

THE MEDITERRANEAN DIET: A SUSTAINABLE CONSUMPTION PATTERN

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The term “Mediterranean Diet” was coined over 40 years ago, as the way of living and eating observed in the lands around the Mediterranean Basin and it was linked with the health benefits observed among the people adhering to it. The Mediterranean diet is closely related to social habits revolving around agriculture and food production, as well as the traditions linked to food preparation and consumption. This way of living has been known in the Mediterranean from the years BC, albeit with local adaptations to the various existing economic, social and religious contexts around the different regions.

Nowadays, due to the increasing urbanisation of the population, the globalisation of the agricultural market, the development of a mass food culture and the relative prosperity of the developed and developing Mediterranean countries, this diet has been progressively abandoned to a great extent. This is particularly true in urban areas, where people have lost a large part of the connection with the natural environment and have adopted a lifestyle that minimises the available time required to pay attention to avoiding food waste.

This chapter takes a closer look at the nutritional, socio-cultural and environmental benefits of the Mediterranean diet and their relations to reduced food loss and waste. It describes the drivers of its erosion and the impacts they have on the characteristic aspects of the diet and also suggests policies to be implemented in order to promote its adoption to improve food systems sustainability in Mediterranean countries. This will contribute to minimising food loss and waste along the whole food chain, from agricultural production, food collection, storage and distribution to consumption.

The Mediterranean diet, a sustainable diet that reduces food losses and waste

Nutritional adequacy and health benefits of the Mediterranean diet

The concept of the Mediterranean diet, whose main ingredients were known by the populations of the Mediterranean Basin of the pre-Christian era, was originally conceived by Ancel Keys in the Seven Countries Study (Keys, 1970). His observations indicate that all-cause and coronary heart disease death rates were lower in study cohorts with olive oil as the main dietary fat compared to northern Europe (Keys *et al.*, 1986). Since then, the scientific community recognised that the Mediterranean diet has profound health effects. Nowadays, the term is widely used in biomedical and non-biomedical studies to describe a dietary pattern characterised by high consumption of vegetables, fruits and legumes, moderate amounts of dairy products (principally cheese and yogurt), low to moderate amounts of seafood and poultry and low amounts of red meat. Olive oil is the main type of added fat and wine is consumed modestly, normally with meals (Willett *et al.*, 1995).

In numerous epidemiological and some interventional studies, greater adherence to the Mediterranean diet has been associated with longevity, as well as with lower prevalence and incidence of chronic diseases. Adherence to the MD has been specifically associated with a significant reduction in total mortality, mortality from cardiovascular disease and cancer, and it has been proven to lower cancer risk and to confer to primary and secondary prevention of coronary artery disease (including stroke) (Trichopoulou *et al.*, 2003; Sofi *et al.*, 2010). Last but not least, the Mediterranean Diet has been found to be protective against mild and advanced cognitive impairment (Yannakoulia *et al.*, 2015).

A lot of research has been conducted so far with regards to the abundant nutrients in this dietary pattern and their health benefits: monounsaturated fatty acids, fibre, antioxidants, such as vitamins E and C, resveratrol, polyphenols, selenium, glutathione. However, more recently, scientists tend to admit that the whole pattern is more important than any specific ingredient and that the health benefits go well beyond the individual effects of nutrients (Donini *et al.*, 2015). This is why, in this chapter we take into account nutrients and foods, their interactions, inter-correlations and cumulative outcomes. Furthermore, eating is a complex behaviour consisting of several factors apart from the choice of specific foods, such as the organisation of food into meals and the conditions of preparing and eating that may also influence health and wellbeing.

The Mediterranean diet, an intangible cultural heritage of humanity

The Mediterranean diet, derived from the Greek word *diata* that means way of life, has been inscribed in UNESCO's Representative List of Intangible Cultural Heritage of Humanity on the 16 of November 2010. Its nomination was supported by four Mediterranean countries, Greece, Italy, Morocco and Spain. Cyprus, Croatia and Portugal joined in 2013. UNESCO recognised the Mediterranean Diet as a "set of skills, knowledge, rituals, symbols and traditions" ranging from the landscape to the table, and which in the Mediterranean basin concern "crops, harvesting, picking, fishing, animal husbandry, conservation, processing, cooking, and particularly the way of sharing and consuming the cuisine".

In modern times, the Mediterranean diet is threatened by the globalisation and internationalisation of lifestyles, two of the main reasons why farming populations are gradually being reduced and people are losing contact with the land as they become more urbanised.

Local economic development: women and small-holder farmers

Since the 1990s there has been a resurging interest in promoting local food systems as economically viable systems for farmers and consumers (Sonnino, 2013). Demand for local foods in many countries and regions around the globe has been increasing and, in parallel, there has been an increased interest in the implications of this growing demand for local development in the context of sustainability goals across environmental, economic and social arenas (Hinrichs and Charles, 2012).

Different definitions may be given to local foods, but in the present context this term refers mainly to geographical proximity, therefore the physical place where food is produced and/or consumed. While the Mediterranean diet fits well into the definition of local foods, it also fits into the definition of "locality" foods, which are foods that have "a specific geographical provenance..., but can be marketed anywhere" (Hinrichs and Charles, 2012).

The contribution that local food makes to local development has been well researched and documented, and some have gone all the way to consider it the vanguard of the "new" model of rural development (Goodman and Goodman, 2007). While economic growth and job creation are immediate objectives of local development, the concept goes beyond this to include the creation of new products, services and experiences and the associated development of new markets. In this sense the Mediterranean diet can be a lever for economic development. Local, international, gastronomic as well as medical tourism related to it is already being promoted in Greece, Italy, Spain and other countries in the Mediterranean. It is also leading to unique selling opportunities for Small and Medium-sized Enterprises (SMEs), cooperatives and producer organisations of the agro-food sector. In the first place, these new services and products benefit small-scale producers and empower women, in particular. Small-scale farmers produce the bulk of fresh food supply, a prominent characteristic of the Mediterranean diet in many countries around the Mediterranean Sea. They are also involved in post-production activities including small-scale

processing of traditional and local food products that are finding entries into local and international markets. Women and their organisations actively contribute to local economic and social development through the agricultural work they do on family farms. They also play an essential role in transmitting knowledge on the Mediterranean diet as well as safeguarding the traditional knowhow and techniques by perpetuating the preparation of traditional food products. In addition, they preserve the knowledge of indigenous plants as edible foods and hence safeguard biodiversity. The role of women in the Mediterranean has been particularly crucial in expanding availability and accessibility of nutritional food on a sustainable basis. Through the preservation of abundant seasonal produce for later use during the year, they have made possible the availability of and access to diversified food using local produce: the Mouneh in the East Mediterranean, the Khazin in Egypt and the Aoula in Algeria are examples of traditional food-saving practices that women, collectively or individually, produced to make use of food surplus that could otherwise be wasted.

Environmental benefits of the Mediterranean diet: footprint and biodiversity

As described by its pyramid form (Bach-Faig *et al.*, 2011), the Mediterranean diet is mostly based on the consumption of fruits and vegetables, beans, nuts grains and seeds, while poultry, dairy products and especially red meat are consumed in smaller portions. However, the globalisation of the agricultural market and the increasing trend of urbanisation have modified the dietary patterns, with an increase of meat-based food products consumption.

The processes involved in food production consume resources and put pressure on the environment, in terms of greenhouse gas (GHG) emissions, water use, energy consumption, chemical inputs (fertilisers, pesticides, etc.) and land usage (UNEP, 2010). In particular, animal-based foods require more land and energy resources when compared to vegetable-related foods. Besides, conventional agricultural production methods have a greater environmental impact than organic methods (Baroni *et al.*, 2007).

Several studies have investigated the environmental footprint of the Mediterranean dietary pattern, in comparison with national and regional dietary patterns. Sara Sáez-Almendros *et al.* (2013) have compared the Spanish dietary pattern with the Mediterranean and western dietary patterns. The results reveal that the Mediterranean dietary pattern demands less soil, water and energy compared to the other two patterns. The western dietary patterns had the highest demands of these resources. Meat-based, high protein diets also have a higher carbon footprint, compared to fruit and vegetable based diets with lower protein content.

When consuming mainly plant, bio-diverse and local foods produced through eco-friendly systems, we contribute to the sustainable nature of the diet. Nowadays, in order to achieve high yields, only particular varieties of crops are used, usually in monocultures. This leads to the loss of wild varieties. As a result, the genetic diversity is reduced and the current crop genotypes lack the genetic richness of landraces. In

contrast, the Mediterranean diet culture of growing crops and raising domestic animals consisted of using different varieties of wild ancestors, developed through natural breeding locally, hence increasing the genetic diversity and biodiversity. Furthermore, because of the dependence on local resources and food stocks, the fishing and hunting pressure on local fish and animal populations respectively was less severe. The global ever-increasing demand for food cannot be met by a simple return to traditional practices. However, through the implementation of proper policies and provision of incentives to farmers, it is possible to achieve sustainable agriculture and food that meets present and future food needs (FAO, 2014).

Socio-cultural benefits: social fabric and food cultural heritage

In the early Mediterranean diet pyramid (Willett *et al.*, 1995), lifestyle behaviours have not been strongly emphasised as important components of the way of living. Apart from physical activity, factors like social support, sharing food, having lengthy meals and post-lunch siestas, were only mentioned as being of particular interest but not explored or further investigated. In 2011, the Mediterranean diet pyramid was revised in the light of contemporary lifestyle and sustainability (Bach-Faig *et al.*, 2011), to refer to a lifestyle pattern rather than a diet *per se*. In the new revision, qualitative and quantitative elements were taken into account, as well as social and cultural features characteristic of Mediterranean life: eating in moderation, socialisation during eating, cooking skills, seasonality, biodiversity, eco-friendliness and consumption of local products, regular practice of moderate physical activity and adequate rest. The concept of frugality and moderation was emphasised because of the major public health challenge of overweight and obesity. Moderate consumption requires respective food production and use of resources, which leads to smaller food waste. This revised Mediterranean diet pyramid was conceived as a simplified main frame able to be adapted to different country-specific variations related to various geographical, socio-economic and cultural contexts. It was aimed at better popularising its applicability in the present daily lifestyle, without leaving out the different cultural and religious traditions and different national identities present in the Mediterranean area.

In essence, the traditional dietary patterns of people around the Mediterranean Basin encompass a lot of practices, skills, spaces and associated objects, in interaction with the surrounding environment. The perceptions we have about the Mediterranean diet and the scientific research that studies it still focus on foods and nutrients, but tend to forget about the cultural heritage associated with it that is equally important. There are some fragmentary reports noting that food consumption habits, including meal patterns, structure and hospitality rituals, are essential issues to consider when trying to adopt or adhere to the Mediterranean diet (CIHEAM and FAO, 2015). Furthermore, the preference for seasonal, fresh and minimally processed foods may, in most cases, maximise the content of protective nutrients and substances in the diet. The conviviality aspect of eating strengthens socialisation and communication. Perceived as opportunities for social interaction, mealtimes maintain and reaffirm individual and group identities, whereas devoting enough time and space to culinary

activities is also important. Finally, regular practice of moderate physical activity (at least 30 minutes a day), adequate sleep and rest during daytime (naps) serve as basic complements to the dietary pattern (Willett *et al.*, 1995). The Mediterranean diet includes all these social aspects and expresses the intimate relationship between nature and people. However, it is a highly diversified heritage making it impossible to have a single model for all Mediterranean countries. There are variations reflecting different natural, economic, religious and cultural traditions. Although different countries in the Mediterranean region have their own dietary patterns, it is appropriate to consider these patterns as variants of a single entity: the Mediterranean diet.

The erosion of the Mediterranean dietary pattern

Drivers

Socio-cultural, economic and demographic factors. The drifting away from traditional diets to adopt less healthy lifestyles has become a common phenomenon in all Mediterranean countries, with the acceleration of modernisation and rapid changes in the lifestyle and economic activities related to it. Between 1950 and 2000, the population in the five Southern European EU-member countries doubled, while that of the remaining Mediterranean countries increased more than nine-fold (Salvati, 2014). The demographic divide between countries of the northern shore on the one hand and those of the eastern and southern shores on the other hand is caused by higher fertility and population growth rates in the latter.

Alongside the demographic change, a phenomenon of rapid urban growth has been taking place. Nowadays, it is estimated that two in every three inhabitants in the Mediterranean countries live in urban areas, and over a third of the population growth occurs in the coastal cities where most of the economic activities are concentrated. This urban growth is mostly brought by an internal redistribution of the populations and a rural exodus towards cities that offer employment opportunities and better lives. While the typology of the Mediterranean Basin with vast areas of hills, plateaux and mountains characterising the inland areas, has helped this movement towards the coasts, the growing international tourism along the shores has accelerated this phenomenon in the last two decades.

Rapid urbanisation has had impacts not only on the lifestyle and associated food consumption patterns but also on biodiversity, which is one of the defining characteristics of the Mediterranean diet. Nowadays, the Mediterranean coast is considered one of the world's biodiversity hotspots. On the other hand, urbanisation has largely contributed to farming and natural land degradation and loss along the coasts of the region, affecting the traditional agricultural livelihoods and local food production. Parallel to the demographic divide between the two shores, there have also been different urbanisation trends between the northern shore and the south-eastern shores of the Mediterranean: in northern countries, the urbanisation rate has been expected to increase moderately by 2050, it has been expected to grow more rapidly

in North Africa (Salvati, 2014). In all cases, increased urbanisation favours the mass production of low cost food and the necessity for the transfer and storage of these products in urban centres is increasing the amount of spoiled and wasted food.

Another factor that has affected the erosion of the Mediterranean Diet is the change in family structure: from an extended one where culinary practices and knowledge were passed from one generation to another, to a nuclear family where the traditional wisdom on how to prepare and use food was lost. As with most patriarchal societies, Mediterranean women have had the main responsibility for food preparation, and often its production and distribution. The achievement of higher education levels and the entry into paid labour have contributed, at different paces in the countries of the Mediterranean region, to the fact that women are moving away from such a paradigm.

Impact of globalised markets on the Mediterranean Diet. The globalisation and liberalisation of trade have had a positive effect on improving food security around the globe. As a result of the opening up of markets, consumers have access to a wider and more diversified food offer all year round. However, this change has drastically affected the way food is produced, procured, distributed and consumed. One of the salient features of this change is the entry of international super- and hyper-markets in countries of the Mediterranean, changing the way people buy and consume food. The diffusion of supermarkets has happened at different paces in the countries of the northern shore and those of the eastern and southern shores, with the former embracing the phenomenon earlier. By the late nineties, most eastern and southern Mediterranean countries have experienced an increase in Foreign Direct Investment (FDI) in the retail sector pushed by the saturation and intense competition in domestic European and US markets and the much higher margins to be made by investing overseas.

At local level, the competition between large supermarket chains on the one hand, and traditional food shops on the other, has not been to the advantage of the latter. With increasing incomes, high rates of urbanisation and the changing of women's role within the family, a new way of life and demands have emerged. Supermarkets compete better than traditional shops as they bring with them significant improvements in standards of food quality and safety at competitive prices and convenience, factors which are highly attractive to an increasingly sophisticated consumer. Since the beginning of the nineties, there has also been a rise in the diffusion of fast food chains in the Mediterranean countries. Such changes have resulted in a gradual shift in the dietary consumption patterns towards a more universal one characterised by increased consumption of animal products, fats and sugar.

In parallel, the reputation of the Mediterranean Diet as a healthy diet has increased the demand for locally-produced foods and commodities. Thus, in recent years, a good part of the expansion of world consumption of olive oil was accounted for by increases in countries with no or little tradition in olive oil production or consumption like North America, non-Mediterranean Europe, Japan, Australia and Brazil. The liberalisation of trade has made olive oil a catalyst for economic growth in many Mediterranean countries propelled by the high economic returns from olive oil

exports in particular. However, this has led to the increase of imports of cheaper vegetable oils and the replacement of olive oil in the diets of some Mediterranean countries especially in countries of the East and South Mediterranean.

Consequences of the erosion of the Mediterranean diet

Nutrition and health factors. Mediterranean countries have been witnessing a nutrition transition characterised by a shift towards a 'westernised' diet that is energy-dense and high in refined cereals, animal protein, and fats, with typical foods consumed being red and processed meat, and refined grains. Unlike the Mediterranean dietary pattern, the Western dietary pattern has been associated with an increased risk of obesity (high body mass index and elevated waist circumference) as well as high risk of coronary heart disease, metabolic syndrome, and type-2 diabetes. A strong association has been reported between high consumption of unhealthy food components (processed meat, red meat, trans fatty acids, sugar-sweetened beverages, and sodium), low consumption of Mediterranean healthy foods (fruits, vegetables and beans, nuts and seeds, whole grains, and seafood omega-3 fatty acid), and increased risk of cardio-metabolic diseases (diabetes, systolic blood pressure, high body mass index, fasting plasma glucose, and total cholesterol) across all countries of the region, thus making such food consumption patterns strong predictors of these diseases. In addition, the dietary energy supply from the different food groups (healthy and unhealthy) shows that the traditional diet has been modified: most, if not all, of the Mediterranean countries have shown insufficient *per capita* consumption of protective foods, which fell well below recommended levels, and, inversely, a higher than recommended *per capita* consumption of harmful food components.

Evolution of the Lebanese diet

In Lebanon, studies have shown that the adoption of the Western dietary pattern (characterised by high intakes of fast food sandwiches, pizzas, pies, desserts, carbonated beverages, butter, juices, and mayonnaise) was positively associated with high body mass index and elevated waist circumference, and tripled the risk of hyperglycaemia and metabolic syndrome among adults. The Traditional Lebanese pattern, on the other hand, which is generally considered a Mediterranean pattern as it is highly loaded on fruits and vegetables, showed no association with any of the CVD risk factors.

Environmental impacts of the Mediterranean diet erosion. In the Mediterranean, environmental degradation has reached proportions that require immediate action (UNEP, 2010). The new production and consumption Mediterranean patterns based on animal products, require more water, land resources and energy. According to Cosimo Lacirignola *et al.* (2014) these imply high ecological, carbon and water footprints and unfavourable national virtual water balances. Therefore, it is crucial to increase adherence to the Mediterranean Diet to reduce pressure on the scarce resources.

The ecological deficit of Mediterranean countries during the period between 1961 and 2007 increased: the ecological footprint (EF) of consumption *per capita* increased while the biocapacity of the region decreased. The cropland EF is the most important component of the overall EF. Further evidence of the drifting away of the Mediterranean populations from the traditional dietary pattern and their increasing protein consumption is that the current food ecological footprint of the Mediterranean countries is not significantly lower than in other countries, even though typical products of the Mediterranean Diet (olive oil, vegetables and cereals) have a low EF per calorie provided.

The water footprint (WF) of consumption varies greatly among the different countries of the region. About 91% of the regional WF of consumption is due to agricultural products consumption. The increase in food demand will have effects on the volumes of water used for irrigation. Meat, dairy products and wheat represent more than a half of the WF of food supply in Mediterranean countries (Lacirignola *et al.*, 2014). Roberto Capone *et al.* (2013) analysed the environmental cost for Italy, in terms of water consumption, of non-adherence to the Mediterranean dietary pattern by comparing the estimated water footprint of the traditional diet and that of the current dietary pattern: the result was that the latter is about 70% higher than that of the ideal diet.

Many Mediterranean indigenous species are important ingredients in the preparation of century-old traditional food recipes. Unfortunately, the globalisation of agricultural markets and changes in lifestyles have had a negative impact on the conservation and use of these resources sometimes leading to their irreplaceable loss (FMFC, 2010). Indigenous knowledge is being lost and the genetic diversity of food crops and animal breeds is diminishing rapidly. An exacerbation of the genetic erosion of agro-biodiversity is reducing the sustainability of local production systems and hence their ability to safeguard the Mediterranean diet (FMFC, 2010). The standardisation of cultivation practices, mechanisation, monoculture and changes affecting traditional production systems have reduced the spectrum of diversity of the products used for preparing healthy and nutritious food recipes. Safeguarding and promoting the Mediterranean Diet is of paramount importance for the conservation of the extraordinary biological diversity in the region and *vice versa*.

Resource use intensity is still higher in the region. In European countries, the average fertilisers and mineral nitrogen consumption is higher than the worldwide average (Lacirignola *et al.*, 2014). This is further exacerbated by food losses and waste (FLW) implying the loss of precious resources (water, land, energy) and inputs (fertilisers). FLW reduction is now considered essential to reduce the environmental footprint of food systems. FLW are responsible for the loss of life-supporting nutrition and precious resources (air, water and energy) and they have two major direct environmental impacts: waste of the resources that are used to produce the lost and wasted food and negative impacts including emissions of greenhouse gas. According to Cosimo Lacirignola *et al.* (2014), FLW account for water loss ranging from 294 m³ (Palestinian Territories) to 706 m³ (Portugal) *per capita* per year.

Assessing the sustainability of the Mediterranean diet and food consumption patterns

Methodological approach

The notion of the Mediterranean Diet has undergone a progressive evolution over the past fifty years – from a healthy dietary pattern to a model of sustainable diet. In 2009, an international conference on “The Mediterranean diet as a sustainable diet model” was organised in Parma, Italy, by the Centro Interuniversitario di Ricerca sulle Culture Alimentari Mediterranee (CIISCAM), in collaboration with the FAO, the CIHEAM-Bari, the Italian National Institute of Food and Nutrition, the Forum on Mediterranean Food Cultures (FMFC) and Bioversity International. In 2010, the FAO organised a preparatory technical workshop to identify the four characterising dimensions required to assess the sustainability of a diet: nutrition and health, environment, economic and socio-cultural factors. This was followed by an international symposium on “Biodiversity and sustainable diets”, organised by the FAO and Bioversity International in collaboration with the CIHEAM-Bari and the Italian National Institute for Research on Food and Nutrition (INRAN) during which the following consensus was reached on a definition of “sustainable diets”: “Sustainable diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimising natural and human resources” (FAO and Biodiversity, 2012). Within this definition, the Mediterranean Diet was acknowledged as an example of a sustainable diet to be further studied along with other cultures and agro-ecological zones.

Thanks to its nutritional, health, socio-cultural and environmental characteristics and because it concerns a vast number of countries, the Mediterranean diet was chosen by the FAO for a pilot study intended for the assessment of the sustainability of diet models. In 2011, the FAO in collaboration with the CIHEAM-Bari developed methods and indicators for the assessment of the sustainability of diets and food consumption patterns, in the context of sustainable food systems in the Mediterranean area¹. As an outcome of this collaborative effort, in the final declaration of the CIHEAM meeting of the Ministers of Agriculture held in Malta in 2012, the role of the Mediterranean diet as “a driver of sustainable food systems within the strategies of regional development and on that of traditional local products, since quantitative food security must also be complemented by qualitative approaches” (Lacirignola *et al.*, 2012) was highlighted.

From 2011 to 2013, through several international workshops, multidisciplinary seminars and discussions with many international experts, four dimensions within the three sustainability pillars (social, environment and economic) were identified for the assessment of the sustainability of the Mediterranean diet pattern: nutrition and

1 - www.fao.org/docrep/016/ap101e/ap101e.pdf

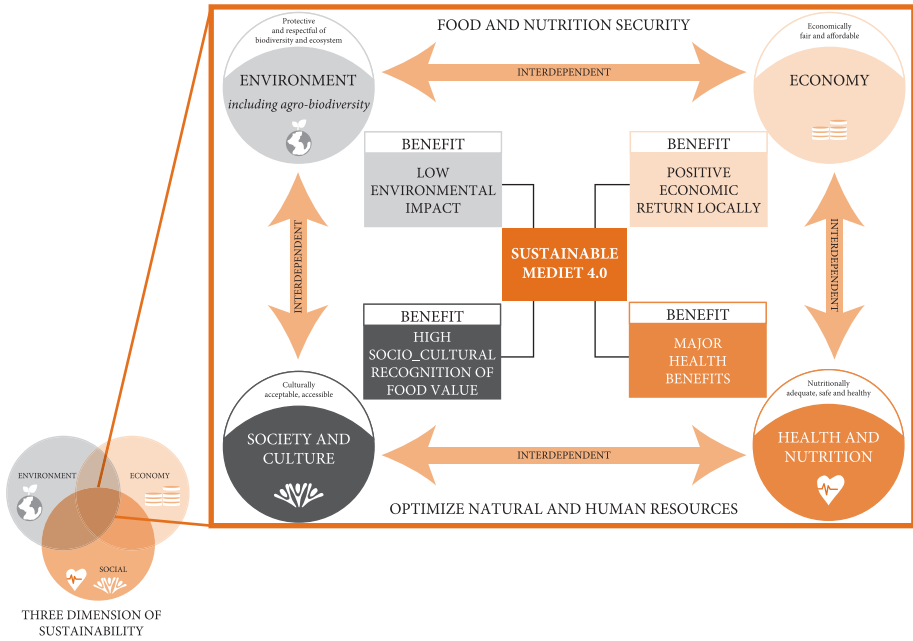
health, environment (including agro-biodiversity), economic and socio-cultural factors. This research enabled the preliminary drafting of a country-specific and person-centred methodological approach and a first, non-exhaustive, ensemble of indicators (Dernini *et al.*, 2013).

This methodological approach based on the use of indicators required a large quantity of data not yet available, intra- and inter-dimension evaluations, prioritisations and economic resources that were not available to accomplish such a complex task. It also required the evaluation of direct and indirect interactions and correlations between the four dimensions. Several challenging questions emerged: how could the relative importance of these indicators be measured? How could one calculate a value/score using the data gathered for each indicator in order to make up a composite index? What are the real available data? How could the different indicators to reach a score/index for assessing sustainability be combined? What is the importance of the four different sustainability dimensions? Are they all equal? Which are the priority criteria/themes within these dimensions? Which are the interdependences? At which scale (individual, household, country, and region) should this operational methodological approach be tested? How could the centrality of the individual, the consumer be measured to assess sustainable diets, in spite of lack of data on individuals and households?

In order to overcome these issues, in 2015, the FAO and the CIHEAM in collaboration with the Forum on Mediterranean Food Cultures (FMFC) and the International Foundation of the Mediterranean Diet, developed a new methodological approach, called the Med Diet 4.0 model (Figure 1), in which, three additional sustainability benefits of the Mediterranean diet are incorporated together with its well-documented health and nutrition values. This model highlights the health and sustainability characteristics of the Mediterranean diet and takes the definition of “sustainable diets” into consideration (FAO and Bioversity, 2012), as well as the four thematic sustainability dimensions and their four related benefits: major health and nutrition paybacks, high socio-cultural recognition of food value, low environmental impact and positive economic local return.

The main challenge for the further development of the Med Diet 4.0 model is to understand the interdependences between its four dimensions and the links between their related benefits. New interdisciplinary cross-cutting studies on the overlapping of these dimensions are therefore required. With four clearly identified benefits, the Med Diet 4.0 model can play a very important educational and communication role in the revitalisation of the Mediterranean diet. It can also provide a better understanding of its connections with Mediterranean food systems. By using the Mediterranean diet pattern as an ideal model, the Med Diet 4.0 model contributes to the development of realistic sustainable diet models and their characterisation in the context of Mediterranean sustainable food systems.

Figure 1 - The Med Diet 4.0 Model



Source: Dernini *et al.* (2013).

Promoting the Mediterranean diet: policies and research

In order to promote the Mediterranean diet as a sustainable lifestyle and dietary pattern, the collaboration of all main stakeholders of the Mediterranean agro-food sector (public institutions, civil society and private sector including producer organisations and cooperatives) is of paramount importance. In this field, international and intergovernmental organisations can act as catalysts of national and local initiatives. The CIHEAM and the FAO have recently signed a new partnership aimed at strengthening the livelihoods of rural communities in the region. This new partnership focuses on food security, nutrition and resilience. The Mediterranean diet is contemplated in the third thematic field of priority of the Memorandum of Understanding (MoU) addressing crises and threats related to food and nutrition security signed in October 2015. One of the fields of work regarding policy development deals with the implementation of a joint vision and strategies on sustainable food systems and the Mediterranean diet in the frame of the UN Post-2015 Agenda and Sustainable Development Goals (SDGs).

The Mediterranean diet as a pilot study

On the occasion of the 9th meeting of the Ministries of Agriculture, Food and Fisheries of the CIHEAM Member States that was held in Malta in September 2012, the CIHEAM and the FAO organised an international seminar entitled “Improving the sustainability of diets and food consumption patterns: the Mediterranean diet as a pilot study”. The conclusions emphasised the need to develop guidelines to improve the sustainability of diets and food consumption patterns in the Mediterranean region. These were approved by the Ministers and were integrated into the final declaration of the meeting, which called upon Mediterranean and international institutions to support the implementation of the seminar recommendations.

Source: *Lacirignola et al. (2012)*.

Promoting balanced nutrition especially among young people

Despite the widely promoted health benefits of the Mediterranean diet and the associated cultural heritage, during the past few decades, Mediterranean people, especially the younger generations, have gradually abandoned this traditional dietary pattern. Despite the fact that there is a lack of longitudinal data enabling a deeper analysis of dietary changes among young people and the exploration of mediating and confounding factors, urbanisation, population growth and the progressive globalisation of food supply have been identified as potential causative factors of this abandonment.

It is important to raise awareness among youth and encourage them to improve their eating habits, as eating behaviours are established early in life and have a great impact on the quality of life as an adult. These early interventions may significantly contribute to the prevention of chronic diseases and promote sustainable lifestyle patterns based on balanced nutrition and physical activity. In this perspective, new initiatives have been undertaken, especially in schools: changes in school food services, adoption of gardening programmes, media campaigns, classroom workshops with the teacher as a role model for a healthy lifestyle. However, these school initiatives promoting healthy lifestyles should develop further and help children and young people understand the relationship between food, wellbeing and the environment, food production and cultural differences. Eating habits can be influenced by recommendations for consumption frequencies, moderation in portions and sizes, development of culinary skills, seasonality, biodiversity, eco-friendliness and locality of food products (Bach-Faig *et al.*, 2011).

This holistic approach was recently adopted by the European Union through the Action Plan on Childhood Obesity 2014-2020². For instance, in the framework of the extension of the national implementation of the “School Fruit Scheme”, education on combating food waste and the promotion of healthy environments are proposed. The increased intake of healthy foods and fresh fruit as well as their availability in schools are strongly encouraged. Health partnerships between national

2 - Action Plan on Childhood Obesity 2014-2020 (http://ec.europa.eu/health/nutrition_physical_activity/docs/childhoodobesity_actionplan_2014_2020_en.pdf).

governments, local governments and non-state actors (smallholders and family farmers, cooperatives, producer organisations supermarkets, retailers and other relevant stakeholders in the community) are of crucial importance for the achievement of these goals.

Local development, incentive schemes, and economic opportunities: the Mediterranean diet as a catalyst

In order to foster local development, local and national authorities must promote the Mediterranean diet. Olive oil is an interesting example of such a strategy. The healthy characteristics of olive oil have increased the demand and made consumers willing to pay a higher price for it in comparison to other edible oils. The growing of olive trees has a very positive impact on rural development as it reduces the high unemployment rate during harvest seasons. The activity is nowadays also combined with rural tourism: in some production areas there are organised tours along olive oil routes, making the olive tree a symbol of the Mediterranean life style. In addition, the growing segment of consumers preferring quality food with certification of origin, leads to the development of economic activities in these regions in addition to an undisputed market-share for the product itself.

The economic valorisation of local food experiences can be a strategy for development. The creation of synergies between producers and tourist operators (hotels, restaurants) enable the increase of purchases of Mediterranean products and at the same time increase the knowledge of traditional processes of production. This eventually leads to the development of agro-food enterprises and the creation of employment. However, Mediterranean touristic regions with agricultural activity are characterised by scattered small towns and villages and small-scale production, which makes the economic viability of such enterprises a challenge. Knowing that small-scale producers in the Mediterranean face a lot of constraints to survive in a globalised economy, collective action organisations (cooperatives and producer organisations) are being created to ensure the sustainability of this mode of production and consumption, to encourage newcomers, especially youth, to adopt sustainable agriculture practices as means of sustainable livelihoods. Access to productive inputs, technology, credit, information and markets are among the much needed services that cooperatives provide to small farmers, without which they might not be able to stay in business. In Egypt, memberships in agricultural cooperatives have made it possible for 4 million farmers to earn their income while in Lebanon, rural women cooperatives have made it possible for their members to increase their otherwise difficult access to local markets. Links to markets, whether domestic or international, are key factors for the success of this mode of production. A Mediterranean label could be a helpful tool in making entries to markets for products that meet the quality requirements. It is therefore necessary to assist small-scale farmers in meeting the requirements for quality and safety in order to increase their competitiveness. Information systems on market opportunities are also necessary to connect local production with niches of economic interest.

The MedDiet label for the promotion of the Mediterranean diet

With the Mediterranean being a primary tourist destination in the world with 150 million tourists visiting the coastal regions every year and with an influx that is expected to double by 2025, other strategies for the promotion of the Mediterranean diet need to be envisaged. In 2015, the Association of the Mediterranean Chambers of Commerce and Industry (ASCAME) initiated the project “Mediterranean diet and enhancement of traditional foodstuffs - MedDiet”, financed by the European Union, and granted the “Med Quality Label” to three hundred restaurants located in six countries (Egypt, Greece, Italy, Lebanon, Spain, and Tunisia) in order to distinguish those who give priority to the Mediterranean diet. The MedDiet label certifies that restaurants offer authentic Mediterranean dishes that comply with the criteria that have been established by the project. A smartphone application is currently being developed to help people find restaurants, which have been granted the MedDiet label. Such incentives could also be extended to other retail outlets to increase adherence to the Mediterranean diet and create economic opportunities.

Domestic markets also provide ample opportunities for the trade of traditional foods in the Mediterranean. In southern Mediterranean countries in particular, dishes with high symbolic value need to be prepared from local foods and continue to have a central position in the identity of the community. In addition, the preferences of Mediterranean consumers to buy fresh produce from the traditional retail sector, especially open air markets, could be exploited and is a means of marketing for cooperatives.

While cooperatives and connections to markets are important for small-scale farmers, they are all the more so for women-led enterprises. In eastern and southern Mediterranean countries, women face more difficulties in accessing inputs, credit, land, and male-dominated markets as shown by a case study on Lebanon³. Nevertheless, the appreciation of traditional homemade products and the willingness of working women, who no longer have time or knowledge to prepare such foods, to buy traditional products made by other women provides the local market with the means to promote the Mediterranean diet. In Algeria, Egypt, Lebanon, Morocco and Syria, the number of women-led businesses that produce and sell traditional food has significantly increased in the last two decades. This growth has provided new sources of income that is sometimes the only income of certain households. Such initiatives have become among the most popular women empowerment programmes supported by national and international organisations in the eastern and southern Mediterranean shores. The National Observatory for Women in Agriculture and Rural Areas (NOWARA)⁴ in Lebanon, for example, has been documenting and promoting such success stories since 2011.

Identifying opportunities for partnerships with local farms is of interest for both producers and consumers. Hence, as shown in the case of Brazil, purchasing from small scale farmers and women producers for school feeding programmes has proven

3 - Lina Abu Habib (ed.), “Case Studies in Women’s Economic Empowerment. A Case from the Middle East”, CRDTA (<https://wideplusnetwork.files.wordpress.com/2012/10/seventhstoryofwomen.pdf>).

4 - NOWARA (www.nowara.org).

to benefit the local economy and to improve nutritional outcomes among children. In the Mediterranean region, this type of programme could promote the Mediterranean diet and create a local economic cycle. However, high prices and fluctuations in product quality and inability to supply local food year-round could be the major obstacles for these enterprises. Assistance from the national authorities by means of the establishment of a national strategy for sustainable production and availability of local food, and in the form of subsidies or improved organisation of the producers, could help alleviate the pressure of the increased production cost, which is especially evident among small-scale producers.

Preserving natural capital

In order to foster and speed up transition towards more sustainable food consumption patterns profound changes in both food consumption and food production are necessary (Lacirignola *et al.*, 2014). Making food consumption models more similar to the traditional Mediterranean diet requires action at all levels (from the state to the individual firm and consumer) and this requires a focus on the maintenance of critical natural capital. It is also important to assess the environmental sustainability of the current Mediterranean food consumption patterns taking into account the different environmental footprints (Lacirignola *et al.*, 2014).

Public policies in all areas of the food system should consider the risks posed by the volatility of prices, sustainability, climate change and hunger. Policies in other sectors (energy, water supply, land use, the sea, ecosystem services and biodiversity) also need to be developed in closer conjunction with the strategies that are directly related to food, in order to protect the environment and reduce resource consumption. Achieving such a coordination of all these policies is a major challenge for local policy-makers. More effective policies, practices and governance (which must be supported by scientific research) are needed at different levels (spatial, temporal, jurisdictional levels etc.). Only sound policies will incite and help consumers and producers make sustainable choices (UN-HLTF, 2012).

The promotion of the Mediterranean diet needs to be accompanied by parallel research initiatives to support local agrobiodiversity and promote high quality local and typical products by focusing on the analysis of the nutrient content that is indispensable for the establishment of sustainable diets. Sustainable food and agriculture policies should also aim to improve the efficiency of agricultural production systems while at the same time preserve the diverse ecosystem services on which they depend⁵. Future agricultural intensification must seek to increase the efficiency of the use of inputs while minimising adverse effects on the environment. The use of energy and water needs to be optimised in all domains: transport, storage (e.g. cold chain), food processing, retail, consumption.

Food environmental sustainability cannot be achieved unless the issue of food losses and waste is recognised and treated. For these to decrease one must adopt multilevel strategies whose main axes would be: the application of current knowledge to

5 - www.who.int/trade/glossary/story028/en

improve the food handling systems and ensure food quality and safety; more education to all stakeholders of the chain, including farmers and consumers; better and adequate infrastructure (storage facilities and marketing systems); improved research and development capacity and special attention to overcoming the limitations of small-scale producers. Interventions to reduce food waste will likely have an even greater impact on freshwater resource availability like other water use efficiency measures in agriculture and food production.

Conclusion

With the acknowledgment of the Mediterranean diet as a sustainable dietary model that has unequalled health, economic, socio-cultural as well as environmental benefits, comes also the recognition that this model diet is being eroded from its natural habitat. The traditional ways of producing and consuming food in the Mediterranean has changed to become a more “westernised” diet style, due to the changing economic and demographic trends, increasing urbanisation and population growth rates, improvements in incomes, change of ways of life and globalisation.

In order to protect and promote the Mediterranean diet, in the framework of their Memorandum of Understanding, the FAO and the CIHEAM have elaborated a vision and strategies to develop sustainable Mediterranean diets and food systems. From a methodological point of view, there should be data generation and collection in order to document the changing dietary habits in the region as well as their drivers in order to provide the information required to formulate adequate policies. Work on the indicators for diets sustainability assessment and research on local biodiversity to analyse the nutrient content of the local species including wild plants, should also be continued with the aim of disseminating them among the scientific community world-wide.

Evidence should be collected in order to advocate the increased adherence to the Mediterranean diet (in all dimensions, health, socio-culture, economics, and environment) as a sustainable diet model for the Mediterranean food systems, minimising food loss and waste (from production to consumption). The quantification of food loss and waste is important, as this will allow a better understanding of the changes happening in the region and help promote what was traditionally a “food-waste-saving culture”. The meetings of the Governing bodies of both the FAO and the CIHEAM aim to draw the attention of the Ministers of Agriculture to the unsustainable situation of food systems around the Mediterranean and on methods and strategies to be adopted to cope with it.

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