

THE RISE OF AGRIFOOD TECHNOPOLES IN THE MIDDLE EAST AND NORTH AFRICA REGION

EL DESARROLLO DE LOS POLOS TECNOLÓGICOS AGRO-ALIMENTARIOS EN EL NORTE DE ÁFRICA Y ORIENTE MEDIO

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ABSTRACT

This article assesses whether the promotion of agrifood technopoles is an effective policy instrument that can contribute to the development of the MENA food industry. The emergence of technopoles in the food sector dates back only 5 to 10 years in most MENA economies, having reached different levels of development. The present study describes the main programmes and strategies to foster agro-industrial development in the region using the technopole model and presents findings, conclusions and recommendations based on the data and examples analysed, as well as on international benchmarking of territorial agro-industrial development initiatives, particularly in the Euro-Mediterranean space.

KEYWORDS: *technopoles; agro-industry; MENA region*

JEL: F02, F13, F14, F59, G18.

RESUMEN

El presente artículo analiza el potencial de los polos tecnológicos agroalimentarios para desarrollar la industria agroalimentaria de la región MENA. El desarrollo de estos polos se remonta tan sólo a los últimos 5 a 10 años en la mayoría de los países de la región, y el nivel alcanzado es heterogéneo. Este estudio describe los principales programas y estrategias usados en la región para polarizar el desarrollo agroindustrial siguiendo el modelo de los polos tecnológicos y presenta conclusiones y recomendaciones basadas en los ejemplos y datos analizados, así como en la comparación con otras iniciativas internacionales de desarrollo territorial agro-industrial, principalmente en el espacio Euro-Mediterráneo.

PALABRAS CLAVES: *polos tecnológicos; agroindustria; región MENA*

INTRODUCTION

The Middle East and North Africa (MENA) region¹ has a high potential for shining in the global agribusiness system, starting with a relatively important agribusiness sector at national and international levels²; followed by a fast-growing domestic demand for agricultural and food products; a leading position in the fields of agroprocessing and irrigation technologies in some cases (notably Israel); an excellent culinary reputation, with Lebanon, Morocco and Syria in the lead; and an expanding land rental market for major agribusiness operations, especially in Morocco and Egypt. (Anima, 2010)

As a consequence of all the above, the Southern Mediterranean rim is becoming increasingly essential in the supply chain of agrifood companies targeting the Euro-African plate and the Middle East, contributing to a *de facto* positioning of the region relatively to other parts of the world. However, global pressure on the food industry of MENA countries is increasing and efforts to gain ground in the race for competitiveness are needed more than ever.

Although agribusiness is a major source of income, employment and food security in the region, the road to its full development is fraught with difficulties, related to infrastructural constraints, trade issues and insufficient access to financial, human and other productive resources (in particular, land and water). As a consequence, MENA countries are net importers of food. In fact, four of these countries (Egypt, Jordan, Morocco and Tunisia) are in the list of major Net Food-Importing Developing Countries of the World Trade Organization (WTO). MENA nations have always had food security on top of their priority list, but have placed further emphasis on this issue after the soaring food price crisis of 2008, which exacerbated the vulnerability of their food systems³. In the wake of such crisis, efforts to promote agro-industrial development as a way to ensure food security were redoubled.

A new agro-industrial strategy has emerged in the MENA region to foster the competitiveness of the sector, while at the same time ensuring food security. This strategy lies on the implementation of ambitious agro-industrial competitiveness programmes following a territorial approach such as food technopoles, clusters and other mechanisms of concentration of agricultural activity. These programmes are linked to investments in public productive infrastructure, particularly airports and ports. Such strategy is complemented by the deepening of public administration reforms aiming at improving the business environment and attracting private sector investment into agriculture, thanks to aggressive Foreign Direct Investment (FDI) hosting strategies, targeted at regional firms (beyond the traditional business elite), multinational agribusiness and companies from other sectors; and the negotiation of

¹ According to the World Bank's classification of countries, the MENA region includes: Algeria, Bahrain, Djibouti, Egypt, Iran, Iraq, Israel, Libyan Arab Jamahiriya, Jordan, Kuwait, Lebanon, Morocco, Oman, Qatar, Saudi Arabia, the Syrian Arab Republic, West Strip and Gaza, Tunisia, United Arab Emirates, and Yemen.

² Syria, Saudi Arabia, Tunisia, Jordan, UAE, Morocco and Lebanon are in the list of the top 30 performers, among developing and emerging countries, in terms of agricultural export growth in the past 20 years, according to FAOSTAT, FAO 2010.

³ For instance, in Yemen, the doubling of the price of wheat and bread has resulted in a 12 percent loss in real income of the poor, which threatens to set back the progress achieved in poverty reduction from 1998 to 2005. (World Bank, 2008)

trade agreements within and outside the region, mainly with their main trading partners, *i.e.* the European Union (EU) and the United States.

MENA countries have tailored these agro-industrial programmes to their socio-economic situation and resource endowments. Egypt, Jordan, Morocco, Syria and Tunisia, for example, are implementing agro-industrial development programmes to climb up the value chain ladder by developing food “hotspots”, such as agro-industrial technopoles, special economic zones (with an agribusiness component), and agro-based clusters (see definitions in Section 1). Other countries with meagre endowment of agricultural land and water resources, such as the Gulf Cooperation Council (GCC) members, are combining the above schemes with major overseas investments to ensure the steady supply of agricultural raw material⁴. For instance, Saudi Arabia is promoting private and public agribusiness investments both locally and internationally (in places as varied as Ethiopia, Turkey, Ukraine and the Philippines) supported by an agricultural development fund of about US\$ 5.3 billion. These two types of initiatives are expected to boost regional agribusiness development and agro-industrial processing with local and imported inputs and raw material, thus, retaining a higher share of value-added locally and creating employment.

Given that food technopoles are the most widely employed modality in the region, they have been retained as the prime focus of this study. The article begins with a brief review of the notions of food technopoles, clusters and related concepts. It focuses on food processing, only tangentially touching upon the downstream (agriculture) and upstream (distribution) activities in the agrifood chain. Subsequently, it describes the main food technopole initiatives in the region placing an emphasis on the new elements introduced in the revised agro-industrial policy, the common and distinctive features of technopoles across the region and the different level of maturity or sophistication achieved. Lastly, the study presents findings, conclusions and recommendations based on the data and examples analysed, as well as on international benchmarking of territorial agro-industrial development initiatives, notably in France and the EU as their policies have served as a model for elaborating MENA’s new agro-industrial policy.

1. FOOD TECHNOPOLES AND RELATED CONCEPTS

1.1. The notion of food technopoles and related concepts

Food technopoles, also called agro-industrial parks or agropole/agropolis, are shared facilities and services (e.g. transport, storage and packaging) built explicitly for the processing of agricultural products. A food technopole is a structured community dedicated to the development of agrifood innovation, bringing together in one location (or in multiple nearby interrelated locations) the necessary elements for making innovation happen: agro-industries, research and training institutions, and related input and service providers. The “soft” elements of the food technopoles (e.g. technological and scientific knowledge, a mindset for collaboration, social consensus, entrepreneurship and long-term vision) are as vital as the “hard” ones (e.g. transport

⁴ GCC member countries: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and UAE.

and information and communication infrastructure, research and technological development (RTD) and industrial facilities) (EIB *et al.*, 2010).

Food poles support their tenants (SMEs, large domestic agribusiness, MNAs and other institutions) by providing a combination of three components: infrastructure, a service platform and a set of dedicated-technopole tools. Good quality and modern infrastructure, together with location, is a key positioning tool *vis-à-vis* prospective tenants. A successful technopole is close to key transport infrastructure (e.g. airports, ports and other logistic hubs), and is endowed with: education, conference, research and telecommunication facilities; multitenant, purpose-built buildings with modules for individual firms and centralised common facilities; as well industry-specific infrastructure such as food labs, food prototype and pilot production and testing and certification facilities. With regard to the services offered, their cost-effectiveness, range and quality will affect the agropole's overall attractiveness. Support and advisory services are expected to include: property services; screening of new business opportunities, food technology intelligence; assistance for patenting and advice on contractual and legal issues; market development (business plans, road shows, international missions); match-making and other networking events; easy access to finance (grants, loans, equity financing); training and capacity building events; and facilitated recruitment from universities. Food poles usually offer dedicated tools, such as: specialized technology and innovation programmes, with an emphasis on fostering multipartner research and industrial development programmes; incentives for technopoles' tenants, such as financial and fiscal incentives and debureaucratisation (one-stop office); dedicated funding instruments; and business incubator initiatives (*i.e.*, platforms designed to help start-up companies by providing them with the necessary facilities and resources that they need to grow).

The United Nations Educational, Scientific and Cultural Organization (UNESCO) and the World Technopolis Association (WTA) list a number of approximate synonyms for the term technopole such as: science park/city/town, technology park/technopark and research park (UNESCO and WTA, 2010). Similar forms of organising actors in networks receive different names in different countries, such as the Italian technological districts, the Anglo-Saxon clusters, the French local productive systems, the European poles of competitiveness and the Canadian poles of excellence⁵. Despite the diverse terminology, the least common denominator is clear: the need to build local networks in a territory to increase the competitiveness of a sector through enhanced coordination between the economic actors (firms and central and local authorities) and knowledge institutions.

Some related concepts close to the notion of food technopoles are briefly considered below, namely food clusters, Special Economic Zones (SEZ) and integrated industrial platforms. Food clusters are, following Porter's definition (1998), "geographic concentrations of inter-connected companies and institutions" in the food industry field. According to Gálvez-Nogales (2010), food clusters are an array of linked agribusinesses, producers and other entities important to competition. They could include, for example, crop, livestock and/or fish production, food processing, as well as suppliers of specialised inputs (e.g. agricultural machinery and equipment),

⁵ Industrial districts (Becattini, 1987), *innovative milieux* (Camagni, 1991), clusters (Porter, 1990), learning regions (Asheim, 1996), regional innovation systems (Cooke, 2001) and food parks (FAO, 2006).

infrastructure and services (e.g. certification and food-related transportation and distribution). Food clusters also often extend downstream to channels and customers and laterally to manufacturers of complementary products and to companies in industries related by skills, technologies or common inputs (such as the bio-tech and bio-fuel sectors). Many food clusters include governmental and other institutions, such as universities, standard-setting agencies, think tanks, vocational training providers, and trade associations that provide specialised training, education, information, research and technical support (based on Porter, 1998).

Although similar in many aspects, clusters and technopoles show some differences. First, technopoles spread over a more reduced well-defined territory than clusters: the former offer a particular form of location, which planning, architecture and leadership are all conceived to promote the establishment of a new socio-productive order (EIB *et al.*, 2010). Second, food clusters could be considered more “organic” than food technopoles, which tend to be artificially created by public authorities (and sometimes academic/research institutions), although often build upon a pre-existing dense agro-industrial tissue. Third, food clusters are more multidimensional, with a dense value network of horizontally and vertically interconnected components. Fourth, whereas food technopoles tend to group firms connected predominantly by horizontal relationships. Finally, technopoles make a greater emphasis on innovation, drawing together economic activities working towards future innovation. Clusters, on the other hand, offer a wider view of collective actions not restricted to RTD, but also including collective marketing, policy dialogue and lobbying, etc.

Two other concepts recurrently used in this article are SEZ and integrated industrial platforms. SEZ are geographical regions with more liberal economic laws than the rest of the country, typically with the goal of increasing FDI. Some SEZs have a food industry focus. Agri-export zones are a hybrid model between SEZ and technopoles, which explicitly uses the idea of a technopole in the hope that it will enhance the export of agricultural products from a given area. Integrated industrial platforms are hubs offering integrated and multidisciplinary technological and logistic services to industrial enterprises, usually with free zone status, and can be targeted to specific manufacturing subsectors, such as the food and beverage industry, or most likely to several industries at the same time.

1.2. Territorial development strategies applied to the agrifood sector

Food technopole and cluster programmes are the result of progressive theoretical developments in economic theory and their translation into policies, based on the recognition of the relevance of location and territories for economic growth, innovation and knowledge dissemination.

The concept of clusters appeared in the late 1990s (Porter, 1998), whereas that of technopole emerged in the 1960s and became quite popular in the 1980s spreading across many countries, but in reality the first experiments initiated much earlier, mostly in the United States. In the 2000s, the accelerated processes of globalisation and decentralisation spurred a renewed interest in these industrial development tools, resulting in a proliferation of clusters and technopoles adopting a broad range of organisational structures. In the 1980s, the number of technopoles in the world was less than 50, to then reach 500 in the 1990s, and around 900 in the 2000s.

Initially, the notion of technopole/cluster referred to the information and communication technology (ICT), automotive, energy, textile and chemical sectors, but gradually evolved to include other industries, such as food and beverage. In fact, these concepts are especially suitable for the agro-industrial sector because: there is a badly felt need for fostering innovation in the food sector, which is scarcely innovative and limit itself to adapting technologies from more innovative upstream industries (e.g. pharmaceutical, biotechnology and packaging industries) (Christensen *et al.*, 1996; Vermeire and Gellynck, 2009); the production of raw agricultural material is intrinsically linked to the particularities of a territory; and the sector's complexity calls for multidisciplinary and multisectoral policy approach with coordination mechanisms such as the ones provided by technopoles/clusters.

Food technopoles and clusters allow the provision of common infrastructure facilities and services to be economically assisted, while also helping the enterprises there to gain from other benefits of clustering (Gálvez-Nogales, 2010). Consequently, they are a means to overcoming informational failures (absence of informational spillovers in discovering the cost structure of an economic activity), and coordination failures (lack of coordination of investment activities with scale economies) in the agrifood sector (Rodrik, 2004). The theory suggests as well that these initiatives can assist to boost the competitiveness of the food industry and attract FDI into it, as well as to enhance food security. They can also smooth the restructuring of the domestic food processing sector that started in the mid 1990s, spurred by the processes of consolidation (with mergers and acquisitions of small and medium agro-industries), multinationalisation and specialisation among the surviving smaller food processors. (Reardon *et al.*, 2009)

Technopoles, clusters and other territorial approaches acknowledge the conclusions of the new developments in economic geography, and particularly the New Economic Geography theory⁶ (Krugman, 1991) and Porter's ideas (1990, 1998) of "competitive advantage" and "cluster", *i.e.*, the existence of cumulative processes of concentration and agglomeration, and the emergence of knowledge-based economies. Recent literature on agglomeration and international trade fragmentation provides valuable insights for understanding the latest developments in the MENA agrifood sector. According to Marshall's agglomeration theory⁷, Krugman's New Economic Geography School, and Porter's cluster policies, agribusiness firms are likely to obtain gains from three types of agglomeration economies: a local pool of skilled labour, local knowledge spillovers and local supplier linkages. Clustering favours innovation in agribusiness activities, as firms benefit from flexible inter-firm alliances, supported by mutual information exchanges of formal and informal nature.

However, as important as the forces of agglomeration and localised innovation remain, global integration and fragmentation (Grubel and Lloyd, 1975; Lloyd and Lee, 2002) are also on the march. In the globalisation era known as 3.0⁸, agribusinesses

⁶ One of the greatest contributions of the New Economic Geography is to explicitly model 'the self-reinforcing character of spatial concentration' (Fujita *et al.*, 1999).

⁷ The agglomeration theory describes the process of firms locating close to each to benefit from "external economies" including input-cost externalities and delivery-cost externalities. (Marshall, 1920; Johansson and Quigley, 2004)

⁸ Friedman (2005) states that a third wave of globalisation or "globalisation 3.0", which started around 2000, is "shrinking and flattening the world and empowering individuals and small groups."

move to build up efficient intra-firm structures and inter-firm relationships. Instead of internally undertaking all production operations, agribusiness firms might delegate some activities to other firms through arrangements of different kinds. The dispersal or “slicing up” of agricultural value chains on an international basis involves vertical trading chains spanning a number of countries, each specialising in a segment of the supply chain. This fragmentation has also arrived to MENA countries, as many agribusiness firms from Western Europe have “nearshored”⁹ (*i.e.* transferred their production/distribution operations) to locations in the Southern Mediterranean rim, attracted by the relatively low-cost qualified workforce, cost-efficient transportation, communications access and location in similar time zone.

Agribusinesses are simultaneously exploiting the advantages of fragmentation and agglomeration, reconciling these two apparently contradictory forces by building long-distance linkages that work to strengthen technopoles and clusters, while at the same time agribusinesses exploit locality-derived advantages when connecting to global value chains (Gertler, 2003; Wolfe and Meric, 2004; Hansen, 2008). Hence, fragmented production blocks are not evenly geographically distributed, but are rather concentrated in poles of competitiveness where service link costs (costs required to connect remotely located production blocks) are relatively low. Moreover, the fragmentation theory argues that the key to attract fragmented production blocks is to improve location advantages by, for example, developing agro-based technopoles or clusters. These initiatives involve implementing measures that encourage agglomeration, e.g. FDI promotion, infrastructure development, improvement of custom procedures, certification services, stimulus of human capital, as well as more abstract coordination costs that connect remote production blocks. MENA countries have implemented various types of trade and FDI facilitation measures to reduce service link costs and encourage MNAs to participate in agro-industrial agglomerations in their territories as well as connect these spaces with international agrifood networks. In addition, technological progress, domestic liberalisation, international openness and heavy investments in high-quality infrastructure have lowered the costs of service links between MENA countries and industrialised countries and regions, notably the EU.

Delving further into the dynamics of regional innovation reveals that economic geographers paid great attention in the 1980s to the geography of innovation. According to this theory, some regions (sub-national units) are more capable of developing and realising innovations than others, depending on their local stocks of knowledge as embodied in public, academia and private RTD. Indeed, RTD, a key driver of innovation, is extremely spatially concentrated, favouring only a small set of regions in the world (Feldman and Audretsch, 1999). Baldwin *et al.* (2001) and Baldwin and Martin (2003) attribute this regional dimension of innovation to the importance of face-to-face contacts for knowledge transmission. Moreover, empirical studies have found a significant positive correlation between regional stocks of knowledge and economic performance (e.g. Varga *et al.*, 2000). In other words, “growth, through innovation, spurs spatial agglomeration of economic activities which in turn leads to a lower cost of innovation and higher growth so that a circular causation between growth and the geographic concentration of economic activities sets in” (Martin and Ottaviano, 2001). Additionally, recent academic analysis of

⁹ “Nearshoring” refers to “offshoring” production and distribution arrangements (*i.e.* moving the supply of goods and services from domestic to overseas locations) when carried out in nearby countries.

empirical evidence on the innovation process has shown that innovation is seldom an outcome of the effort of a single agent; on the contrary, it is usually the result of the collective efforts of many firms and institutions engaged in a common endeavour.

These theories have been readily accepted by policy-makers resulting in a renewed multidimensional (encompassing industrial, science and technology, agricultural and regional policies) and multilevel (with both central and local authorities involved) agro-industrial policy aimed at fostering innovation, competitiveness and food security. This new generation of agro-industrial policies, in brief, sustains that regions can grow by increasing their local stock of knowledge through the creation, diffusion and commercialisation of new agro-industrial ideas, technologies and know-how. This can be done in several ways. First, regions can contribute to achieving a critical mass of organisations that provide inputs to the innovation process, such as knowledge, skills and capital. For instance, governments can supply RTD, education and capital that match the need of local agribusiness firms, increasing their absorptive and innovative capability and flexibility (e.g. by upgrading their routines through the supply of new skills). Second, regions can stimulate the effective transfer of knowledge by enhancing spin-off dynamics (Helfat and Lieberman, 2002). Third, regions can encourage labour mobility as a mechanism to transfer skills and experience to local agribusinesses (Camagni, 1991). Fourth, policy-makers can stimulate collaborative networks as effective settings through which knowledge circulates and interactive learning takes place, by acting as knowledge brokers or establishing agro-industrial platforms that facilitate knowledge spillover. All these things are easily achieved within the framework of technopoles, food clusters and similar policy tools. As a result, governments have begun to direct resources to stimulate poles/clusters of agribusinesses and forge links with knowledge institutions (EIB *et al.*, 2010).

All the above should not be understood as a green light to start technopole programmes from scratch. On the contrary, public interventions should facilitate the strategic development of the agro-industrial sector building on the existing regional stock of knowledge and understanding how it is positioned in the international scene. Effective policy-making requires localised action attuned to available regional resources and institutional framework. This understanding should guide policy-makers in designing adequate technopole policies that encompass agricultural, industrial, research and development, innovation and competitiveness policies.

This new policy approach is very much in tune with the changes occurred in the innovation strategies of agribusinesses. In the 1980s MNAs used to implement their RTD activities in central laboratories. In present days, the nature of the globalisation process has forced MNAs to reconsider their RTD strategies (Gordon, 1990; Veltz, 1993). At present, they carry out almost 30 percent of their RTD activities abroad (Kalotay, 2005), through increasingly reactive and sophisticated worldwide networks and multipolar structures formed by small-scale RTD units plugged in local knowledge systems (Sachwald, 2004). Technopoles facilitate the adoption of such innovation structures. Paradoxically, the more “global” the food industry has become, the more the local dimension has gained in importance to innovate and remain competitive. This is why MNAs favour technopoles or poles of excellence, *i.e.*, locations with high scientific and technological potential, where relevant information and research capabilities can be found.

2. FOOD TECHNOPOLES IN THE MENA REGION

2.1. Regional overview

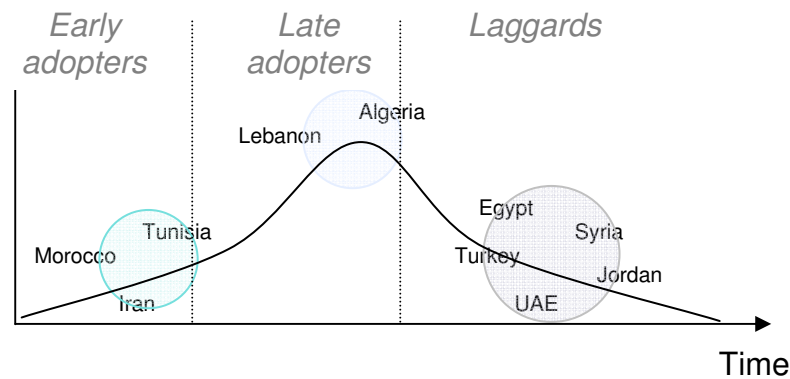
Economic opening has led to new challenges facing MENA agro-industries that are pressured into reaching competitiveness levels comparable to that of MNAs. Regrettably, the agro-industrial fabric of these countries is weak, constrained by multiple factors (e.g. limited access to financial resources, shortage of leaders, innovation gaps) and predominantly formed by small enterprises with low- and medium-technology. A World Bank study (2009b) on the performance of MENA manufacturing reveals that firms' size and foreign ownership of capital justify scale economies and externalities linked to participation of foreign capital in the agroprocessing sector of the region. This fact justifies a policy of concentration of small agro-industrial enterprises, exemplified by food technopoles.

Furthermore, MENA countries need to build a renewed (Mediterranean) identity and branding to position themselves on the global agrifood map, gain in relative competitiveness and climb up the value ladder. Such a positioning implies the incorporation of more technological and innovation content in the agro-industrial sector to generate a breakthrough by upgrading processes, taking advantage of lower production costs and fully adopting international food standards. Again, food technopoles are highly effective means to foster this type of innovation.

In recognition of the above, Governments across the MENA region started to timidly use technopoles and other industrial territorial approaches to promote food "hotspots" in the 1990s, and in the mid 2000s these notions became mainstream in the regional agro-industrial agenda (Ciheam, 2009). Most MENA food technopoles deal with high-value, export-oriented agricultural products such as olive oil, fish and fresh fruits and vegetables. The pressing issue now is how to further develop these poles, so that they benefit the countries' economy in a sustainable manner.

The development of food hotspots across MENA countries, although having in essence the same approach, exhibit some nuances and different degrees of development. MENA countries could be classified as early adopters, late adopters and laggards depending on how much and how well they have applied the technopole strategy to their agrifood system (See Figure 1). According to this classification, Tunisia, Morocco and Iran would be qualified as "early adopters", since they have undertaken ambitious upgrading programmes of *mise à niveau*, using technopoles to upgrade food firms with growth potential. Algeria and Lebanon would be "late adopters": they have a few agro-poles, most of them at a planning/infant stage. Jordan, Egypt, Syria, Turkey and the United Arab Emirates (UAE) could be considered as "laggards", since they do not have technopoles dedicated in exclusivity to the agrifood sector. Finally, other countries have developed technopoles dealing with ICT and other high-tech sectors, but nothing at all (or at least not yet) with food processing. This is the case of Kuwait (Kuwait Technology Park), Qatar (Qatar Science and Technology Park targeting the gas, petrochemicals, healthcare, ICT, water technologies, environment and aircraft sectors) and Saudi Arabia (tecnoparks oriented to ICT and other knowledge-based industries) (Djeflat, 2009). This reflects the strategic positioning of their economies and the lack of natural endowments that prevent these countries from investing in agrifood.

Figure 1: Classification of MENA countries according to the level of development of their food poles. Adoption curve of the food pole approach



This classification refers only to the development of technopoles in the agrifood sector. Countries qualified as laggards here, might have very advanced technopole initiatives in other sectors, as in the case of Egypt and UAE. Or they might have adopted other technology transfer and innovation (TTI) tools or instruments. For instance, most MENA countries possess innovation and technology centres and business/technology incubators dealing with agrifood (a basic building block for developing technopoles), although their number, sophistication and track record varies considerably (European Communities and OECD, 2008).

2.2. Early adopters

These countries have established themselves as pioneers or early adopters of the food technopole approach in the MENA region. These are Morocco, Tunisia and Iran.

Morocco, like Tunisia, has gradually moved on from generalised *mise-à-niveau* industrial platforms towards a new industrial strategy with more specific sectoral upgrading, and with innovation and RTD as centrepieces. This new strategy is clearly spelled out in the Industrial Plan (2005) called *Pacte National pour l'Emergence Industrielle*, which focuses on overhauling eight sectors, including agrifood, with a budget of €1,128 million for the 2009-2015 period. It provides a sound framework for coordinating the endless list of innovation programmes and instruments that Morocco has in place: technopoles, knowledge and technology transfer networks, firm incubators, innovation awards, industrial technical centres, agro-industrial guarantee schemes and awareness-raising and matchmaking events (European Communities and OECD, 2008). The Plan seeks to develop 15 flagship technopoles in 8 key sectors, including agro-industry and fish processing. It identifies four priority areas for the agrifood sector: horticultural products, seasoning, herbs and spices and berries; organic food and prepared meals; quality traditional products such as olives, olive and argan oils and orange juice; and fish processing.

Besides the Industrial Plan, the agrifood sector is also guided by the Green Plan (2008). The Green Plan employs a two-track strategy combining an investment promotion plan in high-value agrifood chains (€900-1,350 million/year) and a range of instruments to improve subsistence farming (€450 million/year) as a means to attain food security.

Table 1: Moroccan food technopoles

Location	Sectoral focus	Surface (ha)	Status
Meknes Agropolis, Meknes-Fez	Food Processing	130 (up to 450)	In progress
Oriental Agropolis, Berkane	Food Processing	100 (up to 130)	In progress
Souss-Massa Agropolis (Agrotech), Agadir	Food Processing	-	In progress
Tadla Agropolis, Tadla-Azilal	Food Processing	150 (up to 244)	In progress
Gharb Agropolis, Kenitra	Food Processing	-	Planned
Haouz Agropolis	Food Processing	-	Planned
Haliopolis, Agadir	Fish processing	150	In progress
Dakhla- Laâyoune fish hubs	Fish processing	-	Planned

Source: MITNT, 2010

These two plans converge in the promotion of food technopoles. So far six food poles (Meknes, Berkane, Gharb, Haouz, Souss-Massa/Agadir and Tadla), plus two fish processing hubs (Agadir and Dakhla-Laâyoune) are operational or under development (Table 1). These poles are expected to generate additional sales of €361 million and create 16,000 new jobs (Ciheam, 2009). Provided with one-stop shops, they host agribusiness activities on lots of land with a surface ranging from 100 to 400 hectares. They allow agribusiness operators to access land at competitive prices while receiving quality services (administration, telecommunications, logistics, accommodation, catering, certification and auditing services, etc.) and having access to specialised training programmes managed by private firms and interprofessional associations, tailored to fit the specific needs of the technopole firms.

Most of these technopoles are in an infant phase. The Meknes-Fez pole is already at the commercialisation stage. This agropole has a cost of €440 million and is expected to create 11,000 jobs. Covering a total area of 450 hectares (130 developed in the first phase), it integrates an agro-industrial zone, a logistics hub and communal facilities, a service park (*i.e.*, an intelligent city clustering ICT and other agribusiness support services) and a RTD park, where food quality laboratories are located. The agropole tackles the export-oriented horticultural and olive oil chains as well as those of milk, cereals and red meat, intended primarily for local markets. Meknes was selected to house this food pole given its well developed agro-industrial base, with leading domestic and multinational agro-industries as well as several research and higher education institutes present in the region.

The Berkane agropole was launched in 2009 to deal with the citrus, olive oil and vegetable chains. It covers over 100 hectares divided in three areas: a food marketing and processing zone, a logistic platform and a service zone. A complementary adjacent park dedicated to RTD and quality control for food products is being constructed with funds from the Ministry of Agriculture and Fisheries (€8.4 million, 6.8 hectares). With a cost of circa €200 million, it is expected to generate between 5,000 and 7,000 direct jobs.

Agrotech¹⁰ is an agro-technological pole established in Agadir, capital of the Souss-Massa-Draâ region. It is managed by the *Association Agrotechnologies Souss-Massa-Draâ*, created in 2006 with representatives from the Regional Council, other local and national authorities, professional associations, financial institutions, training and research institutes and private firms. The construction works started in mid 2007, and the total investment will amount to €9 million and generate 400 jobs. This agropole promotes collective actions regarding the promotion of *produits du terroir* (products with geographical indication, such as dates, saffron, prickly pears, honey, etc.) and the development of the horticultural and citrus value chains. It is also setting up an incubator for SMEs specialised in agrotechnologies. Agropolis International¹¹, a multistakeholder knowledge platform specialised in agriculture, food, biodiversity and environment based in Montpellier (France) has provided technical assistance for establishing Agrotech. Among other things, Agropolis organised several exchange visits between Agadir and Montpellier and provided technical advice regarding the possible modalities and governance structure of Agrotech.

Three agropoles are still at a planning stage: Gharb, Haouz and Tadla. In 2009 a strategic study on the latter was conducted focusing on the olive, citrus, vegetables, milk and red and white meat chains. The establishment of the Tadla Agropolis will be carried out through a partnership between the Ministry of Industry, Trade and New Technologies, the Regional Council of Tadla-Azilal, and the *Institut des Régions Chaudes Tadla-Azilal*, and its development and management will be entrusted to a specialised firm. Furthermore, fish processing poles are being developed in Dakhla-Laâyoune and Agadir. The latter will be managed by a public-private association called *Parc Haliopolis Société*, created in early 2010 by the Souss-Massa-Draâ region, Igrane Fund, *Crédit Agricole* and MedZ¹².

Regrettably, food technopoles are receiving comparatively less attention, due to the fact that they are under the supervision of the Ministry of Agriculture, while all the other poles are the responsibility of the Ministry of Industry. In addition, the food pole strategy does not take fully into account that the real problems are located upstream in the agribusiness sector, *i.e.* primary agricultural production (Tandia, 2009).

Tunisia has implemented a wide-ranging set of innovation-related policies including the Industrial upgrading programme (1996), a Law on technopoles (2001), the Industrial modernisation programme (2003), a Law on competitive clusters (2006), and the creation of a national agency for the promotion of research and innovation (2008). Nowadays, Tunisia is embarking on an aggressive innovation strategy that puts in place a broad array of programmes and mechanisms to promote innovation, including the National Plan of Tunisia Technoparks Network. According to the European Investment Bank (EIB *et al.*, 2010) the Plan is a top-down initiative that targets both national and regional goals, and “requires analytical efforts to create a value proposition based on regional competitive assets”.

Each technopole specialises in a different sector and brings together education, an industrial zone, research, technical experimentation and an incubator. The Tunisian technopoles have five distinct areas dedicated to production, RTD, training,

¹⁰ www.ass-agrotech.org

¹¹ www.agropolis.fr

¹² www.medz.ma

technology and services transfer, and common facilities. The idea behind this structure is to further the cross-fertilisation between research institutions, universities and industry and foster the establishment of private companies. One technopole is already operational, 6 are being established and the 11th Economic Development Plan (2007-2011) foresees the establishment of 3 more (Table 2). The goal is to have at least one technopole in each of the country's 24 governorates by 2011 (European Communities and OECD, 2008).

Table 2: Tunisian technopoles

Location	Sectoral focus	Surface (ha)	Status
Ghazala	ICT – 51 tenants	65	Operational
Borj Cédria	Biotech, energy, water and environment	90	In progress
Sidi Thabet	Biotech & Pharmaceutical	115	In progress
Sousse	Mechanics & Electronics	60	In progress
Sfax	IT & Multimedia – 19 tenants	60	In progress
Monastir	Textile	100	In progress
Bizerte	Food Processing	87	In progress
Medenine	Agribusiness (dry area)	-	Planned
Jendouba	Agribusiness: arable crops and livestock	-	Planned
Gafsa	ICT	-	Planned

Sources: Anima, 2010; www.iasp.ws; www.elgazalacom.nat.tn; www.ecopark.rnrt.tn; www.biotechpole.rnu.tn; www.technopole-sousse.rnrt.tn; www.it-sfaxpark.rnrt.tn; www.texpark.rnrt.tn; www.bizertaeconomicpark.com.tn.

Tunisia initiated its technopole programme by opening in 2001 the Ghazala technology and communication park, and then moved to other sectors than ICT. For instance, the Bizerte pole deals with agribusiness, the Borj Cédria pole with renewable energy and vegetal biotechnology, the Sidi Thabet pole with biotechnology and pharmaceuticals, Monastir with textiles and textile products; Sousse with mechanical engineering, electronics and ICT; and the Sfax pole with computer systems and multi media. The investment in these six technopoles is estimated in €380 million, including a loan of €80 million from EIB. These technopoles concentrate on high value-added, job-creating activities, thus underpinning Tunisia's economic growth: they are expected to host 1,000 companies, create 40,000 jobs and double exports by 2016. So far, some technopoles have been successfully implemented, yielding spin-off activities and hosting important multinationals (Djefflat, 2009).

Of interest to this study is the food park of Bizerte. The setting up of this park has been long time in the making: the preliminary studies were conducted in 1998 (Bencharif & Rastoin, 1999), but it was only in 2006 that the firm responsible for managing the park, the Bizerte Economic Activities Park, was created. This firm is as a public-private partnership company that has adopted the legal form of a science park linked to a special economic zone, and is responsible for developing, promoting and maintaining the pole. This pole has three main elements. First, it has a food technology park (45 hectares) that encompasses technology demonstration centres, a technology watch unit, an innovation and technology transfer centre, a training centre, a business incubator and a production zone. It gathers 18 research and

training institutions (including the Food Industry Science and Technology Research Centre of the National Engineering School of Bizerte) and about 2,300 researchers. The second element is an agro-industrial zone, a physical extension of the commercial port of Bizerte, which is expected to grow to cover 150 hectares. It deals with five agrifood chains (seafood and canned fish, dairy and cheese, cereals and derivatives, potatoes, wine industry) out of the nine prioritised by the Tunisian strategy of agribusiness development. The pole is expected to accommodate 170 businesses, creating 9,000 jobs, with an overall investment of €150 million by 2020. The third component is a knowledge network called “Agrotech” with local, national and international partners. At the national level, the pole has signed or is planning to sign in the near future cooperation agreements with various national training and research institutions, technical centres and other technopoles. Internationally, the Bizerte Pole has cooperation agreements with the free zones of Cadiz in Spain and Jebel Ali in Dubai, regarding exchange information, promotion and staff training; and with two French poles: Q@limes-Montpellier specialised in agriculture and food processing; and Agroparc-Avignon specialised in fruits and vegetables¹³. The cooperation with Q@limes-Montpellier involves information sharing (the set up of a technology watch unit) and training (i.e. distance learning programme, Master studies, etc.). Likewise, the collaboration with Agroparc-Avignon is centred on the promotion of innovation and technology transfer in five areas (liquid food; dry food; seafood and pre-cooked dishes; cross-cutting issues related to cold chain, traceability and quality; and industrial automation, control and maintenance) and the set up of a start-up/technopreneur centre (Belkahia, 2007).

Another food pole, devoted to arable crops and livestock, is being launched in Jendouba: the feasibility studies were performed in January 2009 (Ciheam, 2009). Additionally, the establishment of a food pole specialised in seafood and fish products is being assessed by the government of Tunisia with support from Agropolis International. The preliminary studies were carried out in 2008, and several locations (Tunis, Monastir, Sfax, Zarzis and the Gabes Gulf) were appraised¹⁴.

Furthermore, Tunisia has been very active to link its technopoles to the international scene. For instance, it has established the Scientific and Technological Results Exchange Network (STREN)¹⁵, which aims to foster cooperation between Tunisia and the EU in the field of innovation. In addition to that, Tunisia signed in 2009 a framework agreement with France on training and protocols to develop closer relationships between French and Tunisian universities and technopoles/clusters in the areas of food, new technologies, textile and transport¹⁶.

Iran’s third and fourth Five-Year Social, Cultural and Economic Development Plans (2000-2004; 2005-2009) sought to promote the development of a knowledge economy by strengthening the role of science and technology in the innovation process. Two key elements of these Plans were the designation of the Ministry of Science, Research and Technology (MSRT) as the coordinator of all national innovation policies and programmes, and the establishment of technopoles and

¹³ Source: Grande convention Euromed at Avignon, 7-8 December 2009, Anima.

¹⁴ www.agropolis.fr

¹⁵ www.stren.ind.tn

¹⁶ http://www.jeuneafrique.com/Article/ARTJAJA2527p068-073.xml2/tunisie-france-plus-que-jamais-partenaires.-Actualite_Info.html

incubators. The MSRT created the Isfahan Science and Technology Town and converted the existing provincial branches of an affiliated research organisation in technopoles. The Ministry of Industry and Mines (MIM) also took upon the idea and set up a number of technopoles located close to universities/research institutes (UN and UNCTAD, 2005). In 2005 the MIM created a new dependence to plan and develop industrial parks/technopoles: the Small Industries and Industrial Parks Organisation (ISIPO)¹⁷. ISIPO is currently dealing with over 400 industrial parks, 7 specialised industrial areas and 7 technology parks, among other entities. The use of technopoles as Iran's main tool for encouraging industrial innovation and development has been further re-stated in the Fifth Five-Year Plan (2010-2014), which envisages the establishment of 50-60 new industrial parks by 2015.

Of relevance to the present study are the multidisciplinary technological parks (targeting the food industry, among other sectors) presented in Table 3.

Table 3: Iran technopoles with a partial focus on agrifood

Name and location	Sectoral focus	Surface (ha)	Tenants
Guilan Science and Technology Park, Rasht	Agrifood, biotechnology, chemistry, electronics, environment, ICT, media and multimedia and mechanics	5	100
Khorasan Science and Technology Park, Mashad	Agrifood, advanced engineering, chemistry, electronics, nanotechnology, ICT and services	120	40
Fars Science and Technology Park, Shiraz	Agriculture, biotechnology, chemistry/chemical technology, ICT, software, media and multimedia and telecommunications	25	45
University of Tehran Science and Technology Park, Tehran	Agriculture, biotechnology, electronics and microelectronics, environment and nanotechnology	5-7	40
Yazd Science and Technology Park, Yazd	Agriculture, biotechnology, electronics and microelectronics, renewable and non-renewable energy, humanities, ICT, media and multimedia and telecommunications	100	51

Source: www.iasp.ws; www.fstp.ir

In recognition of the progress made by Iran in this field, UNESCO has selected the country to host the Regional Centre for the Development of Science Parks and Technology Incubators. The centre, launched in May 2010, organises workshops and other building capacity activities, provides policy advice, facilitates the exchange of experience and best practices, and conducts research and problem-solving in technopole and technology/business incubator development.

2.3. Late adopters

Algeria and Lebanon could fall under this category, since they have adopted the technopole approach as a tool for developing the food sector with some delay in comparison with other peers, but they have made fast progress in designing and implementing comprehensive and sound food pole programmes.

¹⁷ www.iraniec.ir/en

Algeria has not yet developed a comprehensive and systemic agro-industrial innovation strategy, and hence coordination among concerned actors is not entirely satisfactory. The country has rather followed a piecemeal approach with *ad hoc* activities (e.g. setting up of incubators in technology parks and promotion of firm-university linkages through the National Agency for Research and Technological Development). Furthermore, overregulation [*i.e.*, codification of all TTI infrastructures in national laws¹⁸] is killing innovation in Algeria.

To overcome these problems the Algerian government created the National Agency for the Promotion and Development of Technology Parks¹⁹ in 2004. This agency is responsible for formulating, implementing and promoting technopoles/parks; supervising the construction of the parks' infrastructure; and coordinating and creating synergies among education and research institutions, public authorities and private actors. Furthermore, the Government commissioned in 2007 a report to take stock of innovation activities in Algeria and design a new strategy to better coordinate efforts in this policy area (European Communities and OECD, 2008). Based on the recommendations of the study, the Government has recently launched a new industrial programme²⁰ addressing TTI issues. One of the pillars of this new strategy is the promotion of spatial development/TTI tools, such as technopoles. The objective is to upscale and upgrade the pilot interventions undertaken in 1999-2009, during which Algeria spent some €273 million to modernise its industrial and activities zones, which according to ANIMA (2010) were respectively 66 (12,800 hectares) and 477 (7,300 hectares). This is a long-term process aiming at rehabilitating and modernising the country's industrial tissue, which involves the establishment of 12 new technopoles (comprising 1 food technopole in Bejaia), 4 of which are deemed to be established from 2010 to 2013.

Algeria's first experience in developing technopoles was the ICT pole of Sidi-Abdallah, which was supposed to be operational by 2006, but met several difficulties that delayed its starting (Djefflat, 2009). In a second phase, the country embarked in the development of poles around agrifood products and food biotechnology, as stated in both the National Spatial Planning Scheme 2025 (MATE, 2006) and the Industrial Strategy, including the Bejaia and Sidi Bennour poles, both at a planning stage. The Bejaia pole will offer MNAs all the necessary services for their transfer to Algeria: business incubators, one-stop shop of the National Agency for Investment Development (www.andi.dz), business centre, etc. Likewise, the Park of Sidi Bennour, projected as part of the Sidi Abdallah complex, will cover a surface of 51 hectares focusing on services and agro-industries²¹.

These food poles will locate various components in one single space: a technopole with training and research institutions; an "Innopark" or business incubators that allow the transition from prototype development to mass-industrial production; a production area with agro-industries and related service providers with both mature and young agribusinesses; and a service area providing housing, business centres,

¹⁸ Examples: SME Law (Loi n° 01-18 du 12 décembre 2001); Business incubators Law (Décret exécutif N° 03-78 du 25 Février 2003); Technopole Law (Décret exécutif n° 2009-335 du 20 octobre 2009).

¹⁹ www.anpt.dz

²⁰ www.assisesdelindustrie.dz; www.mipi.dz

²¹ www.unido.org/index.php?id=o26090

entertainment and sport facilities, green areas, etc. (*Ministère de l'Aménagement du Territoire, de l'Environnement et du Tourisme de l'Algérie*, 2007)

Lebanon has been rather slow in adopting the technopole approach, but is rapidly catching up. There are five worth-mentioning initiatives in the food sector²². First, Berytech (inaugurated in 2002 by the Saint Joseph University in Mar Roukoz, near Beirut) was initially designed as a multidisciplinary pole covering various sectors including food processing, but has later focused almost exclusively on ICT, media and health. It has a business incubator for start-ups, a hot-desk (shared workspace), a business accelerator for newly-born firms and business hosting facilities for already established companies. Berytech has established partnerships with several countries in Europe and is a member of the Network of European technoparks (Djeflat, 2009). Second, SouthBIC is a food pole located in Saida and administered by the Chamber of Commerce and Industry, with co-funding from the EU and the Lebanese Ministry of Economy and Trade. It counts with a business service centre, business incubation facilities, as well as technological and service units offering a wide range of services (e.g. agrifood pilot plant and labs; recruitment; information technology; design and engineering support; market research; export marketing missions; and capacity building and training). Third, the Bekaa Agripole that supports the agro-based sector, understood in a comprehensive manner: agriculture, agrifood industry, agribusiness and agritourism. Bekaa has a business incubator and a business service centre, which provides support services to agricultural/agro-industrial SMEs (e.g. financial support, accounting and management, human resources management, vocational training and coaching services, marketing, communication and event organisation, and information and technology services). Fourth, the Investment Development Authority of Lebanon has recently approved a plan to develop five special economic zones, of which one will be dedicated to the development of the agribusiness sector, following the technopole concept to concentrate investments and promote synergies. And finally, the Euro-Lebanese Centre for Industrial Modernisation, co-funded by the EU, supports industrial technopoles in sectors like food and beverages since 2001. (European Communities and OECD, 2008)

2.4. Laggards

Egypt, Jordan, Syria, Turkey and the UAE are merely starting to apply the technopole approach to the food industry. These countries, labelled here as laggards, have achieved great success with high-tech technopoles and have some multidisciplinary poles that deal tangentially with the agrifood sector.

Egypt has established several technopoles to encourage investments in the ICT, electronics and business process outsourcing (BPO) sectors. Egypt's first technopole, the "Smart Village Cairo" hosted by the end of 2009 more than 120 ICT companies employing over 28,000 professionals²³. In the agrifood sector, however, little progress has been made, although there are long-term plans for developing food poles building on the experience gained in other sectors (Djeflat, 2009). The most talked about initiative is the MegaFarm Project²⁴, a massive agricultural and agro-industrial complex (over 200,000 hectares) to be built in either North Sinai (potatoes

²² www.berytch.org; www.southbic.org; www.agripole.org; www.idal.com.lb; www.elcim-lb.org

²³ www.smart-villages.com

²⁴ www.gafinet.org

and olives) or the Toshka region (tomatoes and other vegetables). The project design includes dedicated processing facilities, irrigation infrastructure, laboratories, training institutes and other services. Its goals are to attract investments of almost US\$5 billion and create some 45,000 jobs.

Egypt follows two alternative lines of action. The first one pertains to the development of industrial zones (some of them with an agro-industrial flavour) dedicated to specific countries (e.g. China, Jordan, Qatar, Saudi Arabia and Turkey) looking for an export platform to Europe, Africa, and the Middle East. These country-specific industrial zones complement the qualified industrial zones located in Greater Cairo, Alexandria and the Suez Canal. The second line of action refers to the set up of 25 innovation centres within the Ministry of Trade and Industry (MTI), called Egypt Technology Transfer and Innovation Centres (ETTICs)²⁵ (European Communities and OECD, 2008). ETTICs provide a broad range of services: “technology transfer through patents and licensing, technical assistance in product and production development, quality audits and management, advanced human resources development [...], environment and social management, and contracting RTD and innovation projects”²⁶. Some ETTICS target the food industry, such as the case of the Food Technology Centre (FTC) located in Giza, which provides services to the agrifood sector (e.g. pilot food processing, sensorial analysis, food processing improvement and reengineering) and offers technical assistance and training in food technology.

Jordan has invested in the creation of technopoles, business parks and economic zones that serve as enabling platforms offering business and manufacturing space coupled with supporting infrastructure and business services. A case in point is the King Hussein Bin Talal Development Area (Mafraq, near Amman), an industrial and logistic hub with a total area of 2,100 hectares specialised in the food industry (mostly fruits and vegetables), pharmaceutical and medical supplies, light chemicals and other manufactured products. There are other six public industrial estates developed to target food manufacturing and other industries, including the Abdullah II Ibn Al-Hussein pole in Sahab and Al-Hussein Bin Abdullah II in Karak²⁷.

Syria is jumping on the bandwagon of technopole initiatives by setting up a number of technology incubators and technopoles, most of which are in the ICT sector. The country is developing its first food technopole “Agropolis”, with the support of the United Nations Development Programme (UNDP), the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Industrial Development Organization (UNIDO). This technopole will have the status of “agro-industrial special economic zone” and will be located in the Ghab plain, a major food producing area. It will target international agribusiness investors, attracting them with high quality infrastructure, a “one-stop-shop” that provides tenants with all sorts of administrative services and a specialized dispute resolution mechanism.

The technopole concept took in Turkey’s agenda in the mid 1990s. There are four types of special investment zones, of which the first three could fit within the definition of technopole used in this study. Firstly, Technology Development Zones (TDZs), which are areas designed to support RTD activities and attract investments

²⁵ www.tic.gov.eg

²⁶ www.mti.gov.eg

²⁷ www.jordaninvestment.com

in high-technology fields. There are 37 of them: 26 operational and 11 under construction. Secondly, Organised Industrial Zones (OIZs), which are designed to allow companies to operate within an investor- friendly environment with ready-to-use infrastructure and social facilities. There are 263 OIZs in 80 provinces, of which more than half are operational. Thirdly, industrial zones designed to provide suitable sites for large-scale and technology-intensive investments. Fourthly, free zones: there are 20 of them along the Turkish borders to increase the number of export-focused investments. Technopoles have obtained legal status under the Technology Development Zones Law No. 4691 adopted in 2001 and are regulated and supervised by the Ministry of Industry and Trade. Most of the existing technopoles are specialised in ICT and electronics; there are very few initiatives in the agrifood sector, but the idea of developing agropoles is gaining momentum. There are three multidisciplinary poles that partially tackle the food industry: the MRC Technological Free Zone/TEKSEB, the Antalya²⁸ and the Mersin technopoles.

Dubai's 2010 vision clearly stated the willingness to convert the UAE in a knowledge-based economy by implementing various initiatives geared towards linking the worlds of education, research and industry. In this respect, several technopoles have been established over the last decade, such as: the Dubai Media City, the Dubai Internet City, the Dubai Technology Park and the Knowledge Village (Djeflat, 2009). There are three multisectoral technopoles with an agrifood vocation in the country. The first one is the Technology Park Mohammed Bin Rashid. This technopole, launched in 2002 by the Ports, Customs and Free Zone Corporation, is designed to attract foreign investment in research in agrifood, oil and gas, desalination and environment management. The second is known as DuBiotech (Dubai Biotechnology and Research Park), covers circa 230 hectares and tackles various sectors, ranging from agrifood to biotechnology, environment, health care and medicine. The third one is called the Dubai Industrial City, an industrial zone clustering manufacturing facilities in high-value added sectors (agrifood, advanced engineering and chemistry industries) that sprawls across 5,200 hectares. Products manufactured in the city carry the Dubai Quality Mark.

3. CONCLUSIONS AND POLICY RECOMMENDATIONS

The agro-industrial sector of MENA countries has a remarkable growth potential, yet, these nations face several constraints that make them net food importers. All through the 2000s, but especially since the food crisis of 2008, MENA countries have devised a plethora of new programmes and policies to strengthen their food industry as a means to improve both their competitiveness and their food security situation. These agro-industrial competitiveness programmes follow two approaches. The first, employed by North African countries, consists of developing competitive food hotspots by promoting technopoles and other mechanisms of concentration of agricultural/agro-industrial activity. The second approach, used by GCC countries, complements the above strategy with the promotion of agricultural investment overseas to secure agricultural raw materials to be processed in the poles.

The existence of several flourishing technopoles across the MENA region, in particular those targeting high-tech sectors, proves that this policy tool can work

²⁸ www.ateknokent.com

effectively in this part of the world. Much can be learned from these poles in terms of regional specificities regarding structured development approaches, strategic orientations and governance models for dealing with the business and cultural dualisms relating to research-industry collaboration, public and private and inter-ministerial cooperation. Although many attempts have been made to structure the thinking about the dynamics of innovation and the process of forming technopoles and ensuring their sustainability in MENA countries, very few initiatives have focused on the agrifood sector. In fact, the development of poles in the food sector dates back only 5 to 10 years in most MENA economies. Over this period, MENA countries have reached different levels of development in terms of food technopoles. There exists a whole spectrum of infrastructures ranging from Iran, Tunisia or Morocco well organised systems of technopoles, linked to a variety of funding mechanisms, to countries with institutions providing at best subsidised office and industrial space (Yates and Woodham, 2010). The article has classified MENA countries into three categories depending on their commitment to promote agropoles, namely: early adopters, late adopters and laggards.

Furthermore, two types of agropoles coexist in the region: technology-push technopoles (*i.e.* those driven by universities and research/knowledge institutes that have shown their capacity to generate interactions with the industry), which are majority; and a few market-pull technopoles, *i.e.* those with a high concentration of agro-industries that generate high demand for RTD support, and whose core activities are based on the involvement of food industry associations, chambers of commerce and interprofessional organisations (EIB *et al.*, 2010).

The recent agro-industrial plans devised to develop food hotspots in the MENA region represent a new generation of policy models that introduces seven main changes. Firstly, there has been a transition from top-down to bottom-up agro-industrial policies that promote a multi-level innovation system with both local and central authorities involved. Secondly, innovation has been pinpointed as a key driver for agro-industrial development in MENA countries, and food technopoles have naturally been seen as vehicles to generate and disseminate technological and institutional innovations. Thirdly, the new MENA agro-industrial policy focuses on attracting FDI and developing strategic alliances with private sector actors both local and international (Ciheam, 2009). Although in some MENA countries (e.g. Egypt and Morocco) FDI channelled into agriculture is remarkable, the situation could be further improved by establishing food poles, industrial (or free) zones and other tools used by the public sector to package incentives to attract food firms and services providers through a combination of tax concessions, reduced rates for utilities, and infrastructure and RTD investments. Fourthly, the policy focus has shifted from fostering the competitiveness of individual firms to institutional innovations that seek to establish a critical mass of inter-linked enterprises, services, investment and infrastructure development. Additionally, the policy has become multidimensional embracing agricultural, industrial, innovation and regional policies, and creating a collaborative framework among all the public agencies concerned. Moreover, the new agro-industrial policy evidences governments' willingness to attain two overarching goals, ensuring food security and raising the competitiveness of the food industry. Finally, the new policy centres its efforts on enhancing networking, forging strategic alliances and developing linkages at multiple levels: inter-firm linkages; university-corporate linkages; as well as linkages to the international knowledge

economy. As a result, the new policy creates a governance model that promotes food hotspots or local nodes of excellence linked to regional and international knowledge networks, as a way to enhance their positioning in the global food chain.

Given their recent formation, MENA national policies around food technopoles are still heterogeneous and poorly coordinated. There is an evident need to align them. The goal of achieving world-class food technopoles in the MENA region requires action in multiple policy fields, including agricultural, agro-industrial, RTD/innovation, FDI and local development policies. Promoting the growth and effective functioning of food technopoles should be addressed by national/regional aligned policy measures, which entails creating the appropriate framework conditions that lead to technopole cooperation at national, regional and international levels, and notably within the Euro-Mediterranean region. Future technopole policies in MENA countries should deal with the internationalisation of food technopoles, the promotion of cross-technopole cooperation and the creation of sustainable frameworks for technopole development.

Owing to their historical connection, MENA food industrial policy tends to mirror those of France and other EU countries. MENA governments has taken example from the French model of Poles of Competitiveness and other similar European territorial approaches that, although wearing different labels (“distretti tecnologici” in Italy; “centres of excellence” in the United Kingdom and “industrial regions” in Germany), share the same principles: *i.e.* bottom-up policy merging regional, industrial and technological dimensions to adapt to the changes the economy is going through. The new generation of European regional policy programmes for 2007-2013 promotes an approach based on regional innovative clusters/technopoles, reflected in the National Reform Programmes and the increasing number of these types of initiatives supported by Community instruments (EC, 2006). As in the French/European cases, MENA economies are implementing an agro-industrial policy with deep regional grounding based on the concept of competitive food hotspots, a cluster strategy defining a bottom-up policy. These food poles merge the industrial, agricultural, regional and the innovation/RTD policies and are supposed to trigger innovation, attract relocating agro-industries as well as to repel the danger of agro-industrial delocalisation. This conceptual connection between European and MENA technopole programmes and strategies has been translated into several collaboration agreements on technopole development and networking in the Euro-Med space, supported by a wide range of projects and financial mechanisms.

Agropole initiatives in the MENA region are too novel to allow a realistic impact assessment on food security, attraction of FDI to the food sector and competitiveness of this industry. Most agropoles identified are still on a construction phase or at the first stage of their commercialisation process. Although many of them have already been able to attract a considerable number of tenants (especially MNAs), it is too soon to tell whether they are able to achieve their intended objectives, *i.e.* increase the competitiveness and modernise their food industries, ensure food security and attract foreign and domestic capitals into the food and beverage industry.

So far, the MENA agrifood industry (agricultural and processing activities) is performing well, although behind other sectors (e.g. automotive, gas/oil and ICT): it has received € 8.35 billion during the period 2003-2009 (2 percent of the total investment registered). FDI flows are rather concentrated in thematic (e.g.

beverages, biscuits and dairy products) and geographical terms: Five countries monopolise 97 percent of the total number of investment projects: Turkey (42 percent), Egypt (22 percent) and Morocco, Israel, Algeria and Syria (7-10 percent each) (Anima, 2009). The ability to attract FDI merely reflects the performance of the country's food industry: the competitiveness index of the Egyptian food industry has climbed a 26.2 percent in the 2003-2007 period; Algeria: 15.8; Tunisia: 4.6 and Morocco: 2.1 percent²⁹. It would be interesting to study in 5 or 10 year-time whether food poles have succeeded in attracting additional FDI into the region's food industry, and particularly to close the gap between the North and the South Mediterranean rim³⁰. However, it is important to understand that food poles form part of an integral FDI-promotion package that encompasses a series of reforms, diversification programmes and extensive infrastructure investments.

Likewise, it is not acceptable to simply assume that the development of agropoles will automatically improve food security. Agropole strategies seem to work best when dealing with high-value export-oriented products, and consequently, they might have limited scope in holding down the soaring prices of grains and other staple foods. Nevertheless, poles frequently raise employment levels, increase wages and make the area's industries more profitable, thus improving the ability of the area's inhabitants to purchase food and be more food secure. In any case, measuring pole impacts on FDI, food security, etc., will be a daunting task, particularly when it comes to prove causality. It would make more sense to assess the performance of food poles in the region according to easily identifiable criteria such as job creation, number of tenants, additional sales and volume of investments generated.

Finally, four shortcomings in the technopole policy in the MENA region should be pointed out. Firstly, public funding frequently falls short of meeting technopoles' set objectives, but interestingly, technopole promotion mechanisms include fiscal incentives. Secondly, there is still an information gap as agropoles and comparable programmes are not widely advertised. Thirdly, most technopoles in MENA countries are under the auspices of the Ministry of Industry, resulting in a poor integration of agropole initiatives in the agricultural development plans run by the Ministry of Agriculture. One way to avoid this is to create a dedicated agency that will coordinate interministerial strategies and actions related to poles. And lastly, there is a paucity of monitoring and evaluation tools to evaluate the effectiveness of programmes which are consuming sizeable resources. (European Communities and OECD, 2008)

In a nutshell, the present research shows that in order to achieve their intended positive effects, food technopole initiatives in the MENA area should provide core public goods in terms of productive infrastructure and enabling environment for private investment in the food industry; improve incentives for agro-industries and knowledge institutions; build effective institutions; and engage in networking. Eight best practices regarding the scope of agropole initiatives have been identified.

²⁹ COMTRADE Database (*Harmonized System, Rev. 1*); UN Statistics Division, May 2010.

³⁰ In 2005 the top 100 food MNAs had only 160 subsidiaries in the Southern Mediterranean rim, compared with more than 2,000 in Western Europe and 600 in Eastern Europe. Since then, the involvement of MNAs (e.g. as Sara Lee, Unilever, Pepsico, Procter & Gamble and Nestlé) has increased in MENA. (Anima, 2009)

The first practice highlights the importance of fostering good governance to drive positive behaviour and motivate pole tenants. The first step is to get the right mix of incentives. Incentives established to support technopole development can be of market, financial or investment nature. In particular, market incentives appear to be of great importance: the negotiation of preferential trade agreements and the provision of export promotion incentives can be decisive factors in the development and achievements of food poles. Decisions regarding the type of incentives provided and the way they are managed should be made on a case-by-case basis. However, some general remarks can be made. First, the provision of incentives as a stand-alone measure can prove inefficient, and even counterproductive, if insufficient attention has been paid to ensuring an enabling environment for private sector's involvement in food technopoles. Second, it is vital to find the right balance in taxation and incentives in food technopoles to avoid unintended negative impacts. Third, ensuring that a given set of incentives will not harm the links established among the different technopole actors is also important. Nonetheless, incentives may be biased in favour of SMEs, and in fact, they can be fundamental to improve governance in the technopole/value chain by strengthening the capacities and bargaining position of disadvantaged actors or those risking exclusion.

The second step is to ensure the principle of inclusion. Governments should promote the inclusion of SMEs in agropoles and should be able to forge alliances with large firms without compromising support for small agro-industries. This principle is of great importance, because global food firms do not necessarily foster and support the SME upgrading process (IDB, 2005b).

The third element implies the promotion of transparent and participatory decision-making mechanisms relative to resource allocation in the food poles to avoid that political pressure interferes with technopole processes and resource allocation, resulting in the adoption of inadequate strategies. These interferences can originate from strong groups of producers, MNAs and large local firms or even from external agents (e.g. donors and international organisations) supporting food technopole initiatives (Anderson *et al.*, 2004). There are different ways to minimise this pressure on spending decisions. One way to do so is by promoting administrative and political decentralisation that puts decisions on resource allocation closer to local governments and local civil society actors. Another way to handle this is to strengthen the collaboration between the public sector and a range of private-sector actors by adopting collective decision-making mechanisms. One mechanism of this sort refers to the adoption of a multistakeholder consultation process to plan and implement the agropoles. In Tunisia the launching of five technopoles in 2006-2008, including Bizerte, was carried out in a bottom-up and participative way, which involved consensus building and strategy seminars and consultations with leading operators and key institutions, comparing the viewpoints of all the actors and their coherence with the strategic analysis of the agrifood sector and the orientations of the Ninth Tunisian Plan. Similarly, in Morocco, the design and implementation of pole initiatives involves a wide-ranging consultation with the participation of universities/research centres, domestic firms and the local branch of MNAs. Another mechanism identified is the creation of a multistakeholder association that would guide the development of the food technopole. This mechanism places decision-making authority within the membership of the technopole, while assigning responsibility for managing the process to private-sector managers. Actually, most

MENA food technopoles are managed by private consulting firms or specialised firms resulting from a public-private partnership (PPP). The manager of the agropole usually receives technical assistance for their design and implementation from consulting firms, donors, and specialised platforms (such as the case of Agropolis that will be analysed further on). The ownership of the technopoles remains, however, in public hands, although in a few cases (Egypt and Morocco) there are also private stakeholders (including banks).

The second practice deals with the provision of core public goods. The development of food technopoles depends critically on investments in industrial and productive infrastructure (e.g. roads, transport hubs, power, and telecommunications), as well as on investments in markets, finance, and research and extension. The magnitude of the infrastructure gap in the agro-industrial sector is one of the most obvious deterrents to the development of food technopoles. Coordinated investments in core public goods among national, state and local governments are, therefore, fundamental to bridging the infrastructure gap. Considerable scope exists for innovative, public- and private-sector financing schemes, and in fact, PPPs are growing in importance as a funding source for technopole infrastructure improvements (ITC, 2005). MENA technopole programmes are consistently linked to investments in public productive infrastructure, notably airports and ports equipped to receive the largest shippers such as Port Said (Egypt), Tangiers (Morocco), and futures Enfidha (Tunisia) and Cap Djinet (Algeria). For example, Tunisia has announced the future construction of a deep-water port at Enfidha, which will reduce the costs of technopole tenants' trade with distant markets. Morocco, which has well-developed technopole-linked infrastructure (e.g. Tangiers-Med Port and major new motorway links and airports), is further reinforcing it with over €11 billion investment in 2008-2012 (including the Tangiers-Casablanca high-speed train).

Another public good essential for the development of food technopoles is the creation of a favourable climate for private sector investment. In order to enhance investment climate, governments will have to provide public goods such as well-functioning institutions and regulations to make markets work better (e.g. market regulation and information systems, social and environmental regulations, financial institutions and risk-management tools); and secure property rights for land and water to motivate private investments in agro-industry, especially those with a longer-term payoff.

The third practice refers to the need to build effective institutions. Two groups of institutions are important for developing food technopoles: collective actions performed under different organisational schemes and umbrella institutions, and programmes that support food poles at the national level.

The first type of institution refers to those encouraging collective actions within a food technopole. Collective actions can be promoted by different actors or institutions, including: informal groups within the technopole; a formally constituted association member of the food technopoles (i.e. industry association); a consortium or related structure linked to a technopole; or a formally established technopole structure. As mentioned in point 1, there is the possibility of "formalising" collective actions by establishing the food technopole as some form of legal entity, creating a formal structure around the technopole's assets (i.e. facilities) and liabilities (and debts), and implementing some form of operations and maintenance mechanism by which the

technopole's common facilities are managed. All this involves coordinating the inputs, responsibilities and rights of all stakeholders, as well as putting together a legal framework and financial package, and ensuring that the framework and package address the concerns and requirements of all stakeholders.

The second type of institution is an umbrella (food) technopole agency/unit. Some MENA governments have promoted the creation of a national/regional agency in charge of coordinating, designing, implementing and/or monitoring the technopoles within its territory. Such are the cases of the National Agency for the Promotion and Development of Technology Parks in Algeria, the Council for Technology and Technoparks in Turkey or TechnoPark (the science and technology facilitator of Economic Zones World) in the UAE. In addition to this, the involvement of decentralised government agencies in food technopole initiatives is most recommended. The close link with territorial development makes almost compulsory the participation and co-sharing of responsibilities of local governments in the process of technopole development.

Another good practice is linking food technopoles to national and international networks. The internationalisation of food technopoles and the better integration of SMEs in technopoles should be the new priorities of MENA policies. The facilitation of cross-border and cross-technopole cooperation in a sustainable way is an important element for growth and internationalisation of food poles. Study visits, matchmaking events, cooperation/networking workshops, thematic seminars and other tailor-made events allow face-to-face meetings with interested parties, which can spark cooperation at a very hands-on level.

Technopoles can be branched to several existing networks at the national, regional and international levels. At the national level, a few national ministries/agencies policy making bodies supporting technopoles and other ITT have been created in MENA countries, as illustrated in the previous point. Regional technopole initiatives and networks are emerging in MENA, such as ANIMA, a multi-country platform supporting the economic development of the Mediterranean. The ANIMA network gathers around 40 governmental agencies and international actors. Its objective is to contribute to a better investment and business climate and to the growth of capital flows into the Mediterranean region.

Examples of networking in the international arena include: cooperation agreements among poles from various countries, also known as "twinning of technopoles", like the case of Bizerte and Q@limes-Montpellier or Agroparc-Avignon; strategic alliances between poles and multinationals: for instance, Tunisian technopoles cooperate with international private partners from France, Germany and Italy that provide high-value services to their tenants. (European Communities and OECD, 2008); inter-university linkages to support technopoles: for example, a French-Maghreb MBA on Agrifood Management is being launched in Tunisia and Morocco in collaboration with the *Institut Agronomique Méditerranéen de Montpellier*, the *Centre International des Hautes Études Agronomiques Méditerranéennes*, the *Institut National d'Agronomie de Tunisie* in Tunisia, and the World Trade Center Association of Algeria; and meta-technopoles (*i.e.* trans-national associations dealing with the animation and networking of technopoles) of special relevance. The first one is the International Association of Science Parks (IASP) is the worldwide network of

Science and Technology Parks, a NGO in Special Consultative Status with the Economic and Social Council of the United Nations. It has 375 members (as of March 2010), including technopoles in the agriculture and food industry sectors. The second network is the World Technopolis Association (WTA)³¹, a Korea-based multilateral international organisation created with the purpose of promoting the development of technopoles around the world. As of 2008, WTA had 67 members from 32 countries, including some technopoles from the MENA region, most of them from the ICT sector. Once MENA food poles enter into a more mature stage of development, they should be encouraged to join this type of international network. This global networking process aims at creating synergies, transferring knowledge, developing commercial relationships and strengthening innovation and market position in order to stimulate the internationalisation of MENA food technopoles.

MENA technopoles naturally gravitate towards the EU. The EU is keen on developing linkages with non-EU countries and zones interested in cluster/technopole policy dialogue, notably the Mediterranean basin³². MENA countries could gain insights from the successes and failures of technopole network initiatives undertaken by the EU. One of them is the Europe INNOVA TM initiative³³, which focuses primarily on the joint development of new or improved tools for use by cluster/technopole organisations in Europe. This initiative has helped to increase business linkages between clusters in the EU by organising cluster visiting schemes and matchmaking events and preparing partnership agreements for the creation of open sectoral business platforms for clusters. In the agrifood sector, there is one example of such platform or cluster partnership in the field of animal and vegetable biotechnologies, known as ABC-Network³⁴. This network aims at strengthening and improving entrepreneurial innovation and competitiveness through enhanced networking among existing and potential Agro-Biotech Clusters. The network helps to increase cooperation between participants through analysis of best practices and identification of barriers to networking and innovation. The cooperation involves key stakeholders, including firm managers, policy makers, technopole managers, investors and relevant associations. ABC-Network is preparing a roadmap towards the establishment of a major food and agrobio alliance and is launching new sectorial tools, including a mentoring scheme for innovative start-ups and pilot actions in intellectual property and financing.

Another network is the EU-funded Food Innovation Network Europe (FINE)³⁵, which connects European food hotspots through innovation and cooperation. The purpose of FINE is threefold. First, to share best practices, regional strategies, policy recommendations and policy tools to stimulate regional investments in the food hotspots. Second, to promote the clustering of the local, regional, national and EU players in the field of food related RTD, by providing a platform for long-term collaboration. Third, to launch an Action Programme for Europe's food hotspots. In 2008, a natural extension of FINE, the Food Cluster Initiative was launched. Its

³¹ www.wtanet.org

³² The EU actively promotes clusters/technopoles in its territory in recognition of their important role in job and growth creation (more than one third of the total workforce is employed by technopole firms). The EU has issued a Communication on clusters and has established the European Cluster Alliance (ECA) to promote closer policy cooperation between cluster/technopole programmes from different sectors and countries, particularly in the Mediterranean space.

³³ <http://www.europe-innova.org>.

³⁴ www.europe-innova.org/ABC-Network

³⁵ www.networkfine.net

objectives are to increase research and technical development capacity and strengthen cooperation between European food clusters. Its ultimate goal is the creation of a European Food Cluster, which connects so far 31 European food hotspots, allowing them to exchange experiences and access national and regional funding.

There are also good examples of how to channel effective international cooperation to develop food technopoles. There is a host of initiatives carried out by international donors, banks and agencies (e.g. EIB, EU, UNECA, UNIDO and the World Bank) to help Mediterranean countries to develop technopoles and science parks. EIB is supporting the Tunisian government to develop five new thematic technopoles. The support involves financing facilities and technical assistance to help organise and develop the capacity of the poles' future managers. The World Bank has developed, as part of a territorial development programme in the Mediterranean region, communities of practice, experience sharing, and networking. One of the key issues addressed by the World Bank programme is the planning and development of technopoles and science parks. UNECA has implemented a number of projects and studies related to technopoles/parks in the region. It has set-up as well the ECA Science and Technology Network (ESTNET), a collaborative policy research network promoting the dissemination and exchange of information related to science and technology management and policy issues in the MENA region and other parts of Africa. UNIDO has performed a mapping exercise of Technology Parks in the MENA region³⁶ and has developed an online platform (PLATECH) to support the development of technopoles in industrializing countries. This platform provides on-line counselling and e-learning tools for the set-up and development of technology parks, as well as networking services to facilitate specialized exchange of information and opportunities for technical and commercial cooperation among technology parks and between their tenants.

The EU has established several lines of bilateral and multilateral cooperation to contribute to the development of technopoles in the MENA region. One example of bilateral cooperation is the France-Tunisia framework agreement on training (2009) as well as protocols to develop closer relationships between French and Tunisian universities and technopoles/clusters in the areas of food and other sectors (new technologies, textile and transport)³⁷. Multilateral cooperation is more common. Two multilateral projects should be highlighted: *Medibtikar* and *Invest in Med/Med Ventures 2000*. *Medibtikar* (derived from *Mediterranean* and *Ibtikar*, Arabic for Innovation) was an EU-funded programme that ran from 2006 to 2009, with a budget of € 7.3 million. Its beneficiaries were public organisations and private firms concerned with increasing the competitiveness of SMEs in Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, Syria, the Palestinian Authority, Tunisia, and Turkey. Its purpose was twofold: to provide MENA countries with new and improved instruments to stimulate innovation at the firm and country levels, such as technopoles, incubators and innovation and technology centres; and to develop national and regional networks supporting innovation stakeholders and connecting key players across the Euro-Mediterranean countries. One of the five components of *Medibtikar* was precisely to provide services to technopoles and business incubators. The

³⁶ <http://www.unido.org/index.php?id=o27387>

³⁷ http://www.jeuneafrique.com/Article/ARTJAJA2527p068-073.xml2/tunisie-france-plus-que-jamais-partenaires.-Actualite_Info.html

programme encompassed several actions to increase networking between relevant institutions across the MENA region as well as increasing networking between these and equivalent institutions in Europe, e.g. European Business and Information Centre Network (EBN); facilitate dialogue between technole/incubator managers, project holders and financiers; establish a cadre of local experts able to replicate the training/technical assistance tailored to local conditions; raise awareness of the importance of innovation in the research and academic communities (Yates and Woodham, 2010).

Invest in Med is another EU-funded (€9 million) project that has formed a Euro-Mediterranean Network of organisations committed to investment promotion and trade facilitation, strengthening SME collaboration and exchange of best-practices. It intends to increase the abilities and efficiency of Mediterranean Investment Promotion Agencies (IPAs), thus enabling more FDI in the Mediterranean Partner Countries, as well as to reinforce cooperation between European and Mediterranean IPAs. *Invest in Med* is launching MedVentures 2010, a competition targeting the top 100 innovative start-ups in Mediterranean partner countries with the objective of highlighting and supporting the best starting businesses and innovation networks in going international. MedVentures 2010 aims at creating new economic leaders in the Mediterranean by connecting promising entrepreneurs to funds, technopoles and innovation networks, talents, mentoring and coaching networks; as well as developing new dynamics of innovation by mobilising key innovation stakeholders working on concrete cases studies, and developing focused and coordinated actions at a Euro-Med level.

Another good practice is to promote international mobility of food technopole actors and encourage food technopoles to attract international talent. It is recommended to develop short- and long-term mobility programmes, tailored to the context and needs of agropoles. These programmes will enable in-depth learning and exchange of tacit knowledge, build stronger networks and develop concrete opportunities for business cooperation for agropole tenants. One option is to develop a (food) technopole cross-mentoring programme for the MENA region between senior experts and young professionals, targeted at developing specific competencies needed. Another possible mobility scheme involves granting academics the opportunity to spend some time in the technopole business world and then go back to academia. These programmes can be designed and implemented at the technopole, national, regional and international levels, and have a twofold purpose. On one hand, they try to promote academia-business cross-fertilization, and on the other hand, they aim at attracting top-researchers, professors and business professionals to develop the food technopoles' talent base and specialisation. These programmes can encompass activities ranging from funding schemes supporting attraction of best international talent, fairs to raise awareness on job opportunities in the food technopoles, leading talent scouting activities, locating international schools near food technopole hubs, to streamlining the granting of working permits and green cards for the recruited individuals and their families/partners.

Applying clear benchmarks/criteria for success and failure is another good practice. Bureaucrats responsible for agropole programmes can claim success to keep their programmes running. Ideally, the criteria for success should depend on productivity and not on qualitative criteria. While productivity can be difficult to measure, benchmarking, using the experience of similar agropoles in other countries (notably,

in the Euro-Med area) can provide useful indications. The publications of different technopoles in the MENA region show the use of commonly adopted performance measurement indicators for benchmarking purposes: number of jobs created, number of hosted companies, number of incubates graduating, etc. (UNECA, 2009) Additionally, this information can be cross-referenced with indicators measuring the performance of the food industry in international markets, *i.e.* “how the food industry is doing relative to world-class competitors” (Rodrik, 2004). Moreover, MENA countries could learn from the multiple experiences in technopole development ongoing in the EU as mentioned before, but also in East and South Asia, most notably in China, Korea, India and Japan.

Finally, it is essential to fully understand key design issues. The main issues that should be taken into account when planning food poles are three: avoiding a one-size-fits-all approach; realising the long-term implications of investing in food poles; and adopting a strategic sector dimension.

A one-size-fits-all approach should be avoided when developing food technopoles. There are significant differences among MENA countries in terms of geographical location, country size, industrial experience, resource base, economic and political system, level of institutional development, skill base and government capabilities, which result in different characteristics and level of development of technopoles (ITC, 2005). All the above considerations emphasise the need to tailor support measures to the characteristics of each technopole/country.

The second issue regards the fact that establishing food poles requires time. Setting up a food technopole represents a major investment (€10 million and more), over a long time horizon (10-20 years) from conception to maturity. Therefore, it is essential to determine, through feasibility analysis and business plans, whether the conditions for attracting tenants exist, and whether enough financial and human resources are going to be available. Likewise, agropoles are not the only possible measure for promoting the development of the food industry and there can be other effective vehicles for increasing competitiveness and generating new start-ups and employment in the longer term. This implies that the opportunity cost has to be considered. Furthermore, since it might take more than 10 years to complete the first significant phase of the food pole project, it is important to keep all infrastructure and facilities options open. The technology initially chosen may become obsolete in less than a decade. In addition, it is wise to reserve land and to keep possibilities for upgrading in mind to allow for future development. An implication of this long-term effort is that public-sector agencies responsible for promoting food technopoles should have institutional continuity. At the same time, these agencies should be flexible, since a large degree of flexibility is required to be able to continually adapt to events and changing priorities over the time. In the long run, it is also key to ensure the sustainable use of natural resources by the food pole, as its eventual uncontrolled growth can impact very negatively on the sustainability of natural resources, for instance as a consequence of inadequate waste management.

The third design issue that needs to be addressed is that technopoles should be designed to support and be part of a broader strategic innovation framework. They should not be stand-alone entities but rather work alongside other organisations and schemes to promote broader strategies. But, at the same time, technopole support

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policies should be tailor-made to fit the agrifood sector, reflecting the dual nature of food (a basic good without which people are unable to live, and a commodity to be produced and traded), and therefore they need to consider both food security and trade issues.

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