

**Priority 5: Mediterranean food consumption patterns: diet, environment, society, economy and health**

Lacirignola C., Capone R., El Bilali H., Debs P., Cardone G.L., Driouech N., Dernini S., Burlingame B., Gitz V., Meybeck A.

in

Petruzzella D. (ed.), Sancassiani S. (ed.).  
Feeding knowledge

Bari : CIHEAM

Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 120

2017

pages 139-184

Article available on line / Article disponible en ligne à l'adresse :

<http://om.ciheam.org/article.php?IDPDF=00007194>

To cite this article / Pour citer cet article

Lacirignola C., Capone R., El Bilali H., Debs P., Cardone G.L., Driouech N., Dernini S., Burlingame B., Gitz V., Meybeck A. **Priority 5: Mediterranean food consumption patterns: diet, environment, society, economy and health**. In : Petruzzella D. (ed.), Sancassiani S. (ed.). *Feeding knowledge*. Bari : CIHEAM, 2017. p. 139-184 (Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 120)



<http://www.ciheam.org/>  
<http://om.ciheam.org/>

# Priority 5: Mediterranean food consumption patterns: diet, environment, society, economy and health



## Authors

Reference persons: Cosimo Lacirignola & Roberto Capone, CIHEAM-Bari

Senior expert: Hamid El Bilali, CIHEAM-Bari

Contributing authors: Philipp Debs, Gianluigi Cardone and Nouredin Driouech, CIHEAM-Bari

Reference scientists: Sandro Dernini, FAO/Forum on Mediterranean Food Cultures (FMFC);  
Barbara Burlingame, FAO; Vincent Gitz, FAO; Alexandre Meybeck, FAO

### International experts

Rekia Belahsen, Chouaib Doukkali University, Morocco;

Elliot Berry, WHO Collaborating Centre for Capacity Building in Public Health, Hebrew University  
Israel;

Denis Lairon, Université Aix-Marseille, France;

F. Xavier Medina, Universitat Oberta de Catalunya, Spain;

Youssef Aboussaleh, Ibn Tofail University, Morocco;

Gulden Pekcan, Hacettepe University, Turkey;

Antonia Trichopoulou, Hellenic Health Foundation (HHF), WHO Collaborating Centre for Food  
and Nutrition Policies, Medical School, University of Athens, Greece;

Lluís Serra-Majem, University of Las Palmas de Gran Canaria/CIISCAM, Spain.

This white paper is an outcome of the collaborative effort with the FAO/UNEP Sustainable Food  
Systems Program, FAO.

FOOD AND AGRICULTURE ORGANISATION OF THE UNITED NATIONS  
INTERNATIONAL CENTRE FOR ADVANCED MEDITERRANEAN AGRONOMIC STUDIES

**Recommended citation**

**CIHEAM &FAO. 2015. *Mediterranean food consumption patterns: diet, environment, society, economy and health. A White Paper of Priority 5 of Feeding Knowledge Programme, ExpoMilan 2015. CIHEAM-IAMB, Bari/FAO, Rome.***

The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations (FAO) concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these have been endorsed or recommended by FAO in preference to others of a similar nature that are not mentioned.

The views expressed in this information product are those of the author(s) and do not necessarily reflect the views or policies of FAO.

ISBN 978-92-5-108705-3 (FAO)

ISBN-2-85352-542-2 (CIHEAM-Bari)

© FAO and CIHEAM-Bari, 2015

## Acknowledgements

This white paper is the outcome of a collaborative effort with the Sustainable Food Systems Program, Department of Agriculture and Consumer Protection, FAO, Rome.

We would like to thank all those that contributed to the preparation of this white paper with their valuable comments and insights.

The following experts are acknowledged for their significant contribution towards the development of the section regarding the indicators for assessing the sustainability of Mediterranean diets:

- Massimo Iannetta, ENEA, for the development of an Integrated Product Index for the Sustainability of Mediterranean Diets (IPI-SMeD)” and for the identification of environmental indicators;
- Angela Polito, Aida Turrini, Federica Intorre, Giuseppe Maiani, Ex INRAN/CRA; Lorenzo M. Donini, Alessandro Pinto, Annamaria Giusti and Valeria del Balzo, CIISCAM/Sapienza University of Rome, for the identification of nutrition and health indicators;
- Eva Alessi; WWF-Italy, for the identification of environmental indicators;
- Giulio Malorgio, University of Bologna, for the identification of the economic indicators;
- Mauro Gamboni and Silvana Moscatelli, CNR, for the identification of the socio-cultural indicators.

Also, following experts are acknowledged for their contribution to the brainstorming process that has accompanied the development of indicators: Denis Lairon, University Aix-Marseille, France, and FENS representative; Pasquale Steduto, FAO, Rome; Rekia Belahsen, Chouaib Doukkali University, Morocco; Elliot Berry, Hebrew University-Hadassah Medical School, Jerusalem, Israel; Lluís Serra-Majem, University of Las Palmas de Gran Canaria/CIISCAM/MDF, Spain; F. Xavier Medina; Universitat Oberta de Catalunya (UOC) & International Commission on the Anthropology of Food and Nutrition (ICAF)-Europe, Barcelona, Spain; Antonia Trichopoulou, Hellenic Health Foundation & WHO Collaborating Centre for Nutrition, Department of Hygiene and Epidemiology, University of Athens, Greece; Federico Mattei, Bioversity International.

The Forum on Mediterranean Food Cultures (FMFC) has significantly contributed in the organisation of the international workshop “Guidelines for the Sustainability of the Mediterranean Diet”, held on 28-29 November 2011 at the CIHEAM- MAI Bari, towards the establishment of the Mediterranean Diets Working Group (MDWG) for evaluating the sustainability of Mediterranean Diets. A milestone of this collaboration was in 2005 with “the Rome Call for a Common Action on Food in the Mediterranean” (CIISCAM, 2005), that allowed to further re-activate the process of the development of a network for the advancement of Mediterranean Food Cultures started in 2002 by the FMFC and CIHEAM MAI-Bari and other Mediterranean institutions.

A special thanks to Suzanne Redfern, Sustainable Food Systems Programme, FAO, for the editing and layout of this document.

## ACRONYMS AND ABBREVIATIONS LIST

CBD	Convention on Biological Diversity
CDO	Controlled Designation of Origin
CFS	Committee on World Food Security
CIHEAM	Centre International de Hautes Etudes Agronomiques Méditerranéennes
CIISCAM	International Interuniversity Study Centre on Mediterranean Food Cultures
CNR	Italian National Research Council, Italy
COLI	Cost of Living Index
COST	European Cooperation in Science and Technology
CRA	Agricultural Research Council, Italy
DEFRA	Department for Environment, Food and Rural Development, UK
EC	European Commission
EEA	European Environment Agency
ENEA	National Agency for New Technologies, Energy and Sustainable Economic Development, Italy
ESF	European Science Foundation
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
FCPI	Food Consumer Price Index
FDM	Fundación Dieta Mediterránea, Spain
FENS	Federation of European Nutrition Societies
FMFC	Forum on Mediterranean Food Cultures, Italy
GFCM	General Fisheries Commission for the Mediterranean
GHG	Greenhouse gas
GMO	Genetically Modified Organism
HHF	Hellenic Health Foundation
HLPE	High Level Panel of Experts on food security and nutrition
ICAF	International Commission on the Anthropology of Food and Nutrition
IISD	International Institute for Sustainable Development
INFOODS	International Network of Food Data Systems
INRAN	National Institute for Research on Food and Nutrition, Italy
IOTF	International Obesity Task Force
IPCC	Intergovernmental Panel on Climate Change
ITFPCHD	International Task Force for Prevention of Coronary Heart Disease
LCA	Life Cycle Assessment/ Analysis

MAI-Bari	Mediterranean Agronomic Institute of Bari, Italy
MAP	Mediterranean Action Plan
MD	Mediterranean diet
MDF	Mediterranean Diet Foundation
MDP	Mediterranean Diet Pattern
MENA	Middle East and North Africa
NCDs	Non-Communicable Diseases
NGOs	Non-Governmental Organizations
OECD	Organization for Economic Cooperation and Development
PDO	Protected Designation of Origin
PREDIMED	Prevention with Mediterranean Diet
SCP	Sustainable Consumption and Production
SD	Sustainable Development
SDC	Sustainable Development Commission, UK
SDI	Sustainable Development Indicators
SEMC	Southern and Eastern Mediterranean Countries
SME	Small and Medium Enterprises
ULPGC	University of Las Palmas de Gran Canaria
UK	United Kingdom
UNCSD	United Nations Commission on Sustainable Development
UNDESA	United Nations Department of Economic and Social Affairs
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UN-HLTF	United Nations System High Level Task Force on Global Food Security
UOC	Universitat Oberta de Catalunya, Spain
WFP	World Food Programme
WHO	World Health Organization
WWF	World Wildlife Fund for Nature

## Key messages

- Food and nutrition security is still a problem in many Mediterranean countries, especially southern and eastern ones, while obesity and overweight are also becoming a new challenge.
- Today, the main concern for the Mediterranean food and agricultural sector is to provide simultaneously enough food, in quantity and quality, to meet the nutritional needs of a growing population and to conserve natural resources for future generations.
- Changes towards optimizing both food consumption and food production are important to ensure more sustainable food systems and to achieve food and nutrition security in the Mediterranean region.
- To satisfy the increasing food demand - due mainly to changing food consumption patterns and population growth - food production has to become more efficient with a decrease in food losses and waste and an increase in diet sustainability.
- The Mediterranean diet is widely considered as a healthy dietary pattern and a greater adherence to the Mediterranean diet has been associated with significant improvements in health and nutritional status. It has also been recognized as a sustainable diet because of its lower environmental impact.
- However, current data show a decline in adherence to the Mediterranean dietary pattern in northern as well as southern and eastern Mediterranean countries that is critically eroding the Mediterranean diet heritage, recognized in 2010 by UNESCO as an intangible cultural heritage of humanity.
- The abandonment of traditional habits and the emergence of new lifestyles associated with socioeconomic changes pose important threats to the preservation and transmission of the Mediterranean Diet to future generations.
- It is urgent to preserve the cultural heritage of the Mediterranean diet as an outstanding resource for sustainable development as it contributes to promoting local production and consumption, encouraging sustainable agriculture and safeguarding landscapes.
- The promotion and the enhancement of the Mediterranean diet is a critical issue for sustainable development to counteract food insecurity and malnutrition in the Mediterranean region.
- All main stakeholders in the agro-food sector in the Mediterranean region should cooperate towards increasing the sustainability of food consumption and production patterns to achieve food and nutrition security.
- Biodiversity also emerges as a crucial component between sustainability and public health that should be taken into consideration.

## Summary

Today, the principal challenge for the food and agricultural sector is to provide simultaneously enough food, in quantity and quality, to meet nutritional needs and to conserve natural resources for present and future generations. FAO estimates that to satisfy the needs of a growing and richer population with an increased demand for animal products, food production will have to increase by 60 percent towards 2050 (FAO, 2012b). This figure can be reduced by improving production efficiency, changing diets and decreasing food losses and waste.

Food consumption and production trends and patterns are among the most important drivers of environmental pressures. Agro-food systems need to grow within the context of a finite and sometimes shrinking resource base, and must use natural resources in a sustainable manner to preserve the ecosystems on which they rely. Such growth needs to be inclusive and target broader objectives than just primary production; it must include efficiencies along the whole food chain to promote sustainable practices and diets, inside a coherent cultural and social framework. This can be achieved through sustainable food consumption and production driven by the promotion of more sustainable dietary models. Recently, FAO has started to study the concept of sustainable diets in order to design methods and indicators for their assessment in different agro-ecological zones.

In 2010, FAO and Bioversity International organized an international scientific symposium on “biodiversity and sustainable diets”. One of the major outcomes of the symposium was a consensus position on the following 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 optimizing natural and human resources”* (FAO/Bioversity, 2010).

The Mediterranean diet has been well characterized scientifically. It is also recognized as a healthier dietary pattern. It is now being analysed in many surveys and is appreciated for its lower environmental impact. For these characteristics and, because it involves a large number of countries, the Mediterranean diet - recognized by UNESCO as an intangible cultural heritage - has been selected by FAO and CIHEAM for the assessment of diet sustainability models.

However, despite the well-documented health and environmental benefits of the Mediterranean diet, current data show a *decline* in adherence to the Mediterranean diet pattern in the Mediterranean area.

The Mediterranean region is passing through a “nutritional transition” in which problems of under-nutrition coexist with overweight, obesity and food-related chronic diseases. This nutrition transition is alarming as it has negative impacts on health systems. The key nutrition challenges facing the eastern and southern Mediterranean region are protein–energy malnutrition, micronutrient deficiencies, obesity and nutrition-related chronic diseases.

Drivers of consumption patterns and lifestyles are economic, technological, cultural, social and political. Global consumption levels and patterns are affected, among others, by population growth, urbanisation and the rise in affluence and living standards.

Fundamental and radical changes in the whole food systems are indispensable for achieving sustainable food and nutrition security in the Mediterranean region.

Improving sustainable food consumption patterns in the Mediterranean region requires sustainable supply chains, minimizing pressure on natural resources and externalities over the life-cycle - including the reduction of water consumption, and of food losses and waste - and promoting sustainable diets.

Given the importance of food consumption patterns as drivers of human well-being as well as environmental degradation, urgent steps must be taken to assess current food consumption patterns and promote the Mediterranean diet as a sustainable dietary pattern through the development of methods, indicators and policy guidelines.

Transition towards sustainable food systems in the Mediterranean region will require developing a set of comprehensive, coherent, integrated and holistic policies that deal with different spheres and areas of agriculture, environment (land, water and biodiversity), nutrition, health, economy, lifestyle, society, trade and culture.

Coordinated actions are needed at local, national and regional levels, in the Mediterranean countries, with the support of the private sector and the civil society, to strengthen the sustainability of the food systems.

The objective of this paper is to stimulate a multidisciplinary networking dialogue among the Mediterranean scientific community's members on the sustainability of the current food consumption and production patterns in the Mediterranean region.

## **I – Objectives of the white paper**

This white paper aims at contributing to the overall development of the Feeding Knowledge Programme, and of its Euro-Mediterranean Network on Research and Innovation for Food Security. In particular, it is addressed to the priority 5 “Mediterranean food consumption patterns: diet, environment, society, economy and health” to facilitate an interdisciplinary dialogue and exchange among members of the scientific community on the need to improve the sustainability of food consumption patterns and diets in the Mediterranean area and to achieve the goal of food and nutrition security.

The objective of this document is to highlight the role that the current food consumption patterns play in food and nutrition security, public health, environment protection and socio-economic development in the Mediterranean region. The ultimate aim is to stimulate a multidisciplinary dialogue among the Euro-Mediterranean scientific community on the sustainability of current food consumption and production patterns in the Mediterranean region and beyond, to identify the research activities and policy actions needed to move towards more sustainable Mediterranean food systems.

The paper addresses several interdisciplinary and interdependent issues related to food consumption patterns; sustainable diets; health implications of the current food consumption patterns; food environmental footprints; food production systems; food economics; food cultures and sociology; food losses and waste; food system governance and policies.

## **II – Rationale**

Food security, as defined by the World Food Summit in 1996 (FAO, 1996) and revised then in the World Summit on Food Security in 2009 (FAO, 2009), depends on four pillars: (i) Food availability: sufficient quantities of food available on a consistent basis; (ii) Food access: physical and economic access to appropriate foods for a nutritious diet; and (iii) Food use: appropriate use based on appropriate means and knowledge of basic nutrition and care; (iv) Stability in food availability, access and utilization.

Food security is a complex sustainable development issue, linked to health through malnutrition, but also to economic development, environment, and trade. Food insecurity has significant

consequences for individuals as well as for society, including malnutrition, obesity, disease, and poverty.

The cost of malnutrition is both direct and indirect, because overnutrition, like undernutrition, not only has an immediate deficit impact on public health systems, but also an indirect impact on the gradual deterioration of human capital and the inevitable loss of productivity (Hassan-Wassef, 2012). The extent and severity of the health problems linked to food, which affect development, social activity and human beings' creative and productive capacity, have moved the food security issue higher up in the range of global concerns (Hassan-Wassef, 2012).

Unsustainable food consumption and production patterns are increasing food insecurity and putting more stress on ecosystems, the supply of resources, goods and services, and human social systems and well-being. Food consumption and production patterns are among the most important drivers of environmental pressures: land degradation, declining soil fertility, unsustainable water use, over fishing, and marine environment degradation. The social and economic costs of diet-related illnesses are straining individuals, families and national healthcare budgets. Consumption trends, through their direct impact on food accessibility, are adversely affecting food and nutrition security especially of the poor in developing countries.

The challenge of feeding the growing world population, which is expected to reach 9 billion people in 2050, requires new strategies and new multicultural and multisectorial rethinking capable of generating new forms of dialogue, at different levels, towards a more sustainable use of the available natural and human resources, to ensure food and nutrition security (Godfray *et al*, 2010). Eating patterns, which are important drivers for building sustainable agricultural and food systems, are often neglected in the research and policy areas (Guyomard *et al*, 2011).

In the early 1980s, the notion of "sustainable diets" started to be explored to recommend diets which would be healthier for the environment as well as for consumers (Gussow and Clancy, 1986). But, with food globalization and the increased industrialization of agricultural systems, with no attention to the sustainability of agro-food ecosystems, the sustainable diet concept was abandoned for many years.

In the late 1990's the Convention on Biological Diversity (CBD) and its governing body, the Conference of the Parties (COP), began to recognize the importance of biodiversity for ensuring food security. By 2004, the COP formally acknowledged the linkage between biodiversity, food and nutrition, and the need to enhance sustainable use of biodiversity to combat hunger and malnutrition. Two years later, the COP adopted the framework for a cross-cutting initiative on biodiversity for food and nutrition (Toledo and Burlingame, 2006), and by 2010, this initiative has merged with the work on sustainable diets (FAO/Bioversity, 2012).

Recently, the interest in sustainable diets has again been raised by international scientific societies and UN agencies (American Dietetic Association, American Nurse Association, American Planning Association and American Health Association, 2010; American Public Health Association, 2007; DEFRA, 2009, 2011; FAO/Bioversity, 2012; FAO, 2010, 2012b; UNEP, 2012a, 2012b; UNSCN, 2012). A growing body of evidence of the non-sustainability of current dietary trends published in technical reports (EC/JRC, 2009; SDC, 2009, 2011; WWF, 2011; Esnouf *et al*, 2013; Plumiers and Blonk, 2011; Guyomard *et al*, 2011) has further highlighted sustainable diets as an important element for a shift towards sustainable food consumption and production.

Food consumption is variably affected by a whole range of factors including food availability, food accessibility and food choices, which in turn may be influenced by geography, demography, disposable income, socio-economic status, urbanization, globalization, religion, culture, marketing, and consumer attitude (Kearney, 2010). A recent study (Kastner *et al*, 2012) indicates an inverse relationship between the two main drivers for increased land requirements for food production: with socioeconomic development, population growth decreases and, at the same time, diets

become richer in energy density. In many regions, dietary change may override population growth as the major driver behind land requirements for food in the near future.

There is growing evidence of the cost of diets for the environment, society and public health nutrition (Haines *et al*, 2009; Holdsworth, 2010; Hawkesworth *et al*, 2010; Lock *et al*, 2010; O’Kane, 2012; Delaney Burke, 2012; Clonan and Holdsworth, 2012). A growing body of research is showing that the achievement of substantial reductions in food-related GHG emissions to mitigate climate change must be addressed, not only by how we produce and distribute our food but also by what we eat (Marlow *et al*, 2009; Garnet, 2011; Macdiarmid *et al*, 2012; Vieux *et al*, 2012). Recommendations for lowering energy inputs and greenhouse gas emissions from household food consumption include diets with less meat and dairy products, more in-season vegetables and more locally produced and fresh foods (Carlsson-Kanayma, 1998, 2009; Carlsson-Kanayma *et al*, 2003; Trichopoulou, 2012).

A European Commission study (EC/JRC, 2009), which analysed the impact on the European environment caused by changes in the European diets, showed that current food consumption accounts for 27% of all environmental impacts in the EU-27, and highlighted a prominent role of meat production on environmental impacts generated along the food chain. Also, the European study pointed out that suggested dietary alterations imply changes in the structure of agricultural and food production sectors but that the impact on existing production structures would be limited, while more environmental benefits from a change in diet in the EU-27 will occur at a global level (EC/JRC, 2009).

According to studies on of “food miles”, transport represents only a small part of overall food chain emissions and, therefore, “food miles” are a poor indicator of food impacts (Garnet, 2011; Edwards-Jones *et al*, 2008; Weber and Matthews, 2008; AEA Technology Environment, 2005), even if it does vary considerably, depending on country of origin and cultivation or production systems (Sim *et al*, 2007). It is important to acknowledge that ‘food miles’ should not be used as a main indicator for the environmental impacts of food products. The assumption that locally grown food is better for the environment is not always true, as some regions of the world employ more resource- efficient practices than others for the same production (Kissinger, 2012).

Sustainability, water, food security and diets are intimately connected. With rising incomes and urbanisation, dietary patterns with pronounced regional and cultural differences are shifting towards consumption patterns higher in animal products, which increase water demand (Renault and Wallender, 2000; Lundqvist *et al*, 2008). Dietary patterns with high meat consumption require more energy, water and land resources (Pimentel and Pimentel, 2003; Gerbens-Leenes and Nonhebel, 2005).

The Mediterranean diet, acknowledged by UNESCO as an intangible cultural heritage, has been well scientifically characterized also as a healthier dietary pattern, and is a recommended plant-based dietary pattern (Bach-Faig *et al*, 2011). It is now being analysed in many surveys and appreciated for its lower environmental impact (Gussow, 1995; Duchin, 2005; Baroni *et al*, 2007; EC/JRC, 2009; CIISCAM, 2009; Barilla Center for Food and Nutrition, 2010; Burlingame and Dernini, 2011; FAO/CIHEAM, 2012; Dernini *et al*, 2013; Sáez Almendros *et al*, 2013<sup>1</sup>).

For these characteristics and, because it concerns a large number of countries, the Mediterranean diet has been jointly identified by FAO and CIHEAM as a case study for its assessment as a sustainable diet model. The Mediterranean diet has nutritional, economic, environmental and socio-cultural characteristics that make it particularly relevant for such a case study for the characterization of sustainable diets in different agro-ecological zones.

The case study of the Mediterranean diet as a sustainable diet model may clarify what is required for an environmentally sustainable food system and for more eco-friendly food based dietary guidelines. It should lead to innovative intersectoral efforts to counteract the degradation of

ecosystems, loss of biodiversity and simplification of diets through the improvement of sustainable dietary patterns culturally accepted in the Mediterranean region.

The improvement of the sustainability of the food consumption patterns, with particular attention to enhancement of the sustainability of the Mediterranean diet, as a country-based sustainable diet model, and to the reduction of food waste and losses, is a critical priority for the food and nutrition security in the entire Mediterranean region in general, and southern and eastern Mediterranean countries in particular.

In the final declaration of their 9<sup>th</sup> meeting - held in Malta on September 27, 2012 - the Mediterranean Agriculture ministers underlined “...*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*” (CIHEAM, 2012).

Recent events in the Middle East and North Africa (MENA) region have put more attention and pressure on food security. Therefore, it appears necessary to engage even more in strengthening and furthering research and political actions in sustainable food consumption and production in the Mediterranean region (Hassan-Wassef, 2012).

The sustainability of the Mediterranean food systems is under a pressing threat as it was forecasted in the 2005 Mediterranean Strategy on Sustainable Development: “*Mediterranean agricultural and rural models, which are at the origins of Mediterranean identity, are under increasing threat from the predominance of imported consumption patterns. This trend is illustrated in particular by the decline of the Mediterranean dietary model despite the recognized positive effects on health. The prospective scenario for the expected impacts of trade liberalization, climate change and the lack of efficient rural policies offers a gloomy picture in some southern and eastern Mediterranean countries, with the prospect of aggravated regional imbalances, deeper ecological degradation and persistent or accrued social instability.*” (UNEP/MAP, 2005).

One of the most important challenges faced especially by southern and eastern Mediterranean countries is food and nutrition security (FAO, 2011a). The Mediterranean area in general and SEMC in particular are passing through a “nutrition transition” in which malnutrition problems (protein–energy under-nutrition and micronutrient deficiencies) coexist with over-nutrition problems (overweight, obesity), and food-related chronic non-communicable diseases. This nutrition transition is alarming as it has negative impacts not only on health systems but also dramatic economic, social and environmental implications. These interdisciplinary issues are interdependent or related, directly or indirectly, to the sustainability of Mediterranean food consumption patterns especially the decrease of adherence to the traditional Mediterranean diet (WHO, 2010).

Many developing countries are undergoing diet transitions bringing them closer to the diets prevalent in the western countries, i.e. with more energy-dense foods. There follows an increase in the incidence of diet-related non-communicable diseases, which are superimposed on the health problems related to undernutrition that still afflict them. Wider adoption of food consumption patterns akin to those of the Mediterranean diet hold promise of contributing to mitigate adverse effects of diet transitions (Alexandratos, 2006).

Across the Mediterranean region, there is “*unequalitarian drift*” in the current relation between northern Mediterranean countries and southern and eastern ones, where many difficulties are encountered due to the existing economic and social disparities. In fact, the macroeconomic indicators of the Mediterranean region emphasise the marked heterogeneity among the countries and a growing gap between the advanced economies in the northern shores and less developed ones in the southern/eastern ones. Moreover, other social and economic features make a contribution to the considerable development differences between the two Mediterranean shores

(Hervieu and Thibault, 2009): the demographic divide; the densely populated rural areas; the natural resources (soil and water) scarcity; the erosion of the Mediterranean diet model; and the climate change and the loss of biodiversity.

In many Mediterranean countries eating habits are changing following the introduction of Western style dietary patterns. The urbanisation of society, the integration of women into the labour market and retail development are modifying considerably dietary behaviour. Such changes are disrupting the long-established ecological, social and economic equilibriums of the area (Boulier, 2012). The loss of agricultural diversity occurring around the Mediterranean basin is having negative repercussions on the food security and livelihood of populations living in the region. An exacerbation of the genetic erosion of agro-biodiversity due to globalization trends and climate change is reducing the sustainability of local production systems, along with the capacity to safeguard the Mediterranean Diet heritage, based on indigenous food species and varieties (FMFC, 2010).

The Mediterranean agrarian landscape, in its ecological, cultural, social and economic dimensions, is mostly a food-based landscape inextricably linked to the Mediterranean diet. The symbolic value of food and its identification and differentiation has led to the creation of strong links between local food and local heritage and identity, the construction of *cuisines de terroir(s)* and, according to economic values, to local-food production knowledge and skills through the establishment, for example, of systems modelled on geographical indication of provenance (FAO, 2004; 2009). These products of origin-linked quality are strongly connected to the sustainability of the Mediterranean area by contributing to rural development and the preservation of biodiversity (Vasilopoulou *et al*, 2013).

The Mediterranean diet concept has nutritional, economic, environmental and socio-cultural characteristics that make it particularly relevant as a case study for the characterization of sustainable diets in different agro-ecological zones.

In 2010, the inscription of the Mediterranean diet on the UNESCO Representative List of the Intangible Cultural Heritage of Humanity was approved with the following description:

*The Mediterranean diet constitutes a set of skills, knowledge, practices and traditions ranging from the landscape to the table, including the crops, harvesting, fishing, conservation, processing, preparation and, particularly, consumption of food. The Mediterranean diet is characterized by a nutritional model that has remained constant over time and space, consisting mainly of olive oil, cereals, fresh or dried fruit and vegetables, a moderate amount of fish, dairy and meat, and many condiments and spices, all accompanied by wine or infusions, always respecting beliefs of each community. However, the Mediterranean diet (from the Greek **diata**, or way of life) encompasses more than just food. It promotes social interaction, since communal meals are the cornerstone of social customs and festive events (UNESCO, 2010).*

The Mediterranean diet is the alive and evolving result of the millennial history of the Mediterranean (Berry *et al.*, 2011). The Mediterranean diet is transmitted from generation to generation, and it is constantly recreated by communities and groups in response to the change of their environment and their history.

The general term “*Mediterranean diet*” implies a common dietary pattern in Mediterranean countries; however, there are differences in the dietary patterns of the Mediterranean populations (Keys, 1970; Kromhout *et al*, 1989; Trichopoulou and Ligiou, 1997). The Mediterranean diet is characterized by its links to the various food cultures and traditions of the different countries of the Mediterranean area. Mediterranean diets are far from homogeneous; they involve a wealth of typical products and are extremely varied. This “*dietary polymorphism*” partially reflects religious and cultural differences (Manios *et al*, 2006; Berry *et al*, 2011). The most important factors that contributed to this huge diversity of foods and diets in the Mediterranean are:

extremely varied geographical and ecological environments; succession of different dominant peoples (Hebrews, Phoenicians, Greeks, Carthaginians, Romans, Arabs, Byzantines, Ottomans, Spanish, Portuguese, etc.) that introduced and/or diffused different crops and foods throughout the Mediterranean basin.

There is a contrast in food intake patterns between the Northern Mediterranean countries, Balkan countries and Southern Mediterranean countries. Diets in Southern Mediterranean countries are mainly vegetarian as only a small proportion of calories is of animal origin; cereals are the basic ingredient and pulses the main protein source. In Northern Mediterranean countries, food intake has higher animal produce content. Balkan countries have an intermediate diet and intake structure; their diet is richer in animal products than in Southern Mediterranean countries but contains more cereals and pulses than in Northern Mediterranean countries (Padilla, 2008). It is noteworthy that significant dietary differences can be observed even within the same country. In Italy, for instance, the consumption of cereals, fruit and vegetables is higher in the southern part of the country (Lupo, 1997).

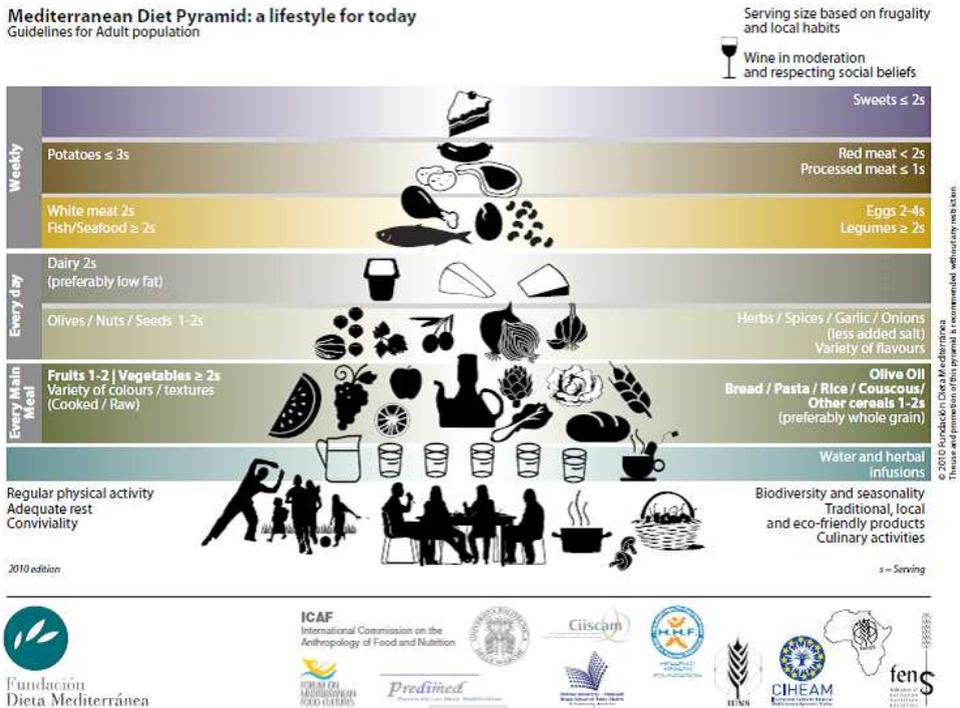
The importance of the Mediterranean diet as an example of a sustainable diet lies, not only in its specific foods and nutrients, but also in the methods used to characterize and analyse it and the philosophy of sustainability that is at its core (Burlingame and Dernini, 2011).

The Mediterranean diet has been widely scientifically reported to be a model of healthy eating and a greater adherence to the Mediterranean diet is associated with significant nutrition and health benefits (Willett *et al*, 1995; Nestle, 1995; ITFPCHD, 2000; Serra-Majem *et al*, 2006; Sofi *et al*, 2008; Maillot *et al*, 2011). The health benefits of the Mediterranean Diet and its prophylactic effects against chronic diseases has been well established by the scientific community, since the pioneer *Seven Countries Study*, conducted by Ancel Keys established the association of a traditional Mediterranean dietary pattern with a markedly reduced incidence of coronary heart disease mortality (Keys, 1970, 1980; Keys and Keys, 1975). On the basis of this initial knowledge, scientists constructed dietary scores of adherence to the traditional Mediterranean Diet by indexing positively those beneficial foods which are mostly consumed in traditional Mediterranean diets, and negatively the foods less consumed and more typical of the western industrialized world (Trichopoulou *et al*, 1995; Menotti *et al*, 1999; Sánchez-Villegas *et al*, 2003; Fidanza *et al*, 2004; Serra-Majem *et al*, 2004, 2006; Bach *et al*, 2006; Gerber, 2006; Issa *et al*, 2011). Indeed, numerous more recent studies confirmed that better adherence to the traditional Mediterranean Diet is systematically associated with a markedly reduced risk of cardio-vascular events and mortality (Trichopoulou *et al*, 2003, 2005, 2009; Martínez-González *et al*, 2002, 2009; Estruch *et al*, 2013, 2006; Buckland *et al*, 2008, 2009; de Lorgeril *et al*, 1994; Mendez *et al*, 2006; Panagiotakos *et al*, 2006; Sánchez-Villegas *et al*, 2006; Zazpe *et al*, 2011); with a lower incidence of the metabolic syndrome (Tortosa *et al*, 2007; Babio *et al*, 2009; Kastorini *et al*, 2011; Kesse-Guyot *et al*, 2012) and of type 2 diabetes (Martínez-González *et al*, 2008). The data from a series of case-control studies showed, in general, that high intakes of foods typical of the traditional Mediterranean dietary pattern – i.e. fruit, vegetables, whole grains, olive oil and fish – were associated with a reduced risk of developing various types of cancers (La Vecchia, 2004; Bosetti *et al*, 2009; Vernele *et al*, 2010).

In 2005, “the Rome Call for a Common Action on Food in the Mediterranean” (FMFC, 2005), further re-activated the process of interdisciplinary dialogue started in 2002 by the Forum on Mediterranean Food Cultures, CIHEAM MAI-Bari, Mediterranean Diet Foundation and Sapienza University of Rome, among the international Mediterranean diet scientific community for a consensus position on a redefinition of the Mediterranean diet (Serra-Majem *et al*, 2004a). This process continued in 2009, at the 3<sup>rd</sup> International CIISCAM Conference, held in Parma, Italy, where a consensus position was reached on a new revised, updated and unpatented Mediterranean diet pyramid as well as on the Mediterranean diet as an example of a sustainable diet (CIISCAM, 2009). In 2010, this new Mediterranean diet pyramid was further developed at the

8<sup>th</sup> International Congress on the Mediterranean diet, held in Barcelona, Spain (Bach-Faig *et al*, 2011; Dernini *et al*, 2012).

The new revised Mediterranean Diet pyramid was conceived as a simplified main frame in order to be adapted to the different country specific variations related to the various geographical, socio-economic and cultural contexts of the contemporary Mediterranean lifestyle. To counteract the current dramatic decline of the healthy traditional Mediterranean diet pattern all around the Mediterranean area, it was aimed at better popularizing its applicability for present daily lifestyle, without leaving out the different cultural and religious traditions and different national identities present in the Mediterranean area. The concept of frugality and moderation was emphasized because of the major public health challenge of obesity.



**Figure 1. The new Mediterranean diet pyramid (Source: Bach-Faig *et al*, 2011).**

This new revised Mediterranean diet was presented as an example of a sustainable diet, in which nutrition, local food productions, biodiversity, culture and sustainability are strongly connected together, with a lower impact on the environment. The concepts of seasonality, fresh and locally grown products, culinary activities, biodiversity, traditional, local and eco-friendly products, of variety of colours for fruits and vegetables were introduced together with main meals, conviviality and physical activity. Main foods included in the common food basket are: an abundance of olive oil and olives, fruits, vegetables, cereals (mostly unrefined), legumes, nuts and fish, moderate amounts of dairy products (preferably cheese and yoghurt) and low quantities of meat and meat products. Wine in moderation was considered acceptable when it was not contradictory to religious or social norms.

The Mediterranean diet, through its new revised pyramidal representation (Bach-Faig *et al*, 2011), shows that it not only offers considerable health benefits but also respects the environment. In fact, the various represented food groups in the pyramid can also be evaluated in terms of their environmental impact.

But despite the well-documented health and environmental benefits of the Mediterranean diet, current data show a decline in adherence in Northern, Southern and Eastern Mediterranean countries (IOTF, 2005; Garcia-Closas *et al*, 2006; Belahsen and Rguibi, 2006; da Silva *et al*, 2009; Vareiro *et al*, 2009; León-Muñoz *et al*, 2012). The evolution of food consumption in the Mediterranean countries is not encouraging, as these countries have followed the trend towards higher proportions of energy-dense foods (Alexandratos, 2006).

Paradoxically, just as the Mediterranean diet is becoming more popular in the world and increasingly recognised by the international scientific community, the Mediterranean populations are moving further and further away from this dietary model (Lacirignola and Capone, 2009).

### III – Analysis of problems and assessment indicators

The main health, nutrition, economic, cultural, social, environmental issues related, directly or indirectly, to the ongoing nutrition transition and decrease in adherence to the Mediterranean dietary patterns – two parallel processes that are undermining the very bases of food and nutrition security – in Mediterranean countries in general, and SEMC in particular, are briefly discussed hereafter. A preliminary list of indicators for assessing the sustainability of the current Mediterranean food consumption patterns and transition towards more sustainable food systems is also proposed as a basis for further discussion.

#### 1. Problem analysis

Recent trends and projections in the Mediterranean area (UNEP/MAP/Plan Bleu, 2011, 2010, 2008, 2006; Plan Bleu, 2012; FAO, 2012a; UNEP/MAP, 2005) were analysed to identify priority challenges to be addressed for improving the sustainability of the diets and food consumption patterns in the Mediterranean area.

##### ***A. Nutrition and health: malnutrition and decline of the adherence to the Mediterranean diet pattern***

The Mediterranean area could be described as passing through a “nutritional transition” in which problems of under-nutrition coexist with overweight, obesity and food-related chronic diseases. Comparative regional data are shown in the Global Nutritional Index (Rosenbloom *et al*, 2008).

Under-nutrition is still significant in the South of the Mediterranean: 9.2 million people in 2001-03, 3.9% of the population of the zone, compared with 7.3 million people in 1990-92, 3.8% of the population (CIHEAM, 2008). Data referring to 2008 show that the rates of stunting amongst children under five years of age is also very high in many Southern and Eastern Mediterranean countries: 26.3% in Albania, 14.9% in Algeria, 10.5% in Bosnia and Herzegovina, 1.0% in Croatia, 28.9% in Egypt, 12.0% in Jordan, 10.8% in Lebanon, 20.7% in Libya, 22.5% in Morocco, 10.2% in Palestine, 0.5% in Serbia, 27.7% in Syria, 6.2% in Tunisia (UNICEF, 2012), and 10.3% in Turkey (Hacettepe University, 2009; UNICEF, 2012).

According to WHO, overweight and obesity rates in Mediterranean countries continue to rise. Currently reported rates for overweight and obesity are as follows: 54.4 and 21.3% in Albania; 45.5 and 16.0% in Algeria; 67.9 and 33.1% in Egypt; 50.7 and 18.2% in France; 53.7 and 20.1% in Greece; 54.1 and 19.8% in Italy; 61.8 and 27.4% in Lebanon; 64.3 and 28.8% in Malta; 46.8

and 16.4% in Morocco; 59.1 and 24.0% in Portugal; 62.0 and 26.6% in Spain; 53.7 and 22.3% in Tunisia; and 61.9 and 27.8% in Turkey (WHO, 2011).

Recent surveys are pointing out that many countries in the Mediterranean area are drifting away from the Mediterranean diet healthy pattern and current Mediterranean food consumption patterns show a decline in their adherence to the traditional Mediterranean diet (IOTF, 2005; Garcia-Closas *et al*, 2006; Belahsen and Rguibi, 2006; da Silva *et al*, 2009; Vareiro *et al*, 2009; León-Muñoz *et al*, 2012). In the decline of the adherence to the MD, there are two major concerns: an increase in the consumption of saturated lipids (e.g. meat, dairy products, etc.) and sugar, and a decrease in the consumption of complex carbohydrates (e.g. cereals and legumes). A recent study clearly showed that the easiest way to reach all nutrient recommendations was to select more Mediterranean-type food (Maillot *et al*, 2011).

In the Southern Mediterranean countries, populations are suffering from under-nutrition as well as chronic nutrition-related diseases, which are increasingly leading to disabilities and death. The data reported on this region show that there is a shift in dietary habits from a traditional Mediterranean Diet to industrial food, which could explain, in part, the nutritional and metabolic disorders reported in the region's population. Unhealthy eating practices in the Southern Mediterranean countries include high consumption of saturated fats and refined carbohydrates, low consumption of fibre, and sedentary behaviours (Belahsen and Rguibi, 2006).

In the Northern Mediterranean countries, there is a growing trend of obesity and over-weight with increased chronic nutrition-related diseases. There are three trends which can be identified here: 1) a tremendous increase in the consumption of lipids, which is explained by the higher consumption of animal fats (dairy products and meat consumption increasing as income rise), but even more by the consumption of vegetable oils used for cooking and seasoning or included in various industrial foodstuffs; 2) an increase in the consumption of simple carbohydrates, connected in particular with the consumption of beverages and foodstuffs with a high carbohydrate content, and a simultaneous decrease in the consumption of starches (bread consumption has dropped by half in the last 50 years in France, and potato consumption has dropped by two-thirds over the same period); and 3) a change in the total protein content, where the share of animal proteins is increasing to the detriment of vegetable proteins (Padilla, 2008).

The Mediterranean diet is inextricably linked to biodiversity. Indeed, biodiversity plays a key role in ensuring dietary diversity as nutrient composition between foods and among varieties/cultivars/breeds of the *same* food can differ dramatically. In order to guarantee that local Mediterranean diets are healthy, and that the average levels of nutrient intake is adequate, it is important that the biodiversity level is kept high. Mediterranean local food biodiversity has received relatively little attention concerning its nutritional value in the scientific literature, especially on nutraceuticals from plant species, with potential health benefit effects, traditionally used in rural communities (Heinrich *et al*, 2006).

### **B. Economy: population growth, urbanization, food prices, food waste**

Population growth in the Mediterranean Basin is marked by a widening gap between the northern and southern shores: in the North, the growth rate is levelling off and the population is ageing, whereas the population in the South is increasing rapidly and steadily. Between 1990 and 2010, the Mediterranean population has grown at an average annual rate of 1.16 %, from 374 million to 473 million inhabitants. Today, 25% of the Mediterranean population is under 15 years of age and 25% of the 15 to 24-year olds are unemployed. As demonstrated in the recent events of the Arab spring, the construction of a sustainable future for the Mediterranean's young population is one of tomorrow's major challenges (Plan Bleu, 2012).

For the Mediterranean area, the globalisation of the economic field is introducing changes in the distribution and availability of food products (imports, commercial innovation, and transformation

of retail sales). At the same time changes in lifestyles and food habits are being introduced as a result of this transition from tradition to modernity (Florensa and Aragall, 2012).

The urbanization of society, the integration of women into the labour market and retail development are deeply modifying Mediterranean dietary and lifestyle patterns. New forms of distribution and sales are increasing the availability of certain food products leading to a loss of the Mediterranean food structure in northern countries and notable food imbalances in southern countries (Florensa and Aragall, 2012).

Within the globalization process, the pressure from the agro-food market has changed the production methods, i.e. forced the abandonment of some crops, long established livestock farming techniques and traditional crafts. It has imposed new networks and sales systems, and modified consumption habits. This impact entails loss in the knowledge and practices that have contributed historically to the identity of the Mediterranean peoples, and have built a rich and complex food universe in the Mediterranean area (González Turmo, 2012). Recently, the overall perspective of this “most vibrant theatre of human interaction in history” has been well described by Abulafia (2012).

Ancient vineyards, orchards and olive groves have been uprooted to make way for large 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 (Padilla *et al*, 2012).

Price volatility has a strong impact on the poor and on food importing countries, especially where diets are less diversified. It also risks modifying diets, especially of the poorest as they tend to shift to cheaper, less preferred, and often poorer quality foods (HLPE, 2011).

The distribution of food losses and waste along the food chain vary between regions. Relatively speaking, losses in the first part of the food chain, which are due to poor harvesting techniques, lack of transport and poor storage in combination with climate conditions, are more important in developing countries (Lundqvist *et al*, 2008), where 40% of food losses occur at the post-harvest and processing level while in industrialised countries more than 40% of the losses occur at the retail and consumer level, i.e. food is wasted (FAO, 2011b). A study carried out in 2005 to estimate household food waste - using a sample of 500 households in Ankara (Turkey) - showed that waste accounted, on average, for 9.8% of the daily energy intake per person i.e. 215.7 kcal/person (Pekcan *et al*, 2006).

Reducing in the entire Mediterranean area the amount of food lost or wasted throughout the food chain (i.e. from farm to fork) would help improve food security and nutrition. Furthermore, reducing food losses and waste will also ease pressure on water scarcity. To do so, it is crucial to address losses all along the food chain and alert consumers to the environmental impacts of their diets and the negative effects of wasting food.

### ***C. Environment: water scarcity, climate change and biodiversity loss***

Water scarcity is the most critical development problem in the Mediterranean area and the single most important factor in limiting agricultural growth. Water availability in the region has been declining steadily since the late 1950s. Water resources in the Mediterranean region, according to Plan Bleu, are limited, fragile and unevenly distributed (UNEP/MAP/ Plan Bleu, 2008).

The most critical situation is recorded in the Middle East and North Africa (MENA). Water demand has doubled during the second half of the 20th century to reach 280 billion m<sup>3</sup> per year for all riparian countries in 2005. Agriculture is the main water-consuming sector and accounts for 64% of total water demand: 45% in the North and 82% in South and East. According to the projections of the Blue Plan baseline scenario, *water demand is increasingly met by an unsustainable water*

*production* (UNEP/MAP/ Plan Bleu, 2008). Thus, improving the water demand management, water saving, rational water use, and, in some cases, reuse of waste water, even desalination projects to increase water availability especially for agriculture, is of paramount importance for sustainability in the Mediterranean area.

According to the 4<sup>th</sup> IPCC report (IPCC, 2007), the Mediterranean is one of the major regions of the world where global warming will threaten environment and human activities (UNEP/MAP/ Plan Bleu, 2008). Climate change is likely to affect agriculture and food security in the Region primarily through changes in temperature, precipitation, extreme climatic events and sea level rise (Skuras and Psaltopoulos, 2012). Climate change may result in such adverse effects as further deterioration of water scarcity, land degradation, crop failures, loss of rangeland and other vegetation covers, livestock deaths, and fisheries production and quality decline. Desertification is also a major threat to productivity in the South-Eastern Mediterranean countries. People in the dry areas mainly depend on agriculture and exploitation of natural resources for their livelihood and are hard hit by desertification. Of the 243 million hectares of agricultural land resources in the Mediterranean region 63% are located on the southern shores but only 39% are deemed to be arable land. This acreage is decreasing under the pressure of urbanisation and the rapid development of tourism, and soil quality is deteriorating due to the erosion from wind and rainfall, and the intensive use of irrigation (risks of salinization).

The Mediterranean basin is a major centre of plant diversity (Heywood, 1998), one of the eight centres of cultivated plant origin and diversity, with over 80 crops listed (Vavilov, 1951). The Mediterranean basin Biodiversity Hotspot is the second largest hotspot in the world. The rich biodiversity of the Mediterranean terrestrial and marine flora and fauna, including many endemic species, is currently threatened by standardization of cultivation practices, monoculture, chemicals contamination, over exploitation of natural resources, mechanization, and changes in life styles that are affecting traditional production systems across the Mediterranean area and have reduced the spectrum of the biodiversity, particularly relevant in preparing healthy and nutritious food recipes at the foundation of the Mediterranean diet heritage.

Changes in the landscape and ecosystems have increased in recent decades, especially in the Mediterranean. The main pressure on these ecosystems and their biodiversity come from tourism, urban development in coastal areas, over fishing, intensive farming and irrigation, and the abandonment of traditional agricultural practices (Numa and Troya, 2011).

Furthermore, indigenous knowledge on how to recognize, cultivate and use these local crops is also being lost at unprecedented rate. The genetic diversity of food crops and animal breeds is diminishing rapidly. In fact, at the beginning of the 21<sup>st</sup> century it is estimated that only 10% of the variety of crops that have been cultivated in the past are still being farmed, many local varieties being replaced by a small number of improved non-native varieties (Millstone and Lang, 2008).

The disappearance of ecological corridors and the homogenization of the natural mosaics are also threatening the survival and the reproduction of numerous wild species, many of direct economic importance (Zurayk, 2012). Environmental pressure is rising, particularly as a result of tourism, urban concentration in coastal areas, the development of intensive agriculture, the overexploitation of natural resources, overgrazing and the abandonment of traditional agricultural practices. Some effects of these pressures, such as changes in vegetation cover and habitat loss, can be estimated, but others are very difficult to quantify. About 18 percent of Mediterranean species are threatened with extinction, and it is estimated that only 5 percent of the original vegetation remains relatively intact in the Mediterranean region (FAO, 2013). The loss of agricultural diversity occurring around the Mediterranean area could threaten the food security and livelihood of populations living in the region.

Many scientific assessments have sounded the alert about the negative impacts of a thirty-year-old trend of the generalised exploitation of demersal stock that generated a gradual decline of

fish resources and catches in the Mediterranean (Plan Bleu, 2012). For instance, there is over fishing of ground fish some 50% of which are being exploited beyond the limits of biological safety leading to dire consequences for stock survival. According to the latest evaluations carried out by the General Fisheries Commission for the Mediterranean (GFCM), while exploitation is moderate in the case of small pelagic species, large pelagic, and in particular the blue-fin tuna, are in a critical situation. The stock of blue-fin tuna spawning adults is facing a serious risk of depletion. Swordfish are also threatened because of over capture of their young (Plan Bleu, 2012).

#### ***D. Society and culture: homogenization of lifestyles and erosion of the Mediterranean diet cultural heritage***

Food plays a central role in social and cultural life in the Mediterranean area. It is deeply influenced by the evolution of traditional values towards post-modern values as well as by the globalised production system.

Changes in intergenerational relations and gender relations, the role of women in society and interrelations with the rest of the world (tourism and migrations) are having important effects on Mediterranean lifestyles, including westernization of food consumption patterns in the Mediterranean area. These changes are influenced to a large extent by: urbanization, organization of working time, growing participation of women in economic life, fewer household members, fewer generations living together, desocialization, collective environment (Padilla, 2008, Berry and De Geest 2012). With the spread of compulsory schooling the collective environment is gradually replacing the traditional family group, and this is happening at an increasingly early stage in people's lives. Young people's tastes are now formed to a large extent outside the family, in places where food is simplified and industrialized and rarely reflects Mediterranean traditions.

The population in the South is mainly young. By 2020, 36% of the population in the South will be under 20 years of age compared to 20% in the North. Young people who are going through the phase of a break between generations ("adolescent revolt") are more open to media influences and fashion trends, and cultivate a certain degree of ambiguity between modern food which has a social identity appeal and traditional food (Padilla, 2008).

For all these reasons, the Mediterranean diet pattern is presently in decline among consumers because of standardization of lifestyles, loss of awareness and appreciation, particularly among younger generations, about their own cultural food heritage.

Despite its increasing popularity worldwide, the Mediterranean diet, inscribed by UNESCO, in 2010, in the Representative List of Intangible Cultural Heritage of Humanity, is today endangered in all countries of the Mediterranean area. The abandonment of traditional healthy habits and the emergence of new lifestyles associated with socioeconomic changes pose important threats to the preservation and transmission of the Mediterranean diet to future generations (Dernini, 2011). The inscription of the Mediterranean Diet in the Intangible Cultural Heritage List of UNESCO has put on the sustainability agenda, as a safeguarding measure, the utmost critical need of the inventory of this "intangible heritage". This inventory is both a complex process and indispensable tool in order to evaluate and decide what, and how, the intangible cultural heritage of the Mediterranean diet should be protected and transmitted (Reguant-Aleix and Sensat, 2012). However, there is at the present moment, three years later of the Declaration, a big deficit, especially in the government and public policies level, to act practically in relation to safeguarding the Mediterranean Diet. A real work of this nature is still urgent (González Turmo & Medina, 2012).

## **2. Assessment indicators**

In the context of sustainable consumption and production (SCP), indicators can also show whether a society's consumption and production patterns lead to more socially equitable and environmentally sustainable development. In that regard, indicators of SCP are inextricably linked

to broader sets of indicators on environment and sustainable development, including poverty reduction (UNEP, 2008).

A number of international organisations and some governments have developed sets of indicators for SCP, mostly as part of wider ranging indicator sets for sustainable development (SD) but also as part, or in support of, dedicated SCP strategies (Watson *et al*, 2010). International organisations involved in the development of SCP Indicators and Indicator sets include the UNCSD, its Secretariat in UNDESA and the OECD. More recently UNEP has been involved in providing guidance for developing countries in developing SCP action plans including a model SCP indicator framework for use by these countries (UNEP, 2008). The EU Sustainable Development Strategy required Eurostat to develop a set of Sustainable Development Indicators (SDI) and review and update this every two years.

According to the International Institute for Sustainable Development “*an indicator quantifies and simplifies phenomena and helps us understand complex realities* (IISD, 1997). According to the Organization for Economic Cooperation and Development, an indicator is “*a parameter, or a value derived from parameters, which points to, provides information about, or describes the state of a phenomenon/environment/area, with a significance extending beyond that directly associated with its value*” (OECD, 2003).

According to FAO, *an indicator is not only the data on which it is based; it generally comprises elements (a cut-off value, a frame of reference, a mode of expression, etc.) which allow a relatively universal appreciation of the information it supplies and also facilitate comparison in time and space* (FAO, 2005).

### **A. Criteria for selecting indicators**

To select the most effective indicators, the following criteria were considered (Watson *et al*, 2010):

1. *Relevant to the question being asked.* The indicator should be the best indicator currently available to answer the question;
2. *Understandable*.i.e. clear, simple and unambiguous;
3. *Graphically representable*;
4. *Readily interpretable*.i.e. clear which direction the indicator should develop to lead to greater sustainability;
5. *Relevant* in most EEA Member and collaborating countries *i.e.* not restricted to an issue which is limited to a few member countries;
6. *Monitorable*.i.e. based on data that is readily available in member and collaborating countries, or could be made available at reasonable cost-benefit ratio and with regularity within the time frame of a policy cycle (i.e. updated each year and with maximum four year time delay);
7. *Reliable and consistent*.i.e. data collection and analysis methodologies should preferably be consistent from country to country and at the very least be consistent within a given country from year to year;
8. *Representative*.i.e. can be taken to represent current SCP trends within a given sector, final consumption cluster etc.

From a literature review (Maclaren, 1996) on social, environmental, health and sustainability indicators, the following criteria, commonly used in the process of selecting indicators, were also considered:

- Scientifically valid;
- Representative of a broad range of conditions;
- Responsive to change;
- Relevant to the needs of potential users;
- Based on accurate accessible data;
- Based on data that are available over time;
- Understandable by potential users;
- Comparable with indicators developed in other jurisdictions;
- Cost-effective to collect;
- Attractive to the media; and
- Unambiguous.

In the identification process of the indicators considered relevant, as descriptive of the major issues related to the assessment of the Mediterranean diet's sustainability, the Bellagio sustainability assessment and measurement principles were also taken in consideration (IISD/OECD, 2009). In the identification process of the MD sustainability indicators, was also taken into account the set of indicators provided by the UK department for environment, food and rural affairs for enabling and encouraging people to eat a healthy, sustainable diet (DEFRA, 2009). Were also taken in consideration the sustainable development indicators used to monitor the EU sustainable development strategy (Eurostat, 2011).

### ***B. Potential indicators***

An initial set of indicators to assess the sustainability of the Mediterranean diets was identified at the CIHEAM International Workshop held in 2011 in Bari (table 1).

**Table. 1. Potential indicators for assessing the sustainability of the Mediterranean diet, CIHEAM-Bari 2011.**

	Pressure/ impact indicators	
Thematic areas	Production	Consumption
Environment and natural resources (including agro-biodiversity)	<ul style="list-style-type: none"> <li>- Water footprint</li> <li>- Carbon footprint</li> <li>- Ecological footprint</li> <li>- Energy efficiency</li> </ul>	
	<ul style="list-style-type: none"> <li>- Rate of biodiversity erosion</li> <li>- Share of land under organic agriculture</li> <li>- Share of land under sustainable management</li> <li>- Use of agro-chemicals (pesticides, fertilizers)</li> <li>- Number of CDO, PDO, PGI (food quality labels)</li> <li>- Resilience capacity of production systems</li> <li>- Change in arable land area</li> <li>- Change in aquatic resources</li> <li>- Share of area dedicated to urban and periurban agriculture.</li> <li>- Organic matter content (soil fertility)</li> <li>- Level of food processing</li> <li>- Carrying capacity</li> <li>- Number and acreage (ha) of GMO varieties</li> </ul>	<ul style="list-style-type: none"> <li>- Share of organic and eco-friendly food consumption</li> <li>- Food biodiversity consumption</li> </ul>
Economy	<ul style="list-style-type: none"> <li>- Degree of self-sufficiency (trade balance)</li> <li>- Regional (sub-national) income</li> <li>- Employment</li> <li>- Availability of total supply (products from Mediterranean crops)</li> <li>- Volatility of prices and yields</li> <li>- Fair price /trade</li> </ul>	
	<ul style="list-style-type: none"> <li>- Land price</li> <li>- Economic impact of organic agriculture</li> <li>- Diversification of food production</li> <li>- Number/capacity of farm structures</li> <li>- Number of SME in agro-food</li> </ul>	<ul style="list-style-type: none"> <li>- Food expenditure/weekly or monthly income</li> <li>- Share of home food consumption on total consumption</li> <li>- Cost of obesity and non-communicable diseases (NCDs)</li> </ul>

Society & Culture	<ul style="list-style-type: none"> <li>- Number of traditional products still in use</li> <li>- Number of direct sale outlets and farmer markets</li> <li>- Social Life Cycle Analysis (LCA) index</li> <li>- Gender empowerment</li> <li>- Level of transmission of traditional knowledge to new generations</li> <li>- Number of socio-cultural events on Mediterranean food cultures</li> <li>- Number of training sessions related to Mediterranean food cultures</li> <li>- Number of gastronomic tourism itineraries</li> </ul>	<ul style="list-style-type: none"> <li>- Consumer perception and attitude towards MD</li> <li>- Number of consumer organizations</li> <li>- Level of active involvement of the young in MD promotion</li> </ul>
Nutrition, health and lifestyle	<ul style="list-style-type: none"> <li>- Share of diets that is locally produced</li> <li>- Household food security</li> <li>- Prevalence of obesity and non-communicable diseases</li> <li>- Level of physical activity</li> <li>- Burden of nutrition-related diseases</li> </ul>	<ul style="list-style-type: none"> <li>- Biodiversity and food composition.</li> <li>- Nutrient profile of foods</li> <li>- Food energy density</li> <li>- Level of food processing in the diet</li> </ul>
		<ul style="list-style-type: none"> <li>- Mediterranean diet adherence scores and new Mediterranean diet pyramid</li> <li>- Number of young people adhering to the Mediterranean diet/ food consumption pattern- Level of consumption of traditional foods and dishes</li> <li>- Share of eco-friendly and organic food consumption</li> <li>- Biodiversity in food consumption</li> <li>- Dietary diversity score (food choice)</li> <li>- Ratio fresh/ processed foods</li> <li>- Nutrient adequacy scores</li> <li>- Diet energy density</li> <li>- Nutritional anthropometry</li> <li>- Biochemical measurements of nutritional status</li> <li>- Adequate diet affordability</li> <li>- Frugality</li> <li>- Time spent on food preparation</li> <li>- Time for rest/ sleep</li> <li>- Number of meals consumed with family (conviviality)</li> </ul>

Then, through a series of meetings jointly conducted by CIHEAM MAI-Bari and FAO held from January to June 2012, and through an online brainstorming process, held from June to September 2012, a second set of MD sustainability indicators, still under discussion, was identified together with a first outline of a methodology:

A. Nutrition and health indicators

- A1. Diet-related morbidity/mortality statistics
- A2. Fruit and vegetable consumption/intakes
- A3. Vegetable/animal protein consumption ratios
- A4. Dietary energy supply/intakes
- A5. Dietary diversity score
- A6. Dietary energy density score
- A7. Nutrient density/quality score
- A8. Food biodiversity composition and consumption
- A9. Nutritional Anthropometry
- A10. Physical activity/Physical inactivity prevalence

B. Environmental indicators

- B1. Water footprint
- B2. Carbon footprint
- B3. Nitrogen footprint
- B4. Biodiversity (to be determined)

C. Economic indicators

- C1. Food consumer price index (FCPI): cereals, fruit, vegetables, fish and meat
- C2. Cost of living index (COLI) related to food expenditures: cereals, fruit, vegetables, fish and meat
- C3. Distribution of household expenditure groups: Food
- C4. Food self-sufficiency: cereals, fruit, vegetables
- C5. Intermediate consumption in the agricultural sector: nitrogen fertilizers
- C6. Food losses and waste (to be determined)

D. Socio-cultural indicators

- D1. Collective participation, cohesion, conviviality and commensality: Proportion of meals consumed outside home.
- D2. Involvement of consumer in the preparation of food: Proportion of already prepared meals.
- D3. Traditional diets relevance: Consumption of traditional products (e.g. Proportion of product under PDO (Protected Designation of Origin) or similar recognized traditional food.
- D4. Transmission of knowledge: Mass media activities and products dedicated to traditional food. Proportion of mass media initiatives dedicated to the knowledge of food background cultural value.

## IV – Conceptual framework

In the FAO regional priority framework for the Near East it was pointed out that *“with limited and fragile natural resources, high population growth and an increasing demand for food, the Near East Region is structurally unable to feed itself. In addition, both the prevalence of high poverty rates in some countries and inadequate food consumption patterns are major causes of food insecurity and malnutrition. The Region has wealthy but food-deficient countries as well as poor countries with higher levels of food production, which make the food security challenges of this region somewhat unique. The key objectives of this priority area are to achieve a reduction in hunger and malnutrition in the Region in line with the targets of the World Food Summit (WFS) and the Millennium Development Goals (MDGs) through support of regional and national food security initiatives (FAO, 2012d).*

In some Southern and Eastern Mediterranean countries, the civil and political unrest or revolutions have shown the vulnerability of these countries in terms of food security and the limits of sectoral approaches used in the past to manage interdependent issues connected to food security (Hassan-Wassef, 2012).

By taking in consideration the UN-HLTF comprehensive framework for action on food and nutrition security, an approach for tackling food and nutrition security in the Mediterranean area should require: (i) taking into account the interconnectedness and interactions between the food and nutrition security dimensions – availability, access, utilization and stability; (ii) addressing the full spectrum of food and nutrition security, including food production, procurement and distribution of food, and safety-net strengthening;; (iii) integrating cross-cutting issues - such as gender equity, ecosystems and natural resources management, and climate change mitigation and adaptation - into law, policy and programme design;; and (iv) ensuring multi-sectoral engagement and coordination on agriculture, social security, trade and market, employment, health, education, nutrition, and humanitarian assistance. In practice, adopting a comprehensive approach calls for maximum synergy and coordination among all components of food and nutrition security and the sectors which influence them (UN-HLTF, 2011).

Achieving food and nutrition security involves (a) ensuring consistent availability and accessibility of sustainably-produced, nutritious and safe food; and (b) reducing and/or eliminating losses and waste in food production, processing and consumption. Food production and availability should be increased in ways that are environmentally, socially and economically sustainable (UN-HLTF, 2012).

Considering that in the Mediterranean region (i) present food production and processing, food supply and distribution, and food consumption systems are not sustainable due to biodiversity loss, natural resources degradation, climate change, high energy input for food production and consumption as well as poverty; (ii) present vulnerability of many Mediterranean rural communities, and particularly (iii), Mediterranean diet erosion and increasing consumer behaviours towards over consumption. For all these reasons, urgent measures are needed in Mediterranean countries to promote sustainable food consumption patterns and to enhance better adherence to the Mediterranean diet as a sustainable diet model.

Increased adherence to the Mediterranean dietary pattern among the Mediterranean populations, together with a reduction of food losses and waste, can contribute to the improvement of food security and nutrition in the Mediterranean region in general, and SEMC in particular, by improving the sustainability of Mediterranean food consumption and local production patterns. Moreover, the promotion of seasonality and local products would also reduce food miles with a reduction of emissions due to distribution and transportation.

This increased adherence to the Mediterranean diet will improve dietary diversity and plant-based foods consumption, with lower greenhouse gas emissions. It will contribute to reducing

biodiversity loss and consumption of animal-based food (meat, dairy products) and the use of natural resources, especially water, thus increasing food production, and effectively contributing to climate change mitigation. It is particularly important to take into consideration the fact that water resources are becoming very scarce in the Mediterranean region.

## V – Research needs

The challenge of feeding the growing world population requires strategies and multicultural and multisectorial rethinking capable of generating new forms of dialogue, at different specialist levels, such as the ecological public health nutrition's approach (Rayner and Lang, 2012), towards a more sustainable use of the available natural and human resources, to ensure food and nutrition security as well as the sustainability of the food systems. In addition to highlighting the importance of access to food, the more holistic concept that recent definitions of food security leads to identify a wide range of research challenges, from food production to food consumption, spanning the humanities and social and economic sciences (Pálsson *et al*, 2011), as well as nutritional and environmental sciences.

In the Mediterranean region, research has historically concentrated on agronomy and its associated sciences as most of food comes from crops, although livestock and fisheries also received considerable attention. However, research which considers multiple aspects of food security and food systems is needed. While research on producing food has allowed remarkable gains to be made, the dominance of these research fields has overshadowed many other important aspects of research related to the entire food system.

Food systems, and analyses of food security they underpin, provide a rich ground for research. While there is a long list of research questions in agricultural science, there is a major need to extend the research agenda in non-agricultural aspects. Technical fixes alone will not address the food security challenges, and adapting to future demands and stresses requires an integrated food system approach, not just a focus on agricultural practices (Ingram, 2011). According to Goodman (1997), *“Food systems represent all processes involved in feeding a population, and include the input required and output generated at each step. A food system operates within, and is influenced by, the social, political, economic and environmental context”*.

Globalization, industrial development, population increase and urbanization have changed food production and consumption in ways that profoundly affect ecosystems and human diets. The trends are alarming, highlighting the inadequacy of the present food supply and dietary patterns. Considering that (i) present food production and processing, food supply and distribution, and food consumption systems are not sustainable due to biodiversity loss, natural resources degradation, climate change, high energy input as well as poverty; (ii) present vulnerability of many Mediterranean rural communities, and particularly (iii), Mediterranean diet erosion and an increasing consumer behaviour towards of overconsumption; urgent measures are needed to promote adherence to the Mediterranean diet as a sustainable dietary pattern in Mediterranean countries.

Many people in the Mediterranean region are still food insecure, despite world-wide production currently being, in aggregate terms, sufficient for all.

Research which considers multiple aspects of food security and food systems is needed, with particular regard also to assessing the environmental, economic, social, cultural, health and nutritional sustainability of the current food consumption patterns and diets as drivers of food production.

Cross-sectorial and interdisciplinary research on food consumption in the Mediterranean region should lead also to innovative intersectoral efforts to reverse the degradation of ecosystems,

prevent further loss of biodiversity and redress the excesses and imbalances of diets through the improvement of sustainable dietary patterns culturally accepted in the Mediterranean region.

The improvement of the sustainability of the food consumption patterns requires attention to food loss and waste as a critical priority for food and nutrition security in the entire Mediterranean region. It is assumed that an increased adherence to the Mediterranean dietary pattern, including a reduction of food losses and waste, can contribute to the improvement of food and nutrition security in the Mediterranean region in general and southern and eastern Mediterranean countries (SEMC) in particular, by improving the sustainability of Mediterranean food consumption and production patterns.

All in all, the main priority research themes regard: diet-related health implications, food- and agricultural production-related environmental footprints, food cultures and sociology, and food losses and waste.

## **1. Nutrition and health implications of the current food system**

One of the most important challenges faced especially by southern and eastern Mediterranean countries is food and nutrition security (FAO, 2011a). The Mediterranean area in general and SEMC in particular are passing through a “nutrition transition” in which malnutrition problems (protein–energy, under-nutrition and micronutrient deficiencies) coexist with over-nutrition problems (overweight, obesity), and diet-related chronic diseases. This nutrition transition is alarming as it has negative impacts not only on health systems but also dramatic economic, social and environmental implications. These issues are interdependent or related, directly or indirectly, to the sustainability of Mediterranean food consumption patterns especially the decrease of adherence to the traditional Mediterranean diet (WHO, 2010). Therefore, multidisciplinary research is urgently needed to help understand and counteract this “nutrition transition”.

Nutrition transition occurs in conjunction with epidemiological transition towards non communicable diseases and has serious implications in terms of public health, economic growth and nutrition policy. Nutrition transition is malnutrition ensuing not from a need for food, but the need for high quality nourishment. Foods rich in vitamins, minerals and micronutrients, such as fruit, vegetables and whole grains, have been substituted by foods heavy in added sugar, saturated fat and sodium (WHO, 2010). Food systems that promote increased food intake and non-healthy foods, together with physical inactivity, lead to “*obesogenic societies*” (Kickbusch, 2010). In fact, the nutrition transition is associated with an increase in overnutrition and obesity. It also appears to bear a causal relationship to the disease burden and mortality transition referred to as the “epidemiological transition” (Omran, 1971; FAO, WFP and IFAD; 2012).

The prevalence of overweight and obesity has reached alarming rates in the region (Hossain *et al.*, 2007; Sibai *et al.*, 2003; Jabre *et al.*, 2005; Chakar and Salameh, 2006). According to WHO (2011), overweight and obesity rates in Mediterranean countries are high and continue to rise.

The inadequate dietary intake is the immediate factor causing undernutrition that is increasing in many countries of the Eastern Mediterranean region (including North Africa and the Near East) Therefore, undernutrition remains a major health problem in the Eastern and Southern Mediterranean with consequences that are too grave to be ignored (WHO, 2010).

The development of guidelines for the study of the Mediterranean diet as a sustainable diet model can contribute to enhance more adherences to the Mediterranean diet and clarify what is required for an environmentally sustainable food system and for more eco-friendly food based dietary guidelines.

An increased adherence to the Mediterranean dietary pattern among the Mediterranean population can contribute to improve food and nutrition security in terms of food availability, food access and food utilisation. Increased adherence to the Mediterranean diet, characterised by a high

consumption of plant-based foods (cereals, fruit, vegetables) and lower consumption of animal-based food (meat, dairy products), can increase the efficiency of the use of natural resources especially water thus increasing food production.

Taking into consideration the above-mentioned the research topics regarding this theme include the following:

- Relationship between Mediterranean diets and non-communicable diseases (e.g. obesity/overweight).
- Nutrition transition and related health problems (e.g. obesity, malnutrition).
- Role of nutrition, food safety and lifestyle factors in non-communicable diseases development and prevention.
- Beneficial health and nutrition benefits of typical and local Mediterranean products.
- Characterization of functional and nutritional properties of Mediterranean food products.
- Characterizing the current food consumption patterns in the Mediterranean countries.
- Mediterranean eating patterns and diets diversity.
- Observation, analysis and understanding of the evolution of food behaviours and their determinants.
- Development of interdisciplinary studies on ecological public health and nutrition

## **2. Economics of the Mediterranean food system**

For most people a key factor determining access to food is its affordability. This is dependent not only on food cost but also on the disposable income that can be spent on food. Access is also determined by the way society allocates food to its members and food preferences (Ingram, 2011).

The problem of hunger has been accentuated by high food prices and their volatility. In low income countries, food consumption expenditures typically account for 50% or more of households' budgets. In lower middle income countries the figure is about 40%. The principal cause of food insecurity remains poverty and inadequate incomes (OECD, 2013).

For many Mediterranean consumers, income is a major barrier to freedom of nutritious and sustainable food choice (Kickbusch, 2010). Price volatility has a strong impact on the poor and on food importing countries. It also risks modifying diets, especially of the poorest as they tend to shift to cheaper, less preferred, and poorer quality foods (HLPE, 2011). Pressures on food prices are exacerbated by volatile market dynamics and inadequate global coordination (Giovannucci *et al.*, 2012; Headey and Shenggen, 2010).

Economic analyses have shown that diets with a lower energy density - *i.e.* calories provided by whole grains and fresh produce - tend to be associated with higher food costs than calories from refined grains, added sugars, and added fats (Rolls *et al.*, 2005).

Some knowledge gaps regarding the economics of the Mediterranean food consumption patterns are reported hereafter:

- Impact of a higher adherence to the Mediterranean diet on the consumer prices of the typical Mediterranean food products and on the cost of living especially food expenditures.
- Adherence to the Mediterranean diets and health public spending.
- Access to and affordability of high quality Mediterranean food products for different socio-economic groups.
- Food price volatility and food access especially by the poor.

- Impacts of incentives and subsidies on the sustainability of the food system.
- Valorisation of typical and traditional Mediterranean food products.

### 3. Food-related environmental footprints

Diets are a significant factor in a number of critical sustainability issues such as climate change; public health; social inequalities; biodiversity; energy, land and water use; etc. (Reddy *et al.*, 2009).

Environmental degradation - whose primary driving forces are population, consumption and technology - has reached in the Mediterranean proportions that require immediate action (UNEP, 2010).

The type, composition and quantity of food that is produced and consumed affects CO<sub>2</sub> emissions (carbon footprint) (Lam *et al.*, 2010), land use (ecological footprint) (Wackernagel and Rees, 1996) and water resources demand (water footprint) (Mekonnen and Hoekstra, 2010).

The environmental effects of different dietary patterns depend on many factors, including the proportion of animal and plant foods (Smil, 2000; Carlsson-Kanyama *et al.*, 2003; Carlsson-Kanyama and Gonzalez, 2009).

The world is becoming increasingly concerned about the high dependence of the global food system on fossil fuels (FAO, 2011c). Under globalised food systems, produce is often transported long distances, requiring high consumption rates of non-renewable resources (Mundler and Rumpus, 2012). Heinberg and Bomford (2009) showed the interface between the energy crisis and the food crisis. The dependency on fossil fuels of the present food system presents a major risk to food security (Heinberg and Bomford, 2009; Kickbusch, 2010).

Many Mediterranean indigenous species are important ingredients in the preparation of century-old traditional food recipes. Owing to their peculiar nutritional value and taste, these resources contribute to making local food preparations diverse, attractive and healthy at the same time. Unfortunately, globalization of agricultural markets and changes in lifestyles are having a profound impact on the conservation and use of these resources leading to their irreplaceable loss (FMFC, 2010).

Given the fact that nutrient contents of foods can differ significantly based on growing conditions (*e.g.*, trace elements) and the local species and varieties of foods (*e.g.*, vitamin contents), research attention needs to be given to analysing the nutrient content of local food biodiversity. It is only possible to ensure sustainable diets and bridge nutrient gaps when data on the nutrient contents of foods in the food supply are known (Burlingame *et al.*, 2009). The activities of FAO/INFOODS rely on additional data generation through on-going research programmes and analytical laboratories. Similarly, research on dietary intakes and food consumption patterns is needed in order to assess the contribution of food biodiversity to achieving positive nutritional outcomes (FAO/INFOODS/Bioversity, 2010).

The main identified research topics regarding environmental footprints related to food consumption and production include:

- Water, carbon, ecological, energy and nitrogen footprints of food consumption and production.
- Resource efficiency, design of resource circulation and recycling systems, and integrated waste management in the modern food supply chains.
- Developing scenarios regarding the impact of the current food consumption patterns on natural resources in the Mediterranean.
- Environmental impacts of new technologies for food processing/packaging, storage, logistics and distribution.

- Standardisation and harmonisation of metrics to assess environmental impacts of the food chain.
- Contribution of the Mediterranean diets to biodiversity conservation and promotion.
- Local food and sustainability.

#### **4. Food cultures in the Mediterranean region**

Changes in intergenerational and gender relations, the role of women in society and interrelations with the rest of the world (tourism and migrations) are having main effects on Mediterranean lifestyles and food consumption patterns (Padilla, 2008). Urban design and sedentary activities contribute to the many health and nutrition challenges (WHO, 2010).

A plenty of other, often related, causes can explain nutrition transition in general and the erosion of the traditional Mediterranean dietary pattern in particular. These include the income increase (Smil, 2002; Speedy, 2003); the adoption of culturally driven dietary patterns; the deployment of long food chains and of global food players (Finardi *et al.*, 2010).

The Mediterranean diet is currently under an increasing erosion process for the effects of globalization, the homogenization of lifestyles, the loss of awareness and appreciation, and the lack of interest among younger generations about their own cultural food heritage. A silent cultural erosion resulting from new lifestyles is affecting the diversity of food cultures that makes Mediterranean foods so diverse and traceable to local territories and traditions. Such a phenomenon is undermining also the identity of millions of people living in this area whose traditions are so intimately linked to food cultures (Dernini, 2011).

Research on socio-cultural factors on food consumption among the different Mediterranean populations and cultures should be developed.

Some research topics dealing with cultural and social aspects of Mediterranean food consumption patterns with a particular focus on the erosion of the Mediterranean food-related cultural heritage should be particularly further developed:

- Diet, commensality, conviviality, rituality, and sociality.
- Food and Mediterranean cultural identity.
- Influence of age, gender, race, social class and ethnicity on food selection and consumption.
- Relationship between the Mediterranean Diet and traditional knowledge of Mediterranean rural communities.
- Factors influencing consumer attitudes, preferences, perception, acceptance.
- Influence of food cultures on food consumption patterns sustainability.
- Transmission of food knowledge to the young generations.
- Traditional foods in the current diets.
- Possible pathways and mechanisms for generating a shift towards sustainable consumption patterns and lifestyles.
- Consumer decision systems and sustainable consumption.
- Social innovations to promote sustainable production and consumption.

#### **5. Food waste and losses**

Reducing in the entire Mediterranean area the amount of food lost or wasted throughout the food chain (i.e. from farm to fork) would help improve food security and nutrition. Furthermore, reducing food losses and waste will also ease pressure on water scarcity. To do so, it is crucial to

address losses all along the food chain and alert consumers to the environmental impacts of their diets and the negative effects of wasting food.

Research activities are needed to address the causes, extent, quantification, as well as economic and environmental implications of food loss and food waste in the Mediterranean region.

## VI – Policy needs

Previous policies and actions fell short from addressing holistically the problem of food and nutrition security in the Mediterranean in general and SEMC in particular. In fact, most of the previous strategies focused on food availability, adopting a quantitative approach aiming at increasing agricultural production while little attention, and consequently limited research activities and policy instruments, has been devoted to the other components of food and nutrition security that's to say food accessibility and food utilisation.

Therefore, any strategy to address food and nutrition security in the Mediterranean region should encompass both quantitative and qualitative issues and should also consider interactions that exist between them and with other sectors such as nutrition, health, etc. The focus on sustainable diets integrated in a wider food system is original in this sense and allows grasping the different facets and dimensions of food and nutrition insecurity in SEMC.

In the final declaration of the 9<sup>th</sup> meeting of the Ministers of Food, Agriculture and Fisheries of the Member Countries of CIHEAM - held in Malta on September 27, 2012 and dedicated to "Food security and food price volatility within the countries of the Mediterranean" - the Ministers and the Heads of Delegation considered that all forms of sustainable agriculture are necessary to meet the challenge of global food security, without overlooking the contributions of the aquaculture and forestry sectors. They stated as well that the requirements of food security in the Mediterranean must be seen in a context of multiple challenges (geographical constraints including water and land scarcity, demographic growth and urbanisation, climatic changes and environmental threats) and calls for more multilateral cooperation and regional solidarity among Mediterranean countries to face these challenges (CIHEAM, 2012).

Enabling food policies address constraints to achieving food and nutrition security and that support more efficient functioning of the global and national food, nutrition, and agriculture systems. They aim also at enhancing the functioning of supply chains from producers to consumers and supporting the sustainable management of natural resources (IFPRI, 2007). Future food policies must consider both agricultural and health sectors, thereby enabling the development of coherent and sustainable policies that will ultimately benefit agriculture, human health and the environment (Kearney, 2010).

One of the most important points is the development of one intensive and extensive plan and strategy of preservation, including necessary measures to ensure the safeguarding of the diversity of the Mediterranean food cultures heritage as a critical base for the safeguarding of the Mediterranean diet, understood as a cultural system. This preservation strategy should strengthen education initiatives, awareness-raising and capacity-building projects and training in the management of the intangible cultural heritage, in order to effectively preserve and to advance the transmission of Mediterranean diet heritage (Medina, 2009).

Food distribution and catering in many Mediterranean countries is concentrated in the hands of a few operators, who influence product supply, safety and price. The media, advertising and retail sectors and the food industry have a powerful influence on dietary choices, sometimes opposing those recommended by public health specialists (WHO, 2010).

In the southern Mediterranean countries, policies to enhance Mediterranean typical and traditional food products should be implemented, by giving also more relevance to their nutritional benefits and lower environmental impacts, within the different Mediterranean dietary patterns.

Possible policy responses to the diet transition problems include measures to raise awareness of the benefits of healthier diets and/or to change relative food prices in favour of such diets (by taxing fattening foods) or, at the extreme, making individuals who follow 'bad' diets, and thus are prone to associated diseases, bear a higher part of the consequent costs borne by the public health systems (Alexandratos, 2006).

Promoting healthy diets and lifestyles requires a multi-sectoral approach involving the various relevant sectors in societies. The agriculture and food sector figures prominently in this enterprise and must be given due importance in any consideration of the promotion of healthy diets. Food strategies must not merely be directed at ensuring food security for all, but must also achieve the consumption of adequate quantities of safe and good quality foods (WHO and FAO, 2003).

Policies aiming at achieving food and nutrition security in the region should also address the issue of food losses and waste. According to FAO (2012c), strategies for reducing food losses and waste include: (1) application of current knowledge to improve the food handling systems and assure food quality and safety; (2) removing the socioeconomic constraints, (3) more education to all stakeholders of the chain, including farmers and consumers, (4) better and adequate infrastructure, including storage facilities and marketing systems, (5) improved research and development capacity; and (6) special attention to overcoming the limitations of small-scale producers.

Good food system governance is crucial. Increasingly, decisions regarding who produces food, what food is produced, when, where and how that food is produced, and who gets to eat it, are being made by those managing a small number of dominant food firms. Public policy decisions that impact the food system and often facilitate structural change continue to be made at local, regional, national, and international levels of government. Meanwhile, farmers, consumers, policymakers, communities are trying to cope with the impacts that the increasing consolidation and concentration is having throughout the food system.

The governance of the Mediterranean food system is hindered by many problems and constraints including the lack of a common and shared Mediterranean strategy, from food production to food consumption, towards the development of a sustainable agriculture as well as of sustainable food systems in the Mediterranean region. Therefore, the impacts of the policies and actions for improving the sustainability of the current Mediterranean food consumption patterns – as well as their contribution to achieving food and nutrition security in the Mediterranean area – should be also monitored and evaluated through appropriate indicators. These indicators should be used to formulate measures to safeguard and promote the Mediterranean diet as joint heritage as well as to make recommendations for multi-sectoral policy instruments to enhance the sustainability of the Mediterranean agro-food systems and food consumption patterns.

All these actions are necessary to improve the food and nutritional security in the Mediterranean in general and SEMC in particular.

## VII – Food for Thought

An action program should envisage the implementation in the member countries of CIHEAM of a three year pilot project to develop “*Guidelines for improving the sustainability of diets in the Mediterranean area*”.

The Mediterranean diet, in its various national forms, should be used as a model to describe, understand and improve the sustainability of current Mediterranean food consumption patterns.

In order to measure the sustainability of food consumption some potential indicators have been identified in this paper with the aim of formulating recommendations for cross-sectoral policy instruments allowing the improvement of the sustainability of the diets and food systems in the Mediterranean area.

The «Mediterranean Diet», recognized by UNESCO as an intangible heritage of humanity in 2010, could be considered as a model of sustainable diets in the Mediterranean basin, and able to contribute to the sustainability of the agro-food systems around the Mediterranean and to the valorisation of quality products.

Given the importance of diets for health and as drivers of environmental pressure, steps must be taken as a matter of urgency to monitor and measure sustainable diets through analysis of information, development of methods and indicators, and development /promotion of policy guidelines. The assessment and development of sustainable diet models will foster a consensus for action in the Mediterranean region towards nutrition-sensitive agriculture and sustainable development by raising awareness among consumers and governments that agriculture, food, nutrition, health, culture, education, economy, environment and sustainability are strongly interdependent.

Actions to be undertaken in order to change this situation in the Mediterranean region are urgent and represent a timely opportunity to start new strategies for food security.

The development of a methodological approach might be useful for designing policies in order not only to conserve and preserve the Mediterranean diet, as a common cultural heritage and lifestyle, but also to enhance its sustainability. That requires developing a set of comprehensive, coherent, integrated and holistic policies that deal with different spheres and arenas of nutrition, health, lifestyle, society, culture, education, economy, environment, and agro-biodiversity.

A shared methodological approach development will facilitate dialogues among members of the scientific community concerning the sustainability of diets in the Mediterranean area, and towards the development of a feeding knowledge network which could be considered as a “Euro-Med pilot sustainability laboratory”. Such an initiative might provide solutions to counteract the increasing pressure on its fragile natural resources exacerbated by the changes of Mediterranean food consumption patterns, in order, not only to conserve and preserve the Mediterranean diet as a common cultural heritage, but also to promote sustainable food systems for the benefit of all the peoples living in the Mediterranean area.

FAO and UNEP have formed in 2011 a joint Sustainable Food Systems Programme, within the 10 Year Framework of Programmes of the SCP, to improve the efficiency of resource management and reduce the intensity of pollution in food systems from production to consumption, while at the same time addressing issues of food and nutrition security. CIHEAM, in collaboration with the FAO/UNEP Sustainable Food Systems Programme, could play a lead role in identifying and catalysing partnerships with other intergovernmental organizations, national governments, UN and EU agencies, private sectors and NGOs, to enhance the transition of the Mediterranean food systems towards a more efficient sustainable consumption and production pattern.

## References

- Abulafia D., 2012.** The great sea: a human history of the Mediterranean. Allen Lane, UK.
- AEA Technology Environment, 2005.** The validity of food miles as an indicator of sustainable development. Final report for DEFRA, UK. <http://archive.defra.gov.uk/evidence/economics/foodfarm/reports/documents/foodmile.pdf>
- Alexandratos N., 2006.** The Mediterranean diet in a world context. Public Health Nutrition: 9(1A), 111–117.
- American Dietetic Association, American Nurse Association, American Planning Association and American Health Association, 2010.** Principles of a healthy, sustainable food system. [www.planning.org/nationalcenters/health/pdf/HealthySustainableFoodSystemsPrinciples.pdf](http://www.planning.org/nationalcenters/health/pdf/HealthySustainableFoodSystemsPrinciples.pdf)

- American Public Health Association, 2007.** Toward a healthy, sustainable food system. Policy statement. [www.apha.org/advocacy/policy/policysearch/default.htm?id=1361](http://www.apha.org/advocacy/policy/policysearch/default.htm?id=1361)
- Babio N., Bullo M., Basora J., Martinez-Gonzalez M. A., Fernandez-Ballart J., Marquez-Sandoval F., et al., 2009.** Adherence to the Mediterranean diet and risk of metabolic syndrome and its components. *NutrMetabCardiovasc Dis*; 19(8):563-570.
- Bach A., Serra-Majem L., Carrasco J.L., Roman B., Ngo J., Bertomeu I., Obrador B., 2006.** The use of index evaluating the adherence to the Mediterranean diet in epidemiological studies: a review. *Public Health Nutrition*; 9(1A): 132-146.
- Bach-Faig A., Berry E.M., Lairon D., Reguant J., Trichopoulou A., Dernini S., Medina F.X., Battino M., Miranda G., Serra-Majem L., 2011.** Mediterranean Diet Pyramid Today. *Science and Cultural Updates. Public Health Nutrition*; 14(12A): 2274–2284.
- Barilla Center for Food and Nutrition, 2010.** Double Pyramid: Healthy food for people, sustainable food for the planet. Parma.
- Baroni L., Cenci L., Tettamanti M., Berati M., 2007.** Evaluating the environmental impact of various dietary patterns combined with different food production systems. *Eur J Clin Nutr*; 61(2):279-86.
- Belahsen R., Rguibi M., 2006.** Population health and Mediterranean diet in southern Mediterranean countries. *Public Health Nutrition*; 9(8A):1130-5.
- Berry E.M., De Geest S., 2012.** Tell me what you eat and I will tell you yoursociotype: coping with diabetes. *RMMJ* ; 3(2):e0010.
- Berry E.M., Arnoni Y, Aviram M., 2011.** The Middle Eastern & Biblical origins of the Mediterranean diet. *Public Health Nutrition*; 14 (12A): 2288-2295,
- Bosetti C., Pelucchi C., La Vecchia C., 2009.** Diet and cancer in Mediterranean countries: carbohydrates and fats. *Public Health Nutrition*; 12(9A):1595-600.
- Boulier F., 2012.** Food security in the Mediterranean in 2030: From foresight to research priorities. *The Futures of Agriculture. Brief No. 11 - English.* Rome: Global Forum on Agricultural Research (GFAR).
- Buckland G., Bach A., Serra-Majem L., 2008.** Obesity and the Mediterranean diet: a systematic review of observational and intervention studies. *Obes. Rev*; 9:582-593.
- Buckland G., González C.A., Agudo A., et al., 2009.** Adherence to the Mediterranean diet and risk of coronary heart disease in the Spanish EPIC cohort study. *Am. J. Epidemiol*; 170(12):1518-29.
- Burlingame B, and Dernini S. (2011). Sustainable diets: the Mediterranean diet example. *Public Health Nutrition*; 14(12A): 2285–2287.
- Burlingame, B., Charrondiere, U.R., Mouille, B., 2009.** Food composition is fundamental to the cross-cutting initiative on biodiversity for food and nutrition. *Journal of Food Composition and Analysis*; 22, 5: 361-365.
- Carlsson-Kanyama A., Gonzalez A., 2009.** Potential contributions of food consumption patterns to climate change. *American Journal of Clinical Nutrition*; 89 (5): 1704S-9S.
- Carlsson-Kanyama A., Pipping Ekstrom M., Shanahan H., 2003.** Food and life cycle energy inputs: consequences of diet and ways to increase efficiency. *Ecological Economics*; 44: 293-307.
- Cash D. W., Adger W. N., Berkes F., Garden P., Lebel L., Olsson P., et al., 2006.** Scale and cross-scale dynamics: Governance and Information in a Multilevel World. *Ecology and Society*; 11(2): 8.
- CFS, 2012.** Coming To Terms With Terminology: Food Security, Nutrition Security, Food Security and Nutrition, Food and Nutrition Security. Committee on World Food Security (CFS), Thirty-ninth Session, 15-20 October 2012, Rome.
- Chakar H., Salameh P. R., 2006.** Adolescent obesity in Lebanese private schools. *Eur J Public Health*; 16:648-651.
- CIHEAM, 2012.** Final declaration. 9<sup>th</sup> meeting of the Ministers of Food, Agriculture and Fisheries of the Member Countries of CIHEAM; Valletta, 27 September 2012. International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM).
- CIHEAM, 2008.** MediTerra 2008. The future of agriculture and food in Mediterranean countries. CIHEAM–SciencesPo Les Presses, Paris.
- CIISCAM, 2009.** The Mediterranean diet: a model of sustainable diet. 3rd CIISCAM International Conference, Parma. [www.ciiscam.org/203/28/products/3rd\\_ciiscam\\_international\\_conference.html](http://www.ciiscam.org/203/28/products/3rd_ciiscam_international_conference.html)
- Clonan A, Holdsworth M., 2012.** The challenge of eating a healthy and sustainable diet. *Am J Clin Nutr*; 96/3: 459-460.
- Da Silva R., Bach-Faig A., Raido Quintana B., Buckland G., Vaz de Almeida M.D., Serra-Majem L., 2009.** World variation of adherence to the Mediterranean diet, in 1961-1965 and 2000-2003. *Public Health Nutrition*; 12(9A):1676-1684.
- de Lorgeril M., Renaud S., Mamelle N., et al., 1994.** Mediterranean alpha-linolenic acid-rich diet in secondary prevention of coronary heart disease. (Erratum *Lancet* 1995; 345: 738). *Lancet*; 343: 1454–1459.

- DEFRA, 2009.** Indicators for a Sustainable Food System. Report UK. [www.defra.gov.uk/statistics/files/defra-stats-foodsystemindicators.pdf](http://www.defra.gov.uk/statistics/files/defra-stats-foodsystemindicators.pdf)
- DEFRA, 2011.** Sustainable, secure and healthy food supply evidence plan 2011/12. [www.defra.gov.uk/publications/files/pb13515-ep-food-supply.pdf](http://www.defra.gov.uk/publications/files/pb13515-ep-food-supply.pdf)
- Delaney Burke J., 2012.** Bridging the sustainability gap. *Nutrition today*; 47(4): 155-159.
- Dernini S., Berry E.M., Bach-Faig A., Belahsen R., Donini L.M., Lairon D., Serra-Majem L., Cannella C., 2012.** Scientists reassess a dietary model: the Mediterranean diet. In, *Mediterra 2012*. CIHEAM–SciencesPo Les Presses, Paris; 71-88.
- Dernini S. (2011).** The erosion and the renaissance of the Mediterranean diet: A sustainable cultural resource. *Quaderns de la Mediterrania, IEMED, Barcelona*; 16:75-82.
- Dernini S., Meybeck A., Burlingame B., Gitz V., Lacirignola C., Debs P., Capone R., El Bilali H., 2013.** Developing a methodological approach for assessing the sustainability of diets: The Mediterranean diet as a case study. *New Medit*; 3:28-36.
- Dernini S., 2011.** The erosion and the renaissance of the Mediterranean diet: A sustainable cultural resource. *Quaderns de la Mediterrania, IEMED, Barcelona*; 16: 75-82.
- Duchin F., 2005.** Sustainable consumption of food: A framework for analyzing scenarios about changes in diets. *Journal of Industrial Ecology*; 9(1-2):99-114.
- EC/JRC, 2009.** Environmental impacts of diet changes in the EU. Technical Report, European Commission (EC), Joint Research Centre (DG JRC), Institute for Prospective Technological Studies (IPTS).
- Edwards-Jones G., Mila i Canals L., Hounsome N., Truninger M., Koerber G., Hounsome B., Cross P., York EH., Hospido A., Plassmann K., Harris I.M., Edwards R.T., Day GAS A., Tomos D., Cowell S.J., Jones D.L., 2008.** Testing the assertion that 'local food is best': the challenges of an evidence-based approach. *Trends in Food Science & Technology*; 19: 265-274.
- ESF, 2009.** European food systems in a changing world. Strasbourg: ESF-COST Forward Look Report. [www.esf.org/fileadmin/Public\\_documents/Publications/food.pdf](http://www.esf.org/fileadmin/Public_documents/Publications/food.pdf)
- Esnouf C., Russel M., Bricas N., (eds), 2013.** *Food Systems Sustainability: Insights from duALine*. Cambridge University Press, Cambridge.
- Estruch R., Martínez-González M.A., Corella D., Salas-Salvado J., Ruiz-Gutierrez V., Covas M.I., Fiol M., Gomez-Gracia E., Lopez-Sabater M.C., Vinyoles E., Aros F., Conde M., Lahoz C., Lapetra J., Saez G., Ros E., Premixed Study Investigators, 2006.** Effects of a Mediterranean-style Diet on Cardiovascular Risk Factors: A Randomized Trial. *Annals of Internal Medicine*; 45: 1-11.
- Estruch R., Ros E., Salas-Salvadó J., Covas M.-I., Corella D., Arós F., Gómez-Gracia E., Ruiz-Gutiérrez V., Fiol M., Lapetra J., Lamuela-Raventos R. M., Serra-Majem LI., Pintó X., Basora J., Angel Muñoz M., Sorlí J. V., Alfredo Martínez J., Martínez-González M. A., 2013.** Primary Prevention of Cardiovascular Disease with a Mediterranean Diet. *N Engl J Med* 2013; 368 (14): 1279-1290.
- Eurostat, 2011.** Sustainable development indicators. Theme 2: Sustainable Consumption and Production. <http://epp.eurostat.ec.europa.eu/portal/page/portal/sdi/indicators/theme2>.
- FAO, 2004.** 24<sup>th</sup> Regional Conference for Europe. Item Six – Food safety and quality in Europe: Aspects concerning in particular quality, nutritional balance, the importance of agricultural land and cultural heritage (“Terroirs”). Montpellier. FAO, Rome.
- FAO, 2005.** Nutrition indicators for development. FAO, Rome.
- FAO, 2009.** Linking people, places and products. A guide for promoting quality linked to geographical origin and sustainable Geographical Indications. FAO/SINER-GI, FAO, Rome.
- FAO, 2010.** Report of the technical workshop on Biodiversity in Sustainable Diets. FAO, Rome.
- FAO 2011b.** Global food losses and food waste. Extent, causes and prevention. FAO, Rome.
- FAO, 2011c.** “Energy-smart food” for people and climate. FAO, Rome.
- FAO 2012a.** 31<sup>st</sup> Regional Conference for the Near East. Report. [www.fao.org/docrep/meeting/025/md988e.pdf](http://www.fao.org/docrep/meeting/025/md988e.pdf)
- FAO 2012b.** Greening the economy with agriculture. Working paper 4: utilization. Improving food systems for sustainable diets in a green economy. FAO, Rome.
- FAO, 2012c.** Food loss prevention for improving food security in the Near East. FAO Regional Conference for the Near East (RCNE), Thirty-first Session, Rome, 14-18 May 2012; NERC/12/4. FAO, Rome.
- FAO, 2012d.** Regional Priority Framework for the Near East. FAO Regional Office for the Near East, Cairo.
- FAO, 2013.** The State of Mediterranean Forests 2013. FAO, Rome.
- FAO, WFP, IFAD, 2012.** The State of Food Insecurity in the World 2012. Economic growth is necessary but not sufficient to accelerate reduction of hunger and malnutrition. Rome, FAO.
- FAO/Bioversity, 2010.** Report of the international symposium on Biodiversity and Sustainable Diets. Rome. [www.fao.org/ag/humannutrition/28506-0efe4aed57af34e2dbb8dc578d465df8b.pdf](http://www.fao.org/ag/humannutrition/28506-0efe4aed57af34e2dbb8dc578d465df8b.pdf)

- FAO/Bioversity, 2012.** Sustainable Diets and Bioversity. Directions and Solutions for Policy, Research and Action. Rome. [www.fao.org/docrep/016/i3004e/i3004e00.htm](http://www.fao.org/docrep/016/i3004e/i3004e00.htm)
- FAO/CIHEAM, 2012.** Towards the development of guidelines for improving the sustainability of diets and food consumption patterns: the Mediterranean diet as a pilot study. Rome. [www.fao.org/docrep/016/ap101e/ap101e.pdf](http://www.fao.org/docrep/016/ap101e/ap101e.pdf)
- FAO/INFOODS/Bioversity International, 2010.** Expert Consultation on Nutrition Indicators for Biodiversity 2. Food Consumption. FAO, Rome.
- Fidanza F., Alberti A., Lanti M., Menotti A., 2004.** Mediterranean Adequacy Index: correlation with 25-year mortality from coronary heart disease in the Seven Countries Study. *Nut Metab Cardiovasc Dis*; 14: 254-258.
- Finardi C., Arfani F., Turrini A., 2010.** Dietary evolution over time in Europe, between Cyclops and Phaecians: an outlook on the role of supply-side factors in driving changes in the food patterns. 1st Joint EAAE/AAEA Seminar "The Economics of Food, Food Choice and Health" Freising, Germany, September 15 – 17, 2010.
- Florenza S., Aragall X., 2012.** Mutations in Mediterranean societies. In *Mediterra 2012*. CIHEAM–SciencesPo Les Presses, Paris; 91-113.
- FMFC, 2005.** The 2005 Rome Call for a Common Action in the Year of the Mediterranean. 3° Euro-Mediterranean Forum; 30 September – 1 October 2005, Rome. [www.plexusinternational.org/files/download/Allegati/2005\\_rome\\_call\\_for\\_action.pdf](http://www.plexusinternational.org/files/download/Allegati/2005_rome_call_for_action.pdf)
- FMFC, 2010.** Biodiversity? Sustainable food for everybody. Mediterranean diet: an example of a sustainable diet. Mediterranean diet talk show; May 21, 2010, Rome. [www.plexusinternational.org/files/download/Allegati/2010\\_parco\\_della\\_musica\\_talk\\_show\\_background\\_paper\\_inglese.pdf](http://www.plexusinternational.org/files/download/Allegati/2010_parco_della_musica_talk_show_background_paper_inglese.pdf)
- Garcia-Closas R., Berenguer A., Carlos A., Gonzalez C., 2006.** Changes in food supply in Mediterranean countries from 1961 to 2001. *Public Health Nutrition*; 9(1):53-60.
- Garnet T., 2011.** Where are the best opportunities for reducing greenhouse gas emissions in the food system (including the food chain)? *Food Policy*; 36:s23-s32.
- Gerbens-Leenes W., Nonhebel S., 2005.** Food and land use. The influence of consumption patterns on the use of agricultural resources. *Appetite*; 45:24-31.
- Gerber M., 2006.** Qualitative methods to evaluate Mediterranean diet in adults. *Public Health Nutr*; 9(1A):147-51.
- Giovannucci D., Scherr S., Nierenberg D., Hebebrand Ch., Shapiro J., Milder J., and Wheelern K., 2012.** Food and Agriculture: the future of sustainability. A strategic input to the Sustainable Development in the 21st Century (SD21) project. UN-DESA, New York.
- Godfray H.C.J., Beddington J.R., Crute I.R., Haddad L., Lawrence D., Muir J.F., Pretty J., Robinson S., Thomas S.M., Toulmin C., 2010.** Food security: the challenge of feeding 9 billion people. *Science*; 327: 812-818.
- González-Turmo I., 2012.** The Mediterranean diet: consumption, cuisine and food habits. In *Mediterra 2012*. CIHEAM–SciencesPo Les Presses, Paris; 115-132.
- González-Turmo I., Medina F. X., 2012.** *Retos y responsabilidades tras la declaración de la Dieta mediterránea como patrimonio cultural inmaterial de la Humanidad (UNESCO)*, in Cantarero, L. (ed.) *La antropología de la alimentación en España. Perspectivas actuales*. UOC (Universitat Oberta de Catalunya), Barcelona.
- Goodman D., 1997.** World-scale processes and agro-food systems: critique and research needs. *Review of International Political Economy*; 4(4): 663-687.
- Gussow J.D., Clancy K., 1986.** Dietary guidelines for sustainability. *Journal Nutrition Education*; 18(1):1-5.
- Gussow J.D., 1995.** Mediterranean diets: are they environmentally responsible? *Am J Clin Nutr*; 61(suppl):1383S-9S.
- Guyomard H., Darcy-Vrillon B., Esnouf C., Marin M., Momot A., Russel M., Guillou M., 2011.** Eating patterns and food systems: critical knowledge requirements for policy design and implementation. INRA. Document prepared for the Commission on Sustainable Agriculture and Climate Change. [http://ccafs.cgiar.org/sites/default/files/assets/docs/guyomard\\_et\\_al\\_eating\\_patterns\\_and\\_food\\_systems.pdf](http://ccafs.cgiar.org/sites/default/files/assets/docs/guyomard_et_al_eating_patterns_and_food_systems.pdf)
- Hacettepe University, 2009.** Turkey Demographic and Health Survey, 2008. Institute of Population Studies, Hacettepe University & General Directorate of Mother and Child health and Family Planning, Ministry of Health; T.R. Prime Ministry Undersecretary of State Planning Organization and TÜBİTAK, Ankara.
- Haines A., McMichael A., Smith K., Roberts J., Woodcock J., Markandya A., Armstrong B.G., Campbell-Lendrum D., Dangour A.D., Davies M., Bruce N., Tonne C., Barrett M., Wilkinson P., 2009.** Public health benefits of strategies to reduce greenhouse-gas emissions: overview and implications for policy makers. *The Lancet*; 374(9707):2104-2114

- Hassan-Wassef H., 2012.** Food security in the Mediterranean: Public health concern. [www.ipemed.coop/en/our-projects-r16/agriculture-and-rural-development-c86/-sc68/food-security-in-the-mediterranean-public-health-concern-a1485.html](http://www.ipemed.coop/en/our-projects-r16/agriculture-and-rural-development-c86/-sc68/food-security-in-the-mediterranean-public-health-concern-a1485.html).
- 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 Society, B- Biological Sciences*; 365:3083-3097.
- Headey D., Shenggen F., 2010.** Reflections on the global food crisis : how did it happen? how has it hurt? and how can we prevent the next one? Research Monograph 165. International Food Policy Research Institute, Washington, D.C.
- Heinberg R., Bomford M., 2009.** The Food and Farming Transition: towards a post carbon food system. Post Carbon Institute. [www.postcarbon.org/report/41306-the-food-andfarming-transition-toward](http://www.postcarbon.org/report/41306-the-food-andfarming-transition-toward).
- Heinrich M., Müller W.E., Galli C., (eds.) 2006.** Local Mediterranean food plants and nutraceuticals. Karger, Basle.
- Hervieu B., Thibault H.-L., (eds.) 2009.** Rethinking rural development in the Mediterranean. CIHEAM; Presses de Sciences Po, Paris.
- Heywood V.H., 1998.** The Mediterranean region. A major centre of plant diversity. In: Heywood VH, Skoula M (eds) "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.
- HLPE, 2011.** Price volatility and food security. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome.
- Holdsworth M., 2010.** Sustainability should be integral to nutrition and dietetics. *J Hum Nutr Diet; Journal of Human Nutrition and Dietetics*; 23 (5): 467–468.
- Hossain P., Kavar B., El Nahas M., 2007.** Obesity and diabetes in the developing world-a growing challenge. *N Engl J Med*; 356:213-215.
- IFPRI, 2007.** IFPRI's strategy: Toward food and nutrition security: Food policy research, capacity strengthening, and policy communications, updated. International Food Policy Research Institute (IFPRI), Washington, D.C.
- IISD, 1997.** Assessing Sustainable Development – Principles in Practice. International Institute for Sustainable Development, Winnipeg, Canada. [www.nssd.net/pdf/bellagio.pdf](http://www.nssd.net/pdf/bellagio.pdf)
- IISD/OECD, 2009.** Bellagio STAMP: Sustainability assessment and measurement principles. The International Institute for Sustainable Development/The Organisation for Economic Co-operation and Development; Winnipeg, Manitoba.
- Ingram J. S. I., 2011.** From Food Production to Food Security: Developing interdisciplinary, regional-level research. PhD Thesis, Wageningen University.
- IOTF, 2005.** EU platform on diet, physical activity and health. Briefing paper. International Association for the Study of Obesity, London, UK. [http://ec.europa.eu/health/ph\\_determinants/life\\_style/nutrition/documents/iotf\\_en.pdf](http://ec.europa.eu/health/ph_determinants/life_style/nutrition/documents/iotf_en.pdf)
- IPCC, 2007.** Fourth Assessment Report. Climate change 2007: synthesis report. Inter-governmental Panel on Climate Change, Valencia.
- Issa C., Darmon N., Salameh P., Maillot M., Batal M., Lairon D., 2011.** A Mediterranean diet pattern with low consumption of liquid sweets and refined cereals is negatively associated with adiposity in adults from rural Lebanon. *Int.J.Obes*; 35(2):251-8.
- ITFPCHD, 2000.** Consensus statement: dietary fat, the Mediterranean diet and lifelong good health. International Task Force for Prevention of Coronary Heart Disease. London.
- Jabre P., Sikias P., Khater-Menassa B., Baddoura R., Awada H., 2005.** Overweight children in Beirut: prevalence estimates and characteristics. *Child Care Health Dev*; 31:159-165.
- Kastner T., Rivas M.J.I., Koch W., Nonhebel S., 2012.** Global changes in diets and the consequences for land requirements for food. *Proceedings of the National Academy of Sciences*; 109(18): 6868-6872.
- Kastorini C.M., Milionis H.J., Esposito K., Giugliano D., Goudevenos J.A., Panagiotakos D.B., 2011.** The effect of Mediterranean diet on metabolic syndrome and its components a meta-analysis of 50 studies and 534,906 individuals. *J Am CollCardiol*; 57(11):1299-1313.
- Kearney J., 2010.** Food consumption trends and drivers. *Phil. Trans. R. Soc*; 365:2793-2807.
- Kesse-Guyot E., Fezeu L., Hercberg S., Ahluwalia N., Lairon D., 2012.** Adherence to Mediterranean diet reduces the risk of metabolic syndrome: a prospective study. *NutrMetabCardiovasc Dis*;142(5):909-15.
- Keys A.B., Keys M., (eds.) 1975.** How to Eat Well and Stay Well the Mediterranean Way. Doubleday Publishing, New York.
- Keys A.B., (eds.) 1970.** Coronary heart disease in seven countries. *Circulation*(1 Suppl.): 51-52.

- Keys A.B., (eds.) 1980.** Seven countries: a multivariate analysis of death and coronary heart disease. Harvard University Press. Cambridge (MA).
- Kickbusch I., 2010.** The food system: a prism of present and future challenges for health promotion and sustainable development. Triggering the debate – white paper. Promotion Santé Suisse, Bern.
- Kissinger M., 2012.** International trade related food miles – The case of Canada. *Food Policy*; 37:171-178.
- Kromhout D., Keys A., Aravanis C., Buzina R., Fidanza F., Giampaoli S., Jansen A., Menotti A., Nedeljkovic S., Pekkarinen M., et al., 1989.** Food consumption patterns in the 1960s in seven countries. *Am J Clin Nutr*; 49(5): 889-94.
- La Vecchia C., 2004.** Mediterranean diet and cancer. *Public Health Nutr*; 7(7):965-8.
- Lacirignola C., Capone R., 2010.** Rethinking the Mediterranean diet for the 21<sup>st</sup> century. *The CIHEAM Watch letter*; 13:1-5.
- Lacirignola C., Capone R., 2009.** Mediterranean Diet: Territorial Identity and Food Safety. *New Medit*; 4 (8): 2-3.
- Lam H.L., Varbanov P. Klemeš J., 2010.** Minimising carbon footprint of regional biomass supply chains. *Resources, Conservation and Recycling*; 54, 303-309.
- León-Muñoz L.M., Guallar-Castillón P., Graciani A., López-García E., Mesas A.E., Aguilera M.T., Banegas J. R., Rodríguez-Artalejo F., 2012.** Adherence to the Mediterranean diet pattern has declined in Spanish adults. *Journal of Nutrition*; 142 (10): 1843-1850.
- Lock K., Smith D.R., Dangour A.D., Keogh-Brown M., Pigatto G., Hawkes C., Fisberg R.M., Chalabi Z., 2010.** Health, agricultural, and economic effects of adoption of healthy diet recommendations. *The Lancet*; (376):1699-1709.
- Lundqvist J., de Fraiture C., Molden D., 2008.** Saving Water: From Field to Fork – Curbing Losses and Wastage in the Food Chain. SIWI Policy Brief, Stockholm International Water Institute (SIWI), Stockholm.
- Lupo A. (1997). Nutrition in general practice in Italy. *Am J Clin Nutr*; 65(Suppl 6):1963S–1966S.
- Macdiarmid J.I., Kyle J., Horgan G.W., Loe J., Fyfe C., Johnstone A., McNeil G., 2012.** Sustainable diets for the future: can we contribute to reducing greenhouse gas emissions by eating a healthy diet? *Am J Clin Nutr*; 96: 632–9.
- Maclaren V.W., 1996.** Developing Indicators of Urban Sustainability: A Focus on the Canadian Experience. ICURR Press, Toronto.
- Maillot M., Issa C., Vieux F., Lairon D., Darmon N., 2011.** The shortest way to reach nutritional goals is to adopt Mediterranean food choices. Evidence from computer-generated personalized diets. *Am J Clin Nutr*; 94(4):1127-37.
- Manios Y., Detopoulou V., Visioli F., Galli C., 2006.** Mediterranean Diet as a Nutrition Education and Dietary Guide: Misconceptions and the Neglected Role of Locally Consumed Foods and Wild Green Plants. In M. Heinrich, W.E. Müller & C. Galli (eds.) *Local Mediterranean food plants and nutraceuticals*, Karger, Basle;154-170.
- Marlow J.H., Hayes W.K., Soret S., Carter R.L., Schwab R.E., Sabate' J., 2009.** Diet and the environment: does what you eat matter? *Am J Clin Nutr*; 89(suppl):1699s-703.
- Martínez-González M.A., Bes-Rastrollo M., Serra-Majem L., Lairon D., Estruch R., Trichopoulou A., 2009.** Mediterranean food pattern and the primary prevention of chronic disease: recent developments. *Nutr Rev*; 67 Suppl 1:S111-6.
- Martínez-González M.A., Fernandez-Jarne E., Serrano-Martinez M., et al., 2002.** Mediterranean diet and reduction in the risk of a first acute myocardial infarction. An operational healthy dietary score. *Eur J Nutr*; 41: 153–160.
- Martínez-González M.A., Fuente-Arrillaga C., Nunez-Cordoba J.M., Basterra-Gortari F.J., Beunza J.J., Vazquez Z., et al., 2008.** Adherence to Mediterranean diet and risk of developing diabetes: prospective cohort study. *BMJ*; 336(7657):1348-1351.
- Maxwell S., Slater R., 2003.** Food policy old and new. *Development Policy Review*; 21(5–6): 531–553.
- Medina F. X. (2009). Mediterranean diet, culture and heritage: challenges for a new conception. *Public Health Nutrition*; 12: 1618-1620.
- Mekonnen M.M., Hoekstra A.Y., 2010.** The green, blue and grey water footprint of farm animals and animal products. Value of Water Research Report Series No. 48, UNESCO-IHE, Delft, the Netherlands.
- Mendez M.A., Popkin B.M., Jakszyn P., Berenguer A., Tormo M.J., Sanchez M.J., Quiros J.R., Pera G., Navarro C., Martinez C., Larranaga N., Dorronsoro M., Chirlaque M.D., Barricarte A., Ardanaz E., Amiano P., Agudo A., Gonzalez C.A., 2006.** Adherence to a Mediterranean Diet is Associated with Reduced 3-year Incidence of Obesity. *Journal of Nutrition*; 136:2934-2938.
- Menotti A., Kromhout D., Blackburn H., Fidanza F., Buzina R., Nissinen A., 1999.** Food intake patterns and 25-year mortality from coronary heart disease: cross-cultural correlations in the Seven Countries Study. The Seven Countries Study Research Group. *Eur J Epidemiol*; 15(6):507-15.

- Millstone E., Lang T., 2008.** The Atlas of Food. Earthscan, second edition, London.
- Mundler P., Rumpus L., 2012.** The energy efficiency of local food systems: A comparison between different modes of distribution. *Food Policy*; 37: 609-615.
- Nestle M., 1995.** Mediterranean diets: historical and research overview. *American Journal Clinical Nutrition*; 61(suppl.):131S-20S.
- Numa C., Troya A., 2011.** The challenge for biodiversity conservation in the Mediterranean. *IEMED Mediterranean Year Book 2011*; 255-260
- O’Kane G., 2012.** What is the real cost of our food? Implications for the environment, society and public health nutrition. *Public Health Nutrition*; 15(02):268-276.
- OECD, 2013.** Global food security: challenges for the food and agriculture system. Working Party on Agricultural Policies and Markets; Committee for Agriculture; Trade and Agriculture Directorate; Organisation for Economic Co-operation and Development (OECD), Paris.
- OECD, 2003.** Environmental Indicators – Development, Measurement and Use. Organisation for Economic Cooperation and Development Reference Paper. OECD, Paris.
- Omran A., 1971.** The epidemiologic transition: a theory of the epidemiology of population change. *The Milbank Memorial Fund Quarterly*; 49(4): 509–38.
- Padilla M., Capone R., Palma G., 2012.** Sustainability of the food chain from field to plate: case of the Mediterranean diet. In “Sustainable diets and biodiversity: United against hunger. FAO/Biodiversity International”, Rome; 230-241.
- Padilla M., 2008.** Dietary patterns and trends in consumption. In, *Mediterra 2008: The future of agriculture and food in Mediterranean countries*. CIHEAM–Presses de Sciences Po. Paris;149- 170.
- Pálsson G., Avril B., Crumley C., Hackmann H., Holm P., Ingram J., et al., 2011.** Challenges of the anthropocene: Contributions from Social Sciences and Humanities for the Changing Human Condition. ESF/COST RESCUE–Task Force on “Science Questions”. Strasbourg: ESF.
- Panagiotakos D.B., Chrysohoou C., Pitsavos C., Stefanadis C., 2006.** Association between the Prevalence of Obesity and Adherence to the Mediterranean Diet: the ATTICA Study. *Nutrition*; 22:449-456.
- Pekcan G., Köksal E., Küçükerdönmez Ö., Özel H., 2006.** Household food waste in Turkey. Statistics Division, working Papers series N° ESS/ESSA/006e; FAO, Rome.
- Pimentel D., Pimentel M., 2003.** Sustainability of meat-based and plant-based diets and the environment. *Am J Clin Nutr*; 78(3):660s-663s.
- Plan Bleu, 2012.** 20 Years of sustainable development in the Mediterranean: review and outlook. *Blue Plan Notes*; 22. [www.planbleu.org/publications/8p22\\_20ans\\_dd\\_EN.pdf](http://www.planbleu.org/publications/8p22_20ans_dd_EN.pdf)
- Pluimers J., Blonk H., 2011.** Methods for quantifying the environmental and health impacts of food consumption patterns. *BlonkMilieuadvies*, PJ Gouda, The Netherlands
- Rayner G., Lang T., 2012.** Public health and nutrition. Our vision: Where do we go? *World Nutrition*; 3(4): 92-118
- Reddy Sh., Lang T., Dibb S., 2009.** Setting the table - Advice to Government on priority elements of sustainable diets. Sustainable Development Commission, UK.
- Reguant-Aleix J., Sensat F., 2012.** The Mediterranean diet, intangible cultural heritage of humanity. In, *Mediterra 2012*. CIHEAM – Sciences Po Les Presses, Paris; 465-484.
- Renault D., Wallender W.W., 2000.** Nutritional water productivity and diets. *Agricultural Water Management*; 45: 275-296.
- Rolls B.J., Drewnowski A., Ledikwe J.H., 2005.** Changing the Energy Density of the Diet as a strategy for Weight Management. *Journal of the American Dietetic Association*; 105 (5): 98-103.
- Rosenbloom J.I, Nitzan-Kaluski D., Berry E.M. 2008.** A Global Nutrition Index. *Food and Nutrition Bulletin*; 29; 266-277.
- Sáez Almendros S., Obrador B., Serra-Majem L., Bach-Faig A., 2013.** Beyond the health benefits of the Mediterranean Diet: environmental sustainability. *Environmental Health*; 12 (118): 1-8.
- Sánchez-Villegas A., Bes-Rastrollo M., Martínez-González M.A., Serra-Majem L., 2006.** Adherence to a Mediterranean Dietary Pattern and Weight Gain in a Follow-up Study: the SUN Cohort. *International Journal of Obesity*; 30:350-358.
- Sánchez-Villegas A., Delgado-Rodriguez M., Martínez-González M.A., De Irala-Estevez J., 2003.** Gender, Age, Socio-demographic and Lifestyle Factors Associated with Major Dietary Patterns in the Spanish Project SUN. *European Journal of Clinical Nutrition*; 57:285-292.
- SDC, 2009.** Setting the table - Advice to Government on priority elements of sustainable diets. Sustainable Development Commission. UK. [www.sd-commission.org.uk/data/files/publications/Setting\\_the\\_Table.pdf](http://www.sd-commission.org.uk/data/files/publications/Setting_the_Table.pdf)
- SDC, 2011.** Looking back, looking forward. Sustainability and UK food policy 2000-2011. Sustainable Development Commission. UK. [www.sdcommission.org.uk/data/files/publications/FoodPolicy10\\_Report\\_final\\_w.pdf](http://www.sdcommission.org.uk/data/files/publications/FoodPolicy10_Report_final_w.pdf)

- Serra-Majem L., Ribas L., Ngo J., Ortega R., Garcia A., Perez-Rodrigo C., Aranceta J., 2004.** Food, youth and the Mediterranean diet in Spain. Development of KIDMED, Mediterranean Diet Quality Index in children and adolescents. *Public Health Nutrition*; 7(7): 931–935.
- Serra-Majem L., Roman B., Estruch R., 2006.** Scientific evidence of interventions using the Mediterranean diet: a systematic review. *Nutrition Review*; 64:S27-S47.
- Serra-Majem L., Trichopoulou A., Ngo J., de la Cruz J., Cervera P., García Álvarez A., La Vecchia C., Lemtouni A., Trichopoulos D., 2004a.** Does the definition of the Mediterranean Diet need to be updated? *Public Health Nutrition*; 7:927-929.
- Sibai A.M., Hwalla N., Adra N., Rahal B., 2003.** Prevalence and covariates of obesity in Lebanon: findings from the first epidemiological study. *Obes Res*; 11:1353-1361.
- Sim S., Barry M., Clift R., Cowell S., 2007.** The relative importance of transport in determining an appropriate sustainability strategy for food sourcing. *Int J LCA*; 12(6): 422-431.
- Skuras D., Psaltopoulos D., 2012.** A broad overview of the main problems derived from climate change that will affect agricultural production in the Mediterranean area. *FAO/OECD Workshop: Building Resilience for Adaptation to Climate Change in the Agriculture Sector*, 23-24 April 2012, FAO, Rome.
- Smil V., 2000.** Phosphorus in the Environment: Natural Flows and Human Interferences. *Annual review of energy and the environment*; 25 (1): 53–88.
- Smil V., 2002.** Worldwide transformation of diets, burdens of meat production and opportunities for novel food proteins. *Enzyme and Microbial Technology*; 30 (2002): 305–311.
- Sofi F., Cesari F., Abbate R., Gensini A., 2008.** Adherence to Mediterranean diet and health. *BMJ*; 337:1136-1344.
- Speedy A.W., 2003.** Global production and consumption of animal source foods. *J.Nutr*; 133(11 Suppl 2), 4048S-4053S.
- Termeer C. J. A. M., Dewulf A., van Lieshout M., 2010.** Disentangling scale approaches in governance research: Comparing monocentric, multilevel, and adaptive governance. *Ecology and Society*; 15(4): 29. [www.ecologyandsociety.org/vol15/iss4/art29](http://www.ecologyandsociety.org/vol15/iss4/art29)
- Toledo A., Burlingame B., 2006.** Biodiversity and nutrition: A common path toward global food security and sustainable development. *Journal of Food Composition and Analysis*; 19, 6-7, 477-483.
- Tortosa A., Bes-Rastrollo M., Sanchez-Villegas A., Basterra-Gortari F.J., Nunez-Cordoba J.M., Martinez-Gonzalez M.A., 2007.** Mediterranean diet inversely associated with the incidence of metabolic syndrome: the SUN prospective cohort. *Diabetes Care*; 30(11):2957-2959.
- Trichopoulou A., Lagiou P., 1997.** Healthy traditional Mediterranean diet: an expression of culture, history, and lifestyle. *Nutrition Reviews*; (55): 383–389.
- Trichopoulou A., Bamia C., Trichopoulos D., 2005.** Mediterranean diet and survival among patients with coronary heart disease in Greece. *Arch Intern Med*; 25, 165(8):929-35.
- Trichopoulou A., Bamia C., Trichopoulos D., 2009.** Anatomy of health effects of Mediterranean diet: Greek EPIC prospective cohort study. *BMJ*; 338:b2337.
- Trichopoulou A., Costacou T., Bamia C., Trichopoulos D., 2003.** Adherence to a Mediterranean diet and survival in a Greek population. *N Engl J Med*; 348: 2599-2608.
- Trichopoulou A., Kouris-Blazos A., Wahlqvist M.L., Gnardellis C., Lagiou P., Polychronopoulos E., Vassilakou T., Lipworth L., Trichopoulos D., 1995.** Diet and overall survival in elderly people. *BMJ*; 311:1457-1460.
- Trichopoulou A., 2012.** Diversity v. globalization: traditional foods at the epicentre. *Public Health Nutr*; 15(6):951-4.
- UNEP, 2008.** SCP Indicators for Developing Countries - A Guidance Framework [www.unep.fr/scp/publications/details.asp?id=DTI/1085/PA](http://www.unep.fr/scp/publications/details.asp?id=DTI/1085/PA) Paris.
- UNEP, 2010.** HERE and NOW - Education for Sustainable Consumption: Recommendations and Guidelines. A publication from the United Nations Environment Programme (UNEP) and the Marrakech Task Force on Education for Sustainable Consumption.
- UNEP, 2012a.** The Critical role of global food consumption patterns in achieving sustainable food systems and food for all. Discussion paper. Paris.
- UNEP, 2012b.** Avoiding Future Famines: Strengthening the Ecological Foundation of Food Security through Sustainable Food Systems. Synthesis report. [www.unep.org/publications/ebooks/avoidingfamines/portals/19/Avoiding\\_Future\\_Famines.pdf](http://www.unep.org/publications/ebooks/avoidingfamines/portals/19/Avoiding_Future_Famines.pdf)
- UNEP/MAP, 2005.** Mediterranean Strategy For Sustainable Development: A Framework for Environmental Sustainability and Shared Prosperity. Tenth Meeting of the Mediterranean Commission on Sustainable Development (MCS D), Athens.
- UNEP/MAP/Plan Bleu, 2006.** A Sustainable Future for the Mediterranean. The Blue Plan's Environment and Development Outlook. Executive Summary. Sophia Antipolis, France.

- UNEP/MAP/Plan Bleu, 2008.** The Blue Plan's sustainable development outlook for the Mediterranean. Sophia Antipolis, France.
- UNEP/MAP/Plan Bleu, 2010.** Economic Evaluation of Water Demand Management in the Mediterranean. *Study report.* Sophia Antipolis, France.
- UNEP/MAP/Plan Bleu, 2011.** Mediterranean Strategy For Sustainable Development Follow Up: Main Indicators. Sophia Antipolis, France.
- UNESCO, 2010.** Representative List of the Intangible Cultural Heritage of Humanity. UNESCO, Paris.
- UN-HLTF, 2011.** Food and Nutrition Security: Comprehensive Framework for Action. Summary of the Updated Comprehensive Framework for Action (UCFA). United Nations System High Level Task Force on Global Food Security (HLTF); Rome/ Genève/ New York.
- UN-HLTF, 2012.** Food and nutrition security for all through sustainable agriculture and food systems. United Nations System High Level Task Force on Global Food Security (HLTF); Rome/ Genève/ New York.
- UNICEF, 2012.** Monitoring the Situation of Children and Women. Statistics by country – nutrition country profiles. [www.childinfo.org/country\\_list.php](http://www.childinfo.org/country_list.php).
- UNSCN, 2012.** Nutrition security of urban populations, Statement. [www.unscn.org/files/Statements/August\\_31-\\_UNSCN\\_Urban\\_Forum\\_6-\\_Statement\\_final\\_3108\\_finalfinal.pdf](http://www.unscn.org/files/Statements/August_31-_UNSCN_Urban_Forum_6-_Statement_final_3108_finalfinal.pdf)
- Vareiro D., Bach-Faig A., Raidó Quintana B., Bertomeu I., Buckland G., Vaz de Almeida M.D., Serra-Majem L., 2009.** Availability of Mediterranean and non-Mediterranean foods during the last four decades: comparison of several geographical areas. *Public Health Nutrition*; 12 (9A):1667-75.
- Vasilopoulou E., Dilis V., Trichopoulou A., 2013.** Nutrition claims: a potentially important tool for the endorsement of Greek Mediterranean traditional foods. *Mediterr J NutrMetab*;6 (2): 105 – 111.
- Vavilov N.J., 1951.** Phytogeographic basis of plant breeding - The origin, variation, immunity and breeding of cultivated plants. *Chronica Bot*; 13: 1-366.
- Vernele L., Bach-Faig A., Buckland G., Serra-Majem L., 2010.** Association between the Mediterranean diet and cancer risk: a review of observational studies. *Nutrition and Cancer*; 62(7): 860–870.
- Vieux F., Darmon N., Touazi D., Soler L.G., 2012.** Greenhouse gas emissions of self-selected individual diets in France: changing the diet structure or consuming less? *Ecological Economics*; 75:91-101.
- Wackernagel M., Rees W. E., 1996.** Our ecological footprint: reducing human impact on the earth. New Society Publishers, Gabriola Island, British Columbia, Canada.
- Watson D., Lorenz U., Hansen M.St., Szlezak J., Zoboli R., Kuhndt M., Wilson C., Mont O., Wittmer D., 2010.** Towards a Set of Indicators on Sustainable Consumption and Production (SCP) for EEA reporting. European Topic Centre on Sustainable Consumption and Production (ETC/SCP), Copenhagen.
- Weber C.L., Matthews S.H., 2008.** Food-miles and the relative climate impacts of food choices in the United States. *Environmental Science & Technology*; 42(10):3508-3513.
- WHO, 2006.** Addressing the socioeconomic determinants of healthy eating habits and physical activity levels among adolescents. WHO/HBSC forum. [www.euro.who.int/document/e89375.pdf](http://www.euro.who.int/document/e89375.pdf)
- WHO, 2010.** Regional strategy on nutrition 2010–2019. World Health Organisation (WHO); Regional Committee for the Eastern Mediterranean; Fifty-seventh Session, Technical paper EM/RC57/4.[http://www.emro.who.int/docs/EM\\_RC57\\_4\\_en.pdf](http://www.emro.who.int/docs/EM_RC57_4_en.pdf)
- WHO, 2011.** Non communicable diseases country profiles 2011. Global report. [www.who.int/nmh/publications/ncd\\_profiles2011/en/index.html](http://www.who.int/nmh/publications/ncd_profiles2011/en/index.html)
- WHO, 2012.** Food security. [www.who.int/trade/glossary/story028/en](http://www.who.int/trade/glossary/story028/en)
- WHO and FAO, 2003.** Diet, Nutrition and the Prevention of Chronic Diseases. WHO Technical Report Series 916. Report of a Joint WHO/FAO Expert Consultation. World Health Organization (WHO) & Food and Agriculture Organization of the United Nations (FAO).
- Willett W.C., Sacks F., Trichopoulou A., Drescher G., Ferro-Luzzi A., Helsing E., Trichopoulou D., 1995.** Mediterranean diet pyramid: a cultural model for healthy eating. *Am J ClinNutr*; 61 (suppl):1402S-1406S.
- WWF. (2011). Livewell: a balance of healthy and sustainable food choices. UK.
- Zazpe I., Bes-Rastrollo M., Ruiz-Canela M., Sánchez-Villegas A., Serrano-Martínez M., Angel Martínez-González M., 2011.** A brief assessment of eating habits and weight gain in a Mediterranean cohort. *Br J Nutr*;105(5):765-75.
- Zurayk R, 2012.** Can sustainable consumption protect the Mediterranean landscape? In *Mediterra 2012*. CIHEAM–Sciences Po Les Presses, Paris; 155-193.

**Notes**

<sup>1</sup> In this Spanish case study, the adhesion of the Spanish population to the MDP would have a marked impact in all the considered environmental footprints. The MDP pattern in Spain would reduce greenhouse gas emissions (72%), land use (58%) and energy consumption (52%), and to a lower extent water consumption (33%). On the contrary, the adhesion to a western dietary pattern would imply an increase in all these descriptors of between 12% and 72%.

## Annex 1. Conclusions of the CIHEAM International Seminar “The Sustainability of Food Systems in the Mediterranean Area”.



---

### Conclusions of the International Seminar “The Sustainability of Food Systems in the Mediterranean Area” 25-26 September 2012 Malta

---

CIHEAM - Centre International de Hautes Etudes Agronomiques Méditerranéennes – with the technical cooperation of FAO (Nutrition and Consumer Protection Division) and in partnership with MOAN has organized the International Seminar on “The Sustainability of Food Systems in the Mediterranean Area”, held in Malta, from 25 to 26 September 2012. This document summarizes the main issues and makes proposals for actions to be implemented in the Mediterranean basin and highlights concrete projects that can be funded in the coming years.

The main objective of this Seminar, beyond the intrinsic value of the exchanges that took place among the participants (about 70 Euro-Mediterranean experts, senior officials of ministries and international organizations, researchers, etc.), was to provide an innovative approach to reconcile food and nutrition security with sustainability including the use of resources while ensuring the protection of the environment, the adaptation of production systems to climate change, social enhancement and conservation of the Mediterranean diet cultural heritage.

To this end, the participants hope that the recommendations of the seminar will be brought to the attention of the Ministers of Agriculture of the 13 CIHEAM member countries, during their 9<sup>th</sup> meeting on 27 September 2012.

The participants have also emphasized the importance of the role played by CIHEAM, a privileged space for exchanges and analyses aimed at developing cooperation in the Mediterranean basin, a role that has been confirmed and strengthened in the year 2012 by the 50<sup>th</sup> anniversary of its establishment.

The participants focused their consultations in two separate sessions:

1. Food Systems and Sustainable Diets: the Mediterranean Diet as a pilot study;
2. Organic and quality schemes: Sustainability challenges and prospects in the Mediterranean Region

### **Context**

The participants in the Seminar have made the following observations about the evolution of food systems in the Mediterranean countries:

Current food consumption and production patterns are not sustainable in the Mediterranean basin due to biodiversity loss, degradation of natural resources, pesticide contamination, climate change, high energy and water consumption, dietary patterns and eating habits changes and high dependency on imports as well as poverty and vulnerability of many rural and urban Mediterranean communities, and particularly the erosion of the Mediterranean diet;

Currently, in the Mediterranean basin, we have multiple burdens of malnutrition - undernourishment, micronutrient deficiencies, overweight and obesity - due to recent and dramatic shift in dietary patterns. The trends of diet-related diseases (e.g. overweight, obesity, cardiovascular disease, type 2 diabetes, metabolic syndrome, and certain cancers) are alarming, highlighting the inadequacy of the present food systems and dietary patterns. According to WHO (NCD Country Profiles, 2011), overweight and obesity rates in Mediterranean countries continue to rise;

The protective effect on health of a good adherence to a Mediterranean-type diet has been repeatedly evidenced by scientific and medical studies since the 1960's pioneer Seven countries study;

Consequently, urgent measures are needed to promote and disseminate the global concept of «sustainable diets!». For instance, recent scenarios built to model future sustainable agriculture and food consumption acknowledge the necessary changes towards integrated and agro-ecological systems of production as well as a change in the consumption pattern with a higher plant/animal food ratio;

In 2012 the European Commission has presented to the European Parliament, the Council, the European Economic and Social Committee and the Committee of Regions, «Innovation for sustainable growth: a bioeconomy for Europe», which, among other things, envisages activities to spread information among consumers about food products adopting a scientific approach (highlighting the benefits of nutrition, methods of production and sustainability of the environment) and to promote a healthy and sustainable lifestyle;

In 2008, at the 26<sup>th</sup> FAO Regional Conference for Europe, it was recommended to promote local and traditional food products as an essential way for realizing food sovereignty and biodiverse and resilient food production. Several member nations urged FAO to direct more efforts towards market access and consumer awareness of high value traditional products, acknowledging that traditional agriculture practices are often the only farming methods possible in difficult agro-climatic areas. Several delegations agreed that “organic” was a quality designation important for consumers and significant for sustainable agriculture and environment, and countries needed FAO support in establishing a regulatory framework for implementing and protecting this designation. Many delegations highlighted the Mediterranean Diet being rich in biodiversity and nutritionally healthy. Indeed, the promotion of the Mediterranean Diet could play a beneficial role in the development of sustainable agriculture in the Mediterranean region.

The traditional and tradition-based innovative food products are a good way to give value to local biosystems, economies and communities and to improve sustainable development;

Sustainable rural development, organic agriculture and geographical indications were mentioned specifically in the First Conference of Ministers of Agriculture held in Venice in 2003 within the framework of the Euro-Mediterranean Partnership. Organic farming and geographical indications are also mentioned together in various international strategic documents concerning Mediterranean region. Furthermore, development agencies, national governments, private operators and NGOs, working on individual and institutional capacity building for the sustainability of agrofood system, are increasingly taking account the many potential synergies between food quality schemes and certification.

The participants also reflected that the «traditional Mediterranean Diet», recognized by UNESCO as an intangible heritage of humanity in 2010<sup>2</sup>, should be considered as a model of sustainable diet in the Mediterranean basin, and able to contribute to the sustainability of the agro-food systems around the Mediterranean and to the valorisation of quality products.

As a result of these observations, the participants to the seminar felt that the attention of the Ministers of Agriculture of the 13 member countries of CIHEAM, who will meet on 27 September 2012, should be drawn particularly on the increasingly unsustainable situation of food systems around the Mediterranean affecting a large proportion of citizens who currently reside in the Southern and Northern Mediterranean, and on methods and strategies to be adopted to reverse this negative trend.

\*\*\*

## Proposals for an action program

The participants agreed that actions to be undertaken in order to change this situation are urgent and represent the conditions to permanently modify the observed processes and to develop and implement new strategies for achieving sustainable food systems in the Mediterranean. They relate in particular to:

The previous statements made by the CIHEAM's countries Ministers of agriculture in 2008 and 2010, summarized by their final declaration in (Istanbul, May 8, 2010), reporting that it is necessary to: "...*Work to promote a healthy and sustainable regional food production system following the standards of the Mediterranean diet that foster the spirit of conviviality and favour consumption of local and seasonal products, particularly by encouraging regional networks to support public decisions for the protection, promotion and marketing of Mediterranean products and the development of environmentally sound agricultural production systems...*".

The need to reconcile food and nutrition security and sustainable use of resources while ensuring the local food demand and the protection of the environment, and resilience of production systems to climate change and their contribution to its mitigation;

The sustainability of Mediterranean food systems, which represents an important area of thinking and action for governments and international organisations, should replace the short-term approaches. In this context, the use of certification and quality assurance measures (geographical indications, organic agriculture, PDO, etc.) is a very effective means of adding value to products in local and international markets.

\*\*\*

## Activities to be developed

### *Session I*

#### **Food Systems and Mediterranean Sustainable Diets:**

#### **The Mediterranean Diet as a pilot study**

*with technical collaboration of FAO*

Activities must envisage the implementation, in the 13 member countries of CIHEAM and also member States of FAO, of a pilot project to develop "**Guidelines for improving the sustainability of diets and food consumption patterns in the Mediterranean area**". The Mediterranean diet, in its various national forms, will be used as a model to describe, understand and improve the sustainability of current diets and food systems.

In order to assess this sustainability, specific indicators should be identified and further developed to be applied to the different 13 CIHEAM's member countries. These indicators will be used,

in a first step, to characterize the current production and consumption systems in the various Mediterranean countries and, in a second step, to identify the changes needed to achieve both production systems and consumption patterns with noticeably better sustainability and resilience. Measures to protect and improve the Mediterranean diet are expected. Scenarios will be constructed through modelling various options. This will form the basis to formulate recommendations for cross-sectoral policy instruments allowing the improvement of the sustainability of Mediterranean food systems and food consumption patterns.

A previous technical workshop and an international seminar gathered 51 experts in CIHEAM-MAI in Bari in 2011 to launch a first exchange on the necessary indicators to be implemented for that purpose. This Task Force already raised a first list of possible and relevant indicators in four domains, environment and natural resources; economy; society and culture; nutrition, health and lifestyle. An action plan was also proposed.

These indicators could also be used to assess the sustainability of diets in other parts of the world.

\*\*\*

**Session II**  
**Organic and quality schemes: Sustainability challenges and prospects in the**  
**Mediterranean Region**  
*in partnership with MOAN*

Concerning quality schemes for agricultural products and foods it is suggested to:

foster cross-border exchange and public-private permanent dialogue through the strengthening of specific **Network initiatives** focussing on quality schemes and labels (e.g. organic agriculture and local identity products) with promising export potential and significant positive implications for the development of local communities and territories;

establish a cross-border, intergovernmental **Mediterranean Gateway** on quality schemes as well as enhancing bioeconomy through: i) facilitating continued access to up-to-date information on food quality rules, standards and practices changes; ii) providing technical assistance and capacity building to institutional and corporate actors; iii) supporting the design of adequate policies for the integration of Mediterranean small and medium producers and processors into global food quality supply chains; iv) promoting equivalence and local ownership of food quality standards and schemes; v) furthering synergies and complementarities between quality schemes; vi) linking research and enterprising (and clusters) to enhance innovation in agro-food.

## Notes

<sup>1</sup> "...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 optimizing natural and human resources." FAO/Biodiversity International (2010). Biodiversity and Sustainable Diets - United Against Hunger. Report of a scientific symposium; 3-5 November 2010, Rome.

<sup>2</sup> « ... derives from the Greek word "diata" – way of living – it is a social practice based on "know-how, knowledge, and traditions ranging from the landscape to the table and that concern, in the Mediterranean basin, cultures, harvest, fishery, conservation, preparation, cooking and, in particular, the way of consuming» (UNESCO, 2010).