

SUSTAINABILITY OF THE FOOD CHAIN FROM FIELD TO PLATE: THE CASE OF THE MEDITERRANEAN DIET

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Abstract

The Mediterranean diet is considered as a paragon among the world's diets. The reference is the diet of Crete in the late 1960s. Is it provided sustainable?

Various authors have commented on the design of sustainable food. Some emphasize healthy food and alternative agriculture, while others focus on the link between health and welfare, or environmental practices on consumers. For us sustainable food is the one that combines the protection of nutrients, environmental conservation, community development through social aspects.

The traditional Mediterranean diet may be considered as sustainable in part because of (i) a great diversity that ensures food nutritional quality of diet and biodiversity, (ii) a variety of food practices and food preparation techniques, (iii) main foodstuffs demonstrated as beneficial to health as olive oil. fish. fruits and vegetable, pulses, fermented milk, spices, (iv) a strong commitment to culture and traditions, (v) a respect for human nature and seasonality, (vi) a diversity of landscapes that contribute to the wellbeing, (vii) a diet with low environmental impact due to low consumption of animal products. However, trends in plant breeding on an economic base, intensive modes of production and greenhouse production, higher consumption of meat, industrialization of food, endanger the sustainability of food systems. No analysis of social impact has been achieved. We cannot conclude on this aspect of sustainability, nor on the environmental impact of the food chain.

In conclusion, the Mediterranean diet has numerous virtues. We must ensure that modernity and globalization do not alter its characteristics of sustainability.

Introduction

The Mediterranean diet has enjoyed a high reputation over many years, both for its nutritional quality and its health benefits. The traditional Mediterranean diet of the 1960s is considered a model of nutritional benefits (Padilla, 2008). Its multifunctional nature, encompassing the entire range of ecological, nutritional, economic and social functions, puts food at the heart of the concept of sustainable development.

Sustainable food is a concept that has been developed as a key factor to reduce negative externalities of the global food supply chain. Beyond the preservation of the environment, sustainable food includes also moral and health aspects of eating (ethic and nutrition), satisfaction of consumer expectations, and improved product accessibility at geographic and economic level. Faced with fossil energy exhaustion, soil limited capacity, ecosystem degradation, climate change and global warming, unbalanced diets and population increase, we wonder if the Mediterranean current food system can be considered as sustainable. Is the Mediterranean diet consistent with sustainable development? The aims of this paper are (i) to characterize the different aspects of sustainability of the traditional Mediterranean diet (ii) to analyse what are the principal hot spots of food systems today in the Mediterranean area with regard to sustainability.

Material and methods

The definitions of sustainable diets show that they affect various dimensions (agricultural, food, nutritional, environmental, social, cultural, economic) that interact with one another, either inseparably or separately and distinctly. From this point of view, the Mediterranean is the area where more than any other many issues (biodiversity loss, soil erosion, water scarcity etc.) directly or indirectly related to Mediterranean food consumption patterns should be addressed. We have summarized the criteria of sustainable food in Table 1. It is a combination of preservation of the environment, nutrition, and development of the local territory by social and economic aspects all along the food chain, from agriculture to the consumer.

	Environment	Nutrition	Economic	Socio-cultural
Agriculture	Follow sustainable agricultural practices Enhance resilience of production systems Deploy and maintain diversity	Promote diverse food Produce nutritionally dense product	Deploy affordable cultivation practices Promote self reliance through local produce	Maintain traditional agriculture practices and promote local varieties
Food Production	Reduce impact of production, processing, commercialization	Preserve nutrients throughout the food chain	Strengthen local food systems Produce affordable food	Produce culturally acceptable foood
Consumption	Reduce the environmental impact of feeding practices	Promote dietary diversity, food balance and seasonality	Promote access to dietary diversity	Safeguard food traditions and culture Meet local preference & taste

Table 1. The grid of sustainable food system.

From our previous works and experience of the Mediterranean area, we will develop our thinking about each element of sustainability.

Results and discussion

I. Is the traditional Mediterranean food chain linked with the traditional diet sustainable?

Environment: the uniqueness of the Mediterranean area, one of 25 "hot spots" of biodiversity on the planet The importance of the Mediterranean area as regards crop diversity can be judged by the fact that about one-third of the foodstuff used by humankind comes from the Mediterranean climatic region (Harlan, 1995). The Mediterranean basin was one of the eight centres of cultivated plant origin and diversity identified by Vavilov (1951). He listed over 80 main crops and the most important of these are cereals, pulses, fruit trees and vegetables. There were also many herbs, spice-producing plants, horticultural crops, and ornamentals (Heywood, 1998). Several sociopolitical, agroclimatic, ecological and genetic factors have contributed to this remarkable crop diversity in the Mediterranean (Jana, 1995).

Approximately 30 000 plant species occur, and more than 13 000 species are endemic to the hot spot; yet, many more are being discovered every year (Plantlife International, 2010). The Mediterranean Basin is 1.6% of world land with 10% of known flowering plants and 18.4% of mammal species; 0.7% of the world ocean, with 8–9% of known marine organisms (Sundseth, 2009). The hot spot has roughly the same plant diversity as all of tropical Africa, albeit in a surface area one-fourth the size of sub-Saharan Africa (CEPF, 2010).

There are more plant species in the European Mediterranean region than all the other European bio-geographical regions combined. The Mediterranean forests are diverse and harbour up to 100 different tree species. In the Mediterranean Basin there is huge topographic, climatic and geographic variability giving rise to an astounding array of species and habitat diversity.

A diverse landscape

A large diversity of landscapes was shaped by the practices of agriculture and livestock. This contributes to well-being and environmental protection. Cereal, fruit trees, olive groves, vineyards, horticulture, gardening, were cultivated on small perimeters. Agricultural lands and grasslands occupy 40 percent of the Mediterranean region and vary between large intensive olive or citrus groves to more mixed farming systems (Elloumi and Jouve, 2010). The low intensity and localized nature of thousands of years of subsistence farming activities has had a profound effect on the landscape, creating a complex mosaic of alternating semi-natural habitats rich in wildlife. Vineyards and ancient olive groves are also still a characteristic feature of the Mediterranean landscape. On flatter land and in the plains various forms of sustainable agro-sylvo-pastoral farming systems have evolved that make best use of natural resources (Sundseth, 2009). Ranching is also practiced on the land fallow or wasteland or vast semi-desert lands.

Agriculture practices preserving the environment?

We see the continuation of small-scale family farming (17 million family farms with two-thirds or three-quarters less than 5 ha in Turkey, Morocco, Italy, Greece, for example (Elloumi and Jouve, 2010). They practise traditional agriculture-intensive labour and low use of capital. This agriculture is likely to solve the food crisis, according to Olivier de Schutter, Rapporteur on the right to Food at the UN. It is also an agriculture that preserves the earth, by increasing local productivity, reducing rural poverty, contributing to improved nutrition and facilitating adaptation to climate change.

The richness of Mediterranean agriculture is its diversity of cropping patterns. We distinguish five forms of agriculture in the Mediterranean, especially on the outskirts of towns: (1) An entrepreneurial agriculture, innovative, with high added value. It is an innovative farming vegetable specu-

lative, capital intensive, growing thanks to the availability of capital in the current conditions. (2) An opportunistic agriculture in extension due to the constraints of access to land. It is practiced on large farms consisting of clusters of plots, left short-term leases, usually oral. (3) Family farms in the suburban area specialized in local productions to be sold directly in farmers markets. (4) Agriculture need, practiced by the rural exodus from the city and recently installed, because of economic crises; it tends to perpetuate. (5) Pleasure agriculture: the traditional Mediterranean cultivation has an interest in landscape and identity, such as vineyards and olive trees; they are renewed in European countries where they receive aid from the CAP. The aim of policies related to territory quality (AOC) is to ensure the sustainability of these local productions (Jouve and Padilla, 2007).

Another aspect of land preservation is the commitment to organic farming. Mediterranean organic agriculture is growing, but covers a very small percentage of agricultural land: 4.5% in Italy, between 2 and 3% in Spain and Greece, 6.2% in Slovenia, less than 2% in France, 1.5% in Tunisia and less than 1% in other countries (Plan Bleu, 2006). If organic agriculture does not meet market demand in the North, it does not have a local market in the South. This greatly limits its expansion.

The environmental impact of the diet

Duchin (2005), who studied diets from multiple points of view of sustainability, showed that a Mediterranean diet, which consists mainly of plantorigin foods but not excluding a small proportion of meat and other animal products, is closer to public health recommendations issued by the World Health Organization and has a lower environmental effect than the current average United States diet. If, for reasons of public health, the plant-based Mediterranean diet is adopted throughout the United States, not only major structural changes would be needed in agriculture, but the farmland dedicated to food would decrease. Indeed, Duchin argues that the typical Mediterranean diet differs from the current dietary recommendations in the United States by including a much lower meat consumption. This choice would also benefit the environment and that food choice is all the more commendable that the environment would benefit too. Among the various diets tested by Duchin, in a global economy model that incorporates Life Cycle Analysis of 30 foods, plant-dominated diet type emerges as the Mediterranean diet, can meet both nutritional and environmental requirements, and for a growing world population while reducing the pressure of food and agricultural systems on the environment.

Nutrition sustainability: few animal products in the diet

The east Mediterranean diet of the early 1960s has interesting qualities for the development of options to create more sustainable, healthy diets. The environmental impacts of animal production vary with the method of production (e.g. extensive grazing, grazing-based production) (MFAF-DK, 2010).

Meat production has a higher environmental impact than fruit and vegetables production. The global livestock sector contributes about 40 percent to global agricultural output. Meat and dairy animals now account for about 20 percent of all terrestrial animal biomass (Steinfeld et al., 2006). According to the Livestock, Environment and Development initiative, the livestock industry is one of the largest contributors to environmental degradation, at local and global scale, contributing to deforestation, air and water pollution, land degradation, loss of topsoil, climate change, the overuse of resources including oil and water, and loss of biodiversity. The use of large industrial monoculture, common for feed crops (e.g. corn and soy), is highly damaging to ecosystems. The initiative concluded that the livestock sector emerges as one of the most significant contributors to the most serious environmental problems. A person existing chiefly on animal protein requires ten times

more land to provide adequate food than someone living on vegetable sources of protein (MFAF-DK, 2010) which means a much higher ecological footprint

Type of Food	Area required	
Vegetarian food	500 m²	
Dominant vegetarian food	700 m ²	
Western diet	4 000 m ²	
Mainly meat diet	7 000 m ²	

Table 2. Ecological Footprint of different food diets. Source: FAO.

The Mediterranean variety is major. It helps to meet diverse nutritional needs and to limit the environmental impact

There is growing evidence of the impact of diet on health, including increased risk of obesity, cardiovascular diseases and cancers, and also of its role as a social indicator (Reddy *et al.*, 2009; Hawkesworth *et al.*, 2010). Dietary diversity that characterizes the Mediterranean diet explains the disease prevention related to diet. A study of the index of food variety in several countries has shown that France has a very high rate (90%) compared to the United States (33%). In Morocco, the dietary diversity score was 10.2 for ages 12 to 16 years (Aboussaleh and Ahami, 2009). Other surveys in 2006 for adults (Anzid *et al.*, 2009) also showed high levels of dietary diversity in urban areas only.

Beyond the diversity in terms of different categories of food and in terms of different foods within a category, it should be noted the peculiarity of the Mediterranean diet for the variety of flavours: acid, sweet and sour, salty-sweet, bitter, pungent. The preparation techniques are also very diverse: flavoured, breaded, chopped, into batter, stuffed pastry, salads; the techniques of preservation also: sun-drying, salting, fermentation, vinegar, oil, candied (we find all these technical approaches in the Mune in Lebanon). The diversity can be found also in cooking techniques: boil, simmer, roast, broil, fry, steam. People eat structured meals taken in a friendly way. Families and friends eat together tapas in Spain, tramessi in Italy, kemia in Tunisia, meze in Lebanon, mézélik in Turkey.

The recommended Mediterranean food pyramid expresses such diversity (Figure 1).





Figure 1. The double pyramid. Source: Barilla Center, 2010

It not only offers considerable health benefits to individuals but also respects the environment and has less impact. Barilla Center for Food and Nutrition demonstrated that the foods that are recommended to be consumed more frequently, are also those with minor environmental impacts (per kg). In other words, the inverted environmental food pyramid illustrates how the most environmentally-friendly foods also tend to be the healthiest (Barilla Center, 2010). As a matter of fact, the various food groups can be evaluated in terms of their environmental impact. Reclassifying foods no longer in terms of their positive impact on health, but on the basis of their negative effect on the environment, produces an upside-down pyramid which shows the foods with greater environmental impact on the top and those with lower impact on the bottom. When this new environmental pyramid is brought alongside the food pyramid, it creates a food-environmental pyramid called the "Double Pyramid". It shows that foods with higher recommended consumption levels are also the ones with lower environmental impact. This unified model illustrates the connection between two different but highly relevant goals: health and environmental protection. In other words, it shows that if the diet suggested in the traditional food pyramid is followed, not only do people live better (longer and healthier), but there is a decidedly lesser impact - or better, footprint on the environment.

Respect of human nature

Mediterranean people have benefited from the influence of Hippocras about the categorization of food and eating behaviours: hot, cold, wet or dry properties. There is an adaptation to natural conditions in respect of the seasons and a necessary balance among different kinds of products according to the seasons, metabolism and health of individuals.

Social and economy sustainability: strengthen local food systems

Historically, in Europe, the Mediterranean countries have the largest number of initiatives of geographical indications (GI). Locally, they are indicative of a strong connection to the land, the notoriety, the history and the quality of the product. Nearly 80 percent of GIs in the European Union are from Mediterranean countries. France represents alone 20 percent followed by Italy, Portugal, Greece and Spain. In southern countries, this process is beginning in Morocco, Tunisia, Lebanon. In Mediterranean countries, there is a strong attachment to traditions and culture and food is an integral aspect of human culture. The culinary tradition is still transmitted from mother to daughter, although the cookingprocess is often simplified. Festive occasions around food are common: celebrations, religious rituals. Modern life leads to strong ambivalent practices between acculturation and transmission of a cultural identity. To preserve the Mediterranean food culture, UNESCO has recently recognized the Mediterranean diet as an intangible heritage of humanity (2010) in four countries: Spain, Greece, Italy and Morocco. It will be included in a transnational Mediterranean inventory in preparation.

II. The principal hot spots of food systems today The risks on biodiversity

Biodiversity is threatened because pollution, overexploitation, natural disasters, invasive alien species, tourism, intensive agriculture. The change in eating habits combined with the pursuit of profitable varieties led to the abandonment of local varieties and cultural degradation of specific products. There is a globalization of the food market with absurd transport costs, an organization of the food chain in function of economic considerations, without taking into account the environmental impact: 30 percent of greenhouse gas emissions are linked to the food in France. Specialization in agriculture and the changing patterns of farming techniques deplete biodiversity and have a negative impact on greenhouse gas emissions. For instance, there are more and more greenhouses in the south of Spain: 40 000 ha of vegetables in Almería, 7 500 ha of strawberry in Huelva. A majority of the workforce is composed of illegal immigrants.

We are in an era of unprecedented threats to biodiversity: 15 out of 24 ecosystems are assessed to be in decline (Steinfeld *et al.*, 2006). The genetic diversification of food crops and animal breeds is diminishing rapidly. At the beginning of the twenty-first century it was estimated that only 10 percent of the variety of crops that had been cultivated in the past

were still being farmed, with many local varieties being replaced by a small number of improved nonnative varieties (Millstone and Lang, 2008). Only about 30 crop species provide 95 percent of food energy in the world while 7 000 species, that are partly or fully domesticated, have been known to be used in food including many of the so-called underutilized, neglected or minor crops (Williams and Haq, 2002). Humanity depends on ecosystems and their life-sustaining goods and services.

WWF (World Wide Fund for Nature) has listed 32 ecoregions in the Mediterranean hot spot. There are three broad vegetation types: maquis, forests and garrigue (CEPF, 2010). Nowadays, the most widespread vegetation type is the maquis. Many of the endemic and restricted-range plants depend on this habitat; thus, several species are threatened (Tucker and Evans, 1997).

However, whilst small-scale farming is still practised in many parts of the region, the last 50 years have seen a massive change in agricultural practices across large parts of the Mediterranean. Ancient vineyards, orchards and olive groves have been ripped out to make way for industrial-scale fruit or olive plantations and mixed rotational farming has been replaced by intensive monocultures. This has not only caused the loss of wildlife-rich habitats but has also had a major socio-economic impact on large parts of the region as many small-scale farmers have been forced to abandon their land to go and search for jobs elsewhere.

Farming systems

The global changes affecting the Mediterranean region have effects on farming systems and processing of food derived from them. Overall, we can expect a widening of the social and economic divide between industry and family agriculture, namely in the South, because the region is highly dependent on of agricultural imports and therefore subject to the hazards of world agricultural production and its "crisis"; an integration of food to better control price volatility of primary production, while promoting the internationalization of production.

These trends are consistent with the reconstruction of territories: concentration of population in urban and coastal areas; concentration of large farms, competition for use of space between rural and urban areas, and risk of a progressive disgualification of small farming. These changes are associated with the degradation of agro-ecosystems due to climate change, to intensifying production and a devaluation of traditional knowledge. with consequences: a recurring emergence of diseases of various origins, increasing pressure of invasive species, and degradation of biodiversity; stress on crop yields associated with an increase in agricultural water demand coupled with lower ground and underground flows, tensions to share water between uses. In this context of strong pressure on resources (water, land), and increased concentration of population, and environmental degradation, the major health crises, affecting animals or plants, are likely (international trade increasingly important to promote migration of invasive species and pathogens).

Use of water

Modern farming practices through their high demand for pesticides, fertilizers and irrigation water also put excessive pressure on the environment. More than 26 million ha of farmland are now under irrigation in the Mediterranean Basin and in some areas up to 80 percent of the available water is used for irrigation. The exceptionally rapid growth in tourism and urban development in coastal areas combined with the abandonment of small-scale farming practices puts immense pressure on the Mediterranean region's rich biodiversity (Sundseth, 2009).

The Mediterranean population is particularly affected by water scarcity: it represents 60 percent of the population of water-scarce countries in the world with less than 1 000 m³/inhabitant/year (PlanBlue, 2006). Water demand doubled during the second half of the twentieth century to reach 280 billion m³ per year for all riparian countries: 64% is for agriculture (82% in southern countries), 13% for tourism. Moreover, the complexity of the food chain increases the use of virtual water. In the Mediterranean region, water resources are limited, fragile and unevenly distributed over space and time where southern rim countries are endowed with only 13 percent of the total resources (Plan Blue, 2006). According to the projections of the Plan Blue baseline scenario and compared to the year 2000, water demands may increase by a further 15 percent by 2025, especially in the southern and eastern countries where an increase of 25 percent is expected. Furthermore, Mariotti et al. (2008) predicted by 2070-2099 an average decrease of 20 percent in land surface water availability, with a decrease in soil moisture and river runoff, and a 24 percent increase in the loss of fresh water over the Mediterranean due to precipitation reduction and warming-enhanced evaporation. Thus, improving the water demand management, water saving and rational water use, especially for agriculture, is of paramount importance in the Mediterranean region.

A surge of supermarkets

According to expert estimates, the agro-industrial service model, characterized by mass consumption of industrialized products driven by hyper- and supermarkets, may locate in any region where the average revenue per capita is above US \$ 5 000 per head. In 2008, in all Mediterranean countries this limit was reached except in Morocco. For some ten years Mediterranean countries have been facing the development of modern food distribution. If it holds 75 percent of the food market in the north, it remains modest in the south with 5–10 percent, but is growing strongly. In Egypt, it is estimated that around 90–95 percent of the food outlets can be categorized as small grocery stores. The modern retail food service has tripled in five years. In Morocco, like in Tunisia, the modern distribution has duplicated the number of establishments in the last five years. We can count 32 Auchan /Marjane, Metro, Label'Vie, Casino/Asmak Assalam (Chaabi group) in Morocco; 1 Carrefour, 44 super Champion et Bonprix, 1 Géant Casino, 39 Monoprix et Touta, 44 super Magasin Général in Tunisia; and only 1 Carrefour, Blanky/Promy, Cevital in Algéria.

An indicator of each country potential for retail developments is provided by AT Kearney. They classify every year the 30 more promising emerging countries, according to an index based on a set of 25 variables including economic and political risk, retail market attractiveness, retail saturation levels, modern retailing sales area and sales growth. According to the classification for 2010, there were 10 Mediterranean countries ranked in the following places: Tunisia (11), Albania (12), Egypt (13), Morocco (15), Turkey (18), Bulgaria (19), Macedonia (20), Algeria (21), Romania (28) and Bosnia-Herzegovina (29). The problem is that this method of distribution extends distribution channels, massive purchases and sells a wide range of products highly industrialized and not always conducive to health. Thus we are seeing the explosion of soft drinks consumed at any time of the day.

A Food Quality Index of food in regression

Based on the recommendations of the National Research Council, the American Health Association, and the latest proposals of the joint committee of FAO / WHO (2003), we see that the Food Quality Index is decreasing in the main Mediterranean countries.



Figure 2. FQI evolution within the Mediterranean countries (1960-2007). Source: Based on FAO data.

Major concerns relate to the aggravation of saturated fat (meat, dairy and industrial foods), a very sharp increase in sugars (sodas, cookies, desserts), a reduced consumption of starches (bread, potatoes), and micronutrient deficiencies.

The mirror of the new eating behaviours is the increasing overweight and obesity. The main causes are: the lifestyle, the type and frequency of physical activity, the type and quality of food consumed and time spent on food related activities (shopping, cooking, etc.).

A negative balance of the total ecological footprint in the Mediterranean region

With modern diets and food consumption patterns there is a trend to have a greater flow of food commodities over long distances, and highly processed and packaged foods that contribute to increased emissions of greenhouse gases and non-renewable resources depletion. Alteration of the ecosystem occurs if an area's ecological footprint exceeds its biocapacity. Balance of the total ecological footprint in the Mediterranean is shown in Figure 4 based on data of the global footprint network for the year 2007. The results put in evidence an ecological deficit in the Mediterranean region and an alteration of the ecosystem is therefore occurring. The ecological deficit is more pronounced in the Balkans and northern Mediterranean even if they have a higher biocapacity with respect to North Africa and the Near East.

Conclusions

The grid of sustainable diet: what should be done?

For the immediate future, we recommend a better synergy between environmental and health education to obtain agreement for a dietary change for the general public. A lot of researchers explained the health benefits that a plant-based diet would have on health and environment, and this knowledge could be translated into information campaigns. Further research is needed to understand barriers and why changes in diets have not been a main issue on the climate agenda until now. It is there-



80.00 70.00 60.00 50.00 40.00 40.00 50.00 40.00 40.00 50.00 40.00 40.00 50.00 40.004







Figure 3. Overweight and obesity in Mediterranean countries. Source: WHO, 2009.

fore necessary to act urgently to implement a strategy that promotes the use of the concept of "sustainable diets" in different contexts worldwide, in industrialized as well as developing countries.

The Mediterranean diet was proven as good for health; it has nutritional virtues, diversity, seasonality, freshness, culture, skills. The south Mediterranean countries should avoid reproducing a Western pattern of which we perceive the limits today and should incorporate sustainable development goals into their policies Our objective is not to cultivate the past, but to become aware of abuses of food systems in the Mediterranean. Traditional knowledge and experience are wiped out in the name of modernity. Don't we have to learn from our past to ensure a sustainable modernity? It is still possible to build our future on the triad of traditional food, food industry and sustainable development including nutrition, environment and biodiversity.



Figure 4. Balance of the total ecological footprint in the Mediterranean region. Source: Global footprint network, 2007.

References

Aboussaleh, Y. and Ahami, A. 2009. Dietary determinants of stunting and anaemia among preadolescents in Morocco. African Journal of Food Agriculture and Development, 9: 2.

Anzid, K., Elhamdani, F.Z., Baali, A., Boëtsch, G., Levy-Desroches, S., Lôpez, P.M. Cherkaoui, M. 2009. The effect of socio-economic status and area of residence on household food variety in Morocco. Annals of Human Biology, 36: 6.

Barilla Center (2010). Double pyramid: healthy food for people sustainable food the planet. Barilla Center for Food & Nutrition, Parma, Italy.

http://www.barillacfn.com/uploads/file/72/1277731651_PositionPaper-BarillaCFN_Doppia-Piramide.pdf .

CEPF (2010). Ecosystem Profile - Mediterranean Basin Biodiversity Hotspot. For submission to the CEPF (Critical Ecosystem Partnership Fund) donor council.

Duchin F. Sustainable consumption of food: a framework for analysing scenarios about changes in diets. J Ind Ecol 2005;9:99–114.

Elloumi M. & Jouve A.-M. (2010). Extraordinary farm diversity. In: International Centre for advanced Mediterranean Agronomic Studies (CIHEAM); Mediterra Atlas: Mediterranean agriculture, food, fisheries and the rural world. Presses de Sciences Po, Paris; 132 p

Harlan, J.R. (1995). Agricultural Origins and Crop Domestication in the Mediterranean Region. Diversity, 11: 14-16.

Hawkesworth S., Dangour A.D., Johnston D., Lock K., Poole N., Rushton J., Uauy R. & Waage J. (2010). Feeding the world healthily: the challenge of measuring the effects of agriculture on health. Philosophical Transactions of the Royal Sociely, B-Biological sciences, 365, 3083-3097.

Heywood V.H. (1998). The Mediterranean region. A major centre of plant diversity. In: (Heywood VH, Skoula Meds) "Wild food and non-food plants: information networking". Proceedings of the II MEDUSA Regional Workshop (1-3 may 1997, Port El-Kantaoui, Tunisia). Cahiers CIHEAM, Options Méditerranéennes 38: 5-15.

Jana S. (1995). Factors Contribution to Crop Diversity in the Mediterranean. Diversity, 11:15.

Jouve AM, Padilla M (2007). Les agricultures périurbaines méditerranéennes à l'épreuve de la multifonctionnalité: comment fournir aux villes une nourriture et des paysages de qualité, Cahiers de l'Agriculture, Vol 16, 4, juillet-août 2007 pp 311-318.

MFAF-DK (2010). Food s carbon footprint. Ministry of Food, Agriculture and Fisheries, Danemark DK http://www.fvm.dk/Foods_Carbon_Footprint.aspx?ID=42268

Mariotti A., Zeng N., Yoon J., Artale V., Navarra A., Alpert P. and Millstone E. & Lang T. (2008). The Atlas of Food. Earthscan, second edition, London. Padilla M. (2008). Dietary patterns and trends in consumption. In Mediterra 2008 - The future of agriculture and food in Mediterranean countries. International centre for advanced Mediterranean studies – Paris; Presses de Sciences Po. Pp: 149- 170.

Plan Bleu (2006). Executive summary on "A Sustainable Future for the Mediterranean: The Plan Blueì s Environment and Development Outlook", edited by Guillaume Benoit and Aline Comeau 2005. 464 p. Earthscan.

Plantlife International (2010).

Reddy Sh., Lang T., Dibb S. (2009). Setting the table - Advice to Government on priority elements of sustainable diets. Sustainable Development Commission, UK.

Steinfeld H., Gerber, P., Wassenaar T., Castel V., Rosales M. & de Haan C. (2006). Livestock slong shadow: Environmental issues and options-FAO Food and Agriculture Organization of the United Nations (FAO), Rome.

Sundseth, K. (2009). Natura 2000 in the Mediterranean Region. European Commission; Environment Directorate General, Luxemburg.

Trichopoulou A. & Lagiou P. (1997). Healthy traditional Mediterranean diet: an expression of culture, history, and lifestyle. Nutr. Rev.; 55: 383–389.

Tucker G.M. & Evans M. (1997). A Conservation Strategy for the Wider Environment. BirdLife Conservation Series 6, 464 pp.

Vavilov N.J. (1951). Phytogeographic basis of plant breeding -The origin, variation, immunity and breeding of cultivated plants. Chronica Bot., 13: 1-366.

Williams J.T. & Haq N. (2002). Global research on underutilised crops – An assessment of current activities and proposals for enhanced cooperation. International Centre for Underutilised crops, Southampton, UK.