urbanization dynamics in

the Northern and Southern Mediterranean countries reveals a substantially homogeneous situation, with the notable exception of Egypt whose share of rural population appears to be larger and constant (see Figures 12.4 and 12.5 in the Appendix).

As a matter of fact, the positive urbanization trends in the Euro-Mediterranean area are strikingly similar, epitomizing the expansion pressures faced by cities in SMCs (see Figure 12.4 in the Appendix).

Of the 190 million people added to the population of the Mediterranean area in the 1970-2010 period, 163 million live in towns: urban population (i.e., towns exceeding 10,000 inhabitants) increased 1.9% per year during that time span, from 152 million to 315 million, with an estimated total of 385 million by 2025, and more than 74% of this growth took place in the south and east, where urban growth from 1970 to 2010 averaged 3.1% a year (GRID-Arendal 2013). In light of the complex interplay between urbanization and food-related issues (see Section 2), it clearly emerges how any forward-looking strategy for ensuring food security in SMCs needs to take into account the urban dimension.

The Arab uprisings strongly brought this point to the attention of domestic and international policy-makers, as the need to feed “a hungry and potentially volatile population close to the centres of power”¹⁴ came to the fore as a major political priority.

Another crucial issue emerges in this respect with regard to the role of local administrations. As already discussed, the local governments can indeed play a pivotal role in ensuring food security in the urban context. Yet, in order to do so, they need to be actively involved in strategic planning and policy-making. This means that at least some extent of fiscal decentralization in the government structure is required in order for the local authorities to have the power and legitimacy necessary to take the lead in local policy-making. But is this the case in the SMCs? In general, it can be said that the public administration system in the region is highly centralized, with more or less complex webs of deconcentrated field offices of line agencies: most decisions are taken at the central government while the role of subnational authorities is circumscribed and focused on carrying out centrally made decisions (Tosun and Yilmaz 2008:7).

Existing empirical evidence suggests that, other things being equal,

¹⁴ Scott Drimie’s remarks at the conference on “Migration, Urbanization and Food Securities in Cities of the Global South”, 26-27 November 2012, Cape Town, South Africa. See the conference report: <http://www.afsun.org/wp-content/uploads/2013/07/conference-report-for-web.pdf>.

the larger the share of a country's population living in urban areas, the less centralized should be the state and local sector (Oates and Wallis 1988:14). Still, as is the case for the MNCs, urbanization does not automatically trigger decentralization (see Figure 12.5 in the Appendix). Critical issues hindering decentralization and local governance in SMCs encompass long-term historical legacies (such as the centralizing tradition of the Ottoman Empire) as well as socio-political factors such as patronage (Anderson 1987). Thus, even after the Arab uprisings, the margin of manoeuvre for local authorities to take part in the formulation of food policies is limited by structural constraints.

This is clearly in stark contrast with how food policies can be handled at the local level in EU countries, under the principle of subsidiarity whereby in areas which do not fall within its exclusive competence, the Union acts “only if and in so far as the objectives of the proposed action cannot be sufficiently achieved by the Member States, either at central level or at regional and local level, but can rather, by reason of the scale or effects of the proposed action, be better achieved at Union level”.¹⁵

It is not surprising then if among the strategies¹⁶ adopted by SMCs in the last few years to tackle food security issues, it is very difficult to find initiatives specifically devoted to and carried out by cities. Eventually, as effectively summarized by Jari (2010:26), “for decentralization to be effective and local authorities' institutions to become more autonomous, it is necessary to give due attention to revenue generation and appropriate fiscal reforms and not just administrative and political decentralization”. Ambitious administrative and fiscal reforms would be needed to reach such an objective. Nonetheless, as past experiments of decentralized cooperation have shown (see Section 2), a process of empowerment can be triggered even in absence of large-scale institutional reforms if local governments are actively involved in the cross-national formulation and implementation of food policies.

Recently, actions auguring an enhanced role of local governments have started to gain momentum in the wider Mediterranean region. In 2013, an

¹⁵ See the Consolidated version of the Treaty on European Union, art. 5.3.

¹⁶ Strategies to cope with food insecurity include land grabbing, i.e., the acquisition of farmland in developing countries by other countries seeking to ensure their food supplies (see Braun and Meinzen-Dick 2009), agricultural policy reforms to spur productivity, such as those implemented in the 1980s in many MENA countries, as well as the introduction of tariff and non-tariff barriers to trade in order to protect the national producers (see Breisinger et al. 2010:20).

initiative supported by the Arab Urban Development Institute, the World Bank and the Center for Mediterranean Integration brought together mayors and ministers of urban and local administration from Morocco, Tunisia, Jordan, Lebanon, Egypt, Yemen, and the Palestinian Territories to discuss urban governance issues. In 2012, the main outcome of the Euro-Mediterranean Regional and Local Assembly (ARLEM)¹⁷ plenary session held in Bari, Italy, was a call for the extension of the Covenant of Mayors,¹⁸ a pact to fight global warming, to the South Mediterranean region (see Section 5). Such initiatives suggest that the urgent need for local authorities to play a pivotal role in meeting global challenges is starting to surface in the policy agendas of both European and South Mediterranean countries.

While for the reasons outlined above the MNCs today seem to be fertile ground in this sense, it should be noticed that to date no specific initiative has been undertaken to cement Euro-Mediterranean relations by fostering decentralized cooperation on food security issues. Building a solid network of Euro-Mediterranean cities for food security would allow these cities to devise and carry out concrete projects. In this sense, the City of Milan provides an interesting case study on how local authorities can pursue active policies to raise awareness on the territorial dimension of food security. Thus, in the next sections, we will provide a detailed account of Milan's experience as an example of food policy planning by a municipal government. The main objective of this case study is to exemplify the steps that need to be undertaken in order to promote a process with relevant ramifications in terms of cross-national cooperation.

12.4 ADVOCATING GLOBALLY FOR URBAN FOOD POLICIES: THE ROAD TO EXPO 2015 MILAN

Over the last few months Milan has rapidly become one of the most active cities in advocating for the promotion of sustainable urban food policies

¹⁷ ARLEM is a forum for political debate and an integral part of the governance structure of the Union for the Mediterranean, representing its territorial dimension.

¹⁸ The Covenant of Mayors is the first European Commission's initiative directly targeting the local authorities and their citizens to take action against global warming, whose signatories commit to go beyond EU objectives in terms of CO₂ emissions reduction. See <http://www.eumayors.eu>.

worldwide. Such an effort is closely connected with the major international event the Italian city is to host in 2015, Expo 2015 Milan. In March 2008 Milan's candidature was chosen by the Bureau International des Expositions (BIE)¹⁹ as the venue for the 2015 edition of the Universal Exposition.

The themes chosen for the Expo address several of the nutrition and food security challenges discussed above. In fact, participants have been asked to focus on the issue by selecting one of the following 7 sub-themes: Science for Food Safety, Security and Quality; Innovation in the Agro Food Supply Chain; Technology for Agriculture and Biodiversity; Dietary Education; Solidarity and Cooperation on Food; Food for Better Lifestyles; and Food in the World's Cultures and Ethnic Groups.

Despite the political turnover at the head of the Municipality, which shifted in June 2011 from Letizia Moratti's centre-right coalition to Giuliano Pisapia's centre-left one, the initiative has been strongly supported by the new administration. In order to fully deploy the potential of the theme and to capitalize on the large number of Expo participants – more than 140 countries, setting a new record – the City administration launched its most ambitious international initiative early in 2014, to be implemented through a proactive, participatory approach directly involving partner cities all over the world.

On 6 February 2014 at the C40²⁰ Cities Mayors Summit in Johannesburg, mayor Pisapia announced the initiative, stressing the health, social and economic benefits of a new approach to nutrition. In Johannesburg, Pisapia presented the dual path chosen by Milan's administration: firstly, the development and implementation of a food policy for Milan – following the lead of other cities such as London, Toronto and Melbourne – while engaging other major cities of the world to focus on their food system and to use it as an analytical dimension to measure their sustainability, equity and livability, just as Milan was starting to do. The results of the process were to be included in a "Milan Protocol" whose signing ceremony would be held during the Expo 2015 semester. The second objective, which represents the focus of our analysis, is to widen the networks Milan is already

¹⁹ BIE is the intergovernmental organization in charge of overseeing the calendar, the bidding, the selection and the organization of World and International Expos.

²⁰ Created in 2005 by former Mayor of London Ken Livingstone, the C40 Cities Climate Leadership Group (C40) is a network of 69 cities taking action to reduce greenhouse gas emissions. For further information see <http://www.c40.org>.

part of: its twinning and cooperation agreements,²¹ Eurocities²² and the C40 itself. In fact, its involvement within the C40, whose Europe Regional Direction is currently hosted in the City of Milan's International Relations Office, was a primary source of inspiration for Milan's network-building activity.

Advocating for an urban approach to food policy through these networks was considered as a first step towards a wider, participatory network of partners – both local governments and research institutions – to maximize positive spillover for the widest possible numbers of citizens in the world. The planetary dimension of such an approach is often reiterated in Milan's public information, which links it to the actions of the UN system – in particular FAO and WFP – and to global debates over development issues, such as the definition of the new post-2015 Millennium Development Goals.

12.5 THE URBAN FOOD POLICY PACT

The Municipality of Milan wished to create, during EXPO and indeed the whole of the year 2015-16, an open space for discussion, particularly at the city/territorial level and involving several key actors, to assemble guidelines on the issues of food development policy and sustainable pathways towards local best practices to guarantee food security and sovereignty.²³ The Milan Protocol has been conceived as the main ini-

²¹ For a list of Milan's Twin Cities, see http://www.comune.milano.it/wps/portal/ist/it/amministrazione/internazionali/Accordi_gemellaggio.

²² Eurocities is the network of major European cities created in 1986 by the mayors of Barcelona, Birmingham, Frankfurt, Lyon, Milan and Rotterdam. Now including 130 cities in 35 European countries, Eurocities addresses a wide range of policy areas affecting the day-to-day lives of Europe's citizens. For further information see <http://www.eurocities.eu>.

²³ The concept of *food sovereignty* as opposed to food security refers to "the right of peoples to define their own food and agriculture; to protect and regulate domestic agricultural production and trade in order to achieve sustainable development objectives; to determine the extent to which they want to be self reliant; to restrict the dumping of products in their markets; and to provide local fisheries-based communities the priority in managing the use of and the rights to aquatic resources. Food sovereignty does not negate trade, but rather, it promotes the formulation of trade policies and practices that serve the rights of peoples to safe, healthy and ecologically sustainable production". This definition was elaborated by the Peoples Food Sovereignty Network, an international network of social movements, small-scale farmers, workers, environmental and consumer organiza-

tiative of the City administration on this topic. Renamed the Urban Food Policy Pact (UFPP), it has been designed as a participative global effort to define and adopt a common standard regarding food security and nutrition at the urban level. It can also be defined as a “territorial approach to the food systems”, being conceived to address the issue of nutrition and sustainability in the urban context, first and foremost in the middle income countries.²⁴ The main purpose of such an initiative is to develop solutions for the new patterns of hunger, as well as to determine the best path towards a more equitable and sustainable way of urban living. In order to achieve this goal, the Pact has been presented as a tool to harmonize all rules and best practices linked to food production, distribution and consumption at the urban level, define new motivating targets and monitoring indicators, and support all mayors in their daily work to make their cities more resilient to both hunger and CO₂ emissions. For this reason, Mayor Pisapia, through the Municipality’s International Relations department, invited a first group of cities with which Milan had close ties to join Milan in this project and consider the idea of starting a process that may lead to the elaboration of a food policy for their own territory.

In building its network of partners, Milan divided the cities into two groups, according to their level of implementation of food policies. The most experienced cities, like London or Melbourne, have been involved in a permanent advisory group that may support Milan and other cities willing to capitalize on their good practices and their advice.

The first step was extending an invitation to the fellow administrations to identify a representative to participate in preliminary consultative activities to get acquainted with other cities’ experiences on how to build a food policy, and to set out a framework for the Urban Food Policy Pact. These preliminary activities consist of three or four “webinars” and one meeting, to be held in London. The official kick-off of the UFPP project took place on 30 September 2014: on that date, the City of Milan held an introductory online webinar to provide participating cities with an overview of the project and propose a roadmap for subsequent steps. To date, thirty municipalities²⁵ have joined the network, allowing participants to

tions, and other non-governmental organizations (NGOs) working on food sovereignty issues (see Patel 2009).

²⁴ It is interesting to recall that the Southern Mediterranean countries fall within this category, making the UFPP a suitable example of a network including them.

²⁵ They are: Amsterdam, Barcelona, Bilbao, Bogotá, Boston, Chicago, Curitiba, Daegu,

share and discuss best practices, goals and challenges and ultimately to determine a common standard for urban food policies.

The editing of the Pact will hinge on four main themes: a) the creation of three international working groups (Nutrition, Access to Food, and Environment); b) the definition of issues to be addressed; c) a first drafting of the Pact expected to take place in February 2015 in London; d) the adoption of the final version of the document to be presented to other cities in October 2015 in Milan at an international event for the signature of the Pact.

The process initiated by the City of Milan benefits from previous experiences of local authorities using a pact to formalize their commitment towards certain shared monitorable objectives. The three main examples – directly recalled during the first webinar – are the Covenant of Mayors, the Mexico City Pact on “Global Cities Covenant on Climate”²⁶ and the Compact of Mayors.²⁷

The most important source of inspiration, the Covenant of Mayors (see Section 3), was launched by the European Commission after the adoption, in 2008, of the EU Climate and Energy Package. It represents the mainstream European movement involving local and regional authorities in the fight against climate change.²⁸ The Covenant represents an encour-

Dakar, Frankfurt, Gent, Hanoi, Hong Kong, London, Malmö, Maputo, Medellin, Melbourne, Moscow, Nairobi, New York, Niamey, Osaka, San Francisco, São Paulo, Shanghai, Tel Aviv, Turin, Toronto and Vancouver.

²⁶ The Mexico City Pact was launched at the World Mayors Summit on Climate that was held in Mexico City on 21 November 2010. The Pact has been signed by 338 cities around the world, which committed to 10 action points, including the reduction of local greenhouse gas emissions, the promotion of partnerships and city-to-city cooperation and the involvement of civil society in the fight against climate change. The text of the Pact is available online at <http://www.mexicocitypact.org/docs/el-texto-originalEN.php>.

²⁷ Launched at the UN Climate Summit held in New York on September 2014, “The Compact of Mayors is an agreement by city networks – and then by their members – to undertake a transparent and supportive approach to reduce city-level emissions, to reduce vulnerability and to enhance resilience to climate change, in a consistent and complementary manner to national level climate protection efforts”. See The Compact of Mayors Action Statement, <http://www.un.org/climatechange/summit/action-areas/#cities>. Signatory networks are: ICLEI-Local Governments for Sustainability, C40 Climate Leadership Group and United Cities and Local Governments (UCLG).

²⁸ The Covenant’s signatories committed to “go beyond the objectives set by the EU for 2020, reducing the CO₂ emissions in our respective territories by at least 20%, through the implementation of a Sustainable Energy Action Plan for those areas of activity relevant to our mandates”.

aging experience epitomizing the ability of local governments to successfully network and advocate on a cross-national level in order to better achieve common goals.

12.6 BUILDING THE URBAN FOOD POLICY PACT: TOOLS AND PARTNERS

In fostering and nurturing an international consensus on a standard for urban food policies, the City of Milan has deployed a number of policy instruments. Apart from the above-mentioned ICT-based global consultation, Milan is managing an international campaigning and advocacy initiative. Through the EU-funded “Food Smart Cities for Development” project, Milan will coordinate a network of 12 municipalities in Europe, Africa and Latin America.²⁹ The European Commission recently granted its financial support (almost 2.7 million Euros) to the project, through its DEAR (Development, Education and Awareness Raising) programme.

Apart from building partnerships with local authorities, the City of Milan has sought to involve the wider not-for-profit sector based in its territory. The Food Smart Cities for Development project is in fact being implemented in cooperation with several NGOs, including the World Fair Trade Networks and Expo dei Popoli, an umbrella organization including NGOs and other civil society organizations working together on the implementation of the “*Forum dei Popoli*” (People’s Forum), which in June 2015 will gather in Milan dozens of international thematic networks working on food sovereignty and environmental justice. By convening these actors, the City of Milan aims at further involving and informing European citizens on development challenges and opportunities and on issues of nutrition at the local and global level.

Moreover, the activities implemented by the City of Milan benefit from a wide involvement of academia. The Expo Scientific Committee, created by mayor Pisapia in October 2012, is in charge of directly organizing or supporting a number of research and didactic activities, such as conferences, workshops, advocacy and awareness raising activities on the Expo theme “Feeding the Planet-Energies for Life”. Chaired by professor Claudia Sorlini, former dean of the Agriculture faculty of the University of Milan,

²⁹ Milan, Barcelona, Bilbao, Brugge, Gent, London, Marseille, Medellin-Antioquia, Thessaloniki, Turin, Utrecht.

the Committee includes representatives of each of Milan's universities, the Lombardia region, EXPO 2015 SpA (the company in charge of managing the Exposition) and the Italian Pavilion, as well as the Municipality.

Identification of Milan's own food system criticalities, challenges and opportunities, as well as the definition of a participatory process aiming at the choice of priorities, is being implemented through the collaboration of a renowned banking foundation, Fondazione Cariplo, which has an historical relationship with both academic and non-for-profit sectors of Milan and the Lombardia region. Territory, welfare, education, environment and health are the focus of Fondazione Cariplo's task, the results of which will be discussed and integrated by Milan residents before being eventually adopted by the Municipality. A third initiative, Laboratorio Expo,³⁰ has been implemented by Expo SpA (the company managing the Exposition) together with the Giangiacomo Feltrinelli Foundation. Laboratorio Expo consists of a network of universities of Milan and Lombardy and national and international institutes, formed to offer to the public high-level meetings and educational initiatives that explore specific topics linked to the Expo 2015 theme. The result, expected by 2015, is the publication of a report with recommendations for a more sustainable future.

Last but not least, the City of Milan, together with the Chamber of Commerce of Milan, Lombardia Region and Expo SpA, created the Milan Center for Food Law and Policy on 17 February 2014. Conceived as a tool to study, under a comparative approach, foreign, European and international food law, the Center aims at the creation of a close partnership with the UN and the EU, in order to define and support the adoption of an international covenant on "granted food", a shared framework of minimum international standards to be protected by law. This goal is expected to be implemented starting from 2015.

12.7 MILAN'S UFPP AS A MODEL FOR THE MEDITERRANEAN REGION: CHALLENGES AND OPPORTUNITIES

With the aim of stressing the common historical and cultural legacy of Euro-Mediterranean countries, the Mediterranean region will have its own

³⁰ See <http://www.expo2015.org/en/project/laboratorio-expo>.

pavilion at the Expo, called the “Bio-Mediterraneum Cluster”. It will host 11 countries: Albania, Algeria, Egypt, Greece, Lebanon, Libya, Malta, Montenegro, San Marino, Serbia and Tunisia, with the *Regione Siciliana* (the regional administration of Sicily) coordinating the activities of the shared areas of the Cluster. The concept for this Cluster is based upon the cuisine of the Mediterranean; it sets out to celebrate the richness and variety of Mediterranean cuisine and present the social aspects of food all over the region: meals as a highly valuable aspect of social and cultural life, marked by ancient convivial rituals around the table – a bonding practice where differences such as age are surmounted. The similarities among participants are thus not limited to their shared climatic conditions – and therefore common local resources such as wheat, olives and fish, cooked in many different ways. “The Mediterranean culture is the bearer of alternative – and original values compared with those that have led society so far”, declared Ezechia Paolo Reale, Councillor of Agriculture for the Sicily Region.³¹ The Cluster will provide the opportunity to highlight an essential feature of the traditional Mediterranean diet: its reliance on sustainable agricultural biodiversity, primary cause of its healthfulness. Such an initiative exemplifies the existence of a fertile ground for decentralized cooperation in the Euro-Mediterranean region.

The development of a territorial approach, such as the one advocated by Milan in the Southern Mediterranean, might help meet the demands expressed by citizens of the SMCs during and in the wake of the Arab uprisings. Increased political accountability, a closer connection between citizens and administration, and higher responsiveness by the government vis-à-vis the demands of the citizenry would be enhanced if local authorities had a say in shaping food policies. Unsurprisingly, food prices represented a recurring element in demonstrations, e.g., bread quickly became one of the symbols of Tunisian revolution. A territorial approach to food systems, based on a participatory and scientific process of identification of urban food policies, would provide a tailored answer to the new patterns of food deprivation in the region – like elsewhere – while assuring a more equitable and sustainable way of urban living. It could provide shared, resolute answers to the great challenges currently faced by countries in the region, linked to the urbanization patterns described above as well as to increasing sophistication of food production and in-

³¹ See www.expo2015.org/en/food--tradition--mediterranean-diet--sicily-to-manage-the-bio-mediterraneum-cluster.

tensive cultivation and breeding which, although valuable from a strictly economic standpoint, threatens to endanger the biodiversity equilibrium.

A territorial approach could also address the widespread demand for a new legitimacy based on territorial and personal proximity, after decades of political power spreading from a “centre” perceived as increasingly distant and unable to tackle citizens’ everyday needs. Its success would be therefore linked to the ability of city administrations to advocate for the importance of a food policy, nurturing the participation of citizenship in all stages of the process in order to define and implement a tailored approach to the project. Despite the importance of food and nutrition in each individual’s life, it would certainly be an error to assume that all kinds of food-related initiatives would be perceived as relevant for the population, whose formal and informal groups could on the contrary advocate for another agenda, should their contribution not be sufficiently taken into account. Starting from this awareness would help such projects avoid one of the main causes of failure of large-scale cooperation initiatives: the lack of popular backing, potentially causing the initiative to be set aside for electoral and consensus-building reasons.

Moreover, effective urban policies need sufficient funding to be correctly implemented. As already stressed, local government expenditures across the Southern and Eastern Mediterranean region are the lowest in the world, for example only 3% in Jordan, 5% in Tunisia and 17% in Morocco (Bousquet 2013). Up until now, food policies have been an expression of the traditional highly centralized political structure, as in the case of Egypt’s National Food and Nutrition Policy and Strategy (2007-2017), developed by the Egyptian Ministry of Health and Population and primarily implemented through a Nutrition unit within the Ministry and the Inter-Ministerial Committee on Nutrition (UNICEF 2012).

Nevertheless, the strong willingness of mayors to commit to such a goal could partially overcome these limitations, as has indeed happened in the framework of other international networks of cities. An example is the introduction of child and youth policies in several cities of the region, thanks to the advocacy and coordination provided by a partnership between the World Bank and the Arab Urban Development Institute³² based in Riyadh, the technical and scientific arm of the Arab Towns Organization³³ (Al-Salloum et al. 2009).

³² See <http://www.araburban.com>.

³³ See <http://www.ato.net>.

Mediterranean coastal cities have also managed to implement effective cooperation initiatives in the framework of Medcities/Medcités,³⁴ a network created in Barcelona in November 1991 in order to foster partnerships on urban environmental issues. The network has proved to be a useful framework in the preparation for EU-funded projects such as USUDS,³⁵ launched in October 2011 to foster the creation of three new Urban Development Strategies in the cities of Sousse (Tunisia), Saida (Lebanon) and Larnaka (Cyprus) and to establish three Knowledge Transfer Centres based in the cities of Málaga (Spain), Al Fayhaa (Lebanon) and Sfax (Tunisia).

Another implication of a territorial approach to food security based on Euro-Mediterranean decentralized cooperation should also be considered. The process of building and effectively implementing a shared food policy could eventually represent a powerful tool for those advocating for a substantial rethinking of Europe's Common Agricultural Policy (CAP). While creating little more than 1.5 % of EU total GDP, the agricultural sector still receives around 47% of the EU budget and is responsible for the highly criticized destruction of food produced in excess in order to avoid price dropping. Among possible reform solutions, it is worth mentioning Rodolfo Helg's recent contribution, which is based upon an analysis of Mediterranean food production. Helg's "tomato solution"³⁶ proposes the full liberalization of the import of agricultural goods from Southern Mediterranean countries, in order to strengthen those countries' economies while creating more jobs and thus reducing the extent of migration flows to European countries. This solution could also benefit European consumers – thanks to lower market prices – without affecting high standards of production in the Northern Mediterranean countries, thanks to their specificity, geographical indication and high quality. The solution would however be very hard to implement for political reasons, as Helg himself acknowledges, due to the costs related to a necessary conversion of certain crops in countries with influential agricultural sectors such as France, Italy and Germany.

Having defined the means to tackle such challenges, the Urban Food Policy Pact and Milan's international networking and advocating strategy will provide a model for how to eventually boost the empowerment of

³⁴ See <http://www.medcities.org>.

³⁵ See <http://www.usuds.org>.

³⁶ See Rodolfo Helg's presentation at the conference "Innovazione, Sviluppo e Democrazia nel Mediterraneo" held in Milan on 10 October 2013, <http://www.youtube.com/watch?v=tbB0vpUNJWM>.

local government in the SMCs and raise awareness among both local governments and populations on the urgent need for a broader understanding of sustainability, whereby economic policy is implemented with an eye for socio-cultural and environmental specificities. In sum, the Urban Food Policy Pact model offers a tool to cope with the challenges of a high level of urbanization – an urgent issue in the Mediterranean basin. Unlike the majority of international networks, the proponent – although deeply committed – is not an expert in the field, and its invitation to other local authorities follows a participatory approach, which is almost impossible to be perceived as “imperialist”, “charitable” or “indulgent” by the national and local authorities of developing countries. As such, it could represent an effective stimulus for engaging partners in the process. The non-binding nature of the project should not diminish its impact, in particular with regard to its awareness-raising potential. The territorial approach outlined by Milan combines short-term, concrete actions taking place within a longer-term vision, both relying on the participation of citizens. Such an approach therefore has the potential to go beyond the common pattern of North-South cooperation, often lacking one of these two aspects, and to meet the specific needs of the region. A comparison between the stalemate of most top-down partnership initiatives in the Euro-Mediterranean region – starting from the Union for the Mediterranean – and the success of participatory, on-the ground activities – such as the Anna Lindh Foundation and the British Institute’s Young Arab Voices³⁷ or the Goethe Institut’s Cultural Innovators Network³⁸ – serves to show the concrete feasibility of Milan’s proposal, which counters the two main visions about the future of food: increasing scarcity of food resources causing geopolitical turmoil vs. technological progress able to provide a quality nutrition for all. It foresees a future where the action of local governments relies on and benefits from the collaboration of a population well aware of the crucial importance of a fully sustainable food system.

CONCLUSION

The task of achieving food security in the Euro-Mediterranean region poses a number of urgent challenges. The Arab uprisings of 2010-11,

³⁷ See <http://www.youngarabvoices.org>.

³⁸ See <http://www.goethe.de/cin>.

one of whose main triggers was the region's reliance on food imports and the rising prices of agricultural goods, constitute a clear example of the close ties connecting food crises and socio-political disruption. In the SMCs as elsewhere, fast-paced urbanization intertwines with food security issues, magnifying them. Such complex challenges call for multi-level governance and in particular for an active involvement of local authorities in the elaboration and implementation of food policies. Yet, the highly centralized structure of the public administration system in the Southern Mediterranean region makes it difficult for local governments to play a relevant role in this sense. If specifically designed to engage Euro-Mediterranean cities, experiences such as the Urban Food Policy Pact promoted by the City of Milan could engender a *de facto* empowerment of local government across the region and boost positive synergies for the development of sustainable and integrated regional food security strategies.

A number of obstacles need to be overcome, including, but not limited to, the need to adapt the EU's CAP to the specific challenges characterizing the Euro-Mediterranean region. Yet, past – and present – experiences suggest that adopting a territorial approach might prove extremely fruitful in terms of enhanced food security, as well as cementing relations between the Southern and the Northern shores of the Mediterranean.

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13.

Functional Integration of Renewable Energy and Food Production Systems for the Mediterranean Countries

Marco Adami and Alberto Battistelli¹

INTRODUCTION

Agriculture can be defined as the human activity that, by using plants, converts the sun's energy and mineral salts into organic compounds for human use. All starts with plants, then, thanks to their ability to use inorganic carbon (and also nitrogen and sulphur) and to synthesize an incredible number of compounds, which are all together able to nourish humans and to provide other utilities for human activities. Agriculture takes place in all areas where the environment allows plants to grow, and in some cases, even in those places where it would not be possible under natural conditions (Ivanova et al. 1994, Patterson et al. 2008). The interaction between plants and the environment is a crucial factor in determining the variety, stability and efficiency of the agricultural systems in the world and their contribution to food security (Boyer 1982).

The Mediterranean Basin is characterized by a large diversity of soil and climatic conditions. Most specifically its strong seasonal variability in temperature and rain availability constrains crop growth in winter (the humid season) due to low temperature, and in summer due to high temperature and drought (Jacobsen et al. 2012). The interaction between low and high temperature with all the metabolic processes in plants is

¹ The ECOFLEX project has been co-funded by Regione Lazio through FILAS SpA, in the frame of POR FESR Lazio 2007/2013 funding programme (Ref. FILAS-RS-2009-1089). The authors are indebted to Walter Stefanoni (IBAF-CNR), Simona Proietti (IBAF-CNR), Stefano Moscatello (IBAF-CNR) and Giuseppe Colla (University of Tuscia, VT, Italy) for their invaluable contributions to the research activity, Andrea Reale (CHOSE University of Rome Tor Vergata, Rome, Italy) for production of the dummies and Sergio Zamboni, Aero Sekur SpA, Italy, for coordination of the project.

one of the main environmental factors determining crop distribution and its potential productivity, the stability of the production systems in different seasons and the quality of the products (Graham and Patterson 1982, Proietti et al. 2009, Suzuki et al. 2014). Water availability is another crucial aspect of plant life. Sub-optimal water availability reduces photosynthesis and limits plant growth and productivity (Hsiao 1973). Large amounts of water are used for irrigation in order to limit the detrimental effects of water scarcity in agriculture, but often with very limited efficiency (Morison et al. 2008). Agricultural water use can cause salinization of soils and aquifers; it also severely competes with water use in industry and household applications (Wolf 2007). Water saving and its efficient use in agricultural systems are key fundamental aspects for the present and future sustainability of agriculture, particularly in drought-prone areas. Global climatic changes are expected to exacerbate climatic constraints to agriculture productivity in many Mediterranean areas (Alesandri et al. 2014).

Agriculture is so widespread on the planet that all the suitable arable land is already in use, while the demand for food and non-food products from agriculture and forestry is increasing worldwide. New arable land could indeed only be obtained by devastating natural habitats and exacerbating climate change, which is already fuelled by the production of energy via non-renewable greenhouse gas (GHG) emitting systems. Thus, it is imperative to increase the efficiency of the agriculture and forestry systems in order to increase yield per unit of land, while reducing inputs and especially the use of non-renewable resources (Bogdanski 2014). The increase of yield per unit land is linked to the ability of good genotype plants to positively interact with the growing environment. In other words, to increase the efficiency of agriculture we need to maximize the positive sides of the plant-environment interaction while avoiding the negative ones, which can be done by controlling the growth environment. The intensification of agricultural practices requires an increased artificial intervention on the growing environment, thereby raising energy input into the system. Agriculture and food production, post-food management and food preparation are indeed energy-consuming activities and their modernization requires even more energy inputs (McMichael et al. 2007).

Agriculture uses energy, which is expensive and, when produced by non-renewable sources, is the main driver of GHG emissions and climate change (IEA 2013). However, increasing access to modern forms of en-

ergy is a necessary step to tackle poverty (Ki-moon 2011) in both developed and developing countries (IEA 2014). Global policy has recently shifted its focus to the production of renewable energy such as wind, solar and biomass, and in the development of the bio-economy² (Mirzabaev et al. 2014). Several types of systems can produce renewable energy, but they all affect the environment and have relevant implications on land use. Biomass was estimated to be 19% of global final energy consumption in 2012, while bioenergy is already the most used form of energy in developing countries (REN21 2014). While it could be easy to find a global consensus on the need to invest in renewable energy production, it is less easy to provide solutions that are able to satisfy the different natural, social and economic requirements of each geographical region. Most specifically, since the production of renewable energy invariably impacts natural resources, there is a conflict between renewable energy productions and other natural resource use, such as for food production. Land can indeed be used to produce food or to grow energy crops (the term “energy crop” refers to plants cultivated to provide biomass to be used for energy or fuel production). Photovoltaic power stations capture most of the incident light and if positioned in arable land impede cultivation below the modules. Irrigation water used to cultivate energy crops is withdrawn from food crops. Biomass residues can be used for soil amendment or can be burned for heating and cooking. The list of potential and actual conflicts between renewable energy and food production is unlimited. Thus, stakeholders need to functionally integrate the renewable energy production systems with the agricultural and forestry systems of a specific area, thereby promoting synergies between the two systems and mitigating the tradeoffs (Battistelli 2013, Mirzabaev et al. 2014).

In this contribution we report results obtained in a project of industrial research conducted by the Italian company Aero Sekur SpA in collaboration with researchers of the Italian National Research Council, Institute of Agro-Environmental and Forest Biology (IBAF-CNR), the Centre for Hybrid and Organic Solar Energy (CHOSE) of the University of Rome Tor Vergata, and the Department of Agriculture, Forestry, Nature and Energy, University of Tuscia (Viterbo, Italy).

After a brief explanation of the rationale of the project and a concise

² In EC 2012 the European Commission states that bioeconomy “encompasses the production of renewable biological resources and the conversion of these resources and waste streams into value added products, such as food, feed, bio-based products and bio-energy”.

description of the experimental procedures adopted, we will report and discuss some of the results obtained to show that research and innovation can contribute to overcoming the tradeoff between food safety and renewable energy production thereby contributing to ensuring better food security and access to modern renewable energy for future generations.

13.1 THE PROJECT: ECOFLEX

The scope of our interdisciplinary team, composed of public and private company scientists and engineers, is to find earth applications of technological solutions studied for space-based bio-regenerative life support systems (BLSS; these are systems devoted to recycling air, water and nutrients for astronauts during long-term missions in space³), to increase the productivity and sustainability⁴ of agriculture. The general aim of our activity is to develop model systems of sustainable controlled-environment plant food production, using renewable resources, to push plant productivity to its highest level. In particular, with the ECOFLEX project, our team worked on advanced technological photovoltaic cells,⁵ which would in theory be functionally integrated in closed greenhouses to produce renewable energy and nutritious food in any land and environment conditions. A key aspect of this system would be the high productivity of food with the minimal utilization of natural resources such as land and particularly water, which makes it suitable especially for environments with arid land and high solar light availability.

Plant productivity in normal agricultural systems is limited by environmental constraints, but plants can be grown in completely controlled environment systems in order to maximize productivity. These systems can be as small as growth chambers of less than a square meter or as large and complex as the greenhouses of the Biosphere2 initiative,⁶ where

³ For more information, see <http://www.agrospaceconference.com>.

⁴ Sustainable development was first defined in the report of the United Nation World Commission on Environment and Development (1987) as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”.

⁵ A photovoltaic cell is a device that converts solar energy into a direct current. Photovoltaic cells are assembled in photovoltaic modules that can be combined in large banks to compose a photovoltaic power station.

⁶ For more details, see <http://b2science.org>.

four fully functioning ecosystems where enclosed and provided with food and oxygen recycling for eight people for almost two years. Controlling the plant growth environment requires energy, so that sourcing and the cost of energy in a commercial controlled environment system is a key aspect. In the Mediterranean area, sunlight is abundant, so that a closed greenhouse in such an environment would become too hot for optimal plant growth in several months of the year. For many months in a yearly cycle there is an excess of light for greenhouse agriculture in the Mediterranean area, and this extra light can be used to produce renewable energy.

Plants are not particularly efficient in using the energy of the full solar spectrum to fix CO_2 in organic compounds (Hohmann-Marriott and Blankenship 2011). The first reason is that plants are able to collect and use for photosynthesis only a limited fraction of the sun's spectrum, approximately 50% of the total energy available. Other reasons have to do with the inefficiency of the photochemistry, the intrinsic and operative inefficiency of the first enzyme that fixes CO_2 (Rubisco), the energy costs of maintenance (respiration) and limitation in the ability to use the products of photosynthesis for growth and storage (sink capacity). The efficiency of photosynthesis decreases when light intensity increases and this loss of efficiency can be exacerbated by biotic and abiotic⁷ stresses.

In a controlled environment, the efficiency of photosynthesis can be pushed towards its maximum potential by an array of solutions. Increasing the CO_2 partial pressure allows the photosynthetic enzyme Rubisco to work at a higher speed than in ambient CO_2 partial pressure, limiting its negative interaction with oxygen; therefore, high CO_2 is a powerful tool to increase photosynthesis of plants with the C3 type photosynthetic metabolism.

The product quantity and quality of horticultural species can be increased under high CO_2 conditions (Proietti et al. 2013). Setting the appropriate level of other environmental factors such as temperature, water availability, relative humidity, mineral nutrition and avoiding pests and diseases can also increase productivity.

The hypothesis of our experiments was that intercepting a fraction of the incident radiation on the crop with a new-concept photovoltaic

⁷ In the context of plant physiology and productivity, stress indicates an unfavorable condition that limits the plant's performance with respect to the maximum that would be obtained under optimal conditions. The limitation can be due to the plant's interaction with other organisms, such as pathogens (biotic stress), or to unfavorable environmental conditions (abiotic stress).

(NCPV) module can be functional to limit the excess light with limited effects on quantity and quality of the product. The NCPV should mimic the reduction of incident light to the greenhouse that is a normal practice in spring and in summer months in the Mediterranean area and is obtained by shading devices such as neutral absorbing plastic nets.

Plants and crystalline silicon-based photovoltaic modules use approximately the same fraction of the radiation. However, crystalline silicon modules, which are the most used in the market, are held by completely opaque supports, which make it impossible for plants and crystalline silicon-based photovoltaic modules to functionally share sunlight on the same plant growing area.

13.1.1 The Experiment

Plants of tomato, spinach and rocket were cultivated in pots with optimal nutrient and water supply in a growth cabinet at the IBAF-CNR (for cultivation and ambient control conditions see Proietti et al. 2013). CO₂ partial pressure in the chamber was set at 400 ppm. Light intensity to the plant level was set at 800 $\mu\text{mol m}^{-2} \text{s}^{-1}$ (this is a very high light intensity for a growth chamber, still it is approximately 40% of full sunlight in a clear summer day in central Italy). Sets of plants were shaded (50% reduction of incident light) using neutral absorbing plastic net or (NCPV) modules produced by the CHOSE group (Figure 13.1 in the Appendix).

The NCPV modules were organic solar cells built by the CHOSE group in order to minimize neutral absorbance by non-photovoltaic components. The cells were not functional (dummy), but all components affecting absorbance were included in the dummies. Different types of dummies were tested for absorbance and effects on photosynthesis in order to select the type of materials and the distribution of the different components of the PV structures which were the most suitable to limit the impact on plant photosynthesis (Figure 13.2 in the Appendix).

On the selected dummy type, the photovoltaic components were layered in order to reach a final absorbance on the visible fraction of the solar spectrum of about 50%. The detailed structure and components of the dummy cannot be disclosed, because they are bound by confidentiality agreements. Plants were grown under the experimental conditions for a period sufficiently long to reach commercial size and ripening stage. All other growth factors, including relative humidity, temperature, light cycles and mineral nutrition, were set to be accomplished with the opti-

mal requirements for each cultivated species. Growth analysis, physiological measurements, and quantitative and qualitative determinations were performed using standard methods as described in Proietti et al. (2004, 2009, 2013).

13.1.2 Results and Discussion

Different species responded in different ways to the modification of the light environment. Here we report a selection of the experimental results obtained with the ECOFLEX project, to highlight their physiological and productive response after sharing 50% of the incident light with the NCPV dummies. Data of the Neutral net treatment are not reported.

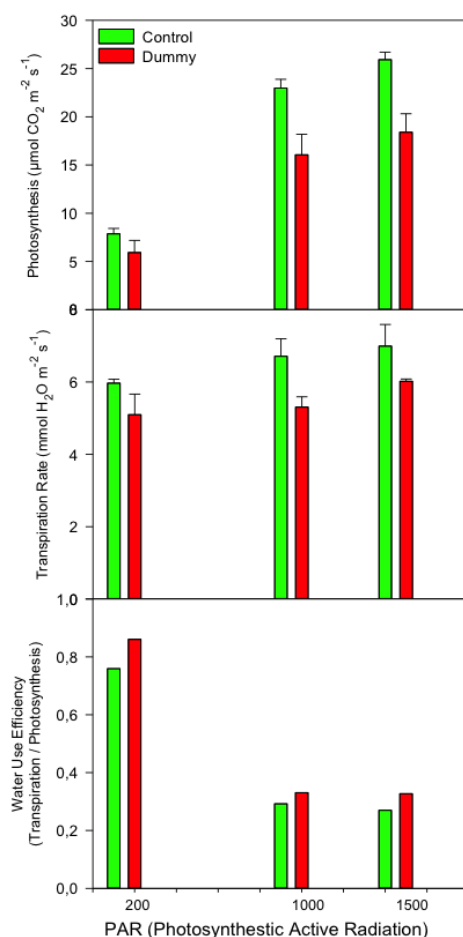
Growth under different light regimes can cause acclimation of photosynthesis; the light response of gas exchange can be measured by portable gas exchange systems (Figure 13.2 in the Appendix). Prior to harvest plants were tested for the response of their gas exchange to changing light intensity. This allowed verifying if and to what extent the different light regimes experienced during the experiment modified the photosynthetic and transpiration response of tested species to incident light intensity (Figure 13.3).

Spinach plants showed a high photosynthetic rate after growth in the growth cabinet, which confirms that our fully controlled growth conditions were optimal for spinach growth. The top panel of Figure 13.3 in fact shows that, as expected, the conversion efficiency of incident light decreases at increasing light intensities. Photosynthesis and transpiration rates of plants grown under the NCPV dummies were slightly lower than those of control plants, particularly at high measuring light intensity. This is in agreement with the expected acclimation of the photosynthetic machinery to the prevailing growing light conditions. However, the reduction was not particularly severe, approximately 10-15% with respect to control. The ratio between the water loss (transpiration rate) and the carbon gain (photosynthesis) was only marginally affected by growth under the dummies.

When plants of all species grown in the growth cabinet at 400 ppm of CO₂ were measured at increasing external CO₂ concentration, their photosynthesis increased rapidly at low-medium CO₂ partial pressure, and almost saturated at high CO₂ partial pressure. This is fully in agreement with the model of C3 type photosynthesis response to increasing CO₂ partial pressure (von Caemmerer and Farquhar 1981). Figure 13.4 shows the

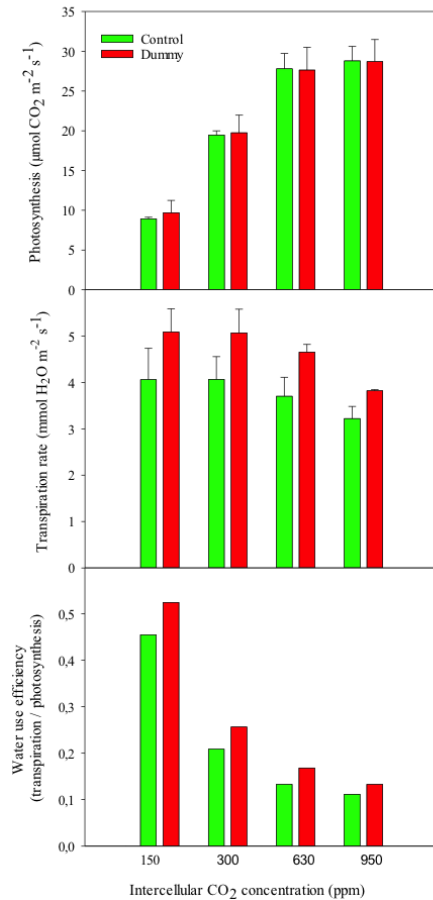
results of photosynthesis measured at increasing CO₂ partial pressures in tomato plants (for details on the type of measurements and on the model applied for calculations see von Caemmerer and Farquhar 1981). Maximum photosynthesis of tomato plants was close to 30 $\mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$, which is a high value that shows how even a summer vegetable species like tomato, could grow perfectly well under our fully controlled environment conditions.

Figure 13.3. Gas Exchanges parameter of spinach plants grown under control or under dummy light environment to changing incident light intensity



Source: Data produced by the authors.

Figure 13.4. Gas exchange parameters of tomato plants grown under control or under dummy light environment to changing CO₂ partial pressure during measurements



Source: Data produced by the authors.

Photosynthesis, at low and high CO₂ partial pressure, was not significantly affected in tomato leaves grown under the NCPV dummies. Spinach and rocket behaved slightly differently showing minor reduction of photosynthetic capacity.

The transpiration rate of tomato plants grown under the NCPV dummy was higher than that of control plants at all measured sub-stomatal CO₂ partial pressures (about 20%). Stomata are small apertures on the leaf surface that allow the exchange of water and CO₂ between the leaf and the surrounding air. However, high CO₂ concentration strongly reduced the

transpiration rate of tomato plants grown under both treatments. Thus, the transpiration efficiency was strongly increased by high CO₂ concentration. This result is particularly important for hot and arid environments, where low water availability strongly limits the productivity of agriculture. Most of the water used by the plant flows through the plant body from the root system to the leaves where it is released via the stomata to the surrounding environment (transpiration). If there is little water available in the soil, then stomata close, and there is a decrease in photosynthesis and yield. Agricultural systems in all hot and arid areas of the world are struggling with the need to provide water to crops, an issue that can be exacerbated by climate change (Tubiello et al. 2007, Alessandri et al. 2014). As shown above, in a closed controlled environment, with high CO₂ concentration, and by controlling the dryness and the temperature of the atmosphere surrounding the crop, the demand for water by the plants can be strongly reduced. More crucially, the water that is not transpired in the open atmosphere, the water vapour released by plants, can be condensed back to be used again for cultivation, thereby working in a closed loop. This would avoid water stress and the related loss of productivity, and would drastically reduce the use of water. In theory, the only water that would leave the system is that contained in the product and waste biomass, or water possibly used for system services. Safety requirements for irrigation water are lower than those for drinking water, and a closed system could function to produce clean condensed drinkable water with potentially very high safety standards. Normally for one Kg of dry plant biomass hundreds (or thousands) of Kg of water are transpired, hence in a closed system clean water production can be a relevant output for areas where drinking water is scarce.

Table 13.1 describes some of the effects of growth under the NCPV dummy on productivity and quality of the production of the three species used. Yield was affected by growth under NCPV dummy significantly in spinach, and slightly in rocket (fresh leaves per plant and leaf area per plant), while no changes in edible fruits per plant were recorded for tomato. Chlorophylls and carotenoid content decreased significantly in spinach but to a lesser extent in rocket due to NCPV dummies. We used the chlorophyll and carotenoid content to evaluate quality changes in leafy vegetable produce because both compounds are components of the photosynthetic apparatus, and their content is expected to change according to acclimation of photosynthesis to the prevailing light environment. Chlorophyll is responsible for the green colour of the leaves and thus affects the perceived quality of the vegetables.

Table 13.1. Effect of growth of rocket, spinach and tomato plants under NCPV dummies on quantity and quality parameters of the products

	Control	Dummy
Rocket		
Fresh leaves (g/plant)	5.5	4.2
Leaf area (cm ² /plant)	124	118
Chlorophylls + Carotenoids (mg/m ² of leaves)	208	185
Spinach		
Fresh leaves (g/plant)	9.3	5.0
Leaf area (cm ² /plant)	136	86
Chlorophylls + Carotenoids (mg/m ² of leaves)	470	444
Tomato		
Edible fruit (g fresh weight/plant)	28	29
Dry matter content (%)	10.5	10.5
Soluble sugars (% of fresh weight)	4.8	3.8
Sucrose/starch	2.1	5.1
Lycopene (% of fresh weight)	0.95	0.92

Source: Data produced by the authors.

A pale green appearance due to low chlorophyll content would be perceived as a poor quality parameter for most leafy vegetables. Carotenoids, on the other hand, are antioxidant compounds with a remarkable nutritional values. The quality of tomatoes increases together with the increase of the content of dry matter of soluble sugars and of lycopene. Growth under the NCPV dummy did not decrease the quality of tomatoes produced. Only the content of soluble sugars decreased slightly, while the dry matter content and the lycopene content were high and similar on fruit of both light treatments. The high sucrose/starch content might indicate that the fruit of the plants grown under the NCPV dummy were slightly less ripened than the others.

Controlled environment agriculture, even simple greenhouse cultivation, is known to push productivity toward its highest limit and not only in developed counties (Wachira et al. 2014). Controlled environment agriculture is largely devoted to the production of vegetables, which are normally a high value part of the diet both in terms of costs and in terms of nutritional value, due to their normally high content of mineral salts, vitamins, antioxidants and nutraceutical compounds. Hence, vegetables play a key role in tackling malnutrition both in developing and developed counties. With controlled environment agriculture, it is possible to tune environmental factors to increase the nutritional value of vegetable produced (Proietti et al. 2004, 2009, 2013).

CONCLUSIONS

In our experiments we tested the effect of growing leafy and fruit vegetable species under 50% reduced light intensity by light sharing between NCPV dummy and the crop. This was done in a “laboratory” with fully controlled growth chambers with a photosynthetically active light intensity of about 40% of that of a sunny day in the Mediterranean area. This is a more rigorous condition compared to doing the same experiment in a natural light greenhouse, because the absolute light intensity would be higher in “field” conditions than in our growth chamber. The CO₂ partial pressure inside the chamber (400 ppm) was not increased with respect to normal ambient partial pressure. Hence, we did not take advantage of the “recovery” of photosynthesis that high CO₂ partial pressure could provide to counteract the decrease of photosynthesis due to the reduction of light intensity. Nevertheless, we recorded only limited decreases of yield and quality in leafy vegetables and none in tomatoes. This strongly suggests that in Mediterranean environments, as in all sunny areas, greenhouses could be efficiently shaded by NCPV modules; the latter would intercept only a tunable fraction of the incident light, thereby helping control the internal greenhouse environment. The renewable energy produced by functional NCPV modules would be available for further control of the internal greenhouse environment, and so to optimize yield and quality of vegetable produce. Depending on the efficiency of the NCPV module, renewable energy could also be available for other off-grid uses or grid upload.

Control of the agricultural environment requires energy. If the required energy can be produced onsite from renewable sources, then the overall system can be self-sustaining. The energy efficiency of food production is as important as the production of food itself because energy availability and its related cost affect poverty, in the same way as food availability does. We need new controlled-environment systems for food production in which the integration of renewable energy sources increases the overall energy efficiency, while increasing the quantity and quality of the products. Our team is working in this direction and here we provide data on the feasibility of only one among the multiple ways that technology can make it possible to achieve this goal.

Controlled environment agriculture can increase sustainable food production and food safety by: a) reducing the use of natural resources to produce food, such as land and water; b) allowing cultivation in un-

suitable land and environments (e.g., arid and salinized land, cities, high elevation areas, polluted land); c) increasing food nutritional quality of vegetables; d) stabilizing seasonal productivity and reducing risks due to extreme events and climate change; e) reducing the loss of production due to pests and diseases; and f) increasing the income per unit of land, raising the monetary revenue of family farmers with small farms.

To achieve this, we need a) new knowledge; b) new, efficient, easy and affordable technology; c) new, efficient, easy and affordable ways to produce renewable energy; and d) new, efficient, easy, tailor-made and coordinated policies favouring science, technology transfer, education, renewable energy production and incentives to farmers. Coordinated policies between EU and non-EU Mediterranean Countries can help to build synergies which would benefit all stakeholders.

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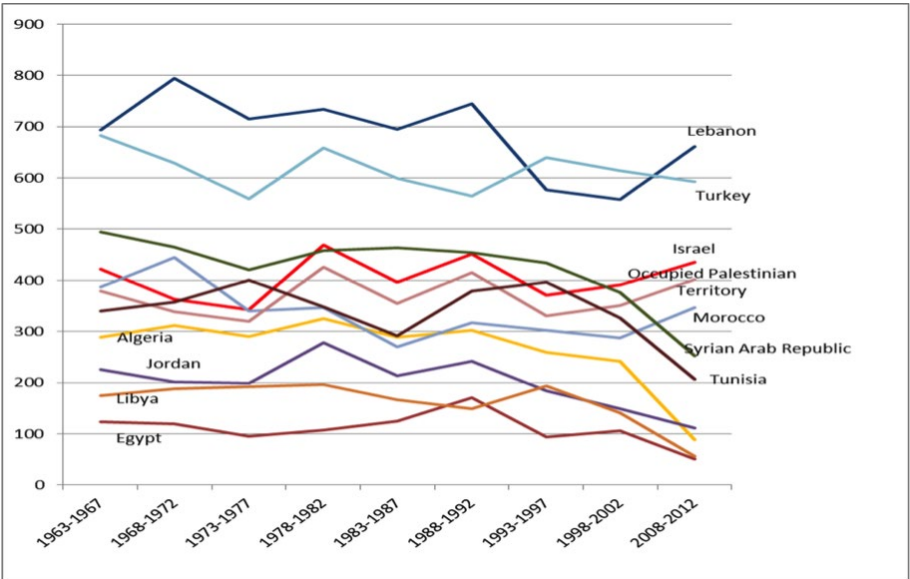
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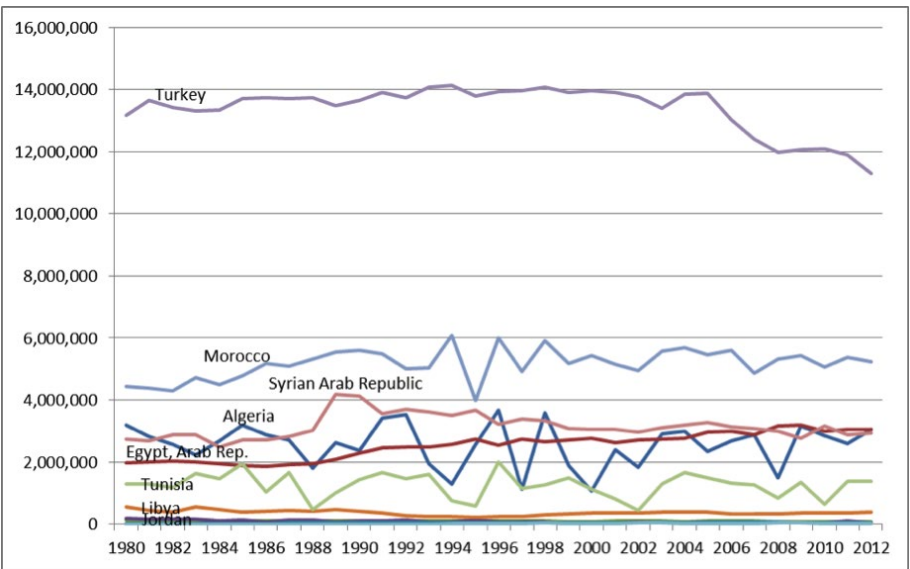
Annexes

Figure 2.1. National Rainfall Index (NRI) (mm/yr) 1963-2011



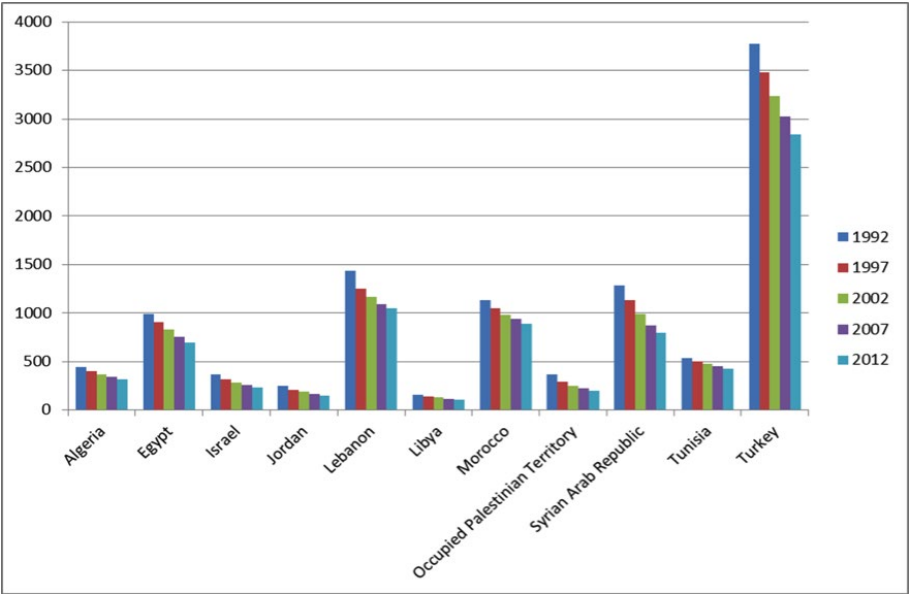
Source: Data analysis from FAO AQUASTAT Database (2013) and World Bank (2014).

Figure 2.2. Land under cereal production in some SEMCs 1980-2012 (hectares)



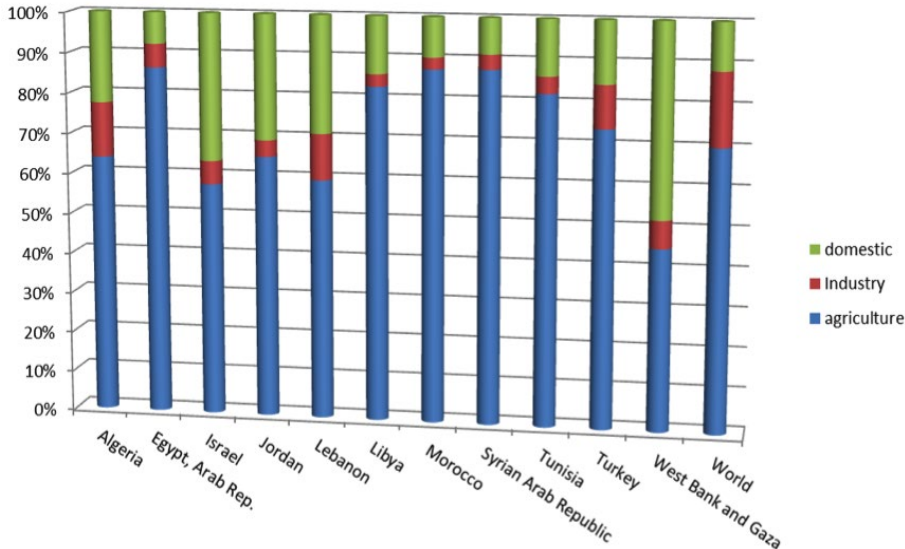
Source: World Bank (2014).

Figure 2.3. Total renewable water resources per capita (actual) (m3/inhab./yr)



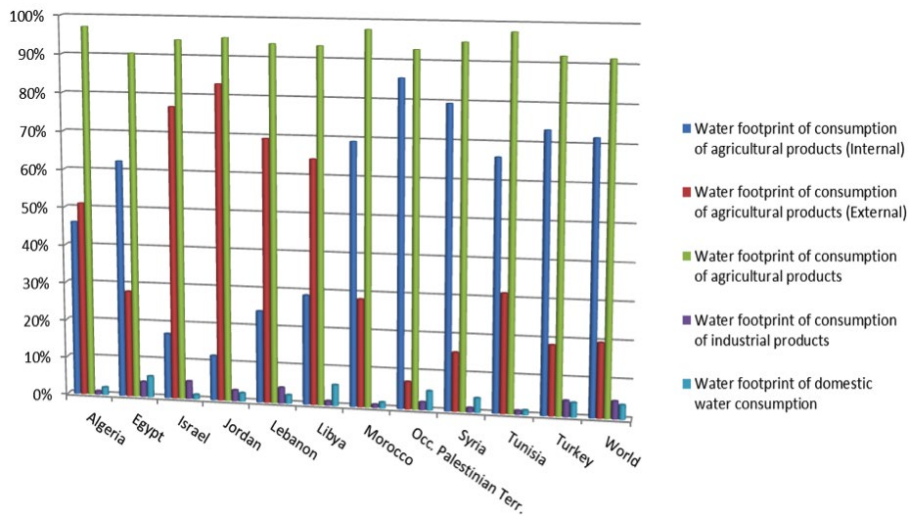
Source: World Bank (2014).

Figure 2.5. Annual freshwater withdrawals, agriculture, industry and domestic (% of total freshwater withdrawal), 2012



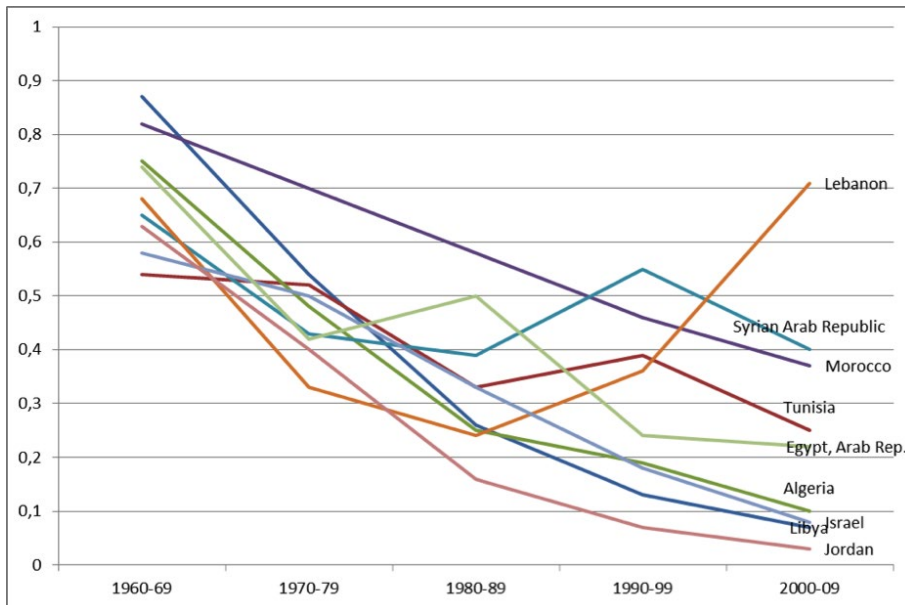
Source: World Bank (2014).

Figure 2.6. Total water footprint of national per-capita consumption by sectors, 1996-2005



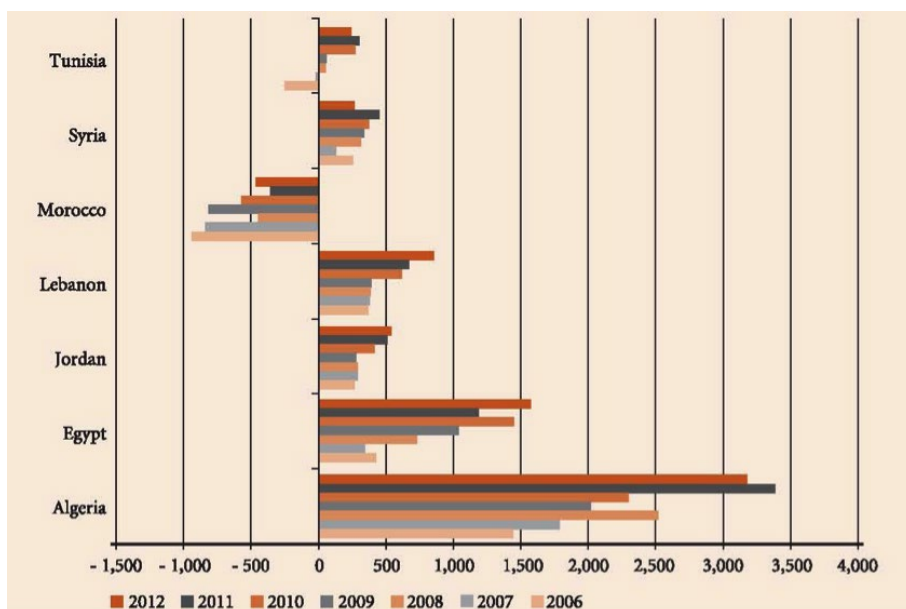
Source: Elaboration based on data from Mekonnen and Hoekstra (2011).

Figure 2.7. Self-sufficiency index for cereals in some SEMCs



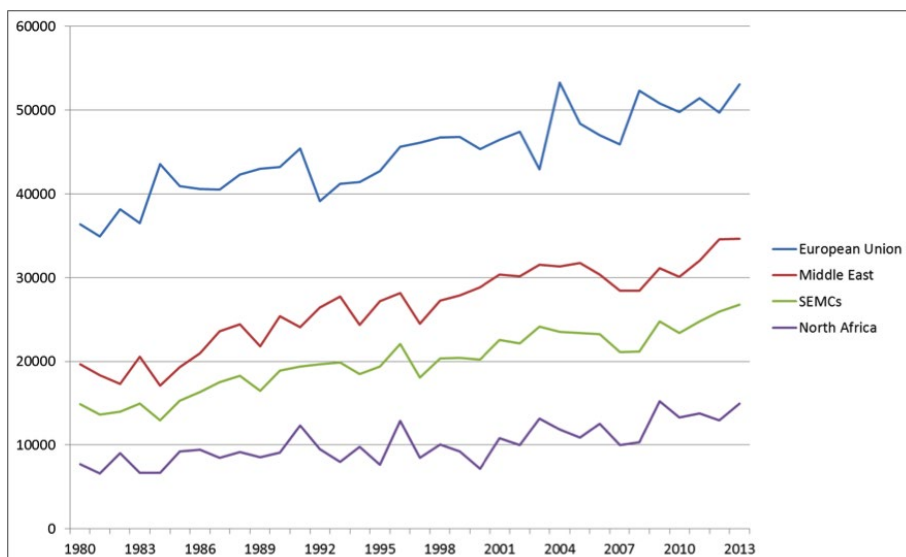
Source: Elaboration based on data from USDA (2010).

**Figure 2.8. EU agro-trade balance with the Arab Mediterranean countries
(in millions of Euros)**



Source: Ben Zid (2014).

Figure 2.9. Cereal yield in SEMCs and European Union (Hg/Ha) 1980-2013



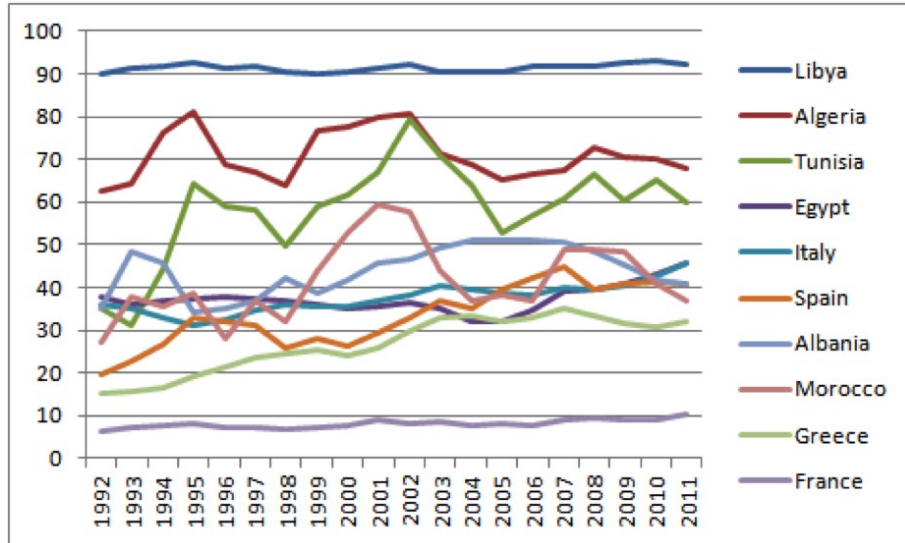
Source: Elaboration based on data from FAOSTAT Database, 2014.

Figure 4.2. GM Food Labelling, States Take Action



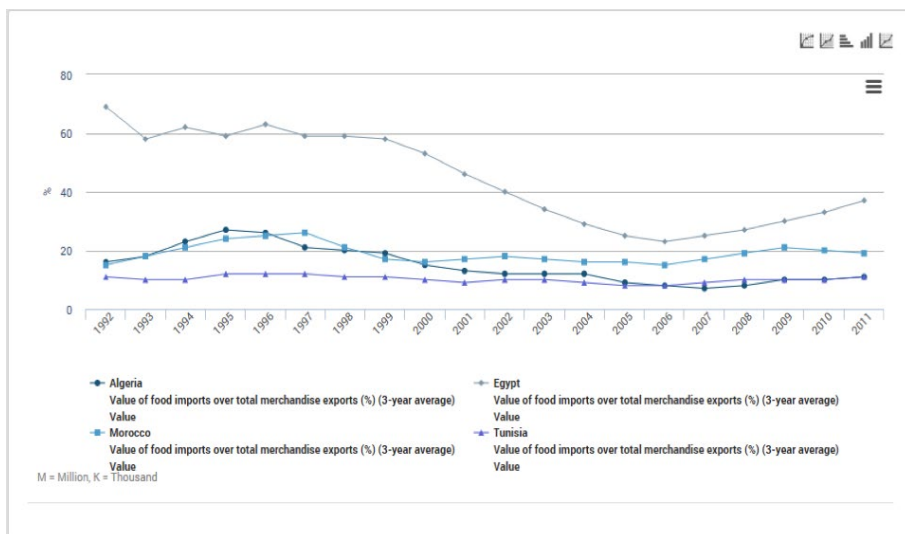
Source: Center for Food Safety, June 2014.

Figure 12.2. Cereal Import Dependency Ratio in the Euro-Mediterranean area (overview)



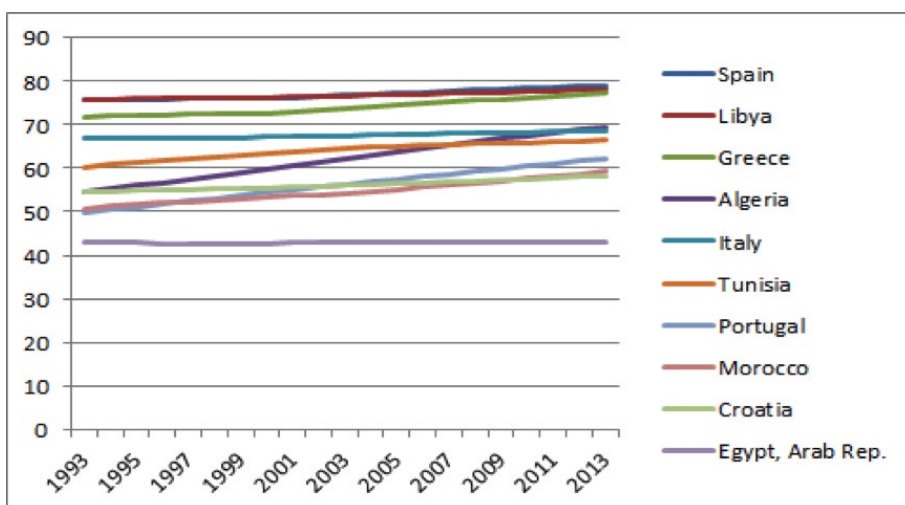
Source: Authors' elaboration based on World Bank data (World Development Indicators 2013).

Figure 12.3. Value of food imports over total merchandise export for select countries in the Euro-Mediterranean area



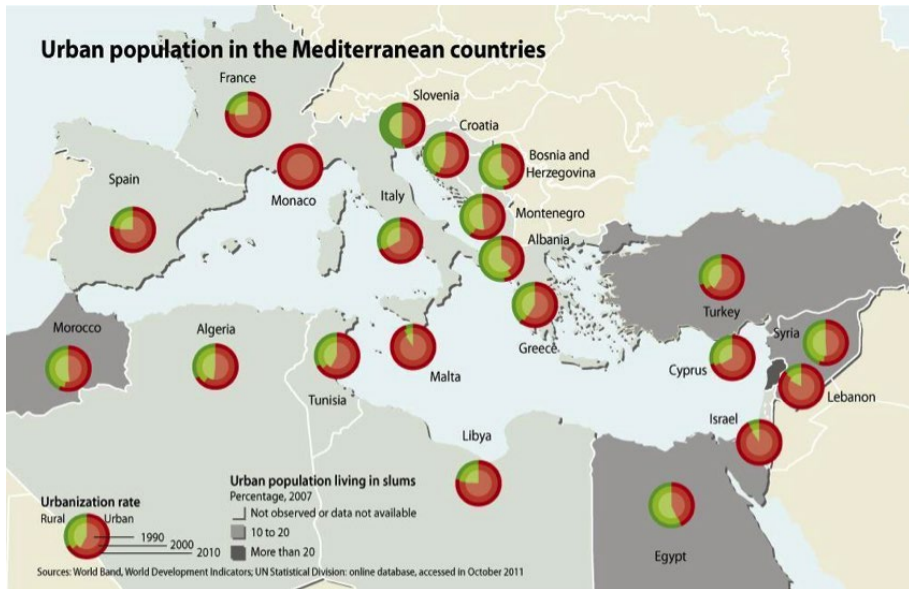
Source: World Bank (World Development indicators 2013).

Figure 12.4. Urban population in select Northern and Southern Mediterranean countries



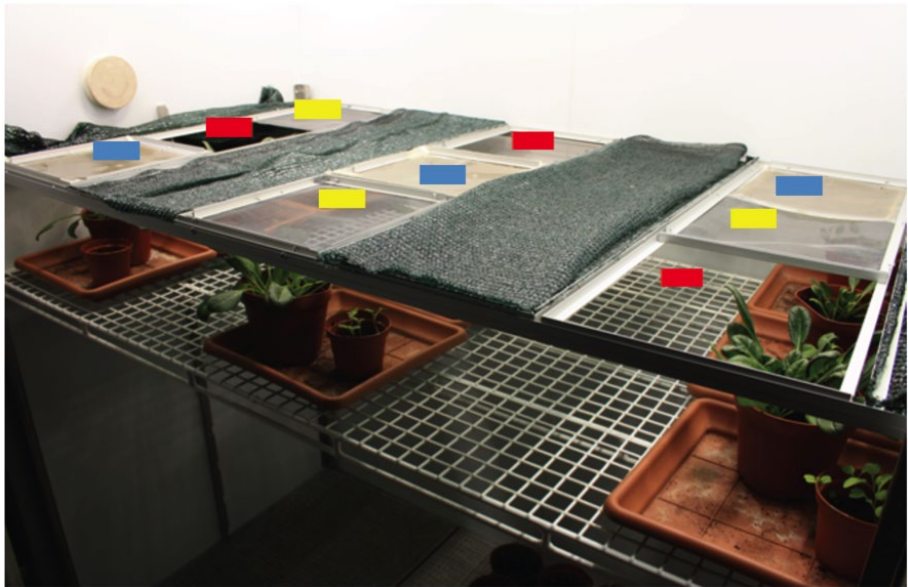
Source: Authors' elaboration based on World Bank data (World Development Indicators 2013).

Figure 12.5. Urban population in the Mediterranean countries



Source: GRID-Arendal (2013).

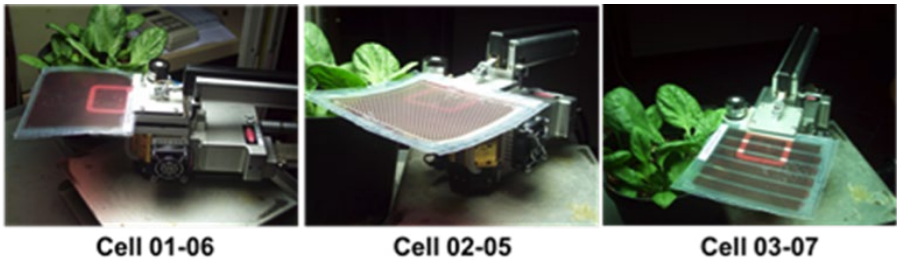
Figure 13.1. Experimental setup in the growth chamber



■ Control ■ Dummy ■ Neutral Net

Source: Picture taken by the authors.

Figure 13.2. Measurement of spinach photosynthesis with different typed of dummies



Source: Picture taken by the authors.

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