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CIHEAM MAI BARI

Technical Workshop

Development of voluntary guidelines for the sustainability of the Mediterranean diet in the Mediterranean region




Proceedings of a Technical Workshop

Development of voluntary guidelines for the sustainability of the Mediterranean diet in the Mediterranean region

14–15 March 2017

CIHEAM-Bari, Valenzano (Bari)

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Purpose of the meeting

The technical workshop was jointly organized by FAO and CIHEAM-Bari, as part of the implementation of the activities of the 10YFP SFSP core initiative on "Sustainable Diets in the Context of Sustainable Food Systems", in which FAO and CIHEAM are both members of the 10YFP-SFSP Multistakeholder Advisory Committee (MAC).

CIHEAM and FAO, on 23 October 2015, signed a new strategic partnership aimed at working together to advance solutions on issues related to improving food security and nutrition in the region.

The 2017 workshop is a follow up to the FAO/CIHEAM-Bari side event "From production to consumption: the Mediterranean diet as a lever in the Mediterranean, within the framework of the SDGs", held at the First World Conference on the Mediterranean diet, in July 2016, in Milan.

This side event was also a follow up to the FAO/CIHEAM side event on "Planting the seeds of sustainability: from production to consumption in the Near East and North Africa Region", held at the 33rd Session of FAO Regional Conference for the Near East and North Africa (NENA), in May 2016, at FAO headquarters, Rome. In the NENA side event's concluding recommendations, the role of the Mediterranean diet was highlighted as a lever to improve the sustainability of food systems and consumption patterns in the Mediterranean region.

Since 2011, the Mediterranean diet has been identified by FAO and CIHEAM-Bari as a joint case study for characterization and assessment of the sustainability of food consumption patterns and diets in the Mediterranean region. Through a series of international workshops, reports and scientific publications, a methodological MED Diet 4.0 approach was also developed towards the assessment of the sustainability of the Mediterranean diet.

THE MEDITERRANEAN DIET AS A SUSTAINABLE LEVER LINKING FOOD CONSUMPTION TO PRODUCTION IN THE MEDITERRANEAN

Within the international debate on a shift towards more sustainable food systems and diets, interest in the Mediterranean diet as a model of a sustainable diet has increased. The notion of the Mediterranean diet has undergone a progressive evolution over the past 50 years – from that of a healthy dietary pattern for the heart to a model of a sustainable diet. The Mediterranean diet is a significant part of Mediterranean food systems, from consumption to production – not just a diet, but more as a lifestyle, an expression of the diversity of Mediterranean food systems and cultures and their different culinary systems. Despite the fact that the Mediterranean diet has been acknowledged as a healthy diet, it is paradoxically becoming less the diet of choice in most Mediterranean countries. Southern and eastern

Mediterranean countries are passing through the "nutritional transition" in which problems of undernutrition coexist with overweight, obesity and food-related chronic diseases. The erosion of the Mediterranean diet heritage is alarming as it has undesirable impacts not only on health but also on the social, cultural, economic and environmental trends in the Mediterranean region.

THE 2017 FAO/CIHEAM-BARI TECHNICAL WORKSHOP

The international workshop is built on the outputs of four previous FAO/CIHEAM-Bari meetings: the international workshop on "Development of guidelines for improving the sustainability of food consumption patterns and diets in the Mediterranean area", in Bari, November 2011; the international seminar on "Sustainability of food systems in the Mediterranean area", in Malta, September 2012; the international workshop on "Mediterranean sustainable food systems towards the Expo Milan 2015: from theory to practice: linking territory, food quality production, food consumption and dietary patterns for improving the sustainability of the Mediterranean diet. The Apulia case study"; and the side event "The Mediterranean diet as a case study for the assessment of sustainable diets", held within the Expo Milan 2015 event "Does the Mediterranean diet still exist?", organized by CNR, CIHEAM-Bari,CREA, ENEA and the Forum on Mediterranean Food Cultures.

The programme of this workshop is within the scope of the 10YFP SFSP core initiative "Sustainable Diets in the Context of Sustainable Food Systems". It is built on the active participation of the following 10YFP SFSP MAC members from the Mediterranean region: ENEA, UNESCO Chair on Food, Culture and Development at the Universitat Oberta de Catalunya and the Hebrew University; and partner members: IFMeD, CIISCAM, Hellenic Health Foundation, CREA, AIX-Marseille University/INSERM/INRA, FQH, American University of Beirut, Chouaib Doukkali University, El Jadida, Al-Quds Public Health Society -Al Quds University, and other experts.

This FAO/CIHEAM-Bari workshop also advances the 2016 Call for Action for the Revitalization of the Mediterranean Diet, which was issued, at the First World Conference on the Mediterranean Diet, within the UN Decade of Action on Nutrition, and as a follow up to the 2015 MEDIET EXPO Call for Action: "Time to Act", issued at the EXPO 2015 Milan.

The workshop will contribute to strengthening collaboration among key stakeholders to consolidate the role of the Mediterranean diet as a lever to improve the sustainability of food systems and consumption patterns in the Mediterranean region, towards achieving the 2030 Agenda's goals for this region, as stressed in the concluding recommendations of the NENA side event, as well as to contribute to the new CIHEAM Strategic Agenda 2016–2015.

In September 2016, at the 11th Meeting of the Ministers of the CIHEAM member states in Tirana, the promotion of the Mediterranean diet was inserted as Thematic Priority 4 of the new CIHEAM Strategic Agenda 2016–2025, as well as in the CIHEAM Action Plan

2025, within Flagship Initiative 2 "Mediterranean Compact for Sustainable Agriculture and Food", in which the Mediterranean diet has been highlighted as a development asset to create interfaces with other sectors such as tourism and gastronomy and contribute to growth and job creation in local economies. Even more, it has been also underscored as a major asset if included in the strategies of the private sector especially in philanthropic initiatives or social and environmental responsibility.

OBJECTIVES

- To produce a discussion paper on the development of voluntary guidelines for the sustainability of the Mediterranean diet in the Mediterranean region, as a contribution to the 10YFP Sustainable Food Systems Programme core initiative "Sustainable Diets in the Context of Sustainable Food Systems". It is built on the outcomes of the 2012 FAO/CIHEAM-Bari discussion paper on "Towards the development of Guidelines for improving the sustainability of diets and food consumption patterns in the Mediterranean area" and the 2015 FAO/CIHEAM-Bari White Paper "Mediterranean food consumption patterns: diet, environment, society, economy and health" issued at the EXPO 2015 Milan. It will also serve towards the development of the first section "Research" of the voluntary guidelines to be further developed.
- To finalize a proposal for the development of a 10YFP–SFSP core initiative for a Mediterranean Multistakeholder Platform on Sustainable Food Systems, as a contribution to the achievement of the objectives of the 2016 FAO/CIHEAM side event at the NENA Regional Conference, as well as to advance the 2016 Call for Action for the Revitalization of the Mediterranean Diet, as a follow up to the 2015 CIHEAM Med Diet Expo Call: Time to Act, towards more sustainable food systems for present and future generations.

Key messages

- Food security and nutrition are still problems in many Mediterranean countries, especially southern and eastern ones, while obesity and overweight are also becoming a challenge in the entire Mediterranean area.

- The traditional ways of consuming and producing food in the Mediterranean area have changed considerably, mainly due to economic, social, cultural, demographic and technological trends, increasing urbanization and globalization and shifting lifestyles.

- 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 area.

- Today, the main concern in the Mediterranean area 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.

- The Mediterranean diet plays a significant role in Mediterranean food systems, from consumption to production – not just as a diet but more as a lifestyle, an expression of the diversity of Mediterranean food systems and cultures and their different culinary systems.

- Despite the fact that the Mediterranean diet has been recognized for its nutritional value and health benefits, as well as an UNESCO intangible cultural heritage of humanity, it is becoming less the predominant diet of choice in most Mediterranean countries.

- The erosion of the Mediterranean diet heritage is alarming as it has undesirable impacts not only on health, but also on social, cultural, economic and environmental dimensions in the Mediterranean area.

- Within the context of the sustainability of Mediterranean food systems, by linking consumption and production, the development of voluntary guidelines for the sustainability of the Mediterranean diet and lifestyle can contribute to its revitalization in the Mediterranean area.

- The inclusion of sustainability into dietary guidelines has been increasingly discussed over the past decades within the international domain and it has been acknowledged that the Mediterranean diet is a sustainable diet model.

- Business as usual is no longer an option; there is a need to transform and adapt food systems to make them more efficient, sustainable and inclusive, which is why there is a need to accelerate the work on the sustainability of the Mediterranean diet to provide policy-makers, countries and consumers with the tools they need to make the best informed choices.

- Tools are needed to assess the sustainability of the Mediterranean diet that go beyond the health aspects and benefits.

- The assessment of the sustainability of the Mediterranean diet requires:
  - conducting transdisciplinary research in multicountry projects linking nutrition, health, agriculture, food sciences, social sciences, economics and environmental sciences;
  - developing a set of coherent, coordinated and integrated policies involving various stakeholders with governing bodies at national and subnational levels.

- There is a need to strengthen the collaboration among key stakeholders to consolidate the role of the Mediterranean diet as a lever to improve the sustainability of food systems and consumption patterns in the Mediterranean region.

- Youth and family farmers are fundamental in advancing towards economic and social growth as well as towards the achievement of the Sustainable Development Goals.

- The Mediterranean diet is an example of a sustainable and nutritional food model that covers all dimensions of food systems: social, economic, environmental and health.

- There is a need to consolidate relationships with Mediterranean academic institutions at the country level towards the development of a Mediterranean training academic network linking food consumption to production through the sustainability of the Mediterranean diet.

- Countries should consider the Mediterranean diet as a lever to improve the sustainability of food systems and consumption patterns in the Mediterranean area. It should be combined with the promotion of traditional and typical products on which it is based to link consumption with production.

Outcomes from the 2016 First World Conference on the Mediterranean Diet: Revitalizing the Mediterranean Diet

Lluís Serra-Majem
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On behalf of the IFMeD International Scientific Committee[1]

The notion of the Mediterranean diet has undergone a progressive evolution over the past 50 years – from that of a healthy diet to a cultural model and sustainable diet, a sustainable lifestyle model. Although the Mediterranean diet is well documented and acknowledged as a healthy diet, it is paradoxically becoming less followed in most Mediterranean countries. The erosion of the Mediterranean diet heritage is alarming as it has undesirable impacts not only on health, but also on socio-cultural, economic and environmental dimensions in the Mediterranean region. The perception of the Mediterranean diet solely as a "healthy" dietary pattern has until recently overshadowed other important socio-cultural, economic and environmental benefits linked to the Mediterranean diet, by linking food consumption with production and distribution.

The First World Conference on the Mediterranean Diet was held as a continuation of the historical joint effort made by scientists and friends, working together, with open minds and independence, to enhance the Mediterranean diet as a sustainable lifestyle for current times. It fostered open interdisciplinary dialogues among all participants on how to revitalize the Mediterranean diet heritage. Contributions from diverse disciplines and different cultures provided a broader understanding of the multiplex sustainable benefits of the Mediterranean diet, to be shared with all countries in the Mediterranean, and showed the environmental benefits of the Mediterranean diet, resulting from its links to production and distribution.

[1] IFMeD International Scientific Committee: Javier Aranceta, University of Navarra, Spain; Rekia Belahsen, Chouaib Doukkali University, El Jadida, Morocco; Elliot Berry, Hebrew University-Hadassah Medical School, Jerusalem, Israel; Barbara Burlingame, Massey University, Palmerstone, North New Zealand; Giorgio Calabrese, President of *Comitato Nazionale per la Sicurezza Alimentare* (CNSA), Rome; University of Turin, Italy, Roberto Capone, CIHEAM – International Centre for Advanced Mediterranean Agronomic Studies, Bari, Italy; Dolores Corella, University of Valencia and CIBER *Fisiopatologia del Obesidad y Nutricion*, Valencia, Spain; Sandro Dernini, Forum on Mediterranean Food Cultures, Rome; Lorenzo Maria Donini, CIISCAM – Inter-University International Centre of Mediterranean Food Cultures Studies, Rome and Sapienza University of Rome; Carlo La Vecchia, Department of Clinical Sciences and Community Health, University of Milan, Italy; Lluis Serra-Majem, University of Las Palmas of Gran Canaria, Spain; Xavier Medina, Open University of Catalunya, Barcelona, Spain; Alexandre Meybeck, Food and Agriculture Organization of the United Nations, Rome; Gulden Pekcan, Department of Nutrition and Dietetic, Hacettepe University, Ankara, Turkey; Suzanne Piscopo, Department of Health, Physical Education & Consumer Studies, Faculty of Education, University of Malta; Antonia Trichopoulou, Hellenic Health Foundation, Athens; Agneta Yngve, School of Hospitality, Culinary Arts and Meat Science, Orebro University, Orebro, Sweden.

It is now time for the Mediterranean diet international community to reach a consensus on how to assess the adherence and the sustainability of the Mediterranean diet at the country level, and how to reconstruct, at least partially, a sustainable eating culture and lifestyle more suited to the times and for all Mediterranean people. This is the consensus challenge that in Milan the World Conference participants have faced and partially achieved in order to truly contribute together towards the revitalization of the Mediterranean diet, as a contemporary lifestyle, a well-being model that includes the principles of sustainability, food security and nutrition for all.

The Congress was organized by the International Foundation of Mediterranean Diet (IFMeD). IFMeD was created in 2014 and reunites individuals from various disciplines and expertise who are internationally recognized for their work in the restoration of the Mediterranean diet. Its aims are to raise public awareness of healthy and sustainable nutrition, making it a central issue, and to promote international cooperation agreements with both public and private stakeholders to support and pursue the values and benefits of the Mediterranean diet.

This first World Conference aimed to "revitalize" the Mediterranean diet and lifestyle – the authentic dietary pattern and way of life, the one that is not only healthy but also environmentally sustainable and accessible to everyone. Expert representatives from the international scientific community discussed this issue and contributed to the development of the contemporary Mediterranean diet's "new" food pyramid that will be published shortly. More than 200 experts participated in this two-day international conference that took place from 6 to 8 July 2016 in Milan.

After the Conference the *International Call for Action for the Revitalization of the Mediterranean Diet* was launched and circulated internationally and endorsed by more than one hundred institutions and organizations worldwide. The Call acknowledged the Mediterranean diet as:

– an evolutionary concept, from a healthy diet to a sustainable Mediterranean lifestyle, an expression of the Mediterranean culture(s);
– a significant part of Mediterranean food systems, from consumption to production, and no longer just a diet, but an expression of the diversity of Mediterranean food cultures and culinary systems;
– a pivotal element for sustainable food systems in the countries of the Mediterranean region within the 2030 Agenda for Sustainable Development, by taking into account its dimensions of health and nutrition, environment (including biodiversity), and socio-cultural and economic aspects; and
– a way of living of the Mediterranean people, and a complex web of cultural aspects that depend on each other and lead from nutrition to the economy, through law, history, politics or religion, strongly linked to local territories.

The Call for action then stressed the need to act together:

– to reduce the increasing erosion of the Mediterranean diet heritage;
– towards the development of academic and research institution platforms;
– towards the development of joint interdisciplinary studies and research projects;
– for effective, integrated curricula in schools;

– to reach a consensus on how to assess the adherence and the sustainability.

The Second World Conference on the Mediterranean Diet to be held in 2018 will include different areas emphasizing these different five actions stressed in the 2016 Call for Action for the Revitalization of the Mediterranean Diet.

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Outcomes from the 2011–2016 FAO/CIHEAM case study on the Mediterranean diet as a sustainable diet

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INTRODUCTION

FAO and CIHEAM, with many partners, have developed a methodological approach for assessing the sustainability of diets, starting from the definition published by FAO and Bioversity in 2010, with the Mediterranean diet as a case study. The purpose of this intervention is to recall the reasons that led to the selection of the Mediterranean diet as a case study, describe the specificities of the approach adopted, and summarize the main outcomes of the work conducted between 2011 and 2016.

As defined in 2010, 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, 2012. Importantly, this definition integrates health as both a dimension and an objective of sustainability. A sustainable diet is first of all a healthy diet. And it is a diet that enables future generations to have a healthy diet. It thus requires assessing the sustainability of an actual diet from two totally different perspectives: from a nutrition perspective, to assess the potential effect on the individual's health, and from a broader sustainability perspective, to assess its impact on the sustainability of a food system, in all its dimensions: environmental, economic and social.

WHY THE MEDITERRANEAN DIET AS A CASE STUDY?

There are first reasons linked to the Mediterranean diet itself. As an archetypal model, it has been well described and characterized, from the diets practised in some rural Mediterranean areas 60 years ago. It is a "model" but constructed from a historic and geographic reality. It is at the same time a well characterized object and a "real" historic diet. It is also a model that, through local specific incarnations, is widely shared in the Mediterranean, in both developed and developing countries. And this model still largely grounds actual diets in the Mediterranean, in spite of it being inherited from poor rural communities, which in itself is of major interest.

A second group of reasons pertains to the interest its characteristics raise, both from a public health and an environmental perspective. First of all, its positive impacts on

nutrition and health are well described, assessed and recognized, with numerous scientific publications (Estruch *et al*., 2013; Trichopoulou *et al*., 2014; Gotsis *et al*., 2014). As shown above, this is the condition sine qua non for a diet to be considered sustainable. There are also a number of studies that, comparing its environmental impact with that of other types of diets, richer in animal products, conclude that it is more sustainable (Almendros *et al*., 2013; Tilman and Clark, 2014; Tukker *et al*., 2011). These two characteristics position the Mediterranean diet as a good candidate for a sustainable diet.

Third, linked to the reasons above, there is an important scientific community working on it, in very diversified disciplines with, very specifically, considerable pluridisciplinary work having been conducted towards the recognition of the Mediterranean diet as an intangible cultural heritage by UNESCO. The work conducted since 2011 is firmly positioned in these tracks.

Finally, the Mediterranean diet, because of the reasons given above and also because of many other social, commercial and cultural reasons, is the object of much international interest, including outside the Mediterranean. Its main characteristics and some of its symbolic components, such as olive oil, are known and promoted all over the world. This makes the Mediterranean diet a good entry point for consumers worldwide to consider diet-related issues, in between their own practices, traditions, representations and values.

HOW TO CHARACTERIZE THE SUSTAINABILITY OF DIETS IN THE MEDITERRANEAN AREA?

The work stream initiated in 2011 was grounded on some implicit "assumptions": the model of the Mediterranean diet is sustainable; actual diets in the Mediterranean area are not sustainable; returning to the model could be a way to make them sustainable, with the idea that showing the sustainability of the model would also be a way to promote its conservation. The objective was to develop a methodological approach that, starting from the model of the Mediterranean diet, would enable an assessment of the sustainability of actual diets in the Mediterranean area, to facilitate a diagnostic in order to raise awareness on critical issues and address them (Dernini and Berry, 2015). The Mediterranean model was therefore the starting point, the framework used to devise a methodology that is then to be used to consider and assess actual diets in Mediterranean countries, many of which are now no longer strictly implementing the model. In other words, the objective was to start from a model that is well known for its positive impacts on health and on the environment to develop a methodological approach to be used for assessing actual diets.

The development of the methodological approach comprised several steps, each of them involving a broad range of experts (see Dernini *et al*., 2013). Four broad thematic areas were first identified: environment and natural resources (including agro-biodiversity); economy; society and culture; and nutrition, health and lifestyle. The choice of having four thematic assessment areas is one of the great originality of the approach. It recognizes health and nutrition as the sine qua non dimension of the sustainability of a diet and enables embracing all the three classical dimensions of sustainability identified in the vast corpus of research and discussions on sustainable development (Berry *et al*., 2015). This also reflects the truly multidisciplinary composition of the team involved. For each of

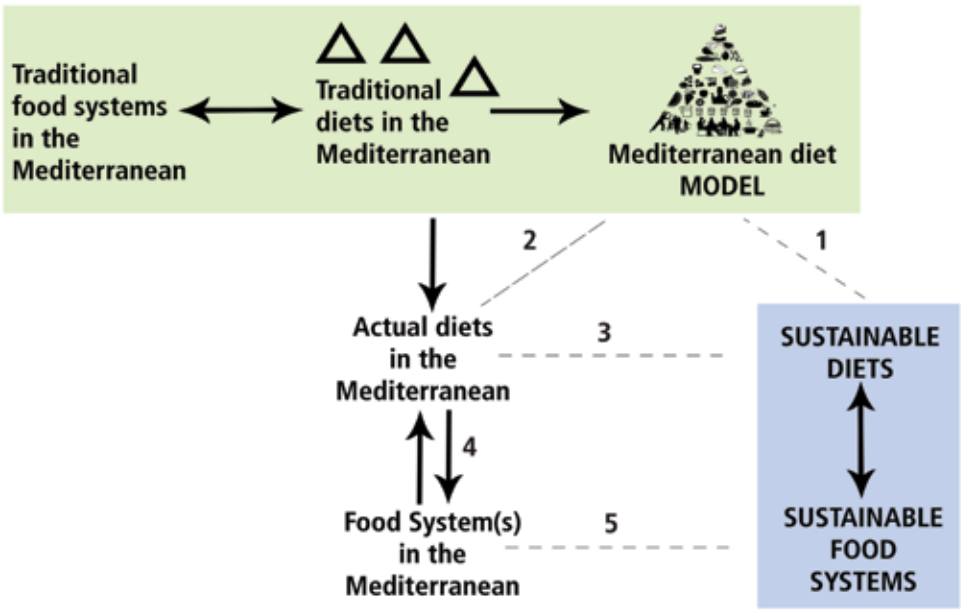

Figure 1. From concepts to actual diets
Source: FAO (2015).

the thematic areas, potential indicators were identified, from existing series developed by international organizations and/or in the scientific literature. This list was then simplified, taking into account data availability as well as the need for a reduced number of indicators (both lists are available in Lacirignola *et al*., 2012). The nutrition indicators were then further elaborated (FAO, 2015).

The process was also oriented by the preparation of a White Paper on Mediterranean food consumption patterns: diet, environment, society, economy and health (CIHEAM/FAO 2015) as part of the Feeding Knowledge Programme developed for Expo Milano 2015. This enabled the identification of main areas of concern for the sustainability of food systems and diets in the Mediterranean area.

The result is a list of potential indicators proposed (see Table 1), many of which are precisely defined, with the methodology to calculate them, some still to be precisely defined, including some awaiting finalization of an agreed international methodology, such as for food loses and waste.

AN ORIGINAL, SYSTEMIC, APPROACH

The approach adopted to characterize the sustainability of diets in the Mediterranean area has very specific features that distinguish it from most of the ongoing research on sustainable diets. Three main features deserve to be highlighted.

In line with the 2010 definition, it is much more holistic, including health and nutrition as a/the main dimension of sustainability of diets, as well as the three dimensions of

Table 1: Potential indicators for assessing the sustainability of the Mediterranean diet

Thematic area	Proposed indicators
A. Nutrition and health	A1. Diet-related morbidity/mortality
	A2. Fruit and vegetable consumption/intake
	A3. Vegetable: animal protein consumption ratio
	A4. Average dietary energy adequacy
	A5. Dietary diversity score
	A6. Dietary energy density score
	A7. Nutrient density
	A8. Food biodiversity composition and consumption
	A9. Nutritional anthropometry
	A10. Physical activity/physical inactivity prevalence
	A11. Adherence to the Mediterranean dietary pattern
	A12. Rate of local/regional foods and seasonality
	A13. Rate of eco-friendly food production and/or consumption
B. Environment	B1. Water footprint
	B2. Carbon footprint
	B3. Nitrogen footprint
	B4. Biodiversity
C. Economy	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 per groups: food
	C4. Food self-sufficiency: cereals, fruit and vegetables
	C5. Intermediate consumption in the agriculture sector: nitrogen fertilizers
	C6. Food losses and waste
D. Society and culture	D1. Proportion of meals consumed outside home
	D2. Proportion of already prepared meals
	D3. Consumption of traditional products (e.g. proportion of product under protected designation of origin or similar recognized traditional foods)
	D4. Proportion of mass media initiatives dedicated to the knowledge of food background cultural value

Source: Dernini *et al*. (2016).

sustainability, environment, economic and social, whereas many recent publications restrict themselves to links between health and environmental outcomes. Even in the environment thematic area it aims to assess the most commonly covered issues such as impacts on climate change but also water use and biodiversity. Integrating economic, social and cultural dimensions enables consideration of topics that are not only indicators of sustainability but also of drivers of change, such as prices, consumption practices, selection of products according to their modes of production or provenance.

It has been designed not from a global perspective but specifically for the Mediterranean area in reference to a spatially referenced "model", taking into account its specificities and

sustainability priorities (CIHEAM/FAO, 2015). This is particularly apparent in indicators such as "adherence to the Mediterranean dietary pattern", the importance given to water use and more generally to resource use, as shown by the indicator on food losses and waste, the indicator on self-sufficiency, a key concern for many countries in the area and also for specific attributes and values of products that are both a distinctive feature and a potential for sustainable rural development.

Its aim is to assess actual diets, recognizing their diversity as well as their links to specific and diverse food systems and territories.

These features go with specific methodological challenges. First of all they drive important data needs, on diverse topics, and, most importantly, at appropriate scales. Assessment of actual diets requires actual data, linked to these diets. These data needs can be broadly divided in two categories: those related to impacts on nutrition and health, to be assessed at consumer level (population or individual) and those related to impacts on the food system. For the first group of data the scope is the same as the scope of the diet being assessed. For the second one it very much depends on where the food is sourced from which raises additional methodological challenges: the need to know where the food is sourced and to assess the impacts of the demand on places and value chains that provide it, that can be quite far from where they are consumed.

Importantly these features, along with the additional data to be collected, enable going beyond the assessment of sustainability strictly speaking and to understand drivers of change and identify opportunities for action.

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Sustainability from theory to practice: Apulia case study

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INTRODUCTION

A pilot project was carried out to assess the sustainability of the high-quality typical agro-food products of Apulia region, in the framework of the Agriculture and Quality Programme 2013–2015 of Apulia Region, under the voluntary Regional Quality Scheme – Products of Quality of Puglia, in accordance with EU Reg. No. 1305/2013.

There is an enormous potential for the development of the agriculture sector in Mediterranean territories by focusing on the enhancement of typical and traditional products, which represent the cornerstone of the well-known Mediterranean diet (Capone *et al*., 2016).

The combination of tradition, innovation and sustainability can help to better communicate the unique attributes and characteristics of typical products to consumers.

Typical and traditional high-quality agro-food products of Apulia region (Regione Puglia, 2010), southeastern Italy, play an important socio-economic role, because this region has a strong agricultural vocation counting on culture, tradition and biodiversity (Moscatelli *et al.*, 2017).

The peculiarities of the regional area are essential for the product typicality. These peculiarities are related to different regional endogenous factors including climate, biodiversity, ecosystems, production and marketing techniques, knowledge, habits, customs and traditions (Capone, El Bilali and Bottalico, 2016).

The paper aims to provide a focus on the Apulia project on the assessment of sustainability, from the economic, environmental, socio-cultural and nutritional-health dimensions, and the enhancement of Apulia typical agro-food products adhering to the Regional Quality Scheme.

MATERIALS, METHOD AND RESULTS

The Regional Quality Scheme is an indication of origin "Products of Quality" of Puglia that relates to plant and animal food products (including fish products) and floriculture, with specific characteristics of product and of process, having higher quality characteristics than current marketing standards, in terms of public health, plant health and animal welfare or environmental protection (Regione Puglia, 2016a).

Typical quality foods could be at the epicentre of the Mediterranean food system's sustainability.

The methodology adopted for the assessment of sustainability of Apulia typical quality agro-food products was particularly focused on the inter-sectorial and interdisciplinary

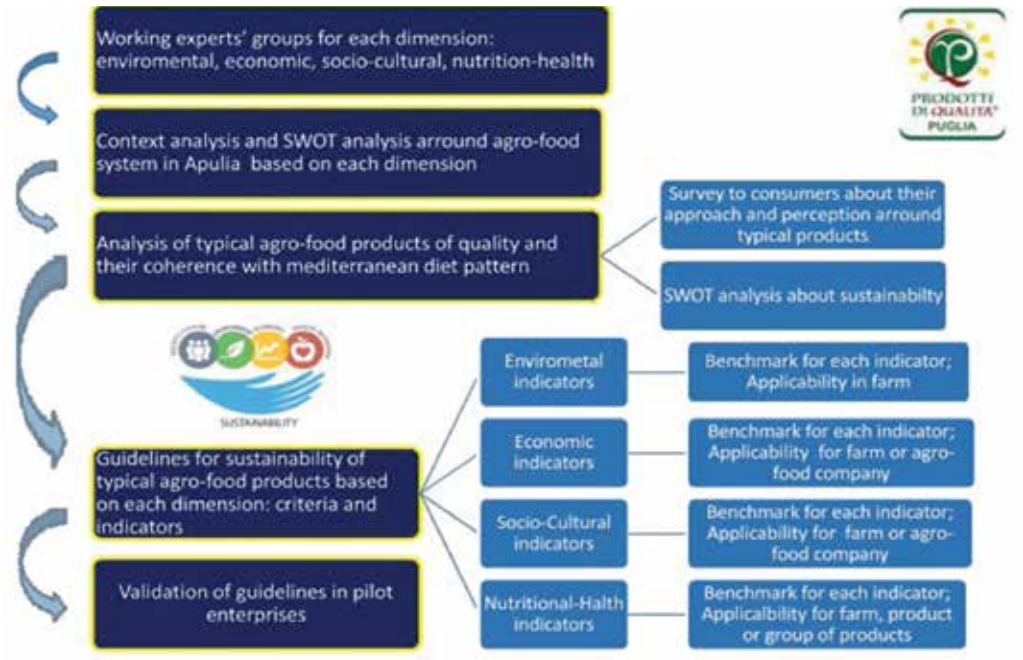

Figure 1. Methodology for sustainability: preliminary approach
Source: Authors' elaboration from the Programme Agriculture&Quality report.

approach; it was applied by Italian experts in this study taking into account the three pillars of sustainable development (environmental, economic, social-cultural) integrated with the health-nutritional component (Figure 1).

The assessment of sustainability for product, for farm, for agro-food company, and for supply chain was elaborated in accordance with the following points in line with the sustainability assessment of food and agriculture systems (SAFA) approach (FAO, 2013):

- criteria of sustainability for each supply chain;
- weight of each criterion for each dimension;
- indicators for each criterion;
- method of scoring and aggregation of indicators for each dimension;
- weight of indicators for each criterion;
- value of benchmark for each indicator and each supply chain.

For each dimension, a working group was set up bringing together experts from different Italian institutions (multidisciplinary approach).

The voluntary guidelines have been drawn up by CIHEAM-Bari in collaboration with the same groups of Italian experts from National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA), Research Centre on Food and Nutrition (CRA-NUT), Olive Growing and Olive Product Industry Research Centre (CRA-OLI), National Research Council (CNR), University of Bologna, University of Napoli Federico II, Forum on Mediterranean Food Culture, and Certification and inspection company of Thiene-Vicenza (CSQA).

Each working group identified a series of indicators that were relevant, specific and measurable at farm level, and appropriate and easy to understand and to communicate to all stakeholders, including farmers, politicians and consumers. The benchmark of each indicator of sustainability was calculated and validated in pilot enterprises.

In 2015–2016, Apulia Region approved the guidelines for the voluntary recognition of the additional "sustainability" standard of Apulia typical quality agro-food products, which also include the criteria related to the indicators that must be calculated starting from the preliminary study and the series of indicators.

The "Additional brand/seal of sustainability" guarantees the sustainability of the farm process to grow or produce the product from an environmental, economic, socio-cultural and nutritional health point of view.

The enterprises, adhering to Regional Quality Scheme, can demonstrate that they subscribe to the "Optional sustainability" requirements by using the "Additional Sustainability Logo" on product/s complying with the guidelines.

In the transition phase, once Puglia Region has approved the sustainability approach/criteria, the enterprise can apply only one dimension instead of general "sustainability". In this case, it uses the logo for one dimension. Within five years, the enterprise must subscribe to all dimensions (Regione Puglia, 2016b).

CONCLUSIONS AND RECOMMENDATIONS

The associated promotion of the quality of the typical foods of the Mediterranean diet together with a sustainability logo/trademark can contribute to the improvement of the sustainability of the Mediterranean diet, and to an effective sustainable development of Mediterranean rural territories such as Apulia region.

The voluntary sustainability standard, such as the one developed thanks to this pilot project, can help in the effort of creating added value for small producers. Communities and cultures that maintain their own traditional food systems are better able to conserve local food specialties with a corresponding crop and animal diversity.

The challenges from theory to practice for the development of voluntary guidelines for the sustainability of the Mediterranean diet in Mediterranean area can be as follows:

- to define the object of sustainability evaluation: diet and products are two different things; in fact not all indicators valid for assessing the sustainability of a diet are valid for products and vice-versa;
- to evaluate the balance between the science (sustainability assessment) and the practicality (in particular, the applicability in a control/certification system);
- to define if indicators must be calculated for products or farms/companies (and food supply chains), then define if the indicators for products and farms can be aggregated;
- to determine how to combine the different indicators to reach a score/index for assessing sustainability;
- to decide which value should have the different sustainability dimensions/pillars, and criteria/themes within dimensions.

In the following months, the main challenge should be to see how these indicators referring to products or enterprises could be used for assessing the sustainability of food chains in the different Mediterranean regions as a driver for development and growth of the entire territory.

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Is the Mediterranean diet still a cultural heritage in Lebanon and Tunisia? Evaluation of the long-term changes in food consumption and deviation from the Mediterranean diet

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While the scientific community has identified the Mediterranean diet (MD) as an example of a sustainable diet with health benefits and protective effects against chronic nutrition-related diseases (CND), this diet is also defined as a cultural heritage with specific local variations.

Tunisia and Lebanon are typical of Mediterranean countries that are facing a nutrition transition characterized by a decrease in undernutrition and an increase in obesity and associated CND (estimated to account for 82 percent of total deaths in Tunisia and 85 percent in Lebanon), highlighting the importance of promoting healthy diets adapted to the local context.

Social factors underline these health changes in both countries. The social model of health considers a broader range of factors that influence health and well-being – for example, environmental, economic, social and cultural conditions can modify individual behaviour.

In the case of Tunisia and Lebanon, urbanization, the increased availability of prepared and processed foods, and mobility and migration are exerting pressure on traditional diets. Westernized eating patterns in children and adolescents have been associated with overweight in both Lebanon and Tunisia.

Although this transition has been well documented for the last decades, relatively little is known about the magnitude and evolution of food consumption changes in the long-term perspective, especially with regard to the traditional MD.

The common project, conducted in collaboration with nutrition research institutions and under the guidance of FAO, aims to provide evidence-based information to support

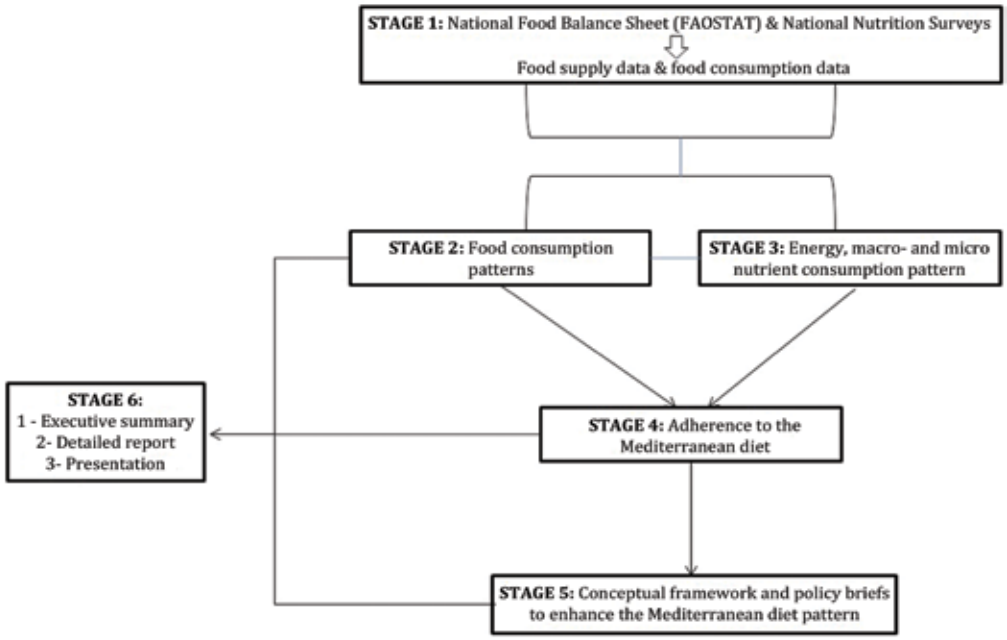

Figure 1. Overview of the project
Note: This project, GCP/RNE/007/ITA (639709), will be funded by FAO.

decision-making for promoting sustainable access of households and individuals to nutritious and diversified food in respect of local traditions and biodiversity.

The following actions have been planned to achieve the above objectives:

Action 1: Document changes in food consumption patterns, nutrient intake and CND in both countries over time based on Food Balance Sheet,[1] household and individual food consumption data and other health assessments. This will be done by analysing food balance sheet data as well as individual food consumption data obtained from national surveys in order to examine secular trends in macronutrient and micronutrient intakes among various age groups in Lebanon and Tunisia.

Action 2: Produce evidence documenting whether and how dietary consumption patterns have moved away from the MD through the use of indices, as well as limiting or enabling factors. This will produce an assessment of how well the traditional dietary patterns conform to variants of the MD and how long the MD has not been transmitted as a cultural heritage. A meeting will be organized between research teams to share the experience of Lebanon and Tunisia and to develop a Mediterranean diet score specific to each country using a commonly agreed-upon approach.

Action 3: Develop, with stakeholders from multiple sectors, a conceptual framework assessing the adherence to the MD and improving its sustainability, within the food system

[1] Food balance sheets present a comprehensive picture of the pattern of a country's food supply during a specified reference period.

context of both countries. This will generate information to be used by governments to promote sustainability and adherence to the MD through targeted interventions. The results from this project will make an essential contribution to improving our understanding of the production, availability, access to and consumption of foods that are part of the traditional Mediterranean diet, within a country-specific context.

Outcome of the project: Generation of evidence documenting whether and how Lebanese and Tunisian dietary consumption patterns have moved away from the traditional Mediterranean diet in order to develop policies and population-level interventions that guarantee a healthy diet for all.

How to create a healthy food environment through production of diversified foods, as in the Mediterranean diet

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The current global nutrition situation indicates that malnutrition, in all its forms (undernutrition, micronutrient deficiencies, overweight and obesity) is widespread and represents an intolerable burden, not only on the national health systems but on the entire cultural, social and economic systems of nations, and is a major impediment to development and full realization of human potential. While some progress has been made in reducing undernourishment from over one billion in the 1990s to the current figure of 795 million in 2015 (FAO.IFAD/WFP, 2015), an estimated two billion people suffer from micronutrient deficiencies (FAO, 2013), while more than 1.9 billion adults are overweight, of which over 600 million are obese (WHO, 2014). Nutrition-related non-communicable diseases are putting immense burdens on national economies. Underlying the current nutrition situation is the problem of unhealthy diets.

The joint FAO/WHO Second International Conference on Nutrition (ICN2, 19–21 November 2014) highlighted concerns about food systems not delivering healthy diets. ICN2, in the Political Declaration,[1] recognized the importance of a food system approach – from production to processing, storage, transportation, marketing, retailing and consumption – as key to promoting healthy diets and improving nutrition, as isolated interventions have limited impact. Furthermore, the INC2 Framework for Action[2] made several recommendations to governments for enabling the food environment to deliver healthy diets.

According to INC2 documents, in order to achieve heathy nutrition there is the need to "implement nutrition education and information interventions based on national dietary guidelines and coherent policies related to food and diets, through improved school curricula, nutrition education in the health, agriculture and social protection services, community interventions and point-of-sale information, including labelling". In addition to that, the issue of primary production is addressed, recommending to "review national policies and investments and integrate nutrition objectives into food and agriculture policy,

[1] http://www.fao.org/3/a-ml542e.pdf
[2] http://www.fao.org/3/a-mm215e.pdf

programme design and implementation, to enhance nutrition sensitive agriculture, ensure food security and enable healthy diets".

The revision of the Italian guidelines for healthy nutrition, expected for 2017, is in line with these recommendations. The guidelines are intended to protect people's health in situations where socio-economic factors have determined overabundance of resources and consequent effects on human health. The opportunity and the need for a periodic revision of the guidelines could be easily explained. In fact, in a line of continuity with previous editions – this is the fourth for Italy – there is first a need to update the continuous development of scientific knowledge on the role of single nutrients and the minor components of the diet and its needs and mutual relationships in the context of a balanced diet. Second, the change of consumption habits and lifestyle behaviour should be taken into account, in the context of a society that increasingly shows attention to correlations between diet and health. Third, the increasing interest towards the correlations between nutrition and diseases related to the usual diet – excessive and/or unbalanced – and the confusion and misinformation about the roles and functions of food and nutrients should be addressed.

Two hot, compelling themes for the next revision of the Italian guidelines will be the environmental impact of food consumption and the economic cost to the consumer of a healthy diet. These issues will therefore be addressed in dedicated chapters that from the ten of the present version of guidelines will be increased to 13. In fact, food poverty and the new vulnerability of some population subgroups lead more and more public health workers to give indications that are also commensurate with ability to pay. Some foods may be too expensive for large sections of the population; on the other hand, there are plenty of food choices that are both healthy and need not burden the family budget. The sustainability of food systems is another hot topic that will be addressed in the next revision of the guidelines. Although currently there is enough food, food production is creating environmental problems in different ways and the long-term sustainability of food production is becoming an increasingly important issue. While these areas are not of close nutritional relevance it is appropriate to consider them and new guidelines should promote a model that is not only healthy but also sustainable.

The Italian guidelines for healthy nutrition are built on the basis of Mediterranean diet principles, a model that has gained fame and honour, being the model that combines prevention of non-communicable diseases, longevity and health combined with consumers' acceptability. Food diversity varies from country to country, as well as eating habits; the possibility for realization of a healthy diet as part of a healthy lifestyle is a possible challenge. It is now possible to define the principles of the Mediterranean diet according to local foods and eating habits.

As in other countries, the Italian diet now is fairly different from those of Cilento 50 years ago that was described by Ancel Keys as protective for health in the very famous Seven Countries Study (Keys *et al.*, 1986). Nowadays, the Mediterranean diet is a convenience phrase: not all inhabitants of the Mediterranean consume this type of diet on a regular basis (Martinez and Martinez-Gonzalez, 2016). It must be emphasized that there

is not one single Mediterranean diet, but rather a number of variations on a basic theme adapted to an individual country's cultures. Therefore, the Mediterranean diet is more than just a defined diet, but it represents the plurality of various cultural expressions of different Mediterranean food cultures and lifestyles (Dernini and Berry, 2015). The reasons why people keep on drifting from one dietary regimen to another remain open to several hypotheses (Bonaccio, Iacoviello and de Gaetano, 2012). Social changes appear to have contributed to radical reversal in dietary habits in Western and Southern European societies although developing countries are slightly turning to Westernised diets as well (Prentice, 2006). Socio economic status is a key determinant of adherence to the Mediterranean diet. In Italy, this relationship was demonstrated in the Molisani Study (Bonaccio *et al*., 2012). Higher income and education are independently associated with a greater adherence to Mediterranean diet-like eating patterns and a lower prevalence of obesity. These results are in line with others (Darmon and Drewnoski, 2015) reporting that higher-quality diets are mainly consumed by better educated and more affluent people, while lower socio-economic groups tend to have lower-quality diets thus exposing themselves to a higher risk of developing diet-related diseases. However, the most interesting results of the Moli-sani study are related to the fact that education per se was found to be independently associated with Mediterranean diet adherence and did not modify the association between income levels and a healthy dietary pattern as shown in the stratified analysis by education levels. That said, we could speculate that educational level compensates, at certain degrees, the economic disadvantages in this South Italian cohort.

Recently, the concept of sustainable food systems and diets has grown in importance. The idea of "sustainable diets", which combines dietary recommendations with healthier environments and consumers was proposed in the 1980s and was recently reviewed. FAO (2012) further defined sustainable diets as "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 are respectful of biodiversity and ecosystems; they are culturally acceptable, accessible, economically fair and affordable, nutritionally adequate, safe and healthy while at the same time optimizing natural and human resources" (FAO, 2012). It seems clear, however, that the sustainability implication of the diet still remains elusive and undefined. In fact there is a need to assess what quantifies or qualifies a sustainable diet that can be benchmarked over time.

In the last decade, the Mediterranean diet has become the object of increasing studies on its environmental sustainability, because of its mainly plant-based dietary pattern and its lower greenhouse gas emissions and lower water footprints, when compared with current Western dietary patterns (Tilman and Clark, 2014; van Dooren *et al*., 2014; Baroni *et al*., 2007; Almendros *et al*., 2013). The issue of the sustainability of Mediterranean diet was recently pointed out in the work of Dernini and Berry (2015). In fact, to broaden the concept of the Mediterranean diet also in terms of sustainability, particularly after its acknowledgment by UNESCO as an intangible cultural heritage, would need more assessments of its socio-cultural and economic sustainability, which are still lacking. This shift of interest on the Mediterranean diet, from a healthy diet to a sustainable dietary

pattern, would also contribute to the improvement of the sustainability of Mediterranean food systems and food security and nutrition in the Mediterranean area. Food plays a central role in the social and cultural life of the Mediterranean area. In this context, the Mediterranean diet is a complex web of interrelated cultural aspects, and it must always be considered as a part of significant social and cultural interdependent Mediterranean food systems, and never as an independent item (Medina, 2009, 2011). Then the enhancement of the Mediterranean diet could be pursued also if its socio-cultural and economic benefits are highlighted together with the well-appreciated healthy and environmental ones.

The creation of a healthy food environment combining consumers' health protection and protection of the environment needs efforts at different levels – policy, programmes, individual, research. In summary, there is a need to increase plant food production in particular fruit and vegetable as well as to increase vegetable protein source foods. Accessibility and affordability of fruit and vegetables represent key issues in order to attenuate social inequalities, especially considering the importance of promotion of consumption of fruit and vegetables for their role in health protection. Nutrition public health actions need to discourage consumption of food items such as meat, dairy products and sugar that affect health and the environment. The promotion of consumption of fruit and vegetables needs to take into consideration the impact of massive plant food production in terms of food waste and water consumption. The cultural change that Italy is going to promote in the next revision of its nutritional guidelines is related to the general approach to nutrition considering that it is the whole dietary pattern that is protective for health and the environment rather than a single food or ingredient.

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Development of voluntary guidelines for the sustainability of the Mediterranean diet in the Mediterranean region

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The global development agenda for 2016–2030 has identified 17 Sustainable Development Goals (SDGs) (UNDP, 2016), of which six are related to and can be addressed through sustainable diets. Adopting sustainable diets simultaneously promotes food security as well as health and well-being of populations, while being protective of the environment and preserving its resources (FAO, 2012). In addition to addressing the SDGs, Mediterranean countries need to curb the alarming levels of diet-related non-communicable diseases (NCDs) by adhering to more sustainable food consumption and production patterns through promotion of the Mediterranean diet (MD) as a healthy and sustainable option.

Studies on the determinants of NCDs have shown a strong association between high consumption of harmful food components (processed meat, red meat, trans fatty acids, sugar-sweetened beverages and sodium), low consumption of protective foods (fruits, vegetables and beans, nuts and seeds, whole grains and seafood omega-3 fatty acid) and increased risk of deaths from cardiometabolic diseases across all countries of the Middle East and North Africa (MENA) region (Afshin *et al*., 2015). In Lebanon, analysis of food consumption patterns among Lebanese adults revealed the predominance of two major dietary patterns: the Western pattern characterized by high intakes of fast food sandwiches, fried foods, pizzas and pies, meat and poultry, refined grains, desserts, carbonated beverages, butter, juices and mayonnaise; and the traditional Lebanese pattern characterized by high intakes of fruits and vegetables, legumes, olives and olive oil, traditional dishes and desserts, eggs, nuts and whole dairy products (Naja *et al*., 2014). A greater adherence to the Western pattern was associated with higher body mass index (BMI) (ß = 0.49, 95 percent CI: 0.21–0.76) and waist circumference (ß = 1.08, 95 percent CI: 0.39–1.76), higher risk of hyperglycemia (OR: 3.81; 95 percent CI: 1.59–9.14) and three times the odds of metabolic syndrome (OR: 3.13; 95 percent CI: 1.36–7.22) (Naja *et al*., 2014). The traditional Lebanese pattern resembles the MD in its protective food components and in its protective effect against diet-related NCDs, particularly type 2 diabetes (OR: 0.46, CI: 0.22–0.97), while showing no association with any of the aforementioned cardiovascular metabolic risk factors (Naja *et al*., 2012, 2014).

To promote adherence to the MD as a healthy and sustainable option, research should include: determining the healthy aspects of the current food consumption habits; identifying

the needed changes towards healthy food options; assessing the environmental impact of the changes by increasing consumption of protective foods and decreasing consumption of harmful foods while addressing the necessary trade-offs; and determining the social and economic dimensions of sustainable diets.

Food-based dietary guidelines (FBDGs) are being revisited and studied in terms of their environmental sustainability in addition to their health implications, particularly in developed countries where most of the work on environmental sustainability has been done so far. In Mediterranean countries, research on environmental sustainability of current food consumption patterns is scarce. Thus, the tools to assess the sustainability of these guidelines need to be revisited and any stipulated changes need to be considered in terms of their sustainability and health value.

Research at the American University of Beirut is being conducted to examine the impact of current food consumption patterns in Lebanon on natural resources and environmental sustainability using the life cycle analysis (LCA) approach. One of these research projects aims at assessing whether the traditional Lebanese diet, which shares many characteristics with the MD, is both healthy and sustainable. To do so, the traditional Lebanese diet as well as its Western counterpart will be evaluated for their environmental footprint, including soil erosion, water use, energy use, greenhouse gas emissions and economic cost. This could provide a model for assessing the sustainability of food consumption patterns elsewhere in other Mediterranean countries (i.e. adapt, replicate and/or scale-up at regional level). In addition, this project could serve for actionable knowledge for revisiting the Lebanese FBDGs for their nutritional impact and sustainability considerations. Developing sustainable FBDGs may be accompanied by policy briefs to inform policy-makers and stakeholders in the country about shifting towards sustainable food consumption, and guide them towards healthy and sustainable eating. The research project also aims at examining the effect of shifting towards a healthier Mediterranean-like diet in MENA on environmental sustainability; in other words, assessing whether changes towards healthy (nutritionally recommended) food consumption patterns can result in more environmentally sustainable diets in MENA.

Towards the same goal, another research project has been recently launched at the American University of Beirut with the support of FAO: *Towards the enhancement of the Mediterranean diet in the Mediterranean region: the case of Lebanon*. This project aims to investigate how food consumption patterns in Lebanon have moved away from the traditional healthy MD to a Westernized health-endangering food consumption pattern, and to develop policies and population-based interventions that promote adherence to the MD. To achieve these goals, this project will: (i) examine changes in food consumption patterns, nutrient intake, and diet-related NCDs in Lebanon by age, gender and rural/urban location over time; and (ii) produce evidence on the shift that occurred in the traditional Lebanese pattern towards an unhealthy pattern, and recommend change that would promote adherence to a traditional MD in Lebanon.

Finally, interventions along the food system, from the production level (including primary production, processing, packaging and marketing) to the consumption level,

can contribute to advancing healthy and sustainable diets and promote adherence to the MD in an attempt to lower diet-related NCDs in an environmentally sustainable manner in the country.

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Education about and for the Mediterranean diet: a snapshot of present actions and a proposal for a way forward

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INTRODUCTION

Since the 1990s the Mediterranean diet has been placed in the spotlight as a model for healthy eating habits (Alexandratos, 2006). Its underlying principles form the basis of different sets of dietary guidelines around the world, where the intake of vegetables, fruits, nuts, grains, pulses, fish and low-fat dairy products, and opting for monounsaturated fats such as olive oil, are stressed. Though much research has been conducted on the protective role of the Mediterranean diet, little is known about preventive and therapeutic education interventions. At the same time, the Mediterranean diet is now being promoted as a lifestyle that goes beyond health to support the well-being of individuals, communities and the natural environment at various levels (Dernini *et al*., 2016).

However, in recent decades the Mediterranean diet, especially among younger generations, is being abandoned (Iaccarino *et al.*, 2017; Bottalico, 2016; Grosso and Galvano, 2016, Belahsen, 2014; Kontogianni *et al*., 2008). It is clear that there is a need to extend and strengthen education along the whole food chain and within different communities to not only increase awareness about the broader positive impacts of the Mediterranean diet, but also to concretely bring about change in food intake. Successfully achieving these goals has strong potential for reducing health risk factors and enhancing sustainability outcomes.

WHO AND WHY

There are multiple stakeholders involved in this complex and special system which determines a population's food intake. All of these stakeholders can benefit individually or help others to benefit through increasing their knowledge and/or skills in appreciating, adopting, facilitating and publicizing and marketing Mediterranean diet concepts. Educating and training about and for the Mediterranean diet needs to be implemented and supported via different channels: through the formal compulsory school system, in different vocational and professional courses at post-secondary and tertiary level of education, through more informal settings for the general public, through consultations with voluntary organizations, the commercial

sector and also with medical professionals[1] and in special briefs to policy-makers. In this way one can mainstream the Mediterranean diet concepts to try and push towards a more pervasive "Mediterranean diet" type of food consumption and related lifestyle.

In 2015, writing for the report of The Rockefeller Foundation–Lancet Commission on Planetary Health, Demaio and Rockström stated "If we can get it right on food, we will have come a long way to getting it right for people and the planet" (p1973). Their statement stemmed from a concern that in order to safeguard human health now and in the future, a common language was necessary around the multiple issues related to the food system. One of the issues mentioned was the need for more widespread adoption of a plant-based, minimally-processed diet, moving away from a Western-type diet; a strategy which has also been emphasized by multiple researchers and organizations for health, economic and environmental reasons (Springmann *et al*., 2016; Garnett *et al*., 2015; The Lancet Commission on Obesity, 2015; WHO, 2013; Popkin, 1998). Policy-makers, in particular must therefore realize that any dietary transition towards a Mediterranean-type diet, or support for current providers and consumers of such diet, requires the creation of environments conducive to its adoption and maintenance.

The need for further research to review interventions that have used Mediterranean diet education and strategies, which were effective in bringing about positive health behaviour change has been previously underlined (Piscopo, 2009). Research-based and anecdotal evidence that has been gathered since then indicates that, in different countries in the Mediterranean region, the Mediterranean diet as a sustainable diet is being recognized by governments as a beneficial backbone for national dietary guidelines and consequently health promotion campaigns (Pace, 2016). It is also slowly being incorporated or strengthened in formal school curricula through different schools subjects (Piscopo, 2015), in training programmes for teachers, agricultural production and professional culinary arts, as well as in community courses (Piscopo, 2014).

WHAT IS NEXT

A mapping exercise is needed in order to identify examples of good practice of education, training and awareness raising at all the different levels.[2] There is a need to recognize gaps with respect to Mediterranean diet education in formal and informal settings, for different population groups and in different sectors. Such an exercise is fundamental in order to help governments and policy-makers establish food, health, agricultural, environmental, financial and education policies, together with concomitant human, economic and physical resources, whereby education in its broadest sense can nurture a food production system

[1] The Need for Nutrition Education/Innovation Programme (NNEdPro) is an award-winning and independently incorporated collaborative group for knowledge generation, translation and evaluation. It represents a strategic partnership between doctors, dietitians, nutritionists and other healthcare professionals, as well as educators and researchers. Its main aim is to develop a critical mass of self-sustaining knowledge, skills and capacity in nutrition and health, within the global healthcare and public health workforce, resulting in significantly improved health practices and outcomes (see http://www.nnedpro.org.uk/).

[2] PERL is a partnership of educators and researchers from over 140 institutions in more than 50 countries, working to empower citizens to live responsible and sustainable lifestyles. Its aims to advance education for responsible living by focusing on consumer citizenship, education for sustainable consumption, social innovation and sustainable lifestyles (see https://www.perlprojects.org/).

and a behavioural social norm in which eating for nourishment, sustainability and pleasure is synonymous with eating the Mediterranean diet way.

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The Sicily Well-Being Island Action Plan

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The Well-Being Island Action Plan (WBIAP) is a visionary journey through some of the 189 major islands in the Mediterranean Sea, belonging to 11 countries of the Mediterranean basin. The journey itself, that starts from Sicily, the biggest Mediterranean island (the Mother Island), is aimed to recompose and reunite the common heritage of Mediterranean Diet diet as a way of being and living inherent in Mediterranean human beings, starting from territorial identity, history, geography, biodiversity, sustainability, equity and health. It is a journey in strict continuity within the MeDiet 4.0 (Dernini *et al*., 2016) framework that began at Milan EXPO 2015 and that looks at and is pervaded by other experiences (SlowMed – http://slowmed.eu, SIDIG-Med – http://www.sidigmed.org) whereby the Mediterranean diet becomes a shared language as a means of dialogue, knowledge and integration.

In this context, the Action Plan, which originates in Sicily, is based and developed essentially on two major axes: (i) education, cultural permeation and empowerment (FED); and (ii) food production, marketing and distribution/trading (DiMeSa 2.0), as described hereafter.

THE FED (FORMAZIONE, EDUCAZIONE, DIETA: TRAINING EDUCATION DIET) REGIONAL PROGRAMME

The FED regional programme is aimed at improving the health of citizens by changing inadequate behaviour and lifestyles that favour the emergence of chronic diseases of high epidemiological importance and great socio-economic impact, including cardio- and cerebro-vascular diseases, cancer, diabetes, chronic respiratory diseases and obesity. The programme dedicates special attention and efforts to achieving a substantial change of negative eating habits and/or incorrect nutritional information, especially by promoting the adoption of a traditional Sicilian diet that is perfectly in line with the principles of the Mediterranean dietary model (Requirez *et al*., 2016).

The FED programme was adopted by the Sicilian Regional Ministry of Health on 20 December 2013 and started officially on 24 February 2014 in Palermo. The programme training activities (first and second level) are currently being carried out and conducted throughout an integrated regional network that eventually leads to impact upon all relevant targets pertaining to selected macro-areas (health, education, agronomy) and relevant stakeholders (see Figure 1).

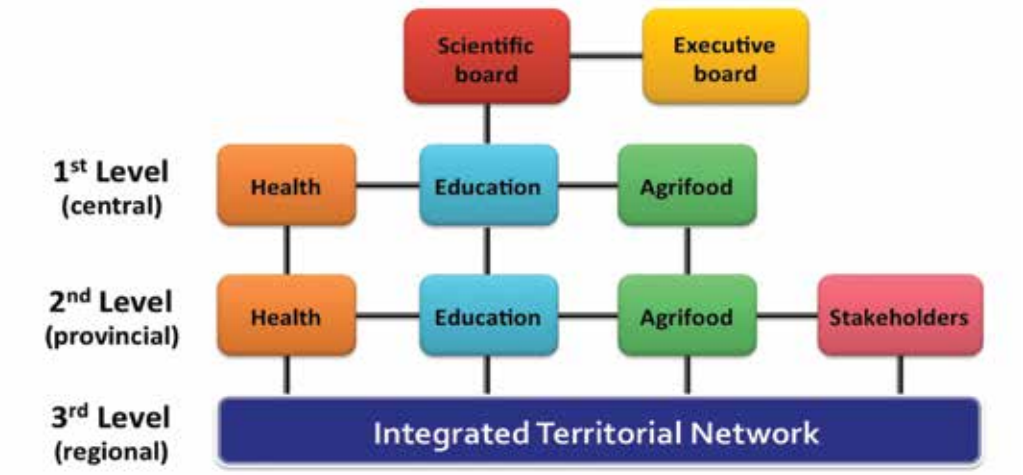

Figure 1. The operational model of the FED Regional Programme
A "cascade" training system is created to seminally diffuse the programme throughout the regional territories. In particular, a 1st (central) and a 2nd (provincial) level of training is implemented, eventually leading to construct an integrated territorial network composed of the Scientific Board's components and both 1st and 2nd level trainers.

Objectives

1. To establish and implement a high-quality regional training programne aimed at developing knowledge and expertise in the framework of health and nutrition, in line with validated scientific evidence, with particular reference to the use of a traditional dietary model (Mediterranean diet) as a primary prevention instrument for the main noncommunicable diseases (NCDs), including cancer. These competence skills will then be translated and forwarded, with uniformity of language and measures, initially to a selected group of trainers (first and second level) and then, through a capillary system of integrated territorial networking, to the final recipients of the various areas of intervention (agronomic, educational and healthcare system).
2. To promote healthy eating behaviour and lifestyles among school students at all educational levels as well as pregnant women, supporting the adoption of a traditional Sicilian (Mediterranean) diet and monitoring its impact using specific tools (anthropometric measures, dietary and psychometric questionnaires) and/or surrogate end-points (hormone profiles, circulating biomarkers, gene and miRNA expression patterns).
3. To encourage healthy eating at both restaurants and community catering establishments (schools, hospitals, refectories, canteens) by consolidating a food culture based on the principles of healthy living, respect for the environment, quality of raw materials, control and safety of food chains and the rediscovery of uniqueness and identity of territories based on individual and collective history, promoting the consumption and preparation of healthy food at all levels, also by sensitizing the associations in the field and using appropriate tools for training and education.
4. To promote the dissemination and consumption of healthy food across the population, also through respect of product's seasonality, local production (short chain), organic

farming, traceability of the production chain, improvement of food health potential, supporting and protecting traditional Sicilian quality food in harmony with the programme "Born in Sicily" run by the Regional Ministry of Agriculture.
5. To support the production of food having high health potential through changes and optimization of production processes, including the recovery and use of by-products (coproducts).
6. To promote sustainable consumption of healthy food, by developing consumer awareness and encouraging responsible purchasing.

Expected impact

1. Improvement of health and well-being status of final beneficiaries (general population) of the programme, based on a substantial change in dietary/lifestyle habits, with a reduction in the medium and long term costs associated with healthcare for major diagnosis-related groups (DRGs), related to diagnosis and treatment of cancer and other chronic diseases (NCDs) and outpatient services, as a consequence of the reduction of risk factors, notably nutrition.
2. Promotion of typical food products also through their health effects in the field of catering and among citizens, with a significant gain of competitiveness in increasingly large and varied market segments, based on the dual advantage of a reduction and/or containment of production costs and an increase in the health potential of traditional food products.
3. Promotion and protection of the traditional Sicilian (Mediterranean) diet across the general population on the basis of its benefits in terms of disease prevention and promotion of a nutritional basis for individual and social welfare.

THE DIMESA 2.0 PROJECT

The AgroBioPesca Technology Cluster fits into the regional landscape as an ideal environment for the development and implementation of a permanent network of public–private partnerships that provides system expertise and activities of public research institutions with the productive and entrepreneurial capacity of agrifood and nutraceutical companies in the regional scenario.

The design of the DiMeSa 2.0 Project (see Figure 2) has been developed in line with the guidelines of the Ministry of Education and in consistency and continuity with both national (CLAN) and European (Horizon 2020) research policies, as well as in harmony with the guidelines established for the Strategic Agenda Research and Innovation of the European Technology Platform "Food for Life" (ETP, 2016) and as part of the Smart Specialization Regional Strategy (EuroInfoSicilia, 2016).

The overall objective remains to promote the implementation of research and innovation initiatives that are featured by a direct impact, in the short and medium term, on the capacity and competitiveness of the Sicilian agrifood industry, thanks to shared strategies for development and activation of instruments to enable an immediate technology transfer.

In this respect, the AgroBioPesca Technology Cluster has embarked on a process of consultation, which began with the launch of a "Call for Ideas" for the construction of multidimensional integrated projects. The industrial research and experimental

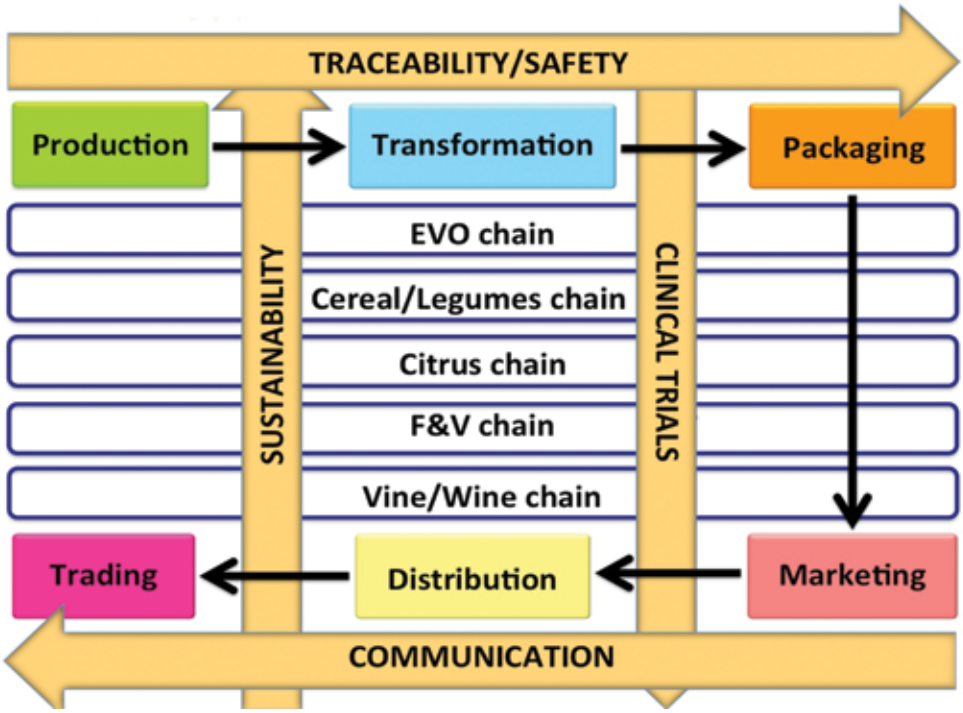

Figure 2. The conceptual framework of the DiMeSa 2.0 Project
The project is divided into "horizontal" objectives, represented by major traditional Mediterranean food chains (extra virgin olive oil, cereals, legumes, citrus, fruit and vegetables, vine/wine chain) and "transversal" objectives, aimed at assessing sustainability, traceability/safety and health potential of individual food products and their relevant chains.

development activities gathered through the above "Call", along with previous experience and results obtained with the DiMeSa Project (Mediterranean Diet and Health – PON02_00451_3361785 [5]), provide an essential basis upon which future research lines and programmatic guidelines can be developed in response to the essential requirements of multiprofessional and intersectoral approaches.

Objectives

Five major objectives have been identified:

1. The analysis and identification of traditional food production processes and the development of innovative biotechnological protocols for the production, transformation and packaging of food with high nutritional and health potential, including extra virgin olive oil, cereals or fruits and vegetables and their derivatives.
2. The definition and implementation of procedures and methodological approaches for the production of functional foods through their enrichment (functionalization) with natural substances and/or plant/byproduct extracts having high health potential and their distribution through innovative marketing and distribution strategies.

3. The clinical validation of specific health claims through the conduct of randomized, controlled clinical dietary intervention trials to assess the health effects of selected functional food products on cohorts of either healthy, high-risk or diseased study-subjects through the evaluation of the impact on some clinical and biomolecular end-points, such as: (a) anthropometric measures; (b) immunological markers of inflammation; (c) oxidative stress and endothelial function; and (d) hormonal profiles and gene expression.
4. The economic evaluation of the concept, traceability and industrial scale-up of either prototypal products or processes aiming to allow their immediate industrialization and successful marketing.
5. The equity and accessibility in food trading to achieve food security against food price volatility.

Expected impact

It is expected that this proposal could have, in the short and medium term, the following outcomes:

1. create a regional network of public research centres and private small and medium-sized entities operating in the framework of human nutrition (Mediterranean diet) and health;
2. produce technological innovation and prototypical industrialization of either processes or products to obtain traditional Mediterranean food having high health potential and market capacities;
3. create the scientific, knowledge-based foundation to obtain health claims from the European Food Safety Authority (EFSA) on selected food products;
4. develop higher education and training courses in the field of the Mediterranean diet, human health and nutrition;
5. accomplish the establishment of spin-off enterprises, eventually leading to the creation of new job opportunities for highly qualified personnel;
6. develop new models of marketing and distribution of Mediterranean diet products based on principles of sustainable, accessible and affordable food supply.

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The catering system and the Mediterranean diet

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[5] *GioService, Rome*

The history of collective catering is very long and dates back to ancient Rome when there were tabernae or osteriae. They represented a "retail unit" within the Roman Empire where many economic activities and many service industries were provided, including the sale of cooked food, wine and bread. These types of facilities increased in the Middle Ages parallel to trade exchanges and pilgrimages. In this period, hospitals began their history and nutritional care was probably the most important type of care they could provide to patients. The catering business began in the nineteenth century and the food service widened to the most demanding customers starting with the major hotels and spa resorts. In parallel, the hospital food service, school and industry cafeterias were implemented due to the health care development, to the development of the school system and to industry revolution. From the twentieth century onwards, new structures were designed for quick and inexpensive dining for those who study, work or are travelling. By the 1960s, home-made food was overtaken by eating in public catering establishments.

At present, the food system, including food services and food retailing, supplies around USD1.5 trillion worth of food in the United States of America, 40 percent of which is supplied by food service facilities, defined as any place that prepares food for immediate consumption on site, including locations that are not primarily engaged in dispensing meals such as recreational facilities and retail stores. Italian families, in 2010, paid €142 $*10^9$ for food consumption; among these €73 $*10^9$ were devoted to food services (INEA, 2012). In fact, employees and students consume at least one-third of their meals outside the family/home, while hospitalized and institutionalized patients, especially those admitted to hospitals/nursing homes for a long time, depend on the hospital catering service for their nutritional needs. Finally, eating out for leisure is increasingly frequent.

Simultaneously, the nutritional status of the population, both in developed and in developing countries, is very frail with a high prevalence of malnutrition. Malnutrition can be defined as "a state of nutrition in which a deficiency, excess (or imbalance) of energy, protein and other nutrients causes measurable adverse effects on tissue/body form (body shape, size and composition) and function, and clinical outcome". It can therefore be

interpreted as a manifestation of the loss of the external environment adaptability (frailty). Moreover, malnutrition affects quality of life (QoL) and the improvement of nutritional status has beneficial effects on physical and psychological aspects of the QoL.

As mentioned, malnutrition can manifest both as over- and undernutrition. Worldwide obesity has more than doubled since 1980 and, in 2014, more than 1.9 billion adults, 18 years and older, were overweight. Of these over 600 million were obese. It is of particular importance that 41 million children under the age of five were overweight or obese in 2014 worldwide. In Italy, in 2012, more than one-third of the adult population (35.6 percent) are overweight, while one in ten is obese (10.4 percent) with important consequences from a clinical, functional and psychological point of view. At the same time, the prevalence of undernutrition is high in the hospital environment (even over 50 percent), in particular in geriatric patients, in migrant populations and through eating disorders that affect around 2 percent of the population at least in developed countries.

Catering services (cafeterias in schools and workplaces, hospital catering services and restaurants) may play a pivotal role in the prevention of over- and undernutrition. Therefore, the overall quality of the catering system plays an important role from a public health point of view, providing all patients/consumers with healthy, balanced and varied nutrition or targeting individual clinical and metabolic needs (e.g. food insecurity or overweight/obesity in schools, risk of malnutrition in hospitals/nursing homes, overweight and obesity in workplaces). School and hospital catering services must meet recommended dietary allowances and dietary guidelines, while the restaurant industry and workplace cafeterias may play an important role in promoting healthier eating habits. For this purpose, the catering system, depending on the context, has to vouch that the prepared meals are attractive and tasty while they meet the nutritional requirements and promote a healthy diet.

The Mediterranean diet in particular has emerged as one of the most effective dietary patterns for the prevention of non-communicable chronic diseases (cardiovascular diseases and atherosclerosis, cancer, dismetabolic diseases, depression and cognitive impairment). The role of this dietary pattern has gained much attention over the last decades, with numerous epidemiological studies and clinical trials highlighting its beneficial effects. However, there is a tendency in Mediterranean countries to abandon the characteristic Mediterranean diet. This is especially true within younger populations. This could have negative consequences and foster the tendency to malnutrition. Therefore, there is a necessity to encourage better adherence to this pattern, especially in the countries where it was first known.

In this view, a two-way interaction may be achieved between the Mediterranean diet and the catering system. Taking into account the size of the catering system, it may be a relevant actor in promoting the Mediterranean diet, allowing the recovery from the progressive erosion of the Mediterranean model that is taking place in the last decades. On the other hand, the adoption of the Mediterranean diet in school, hospital and workplace catering services may help to improve the nutritional status of students, patients and employees.

Since the catering service (in hospitals, schools, etc.) must have a perspective of health, aimed not only to the supply of meals, but to affect the nutritional status and eating behaviour of consumers a project entitled "Intelligenza nutrizionale" (Nutritional intelligence) has been launched to improve hospital catering based on research and verification of the quality through technological innovation. The project sees the collaboration of several entities that have the shared purpose of improving collective catering: Sapienza University as a research and technical development facility, GioService as the service provider, Niko Romito Formazione, which researches new technologies in the field of collective catering, and the Analysis Group, which provides technological support for the verification of nutritional quality. The project begins to move the first steps in hospital catering but aims to expand to all forms of collective catering. Within the framework of the project, reference to the Mediterranean model in the selection of food and gastronomic preparations, in the choice of local and seasonal foods, and in the promotion of all other values that make the Mediterranean model an intangible heritage of humanity as stated by UNESCO, is central.

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Dietary intake pattern in Turkey

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The Mediterranean diet (MD) is identified as a cultural heritage, being an optimal diet for preventing non-communicable diseases, beneficial for human health and a model for a sustainable food system (Vanham *et al*., 2016; Martinez-Gonzalez *et al*., 2009; Trichopoulou, Bamia and Trichopoulos, 2009; Bach-Faig *et al*., 2011a; Sofi *et al*., 2010, 2014; Hu *et al*., 2013). During the last decades, however, diet behaviour in Mediterranean regions has gradually moved away from the traditional MD (Bach-Faig *et al*., 2011b; Castro-Quezada, Román-Viñas and Serra-Majem, 2014). Although the MD has been proposed as an optimal diet, recent research has found that the Mediterranean countries are abandoning the MD and adopting unhealthy food patterns. Recent changes in the actual MD include a reduction in energy intake, reduction in physical activity and a higher consumption of foods with low nutrient density (eg. soft drinks, candy, sweets) (Castro-Quezada, Román-Viñas and Serra-Majem, 2014; Mariscal-Arcas, *et al*., 2009).

DIETARY INTAKE

In Turkey, many surveys have been taken at local and regional levels, showing the nutritional status in different age groups. The last Turkish National Surveys on Food Consumption and Health were conducted in 1974 and 1984. The recent survey, Turkish Nutrition and Health Survey (TNHS-2010), is the largest and most detailed survey ever undertaken of the dietary intake and health status of people in Turkey (TBSA-2010, 2014). TNHS-2010 provides detailed information on dietary intake, physical activity status and anthropometric measurements. This was a collaboration of the Ministry of Health, Hacettepe University Faculty of Health Sciences, Department of Nutrition and Dietetics, and Ankara Numune Training and Research Hospital. In the survey, the nutritional status (nutritional habits, 24-hour dietary intakes, anthropometric measurements, etc.) of the population was determined (TBSA-2010, 2014).

In adults (19–64 years), the mean energy intake was 2162±820 kcal/day for men and 1617±647 kcal/day for women. The major percentage of energy came from bread with other cereals (39.5 percent). The average intakes of protein in men and women were 70.7 and 51.7 g/day, respectively. The mean percentage of energy from protein was 13.4 percent; bread and cereals were the most important contributors of plant protein intake (36.7 percent). The mean percentage of energy from carbohydrates, protein and fat was 51.8, 13.4 and 34.4 percent, respectively. The average intake of dietary fiber was 21.8 g/day. The main contributors of intake of carbohydrates were bread and cereals (64.2 percent) and sugar, confectionary and sweets (12.4 percent). On average, the total fat intake of the subjects was high (34.4 percent). The intake of saturated fatty acids was high (11.3 percent) and intakes

of monounsaturated fatty acids and polyunsaturated fatty acids were 12.1 and 11.3 percent, respectively. The mean intake of added sugar was 22.7±27.9 g/day. Mean daily intakes of meat and meat products, eggs, legumes, nuts, milk and dairy products, fresh fruits and vegetables, bread and cereals, fats and oils, sugar and sweets were 69, 24, 9, 7,189, 548, 277, 33 and 33 g/day, respectively. As seen from the results, especially the intake of fruits and vegetables was higher than the recommendations (TBSA-2010, 2014; Ministry of Health of Turkey, 2016).

The mean energy intakes of the age groups 9–11, 12–14 and 15–18 years were 1677±660, 2017±765 and 2288±940 kcal/day for boys and 1727±629, 1723±686 and 1700±687 kcal/day for girls. Intakes of iron, zinc and calcium were below the recommendations. Mainly, meat, milk and dairy product consumptions were low. The consumption of fresh fruits and vegetables was in the recommended amounts (>400 g/day) (TBSA-2010, 2014; Ministry of Health of Turkey, 2016).

ANTHROPOMETRIC DATA

Overall, the prevalence of underweight, overweight and obese adults was 2.2, 34.6 and 30.3 percent, respectively. The prevalence of overweight and obesity was 39.1 and 20.5 percent in men and 29.7 and 41.0 percent in women, respectively. The mean (±SD) BMI for all age groups was 26.4±4.5 kg/m2 in men and 28.9±6.4 kg/m2 in women. The mean (±SD) waist circumference and waist-to-hip ratios of the men were 93.1±12.7 cm and 0.91±0.08; women were 90.1±15.2 cm and 0.84±0.09, respectively. High waist circumference and high waist-to-hip ratio were identified as 24.8 and 54.2 percent in men, and 53.9 and 40.4 percent in women, respectively. Overall, 14.3 percent of children between 6 to 18 years were overweight and 8.2 percent were obese (TBSA-2010, 2014).

ADHERENCE TO THE MEDITERRANEAN DIET

In a sample from six provinces in Turkey, 300 subjects were evaluated using PREDIMED (Martinez-Gonzalez *et al*., 2012; Cam *et al*., 2014). The mean score was found to be 6.4 in men and 7.0 in women and 6.7±2.0 overall ($p<0.05$). Out of 14 points, 57.9 percent of men and 68.9 percent of women had scores between 6 and 9 points and 34.6 percent of men and 23.4 percent of women had scores below ≤5; 7.5 percent of men and 8.4 percent of women had scores ≥10 points. The differences between provinces were found to be statistically significant ($p<0.05$) (Cam *et al*., 2014).

It was reported in studies that risk groups in the population such as children and adolescents may be the age groups with the most deteriorated Mediterranean diet profile, and there is a need for nutrition education programmes to establish healthy eating habits at a young age that will have beneficial effects in later life. Epidemiological studies suggest that individuals can benefit greatly by adopting the MD (Sofi *et al*., 2010, 2014; Mariscal-Arcas *et al*., 2014).

The KIDMED (Mediterranean Diet Quality Index) developed by Serra-Majem *et al*. (2015) to evaluate adherence to the MD in adults, children and adolescents was used in some research in Turkey. Studies in children and adolescents (ages from 7 to 18 years)

indicated that 4.5 to 40.6 percent of the subjects had a low quality diet (≤ 3 points), 51.6 to 64.2 percent had an average quality/needs-improvement diet (4–7 points) and 7.7 to 39.9 percent had an optimal quality diet (≥ 8 points) (Köksal, Tek and Pekcan, 2008a, b; Erol *et al*., 2010; Sahingoz and Sanlier, 2011; Torun and Yıldız, 2013; Cömert *et al*., 2015).

Providing the Sustainable Development Goals for water, food and energy security to a rapidly increasing and urbanizing global population in a sustainable way is one of the greatest challenges humanity faces (Vanham *et al*., 2016). In a study, the water resources related to food consumption in 13 cities (including Ankara and Istanbul) located in Mediterranean countries, was quantified by means of the water footprint (WF) concept, and the WF of three diet scenarios, based upon a Mediterranean dietary pattern, was analysed. For Turkey, the Turkish Nutrition and Health Survey (TBSA-2010, 2014) and an unpublished study of a dietary survey for Ankara (Pekcan *et al*., 2014) were used. Analysis confirms that, with respect to the water resources, the MD is less resource intensive than, for example, the Turkish national FBDG. The Turkish national Food-based Dietary Guideline (FBDG), developed to optimize a healthy diet, recommends the intake of more meat, the product group that needs the most intensive water requirements to produce (Ministry of Health of Turkey, 2016). The analysis for the Turkish cities shows that the WF of healthy meat is higher for the Turkish FBDG as compared with the MD. It was recommended that if urban citizens want to save water, they need to look at their diets. The WF amount ranged from 3 277 litres/capita/day to 5789 litres/capita/day in Mediterranean countries, and was 4 316 for Istanbul and 4 323 for Ankara (Vanham *et al*., 2016).

For the improvement of the nutrition and health status of the population, more comprehensive efforts are needed to increase awareness about the MD; planning and implementing intervention studies showing adherence to the MD and monitoring of dietary intake of the population are needed. Nutrition education of children and adolescents on the MD should be the priority.

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The socio-cultural dimension in the sustainability of the Mediterranean diet

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INTRODUCTION

The erosion of the Mediterranean diet is being manifested in wide and worrying proportions in those countries where the diet was born, entailing negative consequences on the health, social and environmental sides. New food patterns are quickly spreading in the Mediterranean region, drastically changing not only the food habits but also food supply systems and distribution as a result of a globalized world. In particular, the youngest generations are more likely to abandon the Mediterranean diet. They actually consider the adherence to the local traditional diets as a legacy of the past, since it re-proposes an outdated model, no longer viable in modern life.

To reassign the Mediterranean diet with its true value, a consistent effort among all the Mediterranean countries is necessary. This should lead to defining a shared road map for an effective revitalization of the Mediterranean diet..

The Mediterranean diet has been considered as a model of a sustainable diet for its intrinsic values in terms of health, cultural heritage, natural resources conservation and biodiversity and for its positive social and economic impact.

The concept of sustainable diets has been widely considered in recent years on the international scene and the socio-cultural dimension has been recognized as a further pillar of sustainability. However, more in-depth analyses and large-scale investigations on the socio-cultural side are needed in order to propose proper interventions to reaffirm and transmit the Mediterranean diet values to future generations.

Research appears as a key factor for deeply investigating the scope of the socio-cultural phenomena – why and how these affect the erosion of the Mediterranean diet, giving advantage to unsustainable imported diets. Seasonality, local food production and consumption, as a foundation base of the Mediterranean diet, can effectively favour the empowerment of home-grown economies with benefits in terms of employment and incomes. Some issues are yet to be considered and explored in a large common research programme on socio-cultural aspects for promoting the Mediterranean diet and maximizing its sustainability feature.

CHANGES IN DIETARY HABIT

As mentioned above, in the Mediterranean region, large changes occurred in food choices, lifestyles and habits with respect to past years. These changes can be summarized as follows:

- shifts in consumption patterns for globalized marketing (Johnston, Fanzo and Cogill, 2014), determining a loss of local dietary traditions;
- overeating associated with unhealthy habits, e.g. watching television, high amounts of stress, etc. (Johnston, Fanzo and Cogill, 2014);
- gender differentiation in food behaviour: women suffer more undernutrition, overweight and obesity than men, indicating possibly social/cultural discrimination or inequities (Johnston, Fanzo and Cogill, 2014);
- increase in the consumption of animal-sourced foods worldwide to the detriment of diets rich in vegetables customarily consumed by the Mediterranean populations;
- traditional or local foods are viewed negatively as "food for the poor" (Johnston, Fanzo and Cogill, 2014), due to the "media barrage" that has widely diffused romanticized impressions prompting to imitate Western models with attractive images of consumer culture;
- younger generations express a sort of "modernist claim" against conventionalism linked to ancient customs and traditional diets deemed by now outdated;
- demographic growth and the movement from rural to urban areas have resulted in a drastic change in the daily time devoted to the preparation and consumption of food, also linked to different working conditions.

This situation can change in the different Mediterranean countries.

SUSTAINABLE DIET: THE MEDITERRANEAN DIET AS A MODEL

Sustainability can be interpreted as the "ability to sustain", namely the capacity to maintain over time, continuously creating an environment designed to sustain (Tonkinwise, 2000). In this sense, a comprehensive concept is the "sustainable development", introduced by the Bruntland Report, Our common future (WCED, 1987) published in 1987 and adopted in 1992 within the Earth Summit Rio Declaration (United Nations General Assembly, 1992). Sustainable development aims to reconcile environmental, social and economic demands. Figure 1 shows how both economy and society are constrained by environmental limits, while Figure 2 demonstrates how sustainable development can be achieved only when all three pillars meet. An important issue is how the sustainability concept can be applied to diet. The matter is complicated because, in a diet, food is not the only element to be considered as other additional factors such as behaviour, lifestyles and habits need to be included. This does not allow an assessment of sustainability merely by measuring some related parameters such as the amount of water used for producing 1 kg of food. Nevertheless, a shared definition on sustainable diets has been achieved during the International Scientific Symposium "Biodiversity and Sustainable Diets: United against Hunger" held at FAO in Rome in November 2010 (FAO, 2012). Some elements of the positive impact

Figure 1. The three pillars of sustainable development
Source: Scott Cato (2009).

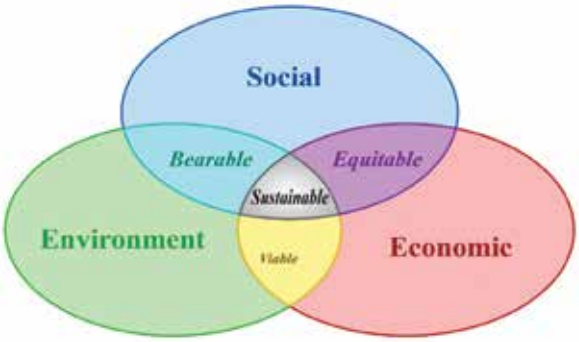

Figure 2. Scheme of sustainable development: at the confluence of three constituent parts
Source: Adams (2006).

Figure 3. Sustainable diets: key components, determinants, factors, and processes
Source: Johnston, Fanzo and Cogill (2014).

of sustainable diets are reported in Table 1. It is important to note that this definition is in accordance with the concept of durability that is inherent to sustainability. Some expressions concerning this aspect are indeed taken into account. They are, inter alia, the contribution to "food and nutrition security and to healthy life for present and future generations", as well as social and cultural implications that qualify these diets as "culturally acceptable, accessible, economically fair and affordable; optimizing natural and human resources". The key components, determinants, factors and processes of sustainable diets are shown in Figure 3. In November 2011, an important workshop took place at CIHEAM in Bari attended by 51 experts (nutritionists, agronomists, economists, biologists, social scientists) from the European Union, the Balkans, North Africa and the Middle East. The purpose of that event was to identify a methodological approach for assessing the sustainability of the Mediterranean diets. The methodological study was pursued to explore four main dimensions of sustainability, namely, environmental, nutritional,

Table 1: Positive impact of sustainable diets

Public health: reduced diet-related chronic disease, nutrient deficiencies
Environmental sustainability: mitigation of climate change and natural resource depletion
Economic sustainability: employment, trade opportunities, incomes
Social inequalities: close gaps in health, incomes in developed and developing countries
Other possible benefits: psychologic and physical well-being, animal welfare, cultural and social diversity, and knowledge sharing

Source: Johnston, Fanzo and Cogill (2014).

economic and socio-cultural. A task force was established by the participants on a voluntary basis with the purpose of identifying methods and indicators for assessing the sustainability of the Mediterranean diet. A first list of 74 indicators was initially produced during the workshop, subsequently reduced to 20, considered the most effective and feasible ones (Lacirignola *et al*., 2012). In this context, CNR has been involved in the development of indicators related to the socio-economic sustainability of diets.

THE SOCIO-CULTURAL SUSTAINABLITY OF DIETS

Considering the above social and cultural changes and evolution of Mediterranean society, and taking into account the socio-cultural dimension of the diet, a specific task has been assigned to the CNR working group with the aim of identifying a set of indicators to evaluate the socio-cultural sustainability of the Mediterranean diet.

Socio-cultural sustainability should be considered as the capacity of the social and cultural factors that characterize the Mediterranean lifestyle to maintain their value over time. Among the different socio-cultural aspects, the strategy adopted for choosing indicators has been focused on four principal issues: (i) the role of diet in terms of commensality and conviviality; (ii) the active involvement of the consumer in the preparation of food; (iii) the level of awareness concerning the cultural value of food attested by the presence of traditional food in the population's diet; and (iv) the capacity or transmitting ancient knowledge in order to ensure the transfer of food traditions towards the youngest generations. Considering these aspects, the four proposed indicators are illustrated below.

Collective participation, cohesion, conviviality and commensality

Food as an expression of collective participation, inclusion, cohesion and commensality. In this context, food is considered as a social experience by consuming and sharing the same food at the same table. This is a peculiar characteristic of the Mediterranean lifestyle. Food is consumed individually, without following any methods of preparation and in as short a time as possible (Barilla Center For Food & Nutrition, 2009). From the time range of meal consumption, we can understand the level of social sustainability of food in terms of commensality and conviviality. Dedicating time to food means giving it the right importance and value. The proposed indicator is: *time of meal consumption*. The range time that has been selected is 30 minutes to one hour for a meal consumed at home.

Involvement of the consumer in food preparation

Preparing and cooking food are expressions of the importance devoted to food by people in their daily life. The emerging social changes associated with rapid and intense industrialization of food production has determined a decrease of willingness of people to devote time to cooking. Furthermore, the distribution of takeaway food (so called prêt-à-manger) has shown how the consumption of meals away from home, mainly fast-foods, has increased exponentially. For this reason, the space dedicated to the preparation of food and the selection of fresh products in the daily diet have specific and significant social implications. The proposed indicator is: *daily time devoted to the preparation of food*.

Traditional diets relevance

Culinary culture represents not only the sum of diverse foods but also food habits, which regulate the relationship between the individual and the food. Most current diets are based on the excessive consumption of meat in place of carbohydrates. This reflects the widespread food disorder that also affects the Mediterranean countries. It is, therefore, important to verify traditional products are currently consumed in daily meals as an expression of the cultural aspects and traditions connected to food. The proposed indicator is: *consumption of traditional products* (e.g. traditional bread) in relation to the total food consumption.

Transmission of knowledge

The knowledge of food and preparation methods is a treasure for protection of an important component of cultural expression of individuals and within families and communities. In this context, oral transmission plays a key role. There is a close link between food and gender and the key role of women in transferring cooking methods and recipes. Given that it is not possible to calculate by an indicator the extent of oral transmission of food traditions it is more appropriate to test the transfer of knowledge from one generation to another taking into account the use of all the available information tools, including information and communication technologies, to which people have daily access, especially the youngest. It is therefore very important to verify the dimension of information dedicated to traditional foods by mass media, newspapers, magazines, publishing companies, etc. and their interest in disseminating traditional culinary knowledge. The proposed indicator is: *mass media activities and products dedicated to traditional food*.

CONCLUSION AND POSSIBLE FUTURE DEVELOPMENT

The current study on socio-cultural sustainability of the Mediterranean diet has generally remained on a theoretical basis. There is a need to re-examine the outcomes reached until now in the light of new perspectives and to define an appropriate programme of research to better explore the socio-cultural factors and put into practice the knowledge acquired. Additional studies are needed for detection of actual social impediments that prevent a large spreading of the Mediterranean diet. It is important to investigate each scope of these impediments and how they affect the erosion of Mediterranean diet as well as to analyse if and how these obstacles differ among countries.

It is also worth remarking on the need to improve scientific knowledge, to be able to provide evidence of the socio-cultural benefits of the Mediterranean diet, revise socio-cultural indicators, and eventually to change them – if appropriate – and to define a programme for their real application in case studies relating to countries on both the southern and northern shores of the Mediterranean. For this purpose, some research instruments can be suggested to achieve the mentioned objectives, such as: investigation by direct survey through questionnaires; statistical data processing; desk research and analysis; interviews with key stakeholders; conducting focus groups for exploring attitudes, opinions, expectations and suggestions, as well as case studies and best practices to be identified.

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Overweight, selected aspects of Mediterranean diet and cancer risk

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Overweight and obesity are related to a number of cancer sites, including – among others – post-menopausal breast, endometrium, colorectum, esophagus (adenocarcinoma), gallbladder and kidney.

Overweight and obesity, however, have not been rising over recent years in several Mediterranean countries, particularly in France and Italy. In Italy, over the last three decades, the prevalence of overweight has remained at around 30 percent, and that of obesity – including that related to psychiatric disorders – around 8 percent of the adult population (Gallus *et al*., 2013). Still, overweight at various ages has been consistently associated not only with cardiovascular disease, but also to several common cancers, including colorectal, endometrial and post-menopausal breast cancer in Italy. Physical activity, in contrast, has been favourably related to colorectal, breast and several other neoplasms (Giacosa *et al*., 2013).

Various aspects of the traditional Mediterranean diet, nutrition and lifestyle patterns are considered favourable non only for cardiovascular disease risk (Turati *et al*., 2015a) but also for several common neoplasms.

Several aspects of the Mediterranean diet have therefore been related to cancer risk in a network of case-control studies conducted in Italy since the early 1980s on over 22 000 cases of 20 cancer sites, and a similar number of controls. For most epithelial cancers, and particularly for digestive tract ones, the risk decreased with increasing vegetable and fruit consumption, with relative risks between 0.3 and 0.7 for the highest versus the lowest tertile, and the population attributable risk owing to low intake of vegetables and fruit ranged between 15 and 40 percent. The inverse association with fruit was particularly strong for cancers of the upper digestive tract (Turati *et al*., 2015b).

A number of antioxidants and other micronutrients and food components (including carotenoids, lycopene, flavonoids, proanthocyanidins and resveratrol) showed an inverse relation with cancer risk, but the main component(s) responsible for the favourable effect of a diet rich in vegetables and fruit remain undefined (Turati *et al*., 2015b; Pelucchi *et al*., 2009). Likewise, an a priori defined dietary inflammatory index (DII) was inversely related to most epithelial cancers, particularly of the digestive tract (La Vecchia, 2009; Shivappa *et al*., 2006).

Fish, and consequently a diet rich in n-3 fatty acids, as well as olive oil, also tended to be favourable diet indicators of the risk of several (epithelial) cancers. In contrast, subjects

reporting frequent red meat intake showed elevated risks for several common neoplasms (Pelucchi *et al*., 2009; La Vecchia, 2009).

Wholegrain food intake was related to a reduced risk of several types of cancer, particularly of the upper digestive tract. This may be due to a favourable role of fibres, but the issue is still open to discussion. In contrast, refined grain intake and, consequently, glycaemic load and index were associated with increased risk of different types of cancer, particularly digestive tract and hormone-related ones (Bosetti, Pelucchi and La Vecchia, 2009).

Furthermore, olive oil, which is a typical aspect and the common denominator of various types of Mediterranean diets, has been inversely related to cancers of the colorectum and breast, and mainly of the upper digestive and respiratory tract neoplasms. It is not clear whether such activity is due to oleic acid itself or to the presence of antioxidants, such as vitamin E and polyphenols and other food components in olive oil. Olive oil, in fact, is a fruit juice and a major source of monounsaturated fats in Mediterranean countries, but also an important source of several micronutrients and food components. It appears therefore to be a favourable indicator of the risk of various common cancers (Pelucchi *et al*., 2011). The observed associations, in fact, may not be due to specific fatty acid components, but to the fact that olive oil is a general indicator of healthier (Mediterranean) diet (Gallus, Bosetti and La Vecchia, 2004).

When a Mediterranean diet score, originally developed by Antonia Trichopoulou *et al*. on Greek data (Trichopoulou *et al*., 2000), was applied to our network of studies, subjects in the highest score level for adherence to Mediterranean diet had a 30 to 50 percent reduced risk of most common neoplasms, particularly of the digestive tract, but also of the liver, pancreas and endometrium (Table 1) (Bosetti *et al*., 2003, 2013; Rosato *et al*., 2016; Filomeno *et al*., 2015).

These findings are only partly in agreement with the results of several (cohort) investigations from North America. Possible reasons for these inconsistencies include different dietary patterns and baseline cancer risk in various populations, but remain open to further discussion and research.

Table 1: Mediterranean diet score and upper digestive tract cancers

	Mediterranean diet score (number of characteristics)		
	<3	4	≥6
Oral/pharyngeal			
Cases/controls	214/241	120/376	41/201
OR (95% CI)	1	0.41 (0.30–0.57)	0.40 (0.26–0.62)
Oesophageal			
Cases/controls	102/147	66/174	14/83
OR (95% CI)	1	0.63 (0.41–0.95)	0.26 (0.13–0.51)
Laryngeal			
Cases/controls	183/225	98/279	19/124
OR (95% CI)	1	0.47 (0.33–0.66)	0.23 (0.13–0.40)
Source: Bosetti *et al.* (2003).			

However, the Mediterranean diet appears to have a number of health benefits besides its sustainability issue (Dernini *et al*., 2016).

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Linking traditional foods with sustainable food systems and health

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The traditional Mediterranean diet has become renowned the word over for its health properties. When we are talking about the traditional Mediterranean diet, we cannot claim that it is adhered to by all, or even most, of today's inhabitants of the Mediterranean basin. Unfortunately, this pattern has all but been abandoned by many individuals and population groups. The low adherence rates to the Mediterranean diet are observed in higher rates among children and adolescents.

In Mediterranean countries, traditional foods generally reflect the traditional Mediterranean diet, so much so that traditional foods in the Mediterranean region have become synonymous with the traditional Mediterranean diet. Traditional foods are an expression of culture, history and lifestyle. Despite the fact that we are living in an era of globalization, many Mediterranean traditional foods can be traced back to centuries ago. They reflect our cultural inheritance and have left their imprints on current Mediterranean dietary patterns, despite the fact that contemporary lifestyles do not encourage their preservation in our daily lives.

Apart from being vehicles of our culture, traditional foods may also possess health qualities, since tradition rarely honours foods that are not palatable and healthy. They are key elements for the dietary patterns in different countries and consequently are important to accurately estimate population dietary intakes. However, this information is missing from most current national food composition databases. In this context, a common definition of traditional foods has been agreed upon for the classification of traditional foods in European food composition tables.

For the production of traditional foods, local products are generally used. Cultivation of local products contributes to a sustainable environment and employment of local people. The "healthy and palatable" combination is very attractive to the food industry and traditional foods could potentially be mass produced. However, unless this production is carefully overseen, there is a risk that poor imitations of traditional foods could be produced, misleading the consumers. This highlights the need to legislate and standardize traditional foods in order to protect the products, the producers and the consumers. The registration of traditional foods could motivate their small-scale or medium-scale production throughout Europe and expand their export potential to countries outside the ones in which they originate. Unfortunately, throughout Europe some traditional foods are threatened with extinction due to altered lifestyles. Therefore,

there is a genuine need to study traditional foods to preserve important elements of European culture and, if possible, enrich and improve the diet of the populations across the whole continent and beyond.

Moreover, since globalization is an incessant process and mass catering could facilitate the production and promotion of traditional foods, there is a need to work closely with the food industry, especially with the small and medium size enterprises that produce traditional foods.

Apparently there is a need to protect traditional foods from the region, as well as manage sustainability by promoting local and quality agricultural and food products that hail from the Mediterranean region.

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The Mediterranean diet: case studies from nutrition, cultural and environmental interactions

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The Mediterranean diet constitutes a globalized pattern. It competes with the Western dietary pattern that is focused on meat, dairy and sugars and, in a certain way, it converges with the Japanese diet, which is also experiencing significant diffusion internationally. The Mediterranean diet represents a highly sustainable pattern with certain indicators that are determinants of climatic change and environment deterioration (greenhouse gas emission, water and land use and energy expenditure) that are much lower when following the traditional Mediterranean diet than when consuming the Western diet. This could have important implications on a global scale.

Biophysical and environmental drivers mostly influence value chain actors and their activities as well as food environments. Fundamental features of production systems such as land, soil, and water are key resources for diets. Land is one of the most important inputs and drivers of food production because it is the source of soils, which are the main source of nutrients and support for plants. Moreover, bodies of water, whether natural or humanmade, are essential reservoirs for fisheries production. Water is also an essential input in crop and livestock production as well as in food processing and preparation. Production systems are affected by climate, making climatic conditions an important driver of food systems. Land and climate characteristics convey endowment, resulting in comparative advantages in production systems. Traditional (Mediterranean) food systems were extremely respectful of biophysical and environmental drivers and also of biodiversity.

In order to illustrate these interactions between nutrition guidelines and the cultural and environmental aspects of the Mediterranean diet, three case studies are described: potatoes, fish and bread.

POTATO CONSUMPTION: HEALTH AND CULTURE

Food globalization, and above all what is called fast food or Western food, concisely represents the erosion of the Mediterranean diet's cultural values, not only because of what the globalized Western food model represents – based mainly on meat, refined flour, sugars, dairy and food transported from anywhere in the world with international free trade laws – but also because of how all these foods have an impact on the ways in which

they are consumed: in the traditional recipes themselves, in landscapes, crops and even in the markets. Nowadays, for example, we have built a food model around the globalized market of tourism that resembles more the Western fast food model than the Mediterranean food model. We are missing out on an opportunity to disseminate our Mediterranean diet as a cultural model and as an excellent food model for public health. The foodways of proximity, respecting traditions and seasons (which usually go together) also represent an opportunity for the economic sector, for tourism, for the environment, etc.

Potatoes are a clear example: their preparation as French fries represents a core of the Western dietary pattern accompanying meat and other meals. As such, they also represent the main ingredient of what is offered to tourists on the Mediterranean coasts. Potato consumption in the United States of America has been described as a major contributor to weight gain in the adult population. The traditional use of potatoes in Mediterranean countries as well as in Nordic countries consists of taking part in traditional recipes with other vegetables, fish and small amounts of meat. In fact, their intake has not been associated with increased cardiovascular disease or hypertension in these countries, but does represent an independent risk factor for such diseases in the United States of America. In addition, a systematic review did not link the consumption of potatoes with an increased risk of obesity or diabetes except for French fries. Potatoes represent a good example of the difficulties in grouping foods without considering the characteristics of the recipe in which the food is consumed. French fries represent the main health issue regarding potato consumption and may be linked to the type of fat used to fry them. The use of certain vegetable fats (rich in palm oil) or shortenings may increase risk, but frying them in olive oil will certainly not represent a significant risk of developing cardiovascular diseases. According to two studies published by Guallar-Castillón *et al*. (2007, 2012), fried foods in Spain are related to an increased risk of obesity but not to an elevated risk of cardiovascular diseases or total mortality.

A FISH CALLED PANGA

Spain has a long tradition of fish consumption, being one of the countries with the highest intake of fish and shellfish worldwide. However, over the last few decades and according to international agreements, there has been a reduction in the number of fish caught, together with a major restructuring of the fisheries sector with a notable reduction in the Spanish fishing fleet. Market pressure along with the need to reduce the price of fish has led to the diversification of products and their origin with an increase in species and fishing from remote locations, thereby reducing the sustainability of fish consumption in Spain.

Recently social alarm was set off when a type of fish was introduced in the menus of school lunch programmes. It dealt with a species whose consumption has increased at an annual rate of 60 percent in Europe and whose scientific name is *Pangasius hypophthalmus*. It is a freshwater fish belonging to the family *Pangasiidae* (iridescent shark, classified by its pronounced dorsal fin and the livery seen in the young) although it belongs to the species of catfish (*Siluriformes*).

From this species, fillets known as *panga* are obtained on the market. It comes from the final stretch of the mighty Mekong River in Viet Nam, a river originating in the peaks of the Himalayas that flows along 4 500 km through China, Myanmar, Lao People's

Democratic Republic, Thailand, Cambodia and finally Viet Nam. The Mekong River has high levels of chemical (notably arsenic and others) and bacteriological pollutants, and is where this fish is intensively and industrially bred in more than 200 overcrowded fish farms of which, only in Viet Nam, there is a total production of 1.55 million tonnes per year, and is exponentially growing. Consumption data for this fish (which is the same as others such as tilapia or the Nile perch, originating from Africa) are not reliable, but some sources state that in 2012 more than 50 000 tonnes of panga were consumed in Spain (around 25 000 in 2014). If we take into account that the consumption of fish and seafood was around 2 million tonnes, this freshwater fish coming from Viet Nam represents up to 2.5–3.0 percent of total presumable consumption in Spain (and perhaps up to 15–20 percent in certain socio-economic groups). If we consider that its content in omega-3 fatty acids is null, as well as its iodine content, and instead it constitutes a plausible source of organochlorines, antibiotics and heavy metals, the question posed is: does it make sense to include it in the Mediterranean diet? From a perspective focusing on health, the answer is no. The same is true when taking into account a sustainability-based viewpoint. Apart from travelling more than 10 000 km as a frozen product to reach Spain, its production has a significant environmental footprint in its country of origin – Viet Nam. Moreover, from the cultural point of view it is difficult to justify its inclusion.

This is a clear example of how in order to meet a demand for food (or offer) a food system is built that is extraneous to the territory and to fishing and culinary traditions, leaving a significant environmental footprint, and having doubtful benefits for public health and consumers. All this would end up as a consequence, and what is more, would lead to another deleterious result. The offering of these types of food at highly competitive prices would favour their consumption by the socially disadvantaged and thus end up increasing health inequalities in population groups that are already more vulnerable to nutritional and food safety risks. Globalization is another driver of the food system that profoundly affects diets. Trade liberalization influences the range of foods that are available and affordable within any given country. It can also sharply influence consumer preferences if supported by increased marketing and convenient prices.

DON'T GO BREAKING MY BREAD

Bread is one of the core elements of the Mediterranean diet. Its nutritional importance has been documented in numerous studies and treatises. It is an important source of carbohydrates, proteins, fibre, vitamins and minerals, which contribute to meeting our daily nutrient requirements. Moreover, its cultural and gastronomic importance has also come to light throughout the unfolding of history.

Nonetheless, bread has received unfair treatment from certain pseudoscientific sectors. It is a food that is reviled by some but also loved, sometimes secretly, by the immense majority. And it will take time and considerable effort for bread to regain the place that it has historically occupied. One of the key objectives of nutrition education should take on is repositioning and revaluing bread once again as a protagonist of our daily diet, but without forgetting its role in obesity and other metabolic diseases.

At any point within our Mediterranean geography you can find a good baker waking up at dawn every day of the year, so that upon getting up, we can enjoy a lovely piece of freshly made bread for an early breakfast.

In Catalonia we have "*pa amb tomaquet*", rustic crusty bread rubbed with garlic, smeared with tomato, adding a pinch of salt and a drizzle of quality virgin olive oil – a marvel that defies description. And how many different sandwiches have we eaten? In Spain, we should build a monument revering the possibilities that sandwiches provide: they can contain ham, tomato, tuna or squid, or include an omelette, salad, pork, sardines, marmalade, mortadella, as well as oil, cheese, honey or chocolate. My grandmother used to put sugar and wine on bread! We can enjoy multitudes of sandwiches for breakfast, as snacks, or even having them for lunch or dinner.

Is there anything that is more balanced from a nutritional point of view than a great sandwich? We know that it is a very good option to give to our children. Even so, we often succumb to easier options that, without a doubt and on many occasions, are less healthy and almost always less tasty. Is this a consequence of the recommendations – in line with those anti-gluten views or those of Dr Atkins's so-called Diet Revolution – to cut down on bread and cereals? It seems likely to be so.

During the 1960s in Spain, when the Mediterranean diet was still widely adhered to in its traditional form, the daily per capita consumption of bread was around 300 g. These were times when obesity did not exist; perhaps you would see a token "fat" or "chubby" person. We had a traditional diet based on a thousand year-old culture emerging from the land and the sea, reflected in its landscapes and customs. Now, more than 50 years later, daily mean bread consumption hardly reaches 80 g, and our children are among the most obese in Europe. Some years ago the traditional dishes we ate on special occasions, and our cuisine in general, began to be simplified to unsuspected levels. Moreover, portion sizes, often for dishes that are of high energy density, greatly surpass our energy needs. This scenario combines with altered ways of life, in which physical activity and thus energy expenditure are low. And yet we are still being sold the message that bread is fattening, although there are very few antecedents in nutrition where a claim has been made with so little – if not null – scientific evidence to endorse it. There is also the message of bread's probable role in obesity as a main source of calories, but does this justify its exclusion from our diet?

On the other hand, sound documentation, derived from epidemiological as well as from intervention studies, clearly indicates that an adequate consumption of bread and cereals (especially in the form of wholegrains) is associated with decreased risk of chronic diseases such as cardiovascular disease and cancer, and certain inflammatory pathologies, including intestinal diseases. However, it is evident that the quality of bread production has gone downhill. The use of poor quality flour, frozen dough and rapid baking processes have led to bread being offered at ubiquitous points of sale (supermarkets, petrol stations, convenience stores and so on) and not in traditional bakeries or bread shops. Still, a certain amount of evidence exists affirming that the flour of artisanal bread dough has a lower glycaemic load and index and, as such, bread made with such dough is perfectly suitable for a balanced diet. It is somewhat similar to what occurs with pasta, which has distinct nutritional characteristics when boiled for longer periods of time versus being prepared "*al dente*".

Should not we also be engaged in defending and protecting culinary traditions, and not only in opposing the consumption of those foods that have suffered the erosion of indus-

Figure 1. Traditional flatbread made in traditional bakery shops from the area of Tarragona (Imperial Tarraco) following a millenary recipe from Ancient Roman times. Its ingredients remain the same as in the past, and the recipe has even not incorporated tomatoes or cheese as has happened with modern pizzas. This represents an example of the sustainability of food culture despite modernization and globalization.
Source: Picture from Joan Reguant, with permission.

trialization? Even though bread might be defined as "ultra-processed" should we go back to producing and eating artisanal bread or just reduce eating more industrialized bread? Should we skip traditionally cooked potatoes or just chips or French fries? Shall we reject the inclusion of fish such as the catfish from remote contaminated rivers? It is our hope that this would indeed occur, for the good of our public health and environment and also for our culinary and gastronomic cultural heritage.

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Promoting sustainable food systems in Mediterranean countries: a framework to implement recommendations and actions

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During the last decades, an impressive drop in the Mediterranean diet adherence index has been observed in numerous countries. The general current dietary patterns are characterized by a lower consumption of plant-based products in favour of animal-based products and ultra-processed foods. Moreover, the Mediterranean region is subject to environmental constraints, especially water resources and soil erosion, threatening the capacities to provide local food ensuring food security.

The Medina-Study Group has proposed a framework to ensure food and nutritional security and to identify the possible changes in food consumption/production (Figure1). Different levels were considered (country, household and individual) by using different databases: food balance sheet (FBS), household budget survey (HBS) and individual dietary survey (IDS). The Medina-Study Group aims to provide solid support for revised guidelines compatible with sustainable food systems promoting good health and nutrition as well as the local cultural heritage and traditional food products.

The development of dietary recommendations usually consists of translating the reference nutrient intakes into food combinations to cover all nutritional requirements (lipids, proteins, carbohydrates, fibres, vitamins, minerals) in order to promote health and reduce the risk of diseases.

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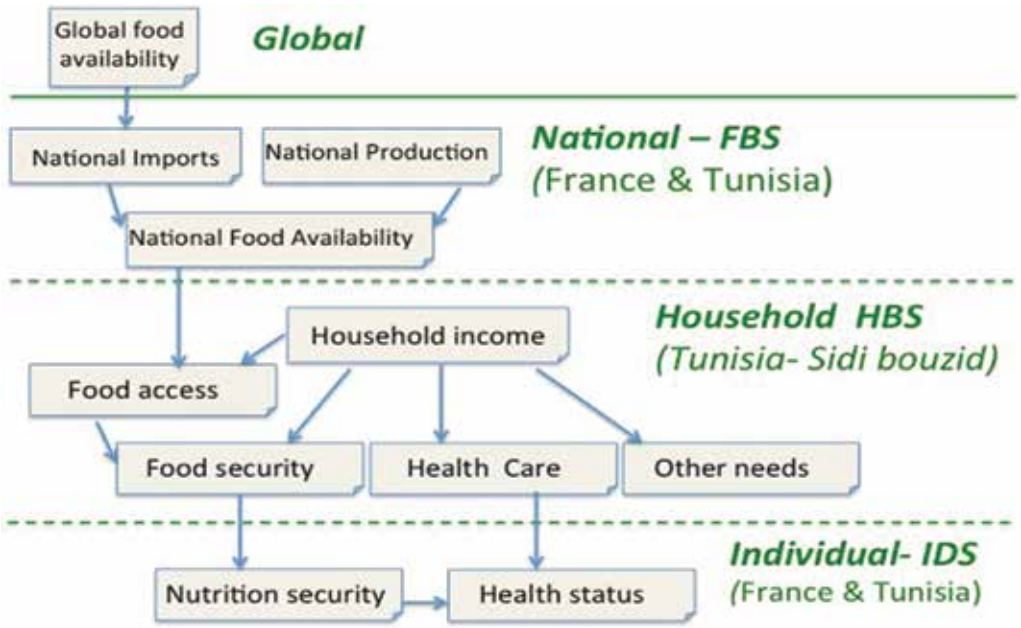

Figure 1. Framework to ensure good nutrition and health

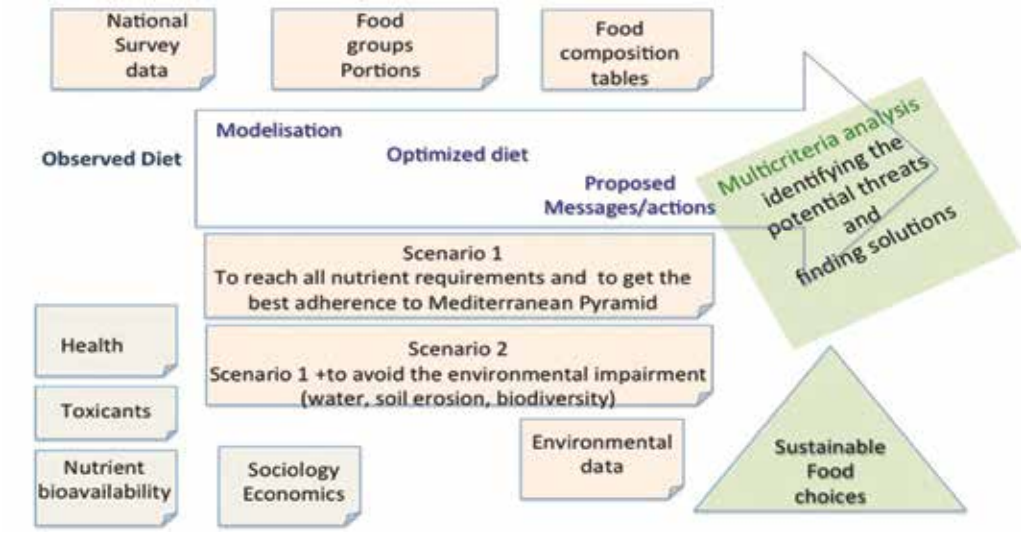

Figure 2. Modelling approach to propose guidelines ensuring good nutrition and sustainability

A methodology has been developed to optimize these combinations of foods to reach all nutrient requirements and achieve a better adherence to the Mediterranean pyramid as previously defined (Bach-Faig, 2011), while taking into account current dietary habits and preferences to reach feasible recommendations. To propose sustainable guidelines,

environmental constraints were added. Environmental impacts are often analysed through carbon emissions (Perignon *et al*., 2016). Nevertheless, in the Mediterranean context, water deprivation, land use and biodiversity impacts are crucial. A hybrid method was used, combining economic statistics and production data. Potential environmental impacts were computed for the total equivalent amount of food of one person during one year in France and Tunisia. Impacts are generally one order higher (roundly 5 to 15 times) for the Tunisian diet than for the French one but food production in Tunisia has positive impacts on erosion and biotic production. Comparing food groups showed the prevailing importance of the group "meat/fish/eggs". The environmental database added to the nutritional database and surveys served to build a scenario fulfilling nutritional adequacy without increasing environmental impairment (Figure 2).

Under the scenario reaching only nutritional adequacy as represented in Figure 2, the main dietary changes were the increases of fruits and dairy products and decreases of meat and starchy foods. In this scenario applied to Tunisian diets, water use and biodiversity were impaired, but not impact erosion resistance and biotic production. Under the scenario adding environmental indicators, which was limited to observed levels, the modelled diets increased the intakes of plant-derived products, fish and low-fat dairy products and decreased meat, fat and sugar.

Dietary changes identified to move towards more sustainable diets in Tunisia will be translated into action proposals to recommend sustainable food choices respecting the Mediterranean identity. Multicriteria analysis will be used to identify the potential threats and find solutions with stakeholders. Moreover, the Medina project targeted studies to valorize traditional dishes and promote the Mediterranean food chain. Optimization work has to be pursued to test the compatibility to cover the nutritional needs without increasing the risk associated with exposure to contaminants as recently done for the French diet (Barré *et al*., 2016). Integrating health, as proposed recently by Anses (2016), and nutrient bioavailability will allow the attainment of more precise recommendations in further scenarios.

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Women's situation and food system sustainability in Morocco

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INTRODUCTION

Food systems in the world including the Mediterranean region are facing several factors that impede the food security of populations and ecosystems' sustainability. Indeed, with the demographic growth and the concern to satisfy the populations with enough food and to meet their nutritional needs, pressure is exerted to increase food production. The latter has an impact on the natural resources. Moreover, the trends of food consumption and dietary models of the populations have also changed. These changes are accompanied by an abundance of food that is more diversified although uneven in different regions and also unbalanced. While these changes are accompanied by a reduction of malnutrition, they have also led to consequences on the population health profile (Belahsen, 2014).

Indeed, in Morocco, as in other countries of the Mediterranean region, the improvement of economic conditions, changes in socio-demographics, diets, urbanization and globalization have led to a nutritional transition associated with the increase of health problems such as obesity and chronic diseases including cardiovascular disease and cancer (Belahsen and Rguibi, 2006).

In this region, the diet is of Mediterranean type and the traditional Mediterranean diet was reported to have a protecting effect on health and the environment and to contribute to food and nutrition security; in addition, it was recognized as a model of a sustainable diet (Belahsen, 2014; ,FAO, 2012; Dernini *et al*., 2012) and women have a crucial role in this dietary model's sustainability.

However, the changes observed with the modernization in the Mediterranean basin countries, including Morocco, are reflected in the sustainability of this diet. These changes pose challenges for policy-makers considering sustainable food policies in different sectors (Kearney, 2010). One of the contributing factors to report in this paper is the effect of these changes on the situation of women.

NUTRITION TRANSITION AND DIET SUSTAINABILITY

The Mediterranean diet (MD) is a characteristic of the populations around the Mediterranean Sea. It is rich in biodiversity, nutritionally healthy and has a beneficial role in the development of sustainable agriculture in the Mediterranean region. The MD is not a

homogenous nutritional model as there are several Mediterranean nations with varied histories, cultures and cultural interferences, traditions, incomes and dietary habits resulting in a wide variation of dietary patterns within the Mediterranean region (Belahsen and Rguibi, 2006; Dernini *et al*., 2012).

All these characteristics make the MD a model of a sustainable diet. According to the FAO definition "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. They 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, 2012).

Today, with the demographic growth and economic improvement, food production and consumption patterns are changing everywhere in developing countries including in African Mediterranean countries such as Morocco (Kearney, 2010; FAO, 2013). Indeed the diet is based on a large consumption of cereals, mainly wheat and fruit and vegetables. The consumption of animal products including fish remains very limited.

The consequences of such a trend are the import of many foods such as wheat and the encouragement of agricultural strategies especially those aimed at export while producing an accentuated homogenization of the national dietary model. As an example, the use of traditional cereals such as barley has decreased and been replaced by wheat, for which the supply is in continuous increase (FAO, 2013), making the levels of energy available at the disposal of the population for consumption (Belahsen, 2014; ,Belahsen and Rguibi, 2006; FAO, 2012) higher than the needs for the body's requirements; in addition to this there is abundance of other foods with high energy density, rich in sugar, salt and fat.

On the other hand, the traditional dietary model was a semi-autarkic model. It is dependent on an ecosystem that guarantees food security by linking humans to the environment. A large part of the production is intended for household consumption in the community. The rest is sent generally to the weekly market to buy other foods or products unavailable locally. In this model, women played an important role that is today ignored or its contribution is minimized and needs to be revalorized to avoid food insecurity. Indeed, the failure to recognize the crucial role of women in agricultural production and food security of households in agricultural and trade policies was considered to be among the factors that contributed to the food crisis (Karl, 2009). The dietary model is embedded in an ecosystem and a good strategy for food security must involve the implementation of public policies focused on the diversity and the valorization of the terroir products. The involvement of women would certainly be an asset in agricultural policies and important to popularize the dietary model's virtues at all ecosystem levels.

TRANSITION AND WOMEN'S ROLE

The global changes observed with modernization in countries undergoing economic, demographic and nutritional transitions have affected the situation of women and has reflected on the sustainability of the food system and diet in the Mediterranean region. Indeed, with urbanization, the mode of activity is accompanied by a change from a

traditional structure of a composite to a nuclear family. There is also a loss of the culinary knowledge nedded to use varieties or part of foods that are under- or no longer used. This knowledge is retained by older people, especially women, and its loss is leading to food waste and affecting biodiversity and changes of dietary habits. Women are therefore protectors of biodiversity, the natural resources (water, wood) and culinary techniques. This role appears in the case of wild edible plants.

CASE OF WILD EDIBLE PLANTS IN MOROCCO

Wild edible plant (WEP) consumption is a part of Moroccan traditional diet that is presently at risk of erosion. Indeed, the traditional knowledge related to their use seems to be declining but it continues to be part of the food habits among local populations especially in winter. Data from an ethno-botanical study (Tbatou, Belahyan and Belahsen, 2016; Tbatou *et al*., 2016) have shown that the knowledge of traditional food practices related to these plants in the rural areas is held mainly by older people. The contact of the latter with young generations is one of the important factors of knowledge transmission, hence the species that are more known by younger people are those more known by older people. However, women know more about WEPs than men. They know the period of their collection, the consumable parts and their different uses in traditional local dishes.

The fact that older women, especially grandmothers, are the main carriers and transmitters of the traditional knowledge related to the use of WEPs in the region means that women are key contributors to safeguard this heritage before its disappearance.

CONCLUSION

The impact of gender needs to be considered and integrating women in the socio-economic environment would be a fundamental requirement. It could guide the strategies and projects aiming to preserve biodiversity and the local traditional food system and the promotion of sustainable use of natural resources in the region. In this context, the organization of professional corporations of women would be a real alternative to allow the preservation of the heritage and also the reinvention of new local products.

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Five relevant points on food, culture and Mediterranean diet

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Like every region, the Mediterranean is a socio-cultural and political construct based on a previous geographical entity, and any discussion of food in the Mediterranean area also involves a social and cultural construction. Food and eating behaviour in general fall within the framework of the societies that produce and recreate them, and therefore within specific socio-cultural systems (Medina, 1996).

While we construct our conception of the Mediterranean based on certain parameters, which are strongly defined by geography and climate, they are also defined by cultural projections, common places and stereotypes that are difficult to avoid. The aim of this short paper is to focus on some points that, in our opinion, are relevant and that we must have it in mind when talking about the Mediterranean diet from a social and cultural perspective.

ON CULTURAL HERITAGE, TRANSNATIONAL RECOGNITION AND THE DEFINITION OF THE MEDITERRANEAN DIET AS A WHOLE SUBJECT

Since the turn of the last century, the "official" concept of heritage can be considered to have begun to take an interest in areas beyond the purely monumental and environmental fields, broadening its scope to more ethno-anthropological and less tangible aspects. An important point to emphasize here is that gastronomic heritage, and therefore human consumption in general, falls within this emerging intangible heritage.

The zenith of UNESCO recognition for food candidacies did not arrive until November 2010, in Nairobi (Kenya), when the three proposals submitted at that time were declared an intangible cultural heritage: the traditional Mexican cuisine, the gastronomic meal of the French (*le répas gastronomique des français*) and the Mediterranean diet. Food had been recognized by UNESCO as an intangible cultural heritage of humanity for the first time. But one of the most important points here is that the definition of the Mediterranean diet in this declared candidacy obviously attempted to be broad and inclusive with all the different (disciplinary) sensibilities around the Mediterranean diet. According to the text presenting the candidacy:

> "The Mediterranean diet, is an articulated cultural ensemble manifested in the following domains specified in the Convention (Article 2.2)", which means that it represents the domains of oral traditions and expressions; ritual social practices and feasts; the knowledge and practices related to nature and the universe and traditional crafts (UNESCO, 2010).

It is important to stress that the inscription always refers to the entire concept of the Mediterranean diet as a whole, and not to each of its possible tangible or intangible components individually: neither olive oil, nor any specific dish, landscape, festival, ritual, etc. However, they are all individual examples of the substantial components of the item inscribed. In other words, they are a necessary constituent part of the Mediterranean diet, and are part of the item recognized as an intangible cultural heritage of humanity, although none of them has been recognized as such on an individual basis (Serra-Majem and Medina, 2014). Furthermore, those components that form part, or not, of the heritage inscribed cannot be selected arbitrarily on the basis of any partial criterion (such as whether they are healthy, for example). This is a key aspect to take into account.

THE CULTURAL HERITAGE IS ALWAYS LIVING – OR IT IS NOT A CULTURAL HERITAGE

Another important aspect that must be borne in mind is that the Mediterranean diet is an item of cultural heritage and, as such, it is living and constantly changing. In other words, these are ductile socio-cultural structures and elements, which evolve as our societies and we ourselves evolve. We cannot therefore hope (even when declaring something to be an intangible cultural heritage and demanding its protection and safekeeping) for this cultural heritage to remain unchanged over time, and neither can we hope for it to remain isolated from different influences. This capacity for evolution is intrinsic to its cultural constitution, and as such should be accepted.

In this sense, the primary consideration in the inscription of an item as a world heritage (tangible or intangible) is that the item exists, is alive and in use. Otherwise, we would be attempting to register something historical, which refers more to the memory of the past than to everyday use (Medina, 2017). And this fact affects the field of history, but not of heritage.

HERITAGE AND ITS SAFEGUARDING: RESPONSIBILITY FROM THE PUBLIC SECTOR

However, the value of this declaration lies also and above all in recognition of the urgent need to preserve the techniques, practices, habits, ideas, values and spaces of the food cultures approved for inclusion. Their safeguarding directly affects the communities and groups that are the basis for this heritage and that maintain it; ways of life and social organization; whether many individuals remain in their places of origin; threatened ecosystems and natural areas with a high heritage value whose survival is not assured; and of course, the genetic and cultural diversity of food. This is no trivial matter, and as we noted a few years ago in a critical article (González Turmo and Medina, 2012) specifically about the Mediterranean diet, this safeguarding is complex and risks removing the issue in question from its context.

Given the scale of the heritage area proposed in the candidacy approved by UNESCO, it is clear that the governments and institutions in the four countries that led it (and the three that subsequently joined it) have assumed a major responsibility, which we are not sure they have understood to its full extent. It is no simple challenge: the food culture

is a complex one, which cannot be defined by merely listing the foodstuffs within it (as some governments and individuals might often wish), culinary preparations or its most distinctive rituals. The same can be said of its relationship to health that, although no one disputes certain aspects thereof, is only a small part of a much more complex whole. Furthermore, this was not the aim of the candidacy.

Many important challenges were assumed when submitting the candidacy, due to the urgent need to safeguard the heritage values that, according to the dossier, affect the Mediterranean peoples and their cultures, their cultural spaces, identity and intercultural dialogue, knowledge and creativity. The initiative now lies with the governments that promoted it, and which must not shirk a responsibility that demands urgent and necessary action.

THE MEDITERRANEAN DIET AS A SUSTAINABLE FOOD SYSTEM FOR THE MEDITERRANEAN AREA

Nevertheless, the Mediterranean diet is still being considered from the point of view of public policies as an independent item, and not as a part of a significant social and cultural Mediterranean food system. Even approaches that appear after UNESCO's declaration of the Mediterranean diet, which seek to be somewhat broader and more inclusive, are reductive when they say that "the reasons that push people to switch between dietary 'healthy' to 'unhealthy' habits are mainly related to the socio-economic situation" (Da Vico *et al*., 2012).

Despite efforts such as those carried out by institutions such as CIHEAM or FAO, attempting to address the Mediterranean diet as a whole item (Dernini *et al*., 2016), health or food consumption is still considered separately from agricultural or fisheries production, economics (sales, import–export, etc.) or the maintenance of traditional structures of distribution or sale. In this framework, while good nutrition should be a goal of agriculture, it is imperative that concerns of sustainability are not lost in the process. Many dietary patterns can be healthy, but they can vary substantially, for example, in terms of their resource cost or their environmental impact.

As every food system in its own biosocial context, the Mediterranean diet is an outstanding resource, not yet fully acknowledged and enhanced within the Euro-Mediterranean Partnership (Medina, 2011; Dernini, 2008) for the achievement of an effective sustainable development in the Mediterranean area. In this sense, we must always bear in mind that the Mediterranean diet is a part of an interdependent social and cultural system, and must never be considered a separate element in itself, as has often been observed, especially from the health sphere and in relation to some selected products. This food system is a complex network of interdependent cultural aspects, and we must remember that all the links in the chain must be protected (Medina, 2015), from production to the dish, including distribution, sales, cooking techniques, food and consumer behaviour, etc.

CULTURALLY COHERENT, MORE THAN CULTURALLY ACCEPTABLE

As in different other fields and items, cultural aspects have traditionally been neglected, observed only as subservient or complementary to other, more important items. Even after

the declaration by UNESCO of the Mediterranean diet as an intangible cultural heritage of humanity, definitions of *diet, sustainable diets*, or the *Mediterranean diet* –even the more open ones; even those drafted by supranational institutions – continue to relegate to the background those aspects more closely linked to culture. In this sense: sustainable diets are protective and respectful of biodiversity and ecosystems, *culturally acceptable*,[1] accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources (FAO, 2011; Burlingame and Dernini, 2011). Jonston, Fanzo and Cogill (2014) add that food must be *culturally sensitive and acceptable*.

But, more than "acceptable", food (but not only) must be culturally "coherent" (Medina, 2015). The Cambridge Dictionary (online edition) defines "acceptable" as: "satisfactory and able to be agreed to or approved of", or simply "just good enough, but not very good". In this sense, if something must be agreed or approved, usually it is because it is not taking part of the system itself, and must be *accepted* from the outside. Or, as the second of the meanings cited above explains very well, it is "just good enough, but not very good".

On the other hand, something "coherent": "it is clear and carefully considered, and each part of it connects or follows in a natural or reasonable way". In this sense, many things may be *acceptable*, but very few are *coherent*. From a local and sustainable point of view, in addition, betting on the cultural "acceptability" of a food can open up too much the spectrum of what is acceptable as edible. But its cultural coherence within a system appeals to other aspects that have nothing to do with what is simply acceptable.

CONCLUSION

Even after the declaration by UNESCO of the Mediterranean diet as intangible cultural heritage of humanity, cultural aspects remain neglected and subservient to other items. In this paper we pointed out some ideas that, in our opinion, are top points when talking about the Mediterranean diet from a social and cultural point of view, but that we also have to take into account when talking about the Mediterranean diet from other perspectives.

We reviewed the definition of the Mediterranean diet as a whole, inclusive and interdependent subject. From this point of view, none of the particular elements that compose this heritage must be considered separately or individually. It is a heritage, on the other hand, that exists, and is alive and in use, taking part of the everyday life of the Mediterranean societies and cultures, and not only of the memory of the past; culturally built, agreed and coherent (more than *acceptable*); locally sustainable under certain premises for the societies in the Mediterranean area. But it is also a big challenge assumed by the public sector (at least, when and after submitting and signing the UNESCO candidacy). The initiative now lies with the governments that promoted it, and which must not shirk a responsibility that demands urgent and necessary action as a web of different social and cultural aspects; it is as a part of a significant social and cultural Mediterranean food system.

[1] Our italics.

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Med Diet 4.0: a transdisciplinary framework for revitalizing the Mediterranean diet as a sustainable diet, linking food security, nutrition and sustainability

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The Mediterranean diet, recognized scientifically as one of the healthiest diets in the world, is unfortunately losing its adherence among populations at the country level in the Mediterranean area. The erosion of the Mediterranean diet heritage, by the loss of its adherence among Mediterranean populations, is alarming as it has undesirable impacts not only on health, but also on social, cultural, economic and environmental trends in the Mediterranean region (CIHEAM/FAO, 2015).

The dietary patterns embraced by the Mediterranean people over the centuries are the result of a number of factors: food production availability, seasonality, the use of small-scale technologies, the wide variety of local cultivars used, the freshness of the food consumed, their homemade preparation, the frugality and the conviviality of meals, and a physically active lifestyle.

The current perception of the Mediterranean diet is instead mostly related to its health benefits, as the results of much scientific evidence produced in the last 50 years have shown, rather than to be also perceived as the result of a sustainable Mediterranean lifestyle, a way of living, as it was defined by UNESCO within its inscription in the List of the Intangible Cultural Heritage of Humanity . The inscription of the Mediterranean diet in the UNESCO Intangible Cultural Heritage List (UNESCO, 2010) also raised the requirement of "safeguarding measures" to preserve and enhance this intangible cultural heritage for transmission to future generations. This, within the identification of these measures, also raised at the same time sustainability issues.

In the last decade, the Mediterranean diet has become the object of increasing studies on its sustainability, particularly on its lower environmental impact as a mainly plant-based dietary pattern with low animal product consumption, with a lower water footprint and lower greenhouse gas emissions compared with the current Western dietary pattern.

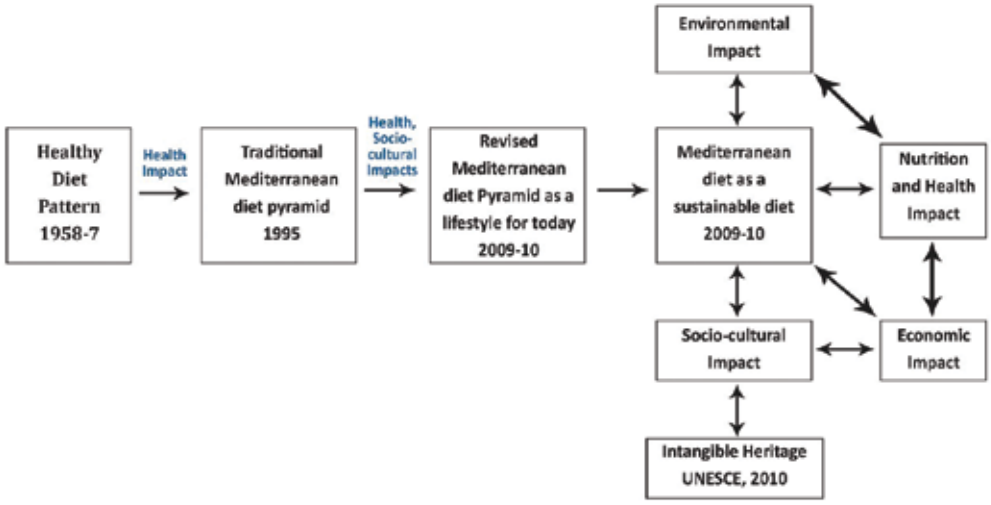

Figure 1. The evolution of the Mediterranean diet concept
Source: Dernini and Berry (2015).

The notion of the Mediterranean diet has undergone a progressive evolution over the past 50 years (Figure 1) – from that of a healthy dietary pattern to the model of a sustainable diet (Burlingame and Dernini, 2011; Dernini and Berry, 2015).

In 2009, at the 3rd CIISCAM Conference on "*The Mediterranean Diet Today: A Model of Sustainable Diet*", sustainability issues were included in the revision of the Mediterranean diet pyramid, published in 2011 (Bach-Faig *et al*., 2011). In 2010, at the FAO/Bioversity symposium "*Biodiversity and sustainable diets: united against hunger*", the Mediterranean diet emerged as a case study for the assessment of a sustainable diet in different agro-ecological zones. As a follow up, in 2011, the Mediterranean diet was identified by FAO and CIHEAM as a joint case study for characterization and assessment of the sustainability of food consumption patterns and diets in the Mediterranean (FAO/CIHEAM, 2012). In 2015, at the Milan Expo conference *Does the Mediterranean diet still exist?*, organized by CIHEAM-Bari, CNR, CREA-Nut, ENEA and the Forum on Mediterranean Food Cultures (FMFC), with the collaboration of FAO, the Med Diet 4.0 was conceived by the author as a contribution to the Med Diet Expo 2015 Call: time to act, issued by CIHEAM (CIHEAM, 2015).

As a follow up, in 2016 at the First World Conference on the Mediterranean R*evitalizing the Mediterranean diet: from a healthy dietary pattern to a healthy Mediterranean sustainable lifestyle*, organized by IFMeD with CIHEAM-Bari and FENS, with the technical collaboration of FAO, the 2016 Call for the revitalization of the Mediterranean diet was launched and the Med Diet 4.0 was presented as a multidimensional framework to characterize the multiple sustainability benefits of the Mediterranean diet (IFMeD, 2016).

The 2016 Call solicited a rethinking for the revitalization of the Mediterranean diet by fully acknowledging the Mediterranean diet as: (i) a significant part of Mediterranean food systems, from consumption to production, and no longer just a diet but an expression of

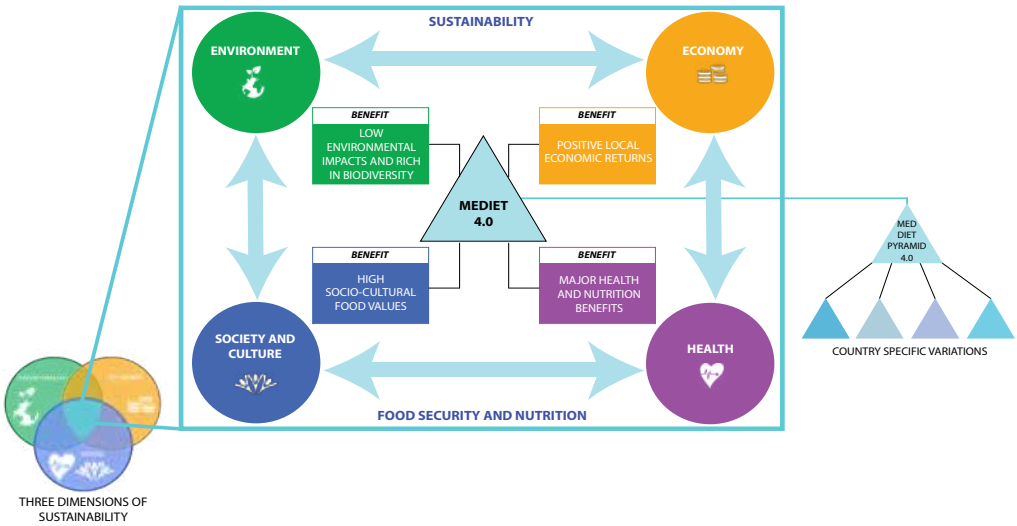

Figure 2. The Med Diet 4.0 framework
Source: Dernini *et al.* (2016)

the diversity of Mediterranean food cultures and culinary systems; (ii) a pivotal element for sustainable food systems in the countries of the Mediterranean region within the 2030 agenda for sustainable development, by taking into account its dimensions of health and nutrition, environment (including biodiversity), socio-cultural and economic aspects; and (iii) a way of living of the Mediterranean people, a complex web of cultural aspects that depend on each other, from nutrition to the economy, through law, history, politics or religion, strongly linked to local territories.

The complexity of interdependent challenges, within the radical transformation of the contemporary Mediterranean and global scenario, requires a rethinking capable of generating new forms of transdisciplinary dialogues and strategies, at different levels, towards the revitalization of the Mediterranean diet as a sustainable resource in the Mediterranean area, at the country level.

To tackle these challenges, the Med Diet 4.0 (Figure 2) was developed to provide a multidimensional framework for the revitalization of the Mediterranean diet, by linking food security and nutrition to sustainability, through its multiple sustainability benefits, with country-specific variations: well documented health and nutrition benefits, low environmental impacts and richness in biodiversity, high socio-cultural food values, and positive economic return locally (Dernini *et al.*, 2016).

By providing a simplified multidimensional understanding of the many sustainability benefits of the Mediterranean diet, the Med Diet 4.0, by taking into account the identity and diversity of food cultures and systems, expressed within the notion of the Mediterranean diet, can contribute to its revitalization by improving its current perception from a healthy diet to a sustainable diet, with country-specific variations.

The assessment of the Med Diet 4.0's four dimensions requires appropriate data, not all presently available at country level, to evaluate intra- and interdimensional weightings, interactions

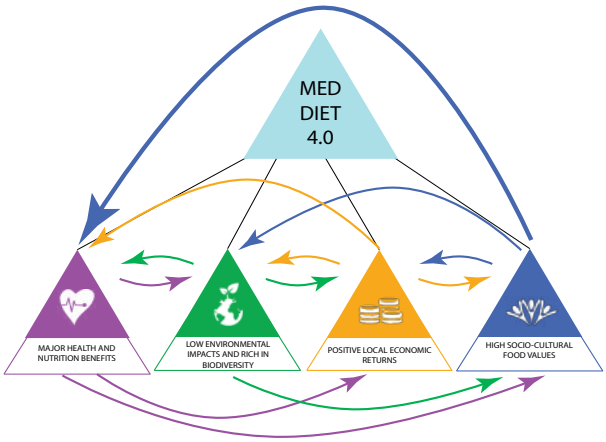

Figure 3. Country specific interdependent sustainable impacts

and correlations between various dimensions. However, there is still a need for further cross-cutting interdisciplinary approaches to define the most appropriate metrics to assess the sustainability of the Mediterranean diet by taking into account all its multidimensional cross-cutting interdependence (Figure 3).

Further multidisciplinary studies are needed for the assessment of the sustainability of the Mediterranean diet by taking into consideration its multiple dimensions and its specific country variations.

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Making the Mediterranean diet the preferred option? Possible contributions of the food environment

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There is, generally speaking, a broad consensus on the health and nutritional value of the Mediterranean diet (MD), as well as on its socio-cultural importance as acknowledged by UNESCO in 2010 when the MD was recognized as an Intangible Cultural Heritage of Humanity (Bach-Faig *et al*., 2011). There is also some evidence of its contribution to sustainability – in all its forms – although more work needs to be done to generate more solid and context-specific evidence (FAO, 2015). In spite of all this, and as rising obesity levels in the region point to, people today no longer adhere to the MD as in past decades, thus leading to a progressive erosion of the MD. The question then – as highlighted in the *2016 Call for Action for the Revitalization of the MD* – is: how to revitalize the MD in such a way as to make sure that it also contributes to the sustainability of the food systems it draws upon? In other words, what is needed is a new revitalized MD that would be beneficial not only for health and nutrition, but also for environmental, socio-cultural and economic sustainability.

In a quest to move towards this objective, a series of methodological approaches and indicators were developed by CIHEAM, FAO and other scientific experts belonging to Mediterranean institutions (FAO/CIHEAM, 2012; CIHEAM/FAO, 2015). More recently, a reviewed methodological framework – the Med Diet 4.0 – was developed together with a more succinct set of indicators with the specific aim of "playing a very important educational and communication role towards the revitalization of the MD" (Dernini *et al.*, 2016).

As a complement to the above efforts, and with an aim of identifying areas of action/policy that would make it easier for Mediterranean people to make the MD the "diet of choice", the food environment concept can provide a useful framework. The term was coined at the beginning of the 2010s to illustrate the importance of complementing educational efforts with actions aimed at changing the underlying material and immaterial determinants of healthy eating. Although there is no one agreed-upon definition of food environments, overall we can say that food environments are made up of the foods that are available, affordable and acceptable to people in their surroundings (IFPRI, 2015; Swinburn *et al*., 2013). Translated into policy terms, which are those areas where policy action is needed to make healthier foods more available, affordable and acceptable? At the international level, among academics

and practitioners, there is a consensus on the core policy domains where action is needed to foster a healthier food environment: (i) nutrition labelling; (ii) food provisioning (or food offered in specific settings, such as schools); (iii) economic incentives/disincentives; (iv) food composition (or nutritional quality of foods produced by food processors); (v) food promotion (advertising and marketing); (vi) food retailing; and (vii) agriculture and food systems (Swinburn *et al*., 2013; Hawkes, Jewell and Allen, 2013; IFPRI, 2015). Some policy frameworks – such as the NOURISHING framework – also include communication and education as key complementary areas of work.

Examples exist, for each of these policy areas, of actions taken by governments and other stakeholders worldwide to create an environment conducive to healthy eating. Some of these include national stop-light nutrition labels for highly-processed sugary products (e.g. Chile), public procurement of local foods in schools (e.g. Italy, Brazil), restrictions on specific food advertisements during children's TV time (e.g. United Kindom), taxes on sugary beverages (e.g. Mexico and some states in the United States of America) and actions in the realm of food retailing, such as fast-food zoning and the promotion of farmers' markets. Similar actions could also be promoted systematically (rather than piecemeal, as is the case today) in Mediterranean countries with the specific aim of revitalizing a dwindling MD. While some actions have already been taken – such as actions related to school feeding or retailing – and are being called for in the context of a sustainable MD (Hachem *et al*., 2015), the novelty could be that of providing a framework that can better help to identify and design a multipronged action. A missing element today is the sustainability aspect, which could be taken from the work done so far (described above) on identifying suitable sustainability indicators.

Not only can food environments help shape a "renewed" MD, but because the MD is so embedded in the culture of the Mediterranean people, so can the local food culture – that persists in spite of globalization – help construct healthier food environments. In other words, the socio-cultural determinants of the MD constitute a good foundation on which to rebuild – possibly even in a revised version – a healthier diet: a source of renewal upon which many other countries and regions facing similar challenges in terms of unhealthy dietary patterns may not have the possibility to draw.

From a governance standpoint, recognizing the different levels at which decisions and policies around food are taken and made (Lang, Barling and Caraher, 2009), what would be the role of local administrators in helping refashion the MD? Certainly that of assessing and monitoring local food environments, promoting the integration of policies from below, and helping rebalance local and global food systems (Brunori *et al*., 2016). Observing the trajectories and experiences of food policy councils also hints at the role of local level administrators in promoting food narratives based on local culture and that of encouraging a "reflexive" localism by spurring local deliberations on food. By using the food environment framework, multiple stakeholders can thus come together to identify which actions would be the most appropriate to ensure that the food associated with the MD becomes more available, affordable and desirable, and that it does so in a sustainable manner.

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Call for action for food security and sustainability in Mediterranean countries

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Sustainable food systems (SFS) take into account the environmental needs along the entire food system chain, from production to consumption. They also incorporate social, health, and economic concerns. The goal of SFS is a world where the earth can produce enough nutritious, safe, affordable food to feed the population while preserving the biodiversity and ecological needs of the planet.

In June 2016, a conference entitled "Sustainable Food Systems: Agriculture, Environment, and Nutrition" was convened in Tel Aviv, Israel. The conference was a joint effort between The Manna Center for Food Security, Tel Aviv University, The Israeli Forum for Sustainable Nutrition, New York University and the Israel section of The International Union of Nutrition Sciences (IUNS). One of the outcomes of the conference was an eight-point call to action to delineate the steps that should be taken by policy-makers towards securing a sustainable food system for Israel. This work-in-progress is based on an attempt to accommodate the 17 SDG goals and the elements of food security (Berry et al., 2015) within the call for action (Figure 1). This summary document aligns the call for action with the SDG goals.

Action Point 1: Make our food system sustainable along the entire food chain – from production to consumption, protecting resources such as soil, air and water in the light of climate change challenges – and reduce food losses and waste (SDG Goals: 7, 12, 13, 14, 15).

Action Point 2: Strengthen the current agricultural basis in Israel, recognize its vital importance in providing local food and strive to align it towards the best practices in sustainable agriculture (SDG Goals: 13, 14, 15).

Action Point 3: Protect the fundamental human right of all residents to sustainable, healthful, nutritious and adequate food. A well-fed nation is a healthy nation and a sustainable, productive nation. This means ensuring food security and nutrition for all (no-one goes to bed hungry) at present and in the future. The Council on National Food Security needs to address these issues regularly (SDG Goals: 1, 2, 3, 5, 6, 12, 16, 17).

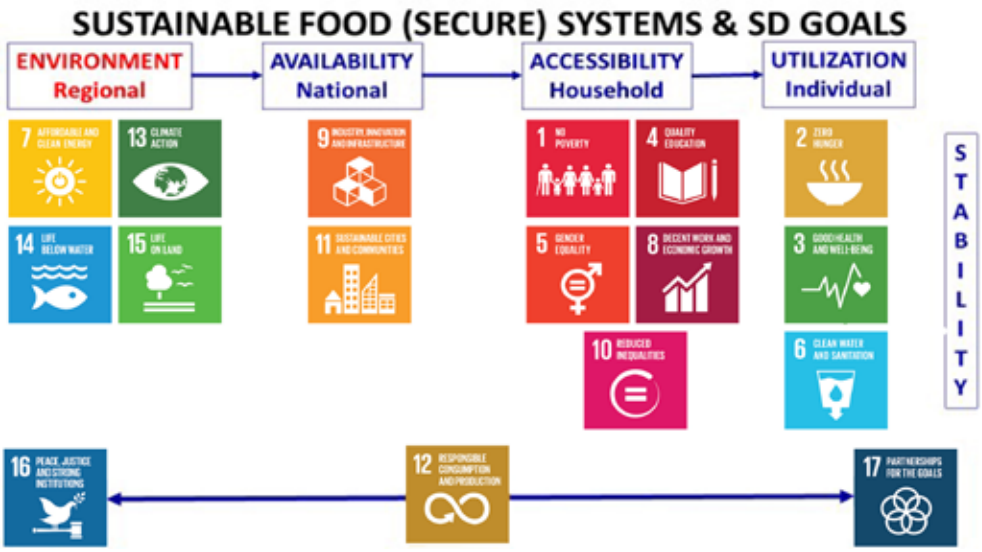

Figure 1. Sustainable food (secure) systems and Sustainable Development Goals – an exercise in positioning the 17 SDGs within the framework of Sustainable Food Systems.

Each country should put in place the institutional responsibility for this self-evident statement.

Action Point 4: Make our food of high nutritional value with a nationwide programme for enriching and monitoring nutrient values of the food supply through a National Data Base Monitor, making sure it is safe, free of pathogens and environmentally friendly (SDG Goals: 9, 10, 12).

Questions regarding food supplementation have to be dealt with to prevent "hidden hunger".

Action Point 5: Direct the food industry, through legislation, to produce healthy, nutritious (minimally processed) foods in a sustainable manner with less sugars, salt and additives that may adversely affect health. Production and marketing must be honest and transparent. Institute legible, intelligible food labelling. Restrict the marketing of junk food and sweet beverages especially to children (SDG Goals: 4, 9).

Action Point 6: Train nutritionist staff to educate the children in our schools (from kindergarten onwards) on how to lead a healthy, sustainable lifestyle that includes good nutrition (Mediterranean diet pattern, cooking skills, eating behaviour, sustainability, growing vegetables, fruits and herbs) and regular physical activity (SDG Goals: 3, 4).

Action Point 7: Promote access to healthy, sustainable foods in restaurants, work-place cafeterias, vending machines, medical facilities (including hospitals), sports arenas, public spaces, schools and day-care centres. Remove junk food chains from hospitals, health clinics and educational places like schools and academia (SDG Goals: 4, 5, 8, 10).

Projects such as Healthy Cities and Health Promoting Schools should be encouraged in each country

Action Point 8: Remember that eating is not a list of do's and don'ts but should be a pleasurable and tasty experience. Meal times are important opportunities for socializing and building relationships. Traditional and cultural preferences in food choices should be respected (SDG Goals: 4, 5, 10).

This has consistently been recommended in the guidelines for the Mediterranean diet (Bach-Faig et al., 2011).

COMMENT

We realize that the exact positioning of the individual SDGs within this framework is open to discussion. However, it is hoped that such an exercise will serve as a basis for debate in other Mediterranean countries. Formulating such calls for action should help direct policy development towards implementing the MeDiet 4.0, with its four sustainable benefits (Dernini et al., 2016) as part of country-specific sustainable food systems. The resulting information will help determine the strengths and shortcomings of SFS policies.

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Multiple perspectives and sustainability assessments of food systems: the case of voluntary sustainability standards

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INTRODUCTION

The sustainability challenge requires systemic changes in food systems. In such a landscape, sustainabilityy assessments are gaining a certain centrality as benchmark setting and information tools to support choices of various food-stakeholder groups, including consumers, corporate and public buyers, investors and policy-makers. To be coherent with the high expectations placed on them, all assessment approaches have to address questions about their quality, such as legitimacy, validity, relevance and usefulness. As the complexity of the sustainability issue is more widely acknowledged, sustainability assessments appear to be especially vulnerable to these quality challenges.

In this regard, ENEA is pursuing a new approach to indicators (Stefanova and Iannetta, 2016), based on soft and critical systems methodologies (Ramage and Shipp, 2009). Within such an approach, indicators are considered only as shortcuts linked to the development models they aim to inform and the central focus is on establishing consistent links between indicators and models as well as maintaining such consistency over time. Development models are based on often overlapping but still not identical perspectives on how sustainable food systems can be achieved (Garnett, 2014). A central question of our approach is how to incorporate different perspectives into sustainability assessment methodologies. This paper addresses the above question through a discussion on voluntary sustainability standards (VSSs). VSSs bear a potential to be considered sustainable innovations (Hautamäki, 2016a). They are believed to be systemic in nature, due to their potential of changing not only producers' behaviour, but also markets and consumers' behaviour (Gruère, 2013). However, to consider them sustainable innovations, as stressed in (Hautamäki, 2016a), it is essential to assess their impacts and their effectiveness in keeping the promises they try to convey to various food system stakeholders.

In this paper, we discuss an iterative, dynamic approach dealing with VSSs linking them to development models, which are dynamically constructed around overlapping but not necessarily identical perspectives on sustainable food systems. Such an approach focuses on the validity of VSSs with respect to corresponding development modes as well as on their efficacy with respect to the Sustainable Development Goals (SDGs). Alignment of perspectives is not pursued through a design of comprehensive, pre-defined sustainability frameworks (as in current practice). Rather, the aim is to obtain feedback and empirically grounded and systematically collected knowledge on efficacy of schemes, which may trigger change and potential alignment of underlying perspectives. This is a knowledge-based process based on a continuous learning cycle rather than on increasingly comprehensive and complete sets of pre-defined indicators.

COMPETITIVE ADVANTAGES AND VOLUNTARY SUSTAINABILITY STANDARDS

Two apparently opposing trends in demand characterize food markets at present (De Filippis, 2012); on one side, the homologation of tastes at the global level leading to increased production of standard products, i.e. products that can be produced with only marginal differences in many places and with similar technologies all over the world and, on the other hand, the differentiation of tastes leading to the increased demand for territory-linked and high-quality products. While the competitive advantage in the segment of standard products is based on technological differentiation and cost leadership, the territory-linked products compete on the basis of quality differentiation. Within such a market landscape, products that address the sustainability challenge have the potential to gain additional competitive advantages. One way of realization of this potential is through compliance to VSSs and communicating it through various forms of information and labelling schemes.

VSSs are information instruments targeting external users regarding one or more aspects of the sustainability performance of products and services (Gruère, 2013). A large set of these information instruments is connected with the Green Economy. The rationale behind VSSs is that they apply to entire markets, thus gradually pushing unsustainable products out of the market. There are many types of VSSs; they can concern a single product or all products of a market, concern a single or multiple phases of product lifecycles, etc. (Gruère, 2013). Also, standards such as geographic indications (GI) or organic, which are not framed in terms of environmental or social outcomes, are considered VSSs since they contain elements that directly or indirectly are meant to preserve natural and social resources or heritages (FAO, 2013).

Compliance with VSSs can lead to competitive advantages by cost reduction, by securing long-term market access, by premium price effects, or by a combination of all these effects (Prag, Lyon and Russillo, 2016). Within the segment of standard products, resource optimization options allow for both reduction of operation costs and improved environmental performance due to reduced use of market-based inputs based on scarce resources such as energy or water. Similarly, in the segment of high-quality products, products with strong links with the natural and cultural resources of a territory are considered to contribute to the achievement of the SDGs from the perspective of territorial

Consumption trends	Product demand	Competitive strategy	Competitive advantages	Valorization strategy
Homologation of tastes	Standard products	Cost leadership	Resource optimization; market access	Technological differentiation
Differentiation of tastes	Territory-linked products	High quality	Premium price; market access	Link with a territory

Figure 1. Market trends: standard and territory-linked products

development. Products able to show such links with territory are also able to obtain premium prices on the market due to the increasing consumer demand for them. A strategy based on certification, which is at the intersection of competitiveness strategies of standard and high-quality products, is securing long-term market access for producers by building trust relationships with retailers and corporate buyers. In fact, a recent market trend is to move the buying decision of certified products from consumers to retailers (Prag, Lyon and Russillo, 2016) (see Figure 1).

However, the effectiveness of VSSs as mechanisms for competitive advantages depends on many factors, such as the specific contextual circumstances (at single value chain or territorial level), on the quality characteristics of the VSSs themselves as well as on the process and governance mechanisms behind the adoption of VSSs and those behind the processes of social construction of referentials and indicators used in VSSs (Prag, Lyon and Russillo, 2016; Porter *et al.*, 2010; Caroll and Shabana, 2010; Sylvander, Isla and Wallet, 2011; Brunori and Rossi, 2007; Arfini, Belletti and Marescotti, 2013).

At present, the main concerns regarding VSSs are related to the phenomenon of proliferation of schemes and the main emphasis is on the issue of comparability across companies or products, leading to two distinct trends in VSSs development. On one side, there is a drive to enhance the comprehensiveness of VSSs in order to cover as many sustainability issues as possible – in fact, the fasted growing segment in VSSs is the segment of lifecycle assessment (LCA)-based standards (Gruère, 2013). On the other side, there is a drive towards harmonization of VSSs in order to cope with issues such as consumer trust and confusion, as well as with issues behind the phenomenon of "greenwashing" (Gruère, 2013). It is still not clear what are the effects and impacts of VSSs multiplication as well as of the corresponding and somehow contrasting efforts towards extending comprehensiveness of VSSs on one side and their harmonization on the other (Prag, Lyon and Russillo, 2016). What is clear is that emphasis on company comparability through compliance to one or another VSSs and comprehensiveness of VSSs cannot replace the need to address validity and effectiveness of VSSs in terms of their contribution to achieving the SDGs (UNFSS, 2016).

VOLUNTARY SUSTAINABILITY STANDARDS AND DEVELOPMENT MODELS

We have identified roughly two development models behind various forms of VSSs (see Figure 2): corporate social responsibility (CSR) and territorial/rural development (Caroll and Shabana 2010), (van der Ploeg *et al*., 2000; Lamine *et al*., 2012; Kristensen, Kjeldsen and Thorsoe, 2016).

The essence of both models resides in their potential for relationship transformations. Models for CSR have evolved since the period of the Second World War building upon the promise of changing fundamental relationships between business and social progress (Caroll and Shabana, 2010). Models for territorial and rural development are more recent and have evolved from the idea around changing relationships between farmers and the territorial systems into which agricultural activities are inserted (van der Ploeg *et al*., 2000). The central concept on the basis of current VSSs supporting the CSR model is that of *negative externalities* of economic activities. Correspondingly, the main objective of indicator systems developed in support of the CSR model is the monitoring of progress of companies' efforts to reduce their harm on the environment. The most advanced and comprehensive types of standards, such as those based on the LCA methodology, also explicitly address the issue of *minimization of trade-offs* between different phases from the lifecycle of products as well as explicitly taking into account potential trade-offs between different areas of concern (Prag, Lyon and Russillo, 2016).

On the other hand, the central concept around which models of territorial/rural development have been shaped is that of *public good*. Here the centrality is not so much on trade-off minimization between different phases and actors across a value chain, but it is rather on the *construction of synergies* between heterogeneous actors and activities through reconfiguration of rural and territorial resources such as land, labour, nature, biodiversity and ecosystems, cultural heritage, networks, etc., (van der Ploeg *et al*., 2000; Lamine *et al*., 2012; Kristensen, Kjeldsen and Thorsoe, 2016)

These two development models are overlapping on many aspects and are also continuously evolving. Therefore the questions of to which degree the two development models overlap or of whether they will eventually converge into a single representation of our sustainable futures are arising in a natural way. This would imply also some form of integration and coherent convergence of the corresponding public policies regulating them (see Figure 2), as well as eventually constructing a truly comprehensive set of high-quality indicators. Such questions lead to considering implicitly or explicitly the issue of multiple perspectives.

DISCUSSION: DEALING WITH MULTIPLE PERSPECTIVES

An approach of accommodation of multiple perspectives, informed by mainly modelling applications, consists of enlarging system boundaries in order to capture, through modelling, a larger set of relevant characteristics. Of course, such an approach implies an assumption of consistency of perspectives, considering them as static entities (Hautamäki, 2016b). This approach is followed by the *life cycle sustainability analysis framework* (Stefanova *et al*., 2014), which tries to extend the I/O modelling core of LCA by

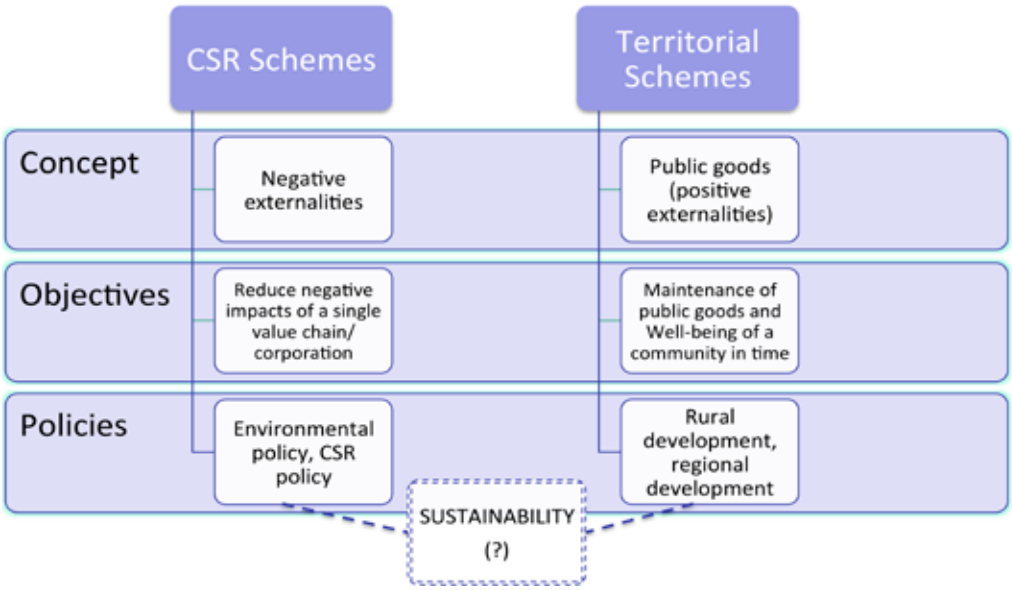

Figure 2. Schematization of VSSs according to models they aim to implement

considering additional modelling mechanisms as well as different scales of analysis. This framework is very comprehensive in its ambition and holistic in nature, but for obvious reasons it is very difficult to operationalize.

A second rather different approach is by adding indicators to existing VSSs for whatever issues are considered not yet covered. Such an approach is pursued by the *life cycle sustainability assessment*[1] framework (UNEP, 2011). Technically, LCS-Assessment apparently looks simpler compared with the LCS -Analysis framework, but the problem is actually shifted at the level of interpretation of indicators. Also various concerns about the quality of such types of schemes can easily be raised regarding in particular their usefulness, since it is not easy to map them into development models.

The two approaches above, illustrated by the two LCSA frameworks, assume that the VSSs that they support are valid, legitimate, effective and useful. At the same time there is seldom a reference to the kind of development models that such schemes aim to inform (usefulness) and whether they actually inform the development model they aim at (validity).

We pursue a different, iterative approach containing built-in elements to test validity (consistency with development models), efficacy (contribution to SDGs) and legitimacy of schemes (see Figure 3).

At the initial iteration level, LCA-based indicators such as the product environmental footprint (EC, 2013) can be considered partially valid with respect to CSR since there is evidence of business cases implementing win–win strategies for resource efficiency,

[1] Life cycle sustainability analysis and life cycle sustainability assessment frameworks are ambiguously denoted by LCSA in the literature, but it is necessary to point out that these are two essentially different extensions of LCA.

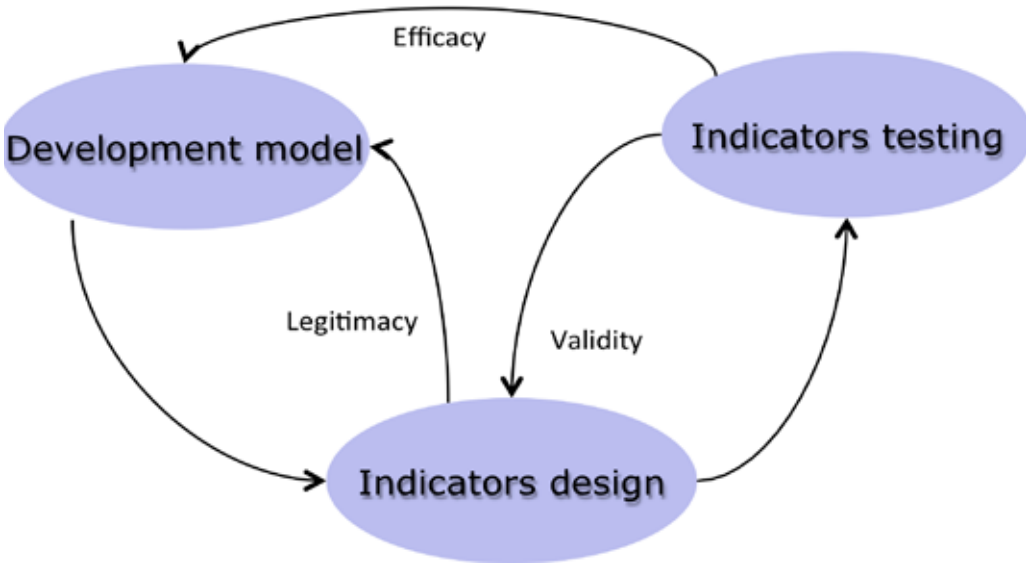

Figure 3. Multiple perspectives: iterative approach

supported by these types of schemes (Porter *et al*., 2010). However, CSR also addresses social impacts and thus it is desirable to extend LCA also in this way, but such extensions require validity checks with respect to CSR models.

In the case of territorial development models, we start from the VSS, developed in the framework of the "Agriculture & Quality" programme of the Apulia region, the main objective of which is to qualify and valorize typical Apulian food products (Capone, El Bilali and Bottalico, 2016). Such schemes have been developed on the basis of a contextual analysis of the Apulian region following a theoretical model for rural development. Subsequent iteration steps include: (i) checking legitimacy through participatory approaches and discussions on the chosen relevant characteristics to represent the territorial development model; and (ii) testing the validity of indicators thorough identification and analysis of a number of appropriate case studies as well as a number of analytical concepts suitable for the analysis of localized agro-food systems.

In order to understand whether these two kinds of VSSs are effectively contributing to SDGs it is also necessary to try to assess their impacts on the environment, on society or on a territory. This starts a subsequent iteration cycle aiming to inform the paradigms for development models on the basis of empirical and systematically collected knowledge. As mentioned earlier, such empirically grounded knowledge gathered in a systematic way is expected to improve understanding of both kinds of development models considered, gaining better understanding on their areas of overlapping or of contrasts. This would allow aligning them at least on the basis of areas where they overlap with consequent (partial) alignment and harmonization of underlying indicator systems.

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Proposals for further research on the Mediterranean diet and sustainability within sustainable food systems

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In line with the previous workshops held in Bari and Rome (FAO, 2015), we specifically discussed the needs for research on and promotion of the Mediterranean diet during the workshop *4th edizione delle Giornate di Carlo Cannella* held at the University La Sapienza, Rome, 26 February 2015. I take the opportunity of this new multidisciplinary workshop to recall the general needs for the Mediterranean diet that were identified on this occasion, with some additions of new points more focused on sustainability issues.

Regarding the Mediterranean diet recommendations for today and the updated pyramid consensually issued in 2011 (Bach-Faig *et al.*, 2011), some need for further improvements on yet uncovered topics was indentified, such as the quantification of portion sizes for adults, or adaptation to various population segments as well as country specificities.

In addition, I more precisely identified the following need to obtain more scientific evidence on important aspects:

- conducting more nutritional surveys in many countries of the Mediterranean basin, and in specific population groups (i.e. children and teenagers, elderly people, etc.);
- reaching consensus on the use of Mediterranean diet scores by weighting the advantages and limitations of available scoring strategies in various contexts ;
- defining the importance of types of food and drink (country-specific) to fulfil nutrient needs
- evaluating the cost of diets (direct and indirect taking into account externatilities) to satisfy nutrient needs;
- evaluating cultural and behavioural issues involved in the progressive abandonment of the traditional Mediterranean diet;
- investigating further the preventive effect of the Mediterranean diet on neuro-degenerative diseases (Parkinson's disease, Alzheimer's disease) and cancers;
- pursuing efforts to determine the mechanisms of action of foods on risk factor
- researching diet–genetic susceptibility interactions or diet–age and diet–gender interactions.

The elaboration of the FAO definition of sustainable diets (FAO, 2012) led us to better take into account other key aspects, leading to the next research topic proposals:

– environmental impacts of Mediterranean diet adoption in various countries;
– sustainability aspects of present dietary patterns in Mediterranean countries;
– optimal compromises for cost/nutrition/environmental impacts;
– links between agricultural practices, local and seasonal foods, dietary patterns;
– agroecology and organic food consumption as levers for transition towards sustainable food systems.

A next step forward has been the publication of *A consensus proposal for nutritional indicators to assess the sustainability of a healthy diet: the Mediterranean diet as a case study*, with a priority list of 13 nutrition indicators (Donini *et al*., 2016). Among this list of indicators, one deals with the extent of organic (agroecology) food production/consumption, as a measure of transition towards more sustainable diets and food systems. This item was already present in the 2011 Mediterranean diet pyramid. However, up to now, very little was known about the consumer expectations, lifestyle, dietary habits (food group intakes), nutrient intakes and fit with recommendations, safety, health-related and sustainability issues associated to eco-friendly/organic food consumption. Thanks to two surveys in Germany (German Nutrition Survey 2) and France (ongoing NutriNet-Santé cohort study), a significant part of this gap is going to be filled. The first scientific papers published identified a specific "organic consumer pattern", associating high education and physical activity level, a plant-based diet better fitting recommendations, ecological awareness and a markedly lower risk of being overweight or obese (Kesse-Guyot *et al*., 2013, 2017; Eisinger-Watzl *et al*., 2015; Baudry *et al*., 2015, 2016a, b). It is indeed a more sustainable lifestyle pattern. This series of focused and original publications provided more insight into the collective publication on Mediterranean diet 4.0 (Dernini *et al*., 2016) enlarging the benefits of the Mediterranean diet from health to sustainability.

Research on some sustainability issues needs to be performed and is in progress. In France, the prospective NutriNet-Santé cohort follow-up will generate short/mid-term data on the impact of organic food consumption on health and risk of diseases (metabolic syndrome, type 2 diabetes, cardiovascular risks, cancers, depression). Exposure to pesticides or endocrine disruptors, and environmental impacts of an "organic diet" are being explored using some first acknowledged indicators (GHGE, energy, land and water use), indicating some significant beneficial effects on footprints when compared with the regular diet.

The interaction between organic consumption and adherence to the Mediterranean diet has recently been assessed, indicating that the best impacts (lower body mass index, lower animal/plant protein ratio, better fit to recommendations) are obtained by combining an organic food-based diet with a Mediterranean diet pattern, but at a higher direct diet cost for consumers (Seconda *et al*., 2017). Such new data reinforce the relevance of sustainability indicators such as adherence to the Mediterranean diet or eco-friendly organic production/consumption and the role of agroecology/organic consumption in a sustainable Mediterranean diet pattern (Kahl *et al*., 2016).

Some of these research projects are/will be part of the international Organic Food System Programme, as a core initiative of the FAO-UNEP 10YFP Sustainable Food System Programme.

This highlights the need for further research work in many countries to better investigate all these key aspects linked to acknowledged indicators, in order to better know and understand the optimal ways to promote a transition towards sustainable diets and sustainable food systems everywhere, and especially in the Mediterranean.

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The freshness of fruit and vegetables

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Freshness is an important attribute of the perceived quality of foods and one of the key drivers of consumer choice of fruit and vegetables (Péneau *et al*., 2006). Notwithstanding this importance, it is difficult to define what freshness is, because the notion of freshness differs between product categories but also within a category of product (Péneau *et al*., 2007). Moreover, the meaning of freshness can vary according to the background of the person who gives the definition (Péneau *et al*., 2007). There is general agreement, however, that freshness is a multidimensional attribute involving a plurality of sensory and non-sensory attributes.

Recently, the project "La freschezza dei prodotti ortofrutticoli" ("The freshness of fruit and vegetables"), has been funded by the Italian Ministry of Agriculture, Food and Forestry Policies and coordinated by the Centre of Research on Food and Nutrition of the Council for Agricultural Research and Economics (CREA).

One of the objectives of the project was to study consumers' interpretation of fruit and vegetable freshness with the aim of identifying sensory and non-sensory attributes on which freshness is judged.

When consumers called to mind "fruit and vegetables", sensory dimension was the most important in describing freshness. Sensory dimension results were composed of attributes that differed according to situational factors: product appearance and colour at the purchase stage; product texture and flavour at the consumption stage.

For the non-sensory dimension, the first attribute in order of importance was "short supply chain". In this attribute, consumers included both the distance between harvest and purchase/consumption point and the time elapsing between harvest and purchase/consumption. For the consumers involved, it is also possible to purchase fresh products in the supermarkets. The second most important non-sensory attribute was "seasonality". Fruit and vegetables in season were associated with freshness through the sensory properties, because seasonal products were described as fresher, tastier and of better quality than those out of season. The lack of chemical treatments during cultivation (organic to a less extent) was mentally associated with fruit and vegetables' freshness. Freshness results were scarcely explained by the attribute "no processing". Our study provided evidence that freshness of fruit and vegetables is no longer an attribute exclusively associated with raw products. Frozen fruit and vegetables, for example, can be considered as fresh, as well as packaged ones. Packaged fruit and vegetables were considered as fresh on the condition that

consumers could visually access and easily assess the integrity and colour of the product inside the packaging. Moreover, packaging can provide information that consumers can associate with freshness, such as use-by date and packaging date.

Non-sensory attributes resulting from the study on consumers' opinion and perception of freshness were investigated in case studies in which attributes and parameters that can be associated with fruit and vegetable freshness were analysed by objective methods (sensory analysis, instrumental methods of analysis).

CASE STUDY 1. FRESHNESS AND SHORT SUPPLY CHAIN

In Western countries, consumer demand for food that is locally produced and marketed is generating increasing interest in various forms of short supply chains. However, in the debate on local food systems it has been pointed out that quite poor scientific evidence supports the claimed higher quality of locally produced fresh foods versus non-locally produced foods (Martinez *et al*., 2010). Fruits that are expected to be subjected to a long supply chain are harvested at early ripening stages. Commonly, detrimental effects on fruit quality are ascribed to this practice. In our study, the effect of the length of the supply chain on tomato quality and freshness was studied simulating, in the laboratory, the conditions to which tomato fruits are subjected during a short or long supply chain.
On the vine fully ripened tomatoes were harvested and subjected to the conditions simulating a short supply chain. Early harvested tomatoes, instead, were exposed to conditions simulating a long supply chain (cold storage for seven days). During the period of simulation of a long supply chain, the tomato fruits ripened. Therefore, at the end of the experiment, there was a sample of red tomatoes fully ripened on the vine, and a sample of red tomatoes ripened to red during the course of the supply chain. Both the samples were analysed for their sensory and nutritional characteristics.

Tomatoes subjected to conditions simulating a long supply chain did not develop the flavour and texture characteristics attained by on the vine fully ripened fruits. Moreover, they developed off-odours that are symptoms of incipient senescence or overripening (Figure 1). Therefore, these fruits resulted as less fresh than those subjected to a short supply chain.

In terms of nutritional quality, the concentration of carotenoids (lycopene) of the fruits subjected to a long supply chain did not reach the same level observed in the on the vine fully ripened fruits (Figure 1).

CASE STUDY 2. FRESHNESS AND MINIMALLY PROCESSED VEGETABLES

Minimally processed vegetables are defined as foods that have been processed to increase their functionality without changing their fresh-like properties (Dinnella *et al*., 2014). However, the minimal processing renders the vegetables highly perishable. Appearance, texture and nutritional value of fresh vegetables gradually change during storage due to the physiological activities involved in tissue senescence. The increasing difference between the original and minimally processed vegetables during storage can be defined as freshness loss.

In our project, we compared the changes in sensory and nutritional quality of packaged (minimally processed) and unpackaged wild rocket leaves during seven days of cold

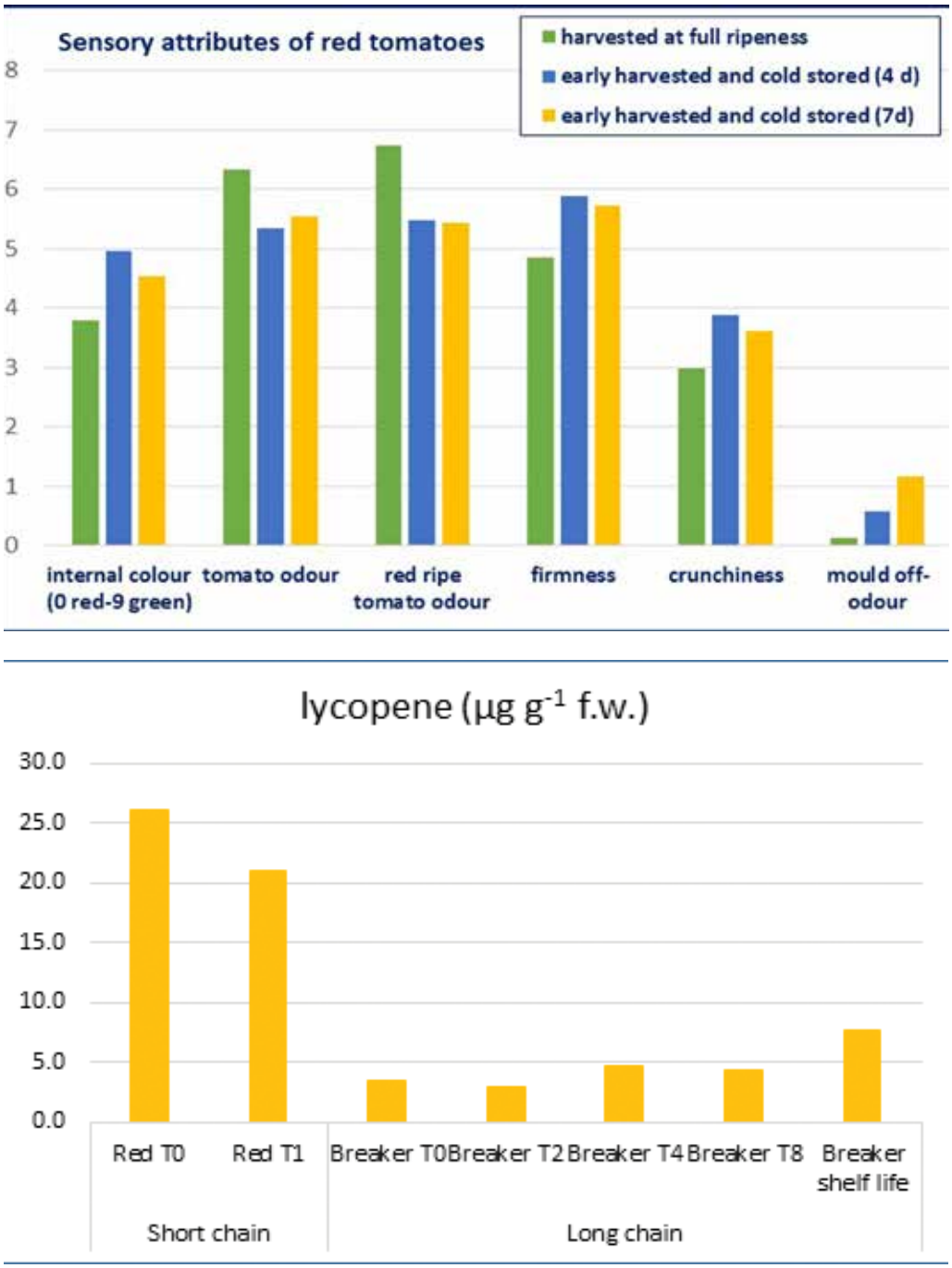

Figure 1. Quality characteristics (sensory characteristics, lycopene content) of tomatoes subjected to conditions simulating a short and a long supply chain

Table 1: Nutritional quality of packaged and unpackaged wild rocket leaves during seven days of cold storage

	Unpackaged rocket			Packaged rocket		
	UPT1	UPT3	UPT7	PT1	PT3	PT7
Total phenol (g kg-1)	1.30±0.02 b	1.07±0.06 c	1.06±0.05 c	1.41±0.03 a	1.26±0.03 b	1.27±0.03 b
Vitamin C (g kg-1)	0.73±0.01 a	0.54±0.01 b	0.35±0.01 c	0.72±0.01 a	0.71±0.03 a	0.66±0.04 a
Total folate (mg kg-1)	1.89±0.20 a	1.76±0.20 a	0.54±0.05 b	1.77±0.18 a	1.80±0.16 a	1.72±0.02 a

Note: Mean values ± standard deviation. Mean values that are followed by different letters within the same row were significantly different according to Tukey's test (at $p<0.05$).

storage. Samples of packaged and unpackaged leaves were analysed at 24 hours, 72 hours and seven days ("expiration date") from harvesting (packaged samples: PT1, PT3, PT7; unpackaged samples: UPT1, UPT3, UPT7) (Table 1).

At the end of the storage time, several sensory attributes associated with visual quality, as well as odour, flavour and texture, showed significant changes with respect to the fresh product in both packaged and unpackaged rocket leaves. However, a greater impact was observed on unpackaged leaves.

Nutritional quality was better preserved in the packaged rocket leaves until the end of the storage time, whereas in the unpackaged products significant negative changes were registered already after three days of storage (Table 1).

CASE STUDY 3. CONTEXT AND FRESHNESS PERCEPTION

Traditionally, studies on consumers' preferences and liking of food products are performed in sensory laboratories where the environmental factors are under control (Bangkuyo *et al*., 2015). These conditions, however, do not correspond to the real conditions of food consumption where stimuli and information from the environmental context are many and complex, and affect the emotional sphere and, consequently, consumer behaviour. Recently, some studies have shown that the meal context during testing can affect the perception of taste. Several approaches have been proposed to study the influence of the context on consumer behaviour. Some of these are based on the recreation of consumption contexts using technological tools such as virtual reality, immersive projection, etc.
In a multisensory immersive hall at the Centre of Research on Food and Nutrition of CREA, it is possible to recreate different immersive environments in which to perform studies on consumer behaviour, choice, preference and liking. By the video projection of outdoor scenarios, specially designed furniture and auditory and olfactory stimuli, diverse situational contexts can be recreated.

We have performed a very preliminary test to evaluate the effect of the consumption context on consumers' perception of freshness of fresh and stored tomato. The test was carried out in both a traditional sensory laboratory (standard sensory testing booths) and a recreated farmhouse dining room (Figure 2). The test performed in the immersive environment resulted in a higher discriminatory power for freshness perception in comparison with the traditional sensory laboratory (Figure 2).

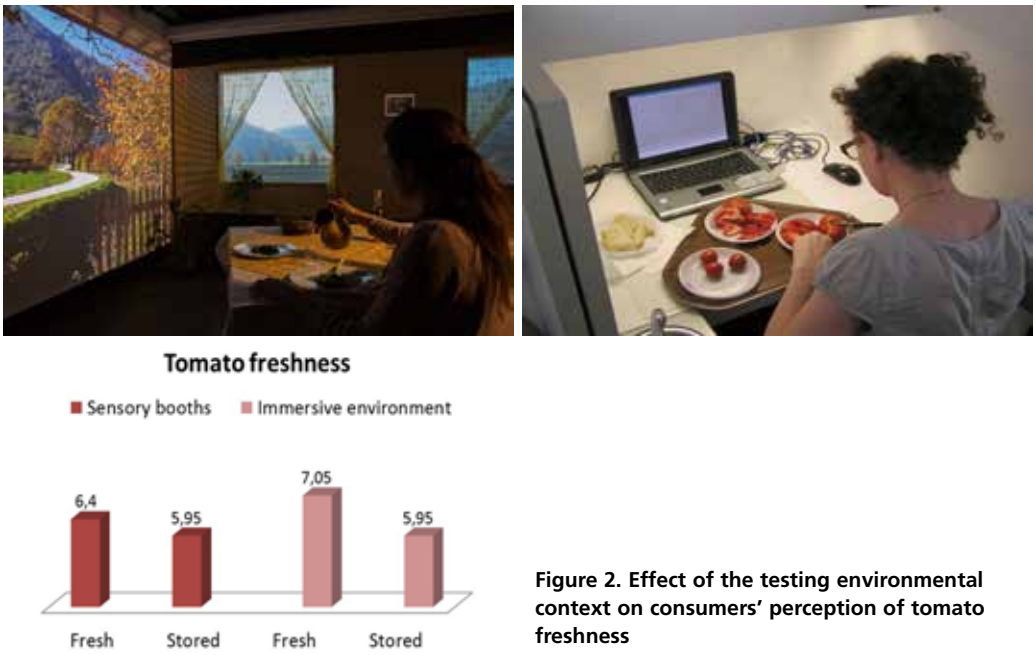

Figure 2. Effect of the testing environmental context on consumers' perception of tomato freshness

CONCLUSIONS

The importance of fresh fruit and vegetables intake for health is widely recognized. To understand the underlying attributes of a product freshness has many implications, because it allows comprehending the consumers' expectations and behaviour. This understanding is fundamental for the diverse stakeholders to improve their systems and develop suitable strategies to fulfil consumers' expectation towards fruit and vegetable freshness. It is fundamental also for policy-makers in order to develop suitable strategies aimed at promoting and increasing the consumption of fruit and vegetables.

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Sustainability of the Mediterranean diet with regard to other traditional diets

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Traditional diets tend intrinsically to be sustainable because they have been developed mainly, if not exclusively, with locally produced foodstuffs, which minimizes at least all environmental problems associated with transportation (high carbon). However, a traditional diet or a sustainable diet may not be healthy, i.e. a vegan and vegetarian diet could lead to an insufficient supply of essential nutrients (vitamin B12, iron, calcium, long-chain n-3 fatty acid etc.). Many traditional diets other than the Mediterranean diet have been shown to be healthy if not for "global health", at least for a specific disease (Poulsen *et al*., 2014; O'Keefe *et al*., 2015; Tayo *et al*., 2012; Désilets *et al*., 2007; Batis *et al*., 2011). Tilman and Clark (2014) have written that replacement of traditional diets by diets higher in refined sugars, refined fats, oils and meats would be a major contributor by 2050 to an estimated 80 percent increase in global agricultural greenhouse gas emissions (GHGe) from food production and global land clearing. In addition, global transition towards a "Western diet" contributes to the increase in the prevalence of non-communicable diseases (NCD).

According to the European Commission, "by 2020, incentives to healthier and more sustainable food production and consumption will be widespread and will have driven a 20% reduction in the food chain's resource inputs. Disposal of edible food waste should have been halved in the EU" (EC, 2011). Some European food-based guidelines integrate sustainability recommendations and others not. Currently, in Europe, the main focus of dietary recommendations is oriented towards prevention of NCD even though undernutrition and food insecurity must also be taken into account in developed European countries (Montagnese *et al*., 2015). FENS has just created a Food Based Dietary Guidelines Working Group (FBDG) aiming to provide a standardisation of views regarding the emphasis of strategies and purpose of FBDG across Europe, including sustainibility.

The food choices that form dietary patterns are the main determinant, which drives the demand for production of agricultural products. Some studies have evaluated the impact of dietary recommendations on sustainability (Meier and Christen, 2013; Horgan *et al*., 2016; SDC, 2011; Van Doren and Cramer, 2012 ; WWF, 2014; Vanham, 2013; Vanham, Hoekstra and Bidoglio , 2014; Vanham, Mekonnen and Hoekstra, 2013; Vanham *et al*., 2016).

Healthy beneficial effects of the Mediterranean diet have been proved by many studies. The proof of its sustainability is more difficult to evaluate because of methodological problems, which have been highlighted during studies performed about other traditional diets. In order to prove the sustainability of the Mediterranean diet, it should be compared

with other diets. This comparison requires a better knowledge of the sustainability of each foodstuff consumed and not only the food pattern. The expression of production of GHGe should be standardized. Diet-related GHGe are different if they are based on consumption-level data or from agricultural commodities. They also depend on levels of food waste. The functional unit chosen also alters the results (basis of food weight [GHGe/100 g food] vs energy density [CO_2 eq/100 kcal of food]). Lower quality diets may be associated with lower GHGe and higher nutritional quality diets may be associated with higher diet-related GHGe (CO_2 eq/100 kcal) (Jones *et al*., 2016).

A Mediterranean food pattern if nutritionally adequate may not be sustainable if foodstuffs consumed are not produced locally but imported because of lower cost. The water footprint should be better assessed as well as food waste compared with other dietary patterns. A national standardized database of life cycle assessment of foods is required for appropriate comparison of dietary patterns. In this paper we will try to propose pathways that could permit the establishment of the sustainability of Mediterranean diet as compared with other food patterns and the way to increase it if taken into account the usefulness of its revitalization in regard to its health benefits.

Some questions we could ask:

- Is the Mediterranean diet truly less sustainable than in the past?
  - o If yes, what are all the reasons?
- Could we make it as sustainable as it was in the past?
  - o If not, what aspects are the most important to ameliorate partially its sustainability?
- Do we think realistically that the Mediterranean diet could be equally sustainable in countries with very different lifestyles, economics, production habits and cultural habits?
- Are we sure that to propose the Mediterranean diet as a model of both sustainable and healthy diet would be well accepted by people and countries with other traditional diets they would like to promote?
- Could we accept to slightly modify the traditional diet even if it is that which has shown its health benefits, in order to improve its sustainability?
  - o If so, what compromises could we propose and are we willing to accept?
  - o If not, how and with what strategy and means?

What could we propose?

- Adopt a common database of GHGe data for all "Mediterranean" foods.
- Adopt a common standard for GHGe determination (ISO?)
- Adopt a complete (from farm to consumer) and identical life cycle assessment.
- Adopt a common functional unit of LCA (GHGe/100g food or CO_2 eq/100 kcal) or evaluate simultaneously multiple functional LCA units.
- Adopt a common method to evaluate regional land bases necessary to increase locally a sustainable production of "Mediterranean" foods.
- Adopt the principle of a systematic multidisciplinary approach of the programmes.
- Better understand what are the main determinants of consumers' choices on the one hand, and their interrelationships with cities' organization, the private sector, gastronomy and tourism on the other.

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Towards a 10YFP–SFSP Mediterranean Multistakeholder Platform on Sustainable Food Systems

Sandro Dernini
FAO

This session had the purpose of revitalizing interest among 10YFP SFSP members participating in the FAO/CIHEAM workshop towards the further development of the joint project proposal of the 10YFP–SFSP core initiative *Mediterranean Multistakeholder Platform on Sustainable Food Systems (10YFP-SFSP Med-Platform)*, through the establishment of a Steering Committee comprising all interested members.

BACKGROUND

The initial project proposal of a 10YFP–SFSP Mediterranean Sustainable Food Systems Platform was started in 2016 by CIHEAM and FAO as focal points, with the Hebrew University, ENEA, UNESCO Chair Open University Barcelona, Aix-Marseille University, CIISCAM/Sapienza University of Rome, the Hellenic Health Foundation and IFMeD.

It was conceived as an outcome of the 2015 CIHEAM Med Diet Expo Call: Time to Act, issued at the 2015 Expo of Milan, as well as a contribution to the *2016 Call for Action of the Revitalization of the Mediterranean Diet*, issued at the First World Conference on the Mediterranean Diet – *to act together towards the development of academic and research institution platforms for an interdisciplinary dialogue on how to revitalize the Mediterranean diet, while improving the sustainability of the Mediterranean food systems, by maintaining the close linkages of the Mediterranean diet, as the result, and driver of a food system, to production, distribution and consumption of its main characteristic products.*

Objectives of the 10FYP-SFSP Med-Platform:

- To strengthen existing collaboration among participating institutions and foster new multistakeholder partnerships in the Mediterranean area towards more sustainable food systems, linking, at the country level, food consumption and food production through the Mediterranean diet.
- To share data and lessons learned towards the identification and development of specific joint initiatives, to be jointly proposed for funding at the regional, national and local levels.

– To allow the dissemination and promotion of results from studies and research through a wide range of training seminars, Web seminars, technical workshops, international conferences, proceedings, scientific articles and newsletters.
– To foster dialogue among all participating stakeholders on key trends, challenges and ideas for action, within the implementation of the 2030 agenda in the Mediterranean area, towards the improvement of the sustainability of the Mediterranean food systems by using the Mediterranean diet as a sustainable leverage for the achievement of food security and nutrition in the area.

The discussion in the session on the Platform development was opened by a joint statement on Mediterranean scientific cooperation across the divide by the 10YFP-SFSP members Ziad Abdeen of the Al-Quds Public Health Society, Palestine, and Elliot Berry of the Hebrew University, Israel, and on how the Platform could become a leverage for reinforcing peace in the area.

The following 10YFP-SFSP members expressed their interest in the development of the project proposal with specific contributions as reported below.

Roberto Capone, CIHEAM-Bari

The promotion of sustainable agriculture and food systems in the Mediterranean is the core business of CIHEAM, as highlighted in the recently adopted CIHEAM Strategic Agenda 2025.

CIHEAM-Bari is willing to contribute to the Platform through the development of several activities for achieving sustainable food and nutrition security in the Mediterranean area, with a special focus on the PRIMA (Partnership for Research and Innovation in the Mediterranean) initiative as well as on the following areas:

- the sustainability of Mediterranean food systems with particular attention to the Mediterranean diet and food losses and waste;
- typical and traditional products' enhancement;
- rural and local development.

The CIHEAM-Bari contribution could be linked to the valorization of some of CIHEAM-Bari's previous experience as follows:

- Agriculture & Quality project aims at the qualification and improvement of quality of Apulia typical productions;
- FOODING project (Valorization of traditional food products for competitiveness and innovation of Italian and Greek small and medium enterprises [SME]) aims to strengthen the competitiveness and innovation of SMEs by improving the quality and quantity of local products and facilitating their enhancement in the framework of the sustainable Mediterranean diet;
- INTRA project (Introducing innovations in traditional agro-food products to increase SMEs' competitiveness), part of the Territorial Cooperation Program European Greece - Italy - 2007–2013, aims to strengthen services for the transfer of scientific and technical innovations from research institutions to companies in order to foster the development of local and traditional food products;

- Expo Milan, 2015 Does the Mediterranean diet still exist? an international conference organized through an agreement between CNR-DiSBa, CIHEAM-Bari, NUT-CREA, ENEA and the Forum on Mediterranean Food Cultures to re-discuss the identity of the Mediterranean diet not only as an healthy diet. As an outcome, The Med Diet Expo 2015 Call: Time to Act was issued by CIHEAM;
- E-learning experience: training courses on the sustainability of the food system and of the Mediterranean diet in the Mediterranean area.

Marie-Josephe Amiot-Carlin and Denis Lairon, Département Alimentation Humaine INRA UMR MOISA

The Département Alimentation Humaine INRA UMR MOISA is willing to contribute to the Platform through:

- sustainable dietary guidelines combining nutritional adequacy of diets without increasing environmental impacts, by using food databases, national surveys and modelling, as currently being carried out in Southeast France and Tunisia; it is an opportunity to develop the work with other teams;
- valorization of the local products (to contribute to building a database on Mediterranean food and recipes, market availability), and to propose education tools on food sustainability (in schools, etc.)
- the next call of PRIMA on sustainable innovation in agri-food systems and water provisions strengthens Euro-Mediterranean cooperation and supports inclusive well-being and socio-economic development in Euro-Mediterranean societies, and especially on the third pillar entitled Mediterranean food value chain for regional and local development through:
- valorization of the nutritional qualities of Mediterranean foods and development of new healthy food products;
- enhancement of the links between nutrition and health;
- enhancement of organization and coordination in the food chains;
- involvement of rural and industrial stakeholders to ensure both food security and regional development;
- promotion of the adoption of organizational innovations and more sustainable business models among firms;
- the relationship between adherence to the Mediterranean diet and prevention of diseases; it is a collaboration with colleagues running the French Nutrinet-Santé cohort, EREN laboratory and experts in nutritional epidemiology. The association and the causal relationship (prospective follow-up) of the Mediterranean diet adherence vs no adherence with different types of diseases and risk factors will be evaluated in this large cohort (30–60 000 adults, five years of follow-up). The question of the relevance of scores of adherence to the Mediterranean diet will be handled;
- the nutritional and environmental impacts of current diets and the model Mediterranean diet in Southeast France – in collaboration with INRA MOISA laboratory, Montpellier and SOLAGRO, Toulouse;

- a two-to three-year project on a Territorial Food System, under the coordination of the Luberon regional natural park in Southeast France; it will include the Mediterranean diet approach.

Massimo Iannetta and Milena Stefanova, ENEA

ENEA is willing to contribute to the Platform through:

- PRIMA, in which ENEA provides support to the Italian Ministry for Research and Innovation in accordance with its institutional role;
- METROFOOD-RI, a new, distributed research Infrastructure of global Interest, by means of which it will be possible to carry out different activities supporting data collection and measurement reliability, as well as basic and frontier research in food and nutrition.

More precisely, ENEA could contribute to the 10YFP SFSP Med-Platform through:

- identification and analysis of territorial case studies in Italy and across the Mediterranean area in order to contribute to the validation of the proposed indicators;
- identification and definition of appropriate concepts, which allow for the analysis of the above-mentioned case studies, starting from existing concepts for localized agri-food systems and extending them to comprise the consumer and consumption phase.

Lluis Serra-Majem, IFMeD

IFMeD is willing to contribute to the Platform through:

- acting as co-lead for the further development of the project proposal of the Multistakeholder Platform with CIHEAM-Bari and FAO;
- facilitating and encouraging the aggregation of regional and local multistakeholder partnerships among institutions, academies, the private sector and civil society organizations, consumers' associations and media associations;
- supporting the dissemination of scientifically relevant and proved information through the Med Diet 4.0 communication campaign on the revitalization of the Mediterranean diet;
- organizing the 2nd and 3rd World Conference on the Mediterranean Diet to foster more synergies towards the implementation of multistakeholder platform activities;
- leading, in collaboration with other institutions, the development of guidelines and recommendations for a sustainable Mediterranean diet at community level to encourage educational initiatives. A specific case study in an island context ("The island in your plate") has been developed. The idea is to build a Mediterranean Island Network focused on these interactions between food sustainability, tourism, traditional foods and environment and biodiversity protection.
- harmonizing the assessment of the Mediterranean diet in different population groups, particularly children and adults. IFMeD is currently modifying the KIDMED index, widely used to assess the Mediterranean diet in children and adolescents, to cover different contexts and territories.

Flavio Paoletti and Laura Rossi, NUT CREA

NUT-CREA is willing to contribute to the Platform through:

- a study on the influence of growing methods, processing, storage and supply chain organization on fruit and vegetable quality characteristics and attributes;
- revision of the Italian Dietary Guidelines based on the Mediterranean diet principle, considering sustainability indicators;
- analysis of national food consumption data for modelling with the objective of environmental impact reduction and maximization of nutritional constraints;
- application of modelling methodology on specific dietary patterns in order to make comparisons (e.g. organic vs conventional or vegetarian vs omnivorous);
- application of modelling methodology to school feeding programmes in order to prepare menus with the highest nutritional value combined with lowest environmental impact;
- application of the methodology of food consumption data for food waste evaluation in different settings (e.g. school menus, domestic consumption) and evaluation of attitude to food waste (motivation, typology of food that is wasted, etc.) though duly designed tests;
- creation of a working table (at national level) on food waste;
- community assessment models (e.g organic districts) to study the link between sustainable food consumption and production.

Nahla Hwalla, American University of Beirut

The American University of Beirut is willing to contribute to the Platform by revisiting the Food-based Dietary Guidelines (FBDGs) for their health and environmental sustainability through current research.

To do so, two projects will be conducted to assess the impact of current food consumption patterns in Lebanon on natural resources and environmental sustainability:

- Project 1: aims at assessing the environmental footprint (EFP) of Lebanese dietary patterns (Western, Lebanese-Mediterranean and high-protein) in terms of soil erosion, water use, energy use, greenhouse gas emissions and economic cost using a life cycle analysis (LCA) approach. This research project also aims at examining the effect of shifting towards a healthier Mediterranean-like diet in the Middle East and North Africa (MENA) region on environmental sustainability; in other words, assessing whether changes towards healthy (nutritionally recommended) food consumption patterns can result in more environmentally sustainable diets in MENA.
- Project 2: with support from FAO is entitled Towards the enhancement of the Mediterranean diet in the Mediterranean region: the case of Lebanon and aims to investigate how food consumption patterns in Lebanon have moved away from the traditional healthy Mediterranean diet to a Westernized health-endangering food consumption pattern, and to develop policies and population-based interventions that promote adherence to the Mediterranean diet.

Elliot Berry, Hebrew University

The Hebrew University is willing to contribute to the Platform through:

- development of suitable metrics for assessing sustainable diets in the Mediterranean region, In particular, working within the framework of the novel MeDiet (MD) 4.0 with its four sustainable benefits. The project will involve the following steps: (i) a suite of indicators for MD 4.0; (ii) selection of most appropriate indicators; (iii) normalization; (iv) definition of weightings; (v) aggregation; and (vi) composite MD 4.0 index.
- together with Al-Quds University, working to scale up educational projects in schools on the Mediterranean diet and lifestyle. These are based on two successful pilot programmes – one involving over 700 kindergarten children and the other over 600 girls and their mothers. The aim is that there should be such instruction throughout the school years.
- development of an educational platform and curriculum that would be suitable for the Mediterranean region.

Antonia Trichopoulou, Hellenic Health Foundation

The Hellenic Health Foundation is willing to contribute to the Platform through research on:

- the relationship between adherence to the Mediterranean diet and prevention of diseases by using data from the Greek National Health and Nutrition Survey;
- the role of traditional Mediterranean foods in catering services (based on the results of the Hector project) and in sustainable nutrition;
- the increase of the adherence to Mediterranean diet by using the experience gained by the Credit for Health project.

Xavier Medina, UNESCO Chair on Food, Culture and Development at the Open University of Catalonia

The UNESCO Chair on Food, Culture and Development at the Open University of Catalonia is willing, together with the members of the UNITWIN network (particularly the Catalan Institute for the Cuisine and Gastronomic Culture in Barcelona, and the University of Yeditepe in Turkey), to contribute to the Platform through the collection and transcription of data on traditional foods and dishes, eating habits, traditional equipment, etc. through fieldwork, participant observation, interviews, focus groups and oral history at regional level in Catalonia (Spain) and in the Yeditepe region in Turkey. A joint and comparative study analysing and checking data to add value to the local products, contributing also to building a database on Mediterranean food and recipes, has been started.

The Catalan part of the research is already finished and published, and all the final information has been added to the National Catalan Database of Intangible (Ethnology) Heritage of the regional autonomous government. At present, the University of Yeditepe is working on their part of the research, following the same methodology. The aim is to extend the project to other Mediterranean regions.

Lorenzo M. Donini, CIISCAM/Sapienza University of Rome

The CIISCAM/Sapienza University of Rome is willing to contribute to the Platform through research on:

- the role the Mediterranean diet may have in catering services; taking into account the size of the catering system, it may be a relevant actor in promoting the Mediterranean diet allowing the recovery from the progressive erosion of the Mediterranean model that has been taking place over the last decades;
- the adoption of the Mediterranean diet in schools, hospitals and workplace catering services, which may help to improve the nutritional status of students, patients and employees.

Rekia Belahsen, Chouaib Doukkali University

The Chouaib Doukkali University is willing to contribute to the Platform through research on:

- adherence to the Mediterranean diet and nutrition transition: to assess adherence to the Mediterranean diet in populations from different geographical sites (sea level/ mountains), area of residency (rural/urban), distances from Mediterranean basin (North/South);
- patterns of food consumption in adults and children/adolescents and adherence to the Mediterranean diet;
- valorization of underused or ignored local foods in different geographical parts of Morocco and diet sustainability;
- the role of women in the protection and transmission of the culinary heritage and traditional food in the Mediterranean region, specifically Morocco;
- promotion of the Mediterranean diet at school level

Ziad Abdeen, Al-Quds Public Health Society

The Al-Quds Public Health Society is willing to contribute to the Platform through analysing food recipes for their nutrient values and developing a composite Mediterranean diet index.

The example of the 10YFP-SFSP core initiative "Organic Food System Programme"

Flavio Paoletti,[1] Johannes Kahl,[2] Denis Lairon,[3] Carola Strassner,[4] Jostein Hertwig,[5] Susanne Bügel,[2] David Gould[6] and Ewa Rembialkowska[7]

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[2]Department of Nutrition, Exercise and Sports, University of Copenhage,

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[4]Münster University of Applied Sciences, Münster, Germany

[5]BERAS International Foundation, Järna, Sweden

[6]IFOAM – Organic International, Bonn, Germany

[7]Department of Functional and Organic Food and Commodities, Warsaw University of Life Sciences, Poland

BACKGROUND

It is widely accepted that the current dominating food systems need enhancement of their sustainability because they have a marked negative effect on the environment, natural resources and human health. The central question is how to make food systems more sustainable and support farmers, as well as provide people with healthy food.

Within the agriculture sector, industrial and livestock farming have the largest environmental footprints, and this impact is increasing as traditional diets around the world are being rapidly replaced by diets higher in energy, meat, dairy products, refined sugar and fat. There is growing scientific evidence that production and dietary behaviour associated with overweight and obesity have detrimental environmental effects in addition to health implications respectively. Therefore, the idea has emerged that global dietary changes may contribute to enabling the food system to be more sustainable, thus giving diets a crucial role in solving both global environmental and human health problems, as well as food security and safety, in line with the sustainable diets definition by FAO (2012).

THE ORGANIC FOOD SYSTEM

Organic agriculture has spread to nearly all regions of the world and the organic food market is growing rapidly worldwide. Various studies have shown the contribution of organic agriculture to global sustainability issues (Reganold and Wachter, 2016). Moreover, a beneficial effect of organic agriculture on human health can be inferred by the prohibition of the use of synthetic pesticides. Although studies directly investigating the role of organic food consumption on health are scant, it has been shown that consumers who regularly consume organic food exhibit healthier dietary patterns than consumers who do not buy

organic at all or buy occasionally. They show a markedly lower prevalence of overweight and obesity (Kesse-Guyot *et al.*, 2013).

Therefore, the organic food system offers an example of successfully combining sustainable food production and sustainable consumption patterns within one system.

THE ORGANIC FOOD SYSTEM PROGRAMME

The Organic Food System Programme (OFSP)[1] (Kahl *et al.*, 2016) is an international programme that encompasses theory and practical implementation. The developmental process of the OFSP was initiated by the International Research Network for Food Quality and Health (FQH)[2] in autumn 2014. The OFSP was officially launched in February 2016 during the International Fair on Organic Food, Biofach, in Nurnberg (Germany).

The OFSP is conceived as a holistic global food system model approach to production and consumption patterns. The scope is to identify, understand and describe transformation processes towards sustainable food systems and make lessons learned available in a globally systematized and contextually applicable way.

OFSP will use the organic food system as a model to understand drivers of sustainable food consumption and production and to link this to real-world examples. Evolution of the organic sector's strategy for contributing to global sustainability includes breaking down divisions or barriers between "organic" and "non-organic" and moving everyone towards best practices (IFOAM Organic 3.0)[3]. Therefore, in the OFSP there are not only links to relevant work and initiatives within organic food systems, but also to those related to them such as agro-ecology, Slow Food, Community Supported Agriculture (CSA), ICLEI, Sustainable Food Cities, Food for Cities and many more.

OFSP is a global initiative working at international, national, regional and local levels. Currently, there are 85 partners from 35 countries and all continents are involved. Partners are from research, multistakeholder networks, farmer associations, education and business. The joining of international networks such as IFOAM – Organics International[4] and BERAS International (Building Ecological Recycling Agriculture and Societies)[5] broadens and enriches the number of countries and consequently scientists and stakeholders potentially involved in the programme.

The implementation strategies of the OFSP focus on the creation, development and multiplication of local sustainable food systems (LSFS) in model regions in potentially any location on the planet. The LSFS are examples of local food clusters that are socially just, environmentally friendly and economically viable. They involve all actors in the food chain, from farmers to consumers. These are connected to other actors, such as processors, wholesalers, distributors and consumers in local market clusters. Knowledge exchange is achieved involving the business sector, public authorities, non-governmental organizations

[1] www.organicfoodsystem.net
[2] http://www.fqhresearch.org
[3] http://www.ifoam.bio/sites/default/files/organic3.0_v.2_web_0.pdf
[4] www.ifoam.bio\
[5] www.beras.eu

(NGOs), research and education. This creates favourable conditions for environmentally friendly food production, sustainable lifestyles and viable communities.

The OFSP contributes to the Sustainable Food System Programme (SFSP) of the 10-Year Framework of Programmes on sustainable consumption and production. In February 2017, the Multistakeholder Advisory Committee (MAC) of the SFSP endorsed the project "Organic Food System Programme: organic food systems as models and living laboratories for transformation processes towards sustainable food systems" as a core initiative of the SFSP.

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Annex 1: Agenda

Wednesday, 14 March 2017

9.00 – 9.30	**Welcome** Cosimo Lacirignola, Secretary General, CIHEAM Representative, Regional Presidence, Apulia County
09.30 – 09.45	**Opening remarks** Fatima Hachem, Nutrition Senior Officer, FAO
09.45 – 10.15	**Scope and objectives of the Workshop** Roberto Capone, CIHEAM-Bari Sandro Dernini, FAO
10.15 – 10.30	**Outcomes from the 2016 First World Conference on the Mediterranean Diet** Lluis Serra-Majem, IFMeD President, Spain
10.30 – 10.45	**Outcomes from the 2011-2016 FAO/CIHEAM case study on the Mediterranean diet as a sustainable diet** Alexandre Meybeck, FAO
10.45 – 11.00	**Coffee break**
11.00 – 11.15	**From theory to practice: the Apulia case study** Gianluigi Cardone, CIHEAM-Bari, Italy
11.15 – 12.30	**Presentation and discussion of the draft paper "Development of Voluntary Guidelines for the Sustainability of the Mediterranean diet in the Mediterranean Region"** coordinated by Fatima Hachem, FAO with Roberto Capone, CIHEAM-Bari
12.30 – 14.30	**Lunch break**
14.30 – 16.50	**Enrichments for the development of the Element 1 "Research" of the Voluntary Guidelines: Facing Priority Sustainability Challenges for Food Security and Nutrition in the Mediterranean Region** Moderator: Ana Islas-Ramos, FAO Contributions by: Jalila El-Ati, National Institute of Nutrition and Food Technology of Tunisia; Laura Rossi, CREA, Italy; Nahla Hwalla, American University of Beirut, Lebanon; Suzanne Piscopo, University of Malta; Ziad Abdeen, Al Quds Public Health Society, Palestine National Authority; Giuseppe Carruba, ARNAS-Civico, Palermo, Italy; Lorenzo Donini, CIISCAM/Sapienza University of Rome; Gulden Peckan, Hasan Kalyoncu University, Gaziantep, Turkey; Mauro Gamboni, CNR, Italy; Carlo La Vecchia, University of Milan

16.15 – 16.30 **Coffee break**

16.30 – 18.30 **Research enrichments (Cont.)**
Moderator: Lorenzo Donini, CIISCAM/Sapienza University of Rome, Italy
Contributions by: Antonia Trichopoulou, Hellenic Health Foundation; Lluis Serra-Majem, IFMeD, Spain; Marie Joseph Amiot Carlin, INRA,Montpellier, France; Rekia Belahsen, Chouaib Doukkali University, El Jadida, Morocco; Xavier Medina, UNESCO Chair on Food, Culture and Development at the Universitat Oberta de Catalunya, Spain; Sandro Dernini, FAO; Gianluca Brunori, University of Pisa, Italy; Elliot Berry, Hebrew University, Israel; Massimo Iannetta and Milena Stefanova, ENEA, Italy; Denis Lairon, Aix-Marseille University; Flavio Paoletti, CREA; Jacques Delarue, Federation of European Nutrition Societies (FENS)

20.30 **Dinner**

Thursday, 15 March 2017

09.00 – 10.15 **Final Paper and discussion on "Development of Voluntary Guidelines for the Sustainability of the Mediterranean Diet in the Mediterranean Region"**, coordinated by Roberto Capone, CIHEAM with Fatima Hachem, FAO

10.15 – 10.30 Coffee break

10.30 – 11.30 **Towards a 10YFP–SFSP Mediterranean Multistakeholder Platform on Sustainable Food Systems**, presented by Sandro Dernini, FAO

The example of the 10YFP-SFSP core initiative "Organic Food System Programme"
Flavio Paoletti, CREA, FHQ

11.30 – 12.00 **Closing remarks**
Anna Lartey, Director, Nutrition and Food Systems Division, FAO
Maurizio Raeli, Director, CIHEAM-Bari

12.15 – 13.30 Lunch

Annex 2: Draft discussion paper

As part of the implementation of the core initiative *Sustainable diets in the context of sustainable food systems*

Development of voluntary guidelines for the sustainability of the Mediterranean diet

I. RATIONALE

1. 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.[1]

2. The incorporation of sustainability into dietary guidelines has been increasingly discussed over the past decades. Within this international debate on a shift of food choices towards more sustainable dietary patterns, the value of the Mediterranean diet as a healthy mainly plant-based dietary pattern as well as a sustainable diet model has been increasingly acknowledged.

3. Since 2011, the Mediterranean diet has been identified by FAO and CIHEAM as a joint case study for characterization and assessment of the sustainability of food consumption and production patterns and diets in the Mediterranean area.

4. In 2012, FAO and CIHEAM published the discussion paper *Towards the development of guidelines for improving the sustainability of diets and food consumption patterns in the Mediterranean area* (http://www.fao.org/docrep/016/ap101e/ap101e.pdf).

5. Through a series of international workshops, reports and scientific publications, a process towards the development of *Guidelines for the sustainability of the Mediterranean*

[1] http://www.unesco.org/archives/multimedia/?pg=33&s=films_details&id=1680&vl=Eng&vo=2, accessed on 15 March 2017

diet in the Mediterranean area was initiated by providing an initial methodological multidimensional framework for the Mediterranean diet as a sustainable diet case study (FAO/CIHEM, 2012; FAO/Bioversity, 2012; CIHEAM/FAO, 2015; FAO, 2015; Hachem *et al.*, 2016: Dernini *et al.*, 2016).

6. In light of the fact that several relevant studies have been published in the last years on the sustainable benefits of the Mediterranean diet, there is a need to further operationalize this multidimensional framework for the assessment of current diets at the national and subnational levels.

7. The traditional ways of consuming and producing food in the Mediterranean area have changed considerably, mainly due to economic, social, cultural, demographic and technological trends, increasing urbanization and globalization and shifting lifestyles.

8. Despite the fact that the Mediterranean diet has been recognized for its nutritional value and health benefits, it is becoming less the predominant diet of choice in most Mediterranean countries. The erosion of the Mediterranean diet heritage is alarming as it has undesirable impacts not only on health but also on social, cultural, economic and environmental dimensions in the Mediterranean area.

9. Within the context of the sustainability of Mediterranean food systems, by linking consumption and production, the development of voluntary guidelines for the sustainability of the Mediterranean diet and lifestyle will drive its revitalization in the Mediterranean area.

10. The sustainability of the Mediterranean diet requires:

a. conducting transdisciplinary research in multicountry projects linking nutrition, health, agriculture, food science, social science, economics and environmental science;
b. developing a set of coherent, coordinated and integrated policies involving various stakeholders with governing bodies at national and subnational levels.

11. ***Priority sustainability challenges for food security and nutrition in the Mediterranean area are:***

- Nutrition and health: triple burden of malnutrition (over- and undernutrition and micronutrient deficiencies) and non communicable diseases.
- Economy: population growth, urbanization, migration, food prices, food waste, inequality.
- Environment: water and land scarcity, climate change and biodiversity loss, food–water–energy nexus.
- Socio-cultural factors: changes in lifestyles, gender and social inclusion, migration and erosion of the Mediterranean diet's intangible cultural heritage.

These challenges become more pronounced in countries and areas that experience human-made and natural disasters and governance failure.

12. By taking into account these priority sustainability challenges, the development of these guidelines will provide a multidimensional framework on interconnected sustainability benefits of the Mediterranean diet to be adapted, implemented and validated at national and subnational levels.

13. Acknowledging the differences in the dietary patterns of the Mediterranean populations, which express a dietary variation that has existed in the Mediterranean area for millennia, the voluntary guidelines employs the term *Mediterranean diet* to highlight the existence of some common dietary characteristics in Mediterranean countries such as:

- Variety and balanced food combination: different food, with more fruits and vegetables of diverse colours.
- Seasonality: fresh foods, minimally processed.
- Traditional, local food products, biodiversity, agroeco-friendliness: territorial linkages – sustainable rural development.
- Culinary activities: preservation and transmission of food knowledge, skills, practices and heritage and pleasure of eating.
- Conviviality: the pleasure of eating together – dialogues between people and cultures.
- Frugality and moderation: small portion sizes – major public health challenge of obesity – food has value, do not waste.
- Active living: physical activity – non sedentary lifestyle.

14. By taking into consideration the diversity of cultures and food systems, expressed within the notion of the Mediterranean diet, a shared and eventually standardized methodological implementation approach for the guidelines' development, within a broader consultation process, can facilitate transdisciplinary dialogues among members of the Mediterranean scientific community, integrating existing different perspectives.

15. On the other hand, by providing science-based evidence on the sustainability of the Mediterranean diet, these guidelines aim to contribute to formulating policies and multistakeholder actions towards healthier dietary patterns in the context of the improvement of the sustainability of food systems in the Mediterranean area.

16. The Mediterranean diet has been highlighted as *a development asset to create interfaces with other sectors such as tourism and gastronomy and contribute to growth and job creation to local economies*. Even more, it has also been underscored as *a major asset if included in the strategies of the private sector especially in philanthropic initiatives or social and environmental responsibility*.[2]

[2] In September 2016, at the 11th Meeting of the Ministers of the CIHEAM member states, in Tirana, the promotion of the Mediterranean diet was inserted as thematic priority 4 of the new CIHEAM Strategic Agenda 2016–2025, as well as in the CIHEAM Action Plan 2025, within the Flagship Initiative 2 "Mediterranean compact for sustainable agriculture and food".

17. Within the implementation of the 10YFP SFSP core initiative on Sustainable diets in the context of sustainable food systems, these guidelines will play a leading role in catalysing multistakeholder partnerships, public and private, at international, regional, national and local levels, necessary to support the Mediterranean diet as a driver as well as a lever in the transition towards more Mediterranean sustainable food systems.

II. OBJECTIVES

18. The objectives of these guidelines, through a broader consultation of experts, are twofold:

(a) to serve as a resource to be used by policy-makers, programme managers, researchers and food system stakeholders in order to improve adherence to the Mediterranean diet at the country level;

(b) to serve as a tool for behaviour modification in different settings and through multiple channels including schools.

III. PRINCIPLES

19. The principles of these guidelines are:

- They are a voluntary instrument that will assist public authorities and other stakeholders undertake interventions and activities to modify unhealthy and unsustainable dietary behaviour in their countries by linking food security and nutrition issues to their specific sustainability priority challenges at the national and subnational levels.
- The process seeks to enhance coherence in guidelines' planning, within country policies of different agencies, rather than duplicate efforts, strengthening the Mediterranean diet, as a healthy way of a sustainable Mediterranean living.

20. Through reflecting and incorporating the multiple benefits of the Mediterranean dietary patterns, and specific country variations, these guidelines aim to improve public awareness, understanding and adoption and multistakeholder motivation and engagement for a shift in food systems and food choices towards more sustainable food consumption patterns in the area.

IV. ELEMENTS FOR ACTION

In order to achieve the objectives of the guidelines, they will consist of three major sections to fill in identified needs for increasing the adherence to the Mediterranean diet at the country level through the improvement of its sustainability. These are:

RESEARCH – aiming to improve knowledge and scientific evidence of the sustainable benefits and impact of the Mediterranean diet on barriers to its adoption and factors and measures that aim to facilitate it, along the four thematic areas: health and nutrition, environment including biodiversity, economy and socio-cultural factors.

AWARENESS – aiming at increasing the awareness of the multistakeholders within the food system in order to revitalize the Mediterranean diet.

IMPLEMENTATION – aiming to propose actions that integrate the sustainability of the Mediterranean diet into national policies, especially agriculture, health and education, to facilitate its adoption by all peoples in the Mediterranean area.

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The technical workshop on ***Development of voluntary guidelines for the sustainability of the Mediterranean diet in the Mediterranean region*** was held on 14–15 March 2017 at CIHEAM-Bari, Valenzano (Bari). It was jointly organized by FAO and CIHEAM, as part of the implementation of the activities of the Sustainable Food Systems Programme of the 10-Year Framework for Programmes on Food Consumption and Productions core initiative on "Sustainable Diets in the Context of Sustainable Food Systems".

The workshop took stock of the work done since 2011 on the Mediterranean diet as a case study for sustainable diets. It highlighted the need to strengthen collaboration among key stakeholders to consolidate the role of the Mediterranean diet as a lever to improve the sustainability of food systems and consumption patterns in the Mediterranean region, towards achieving the 2030 Agenda's goals for this region, as well as to contribute to the new CIHEAM Strategic Agenda 2016–2025. This publication is a compilation of the papers presented at the workshop and includes key messages.

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