

SUSTAINABLE FOOD SYSTEMS

CHANGE OF ROUTE

IN THE MEDITERRANEAN

EDITORS

Sandro Dernini and **Roberto Capone**



CIHEAM
BARI

On the cover the work *Dream of the Soul* by ceramist Antonio Vestita
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Sandro Dernini



FOREWORD

This book comprises 21 distinctive contributions, presenting original perspectives from authors who served as panelists and moderators at the Third World Conference on the Revitalization of the Mediterranean Diet, organized and hosted at our Institute in September 2022.

The CIHEAM's engagement with the Mediterranean Diet began in 2001 in Athens, when our Center was tasked, during the conclusions of the Third Meeting of the Ministers of Agriculture of member countries, to spotlight the Mediterranean Diet as a driver for the development of marginal areas in the region.

Indeed, and with great institutional pride, CIHEAM Bari contributed in 2008 to the first drafting of Italy's technical dossier for the transnational candidacy of the Mediterranean Diet for inclusion in the UNESCO intangible heritage list, a status formalized in 2010.

Building up this achievement, CIHEAM Bari advocated for the Mediterranean Diet as a model for sustainable diets at the "International Symposium on Biodiversity and Sustainable Diets," organized in Rome in 2010 by FAO and Bioversity International.

The following year, in 2011, our Institute convened an international workshop with FAO on the Mediterranean Diet as a case study for assessing the sustainability of diets and food consumption aiming to enhance the sustainability of Mediterranean food systems. A significant step was made in 2015 at EXPO in Milan, where CIHEAM, in collaboration with FAO and numerous national and international institutions, launched the call, "Med Diet EXPO 2015: Time to Act Now", advocating for the transition towards more sustainable food systems, where the Mediterranean Diet was presented as a pivotal element for aligning production and consumption sustainability.

In 2016, we co-organized the 1st World Conference on the Mediterranean Diet in Milan, followed in 2017 by an international workshop co-organized with FAO at our Institute, aimed at formulating voluntary guidelines for the sustainability of the Mediterranean Diet.

The 2nd World Conference on the Revitalization of the Mediterranean Diet was convened in Palermo in 2019, under the theme “Strategies for More Sustainable Food Systems in the Mediterranean Region. The Mediterranean diet as a lever for bridging consumption and production in a sustainable and healthy way.”

As a tangible outcome of the Conference, CIHEAM, FAO, and UfM launched the multi-stakeholder SFS-MED Platform initiative on Mediterranean food systems, affiliated with the UN One Planet Network’s Sustainable Food Systems Programme, culminating in the signing of a tripartite Memorandum of Understanding in January 2021. This book stands as a testament to CIHEAM Bari enduring legacy, following this collaborative endeavor.

The different perspectives of the authors can be likened to coordinates guiding cultural navigation in the Mediterranean, charting pathways towards the transition to more sustainable and resilient food systems, and the revitalization of the Mediterranean diet.

The book’s content is the result of significant individual and collective efforts, aimed at both consolidating existing knowledge and expanding the debate on the sustainability of Mediterranean food systems and the Mediterranean diet- a strategic key of our Institute studies, research activities and international cooperation in recent years.

As a white paper, this book is a daring challenge that CIHEAM Bari has taken up, transcending the traditional boundary of agricultural production to encompass consumption, with the aim of providing valuable insights and actionable proposals to decision-makers and various actors involved, facilitating a real change of direction towards greater economic, environmental, and social sustainability, in the region and in Med countries.

In an era marked by escalating global challenges and competition in food market, Mediterranean countries must harness their collective talent and knowledge to forge a more sustainable and resilient food systems’ future.

Maurizio Raeli
Director of CIHEAM Bari

INTRODUCTION

Sandro Dernini and **Roberto Capone**, Editors

BUILDING AN SFS-MED VISION

The book addresses, through 21 different perspectives from leading authors in their fields, the challenging topic of a “Change of Route in the Mediterranean”, with an innovative transformative SFS-MED Vision approach, moving to the future.

It offers unique perspectives essential for comprehensively tackling issues integral to Mediterranean food systems. These challenges are crucial for aligning with both global and local objectives and expediting the Agenda 2030. The book takes a transdisciplinary approach for the nature of its subject matter by addressing together the sustainability of the whole food system, from production to consumption, and acknowledging inter-relationships ecosystem-dependent and inter-dependencies of different sectors.

It is made as the continuation of a cultural navigation, over several years, with the authors, many of them also session moderators at the Third World Conference on the Revitalization of the Mediterranean Diet, “A Change of Route. Towards more sustainable and resilient food systems in the Mediterranean countries. The Mediterranean diet as a strategic resource for accelerating the Agenda 2030 in the Region”, organized by the CIHEAM Bari in 2022¹.

It builds upon the session outcomes of this Conference to advocate a transdisciplinary collaborative effort on the need of an SFS-MED vision shift, from the current agrifood production standpoint to a more sustainable food consumption viewpoint, positioning the Mediterranean diet and consumers at the forefront.

As a white paper the book, seek to answer to questions raised since the Second World Conference on the Revitalization of the Mediterranean Diet “Strategies towards more Sustainable Food Systems in the Mediterranean Region. The Mediterranean diet as a lever for bridging production and consumption in a sustainable and healthy way”, organized in Palermo in 2019. It aims to prioritize collaborative actions and investments for sustainable food systems in the Mediterranean. It draws insights from studies, projects, workshops, conferences, webinars, independent dialogues, within the United Nations Food Systems Summit and a stocktaking exercise², organized by the SFS-MED Platform, in collaboration with CIHEAM, FAO, UfM, Prima Foundation, and UN OnePlanet Network’s Sustainable Food Systems Programme.

The Mediterranean diet is highlighted in the book as an SFS-MED entry point for a better understanding of multi-dimensional interdependencies between food production and food consumption patterns, with interconnect ecosystem-dependent food components.

The book highlights the need of an innovative SFS-MED vision, integrated with an One Health approach application, recognizing that the health of humans, domestic and wild animals, plants and their ecosystems, are closely linked and interdependent.

The Mediterranean is facing unprecedented and interdependent environmental, economic, and social

1 <https://3mdconference.org/>

2 <https://www.unfoodsystemshub.org/fs-stocktaking-moment/>

challenges, impacting food security, health, nutrition, and sustainability, and the livelihoods of all Mediterranean people. The Mediterranean is marked by the heterogeneity among, and within, its countries and a growing gap between the advanced economies in the Northern shores and the less developed ones in the Southern/Eastern ones. Population growth with demographic changes, urbanization, and globalization, are all driving increased food demand and influencing food choices, which have resulted in profound changes in the food production/processing patterns, in the food consumption patterns and lifestyles.

For coping with these entangled Med challenges, the book offers SFS-MED innovative approaches and operational proposals for fostering synergies across sectors and providing guidance for decision-makers and stakeholders interested in advancing economic, environmental, and social sustainability in the region. It highlights the need also of a change of perception on the Mediterranean diet as a strategic resource of sustainable development for Mediterranean countries, within a more innovative and inclusive SFS-MED food environment.

The book as a “white paper” is a foresight exercise to prioritise actions and investments by giving substance to SFS-MED dialogue, solidarity and cooperation. It provides useful food policy operational proposals, overcoming the silos of fragmented sectoral approaches and integrating different agriculture, environmental, economic, health/nutrition and sociocultural Med dimensions. Drawing on existing knowledge, the book advocates for a shift in focus towards more sustainable food systems, offering economic and social opportunities, particularly for small-scale farmers, fishermen, youth, and women in areas highly affected by migration. As a comprehensive resource, it provides essential readings for stakeholders, students, and practitioners across various disciplines.

Through diverse perspectives and trajectories, the book equips readers with the knowledge, policies, and solutions necessary to accelerate progress towards the Agenda 2030 in Mediterranean countries and the broader region.

Ultimately, the goal of the editors is to establish a common ground for charting a new SFS-MED Route in the Mediterranean, one that embraces sustainability and resilience in the face of evolving challenges.

The CIHEAM Secretary General, **Miano**, in his address titled “Moving Forward” presents a holistic conceptual model. This model embodies the culmination of numerous tangible actions aimed at shifting food production towards human consumption while prioritizing environmental preservation, sustainable utilization of natural resources, and consideration of social and economic factors. It encompasses the welfare of rural and urban communities, as well as the dynamics of food trade, distribution, and accessibility, all with a central focus on human wellbeing.

Food systems connections with two large biological entities are strongly underlined. From one side Nature and on the other side Human beings in variable frameworks of socio-economic and cultural drivers. A very simple equation links the production and the consumption of food.

The complexity of the relationship stems from two main factors: Firstly, food production is intricately linked within various domains. Secondly, consumption extends beyond individual acts, encompassing socio-economic factors inherent to its environment. The conventional model of connection between fundamental or applied research on one side and private businesses on the other side has shown clearly a very limited utility in producing growing and empowering steps for the benefit of local and regional communities.

CIHEAM is firmly engaged in the relaunching of the SFS-MED Platform, either in terms of stakeholder and community participation, in terms of the enrichment of the tools and the financial means neces-

sary to provide additional drive to the SDGs achievement in the Mediterranean countries, refreshing the concepts generated by the declaration of the Matera G20 meeting.

The SFS-MED Platform emerges as a pivotal instrument, attracting the attention of international institutions and national authorities. It provides a collaborative space for discourse and knowledge exchange on various facets of food policies, regulatory frameworks, natural resource utilization and management, food production techniques, transformation processes for both food and non-food items, consumption patterns, and the facilitation of conducive conditions for business development. Moreover, it actively promotes trade relations and international partnerships while advocating for sustainable solutions across social, economic, and environmental dimensions within the Mediterranean countries and the broader region. The need of a novel approach is highlighted for a different working environment in which all actors and stakeholders share various approaches, backgrounds and experiences and actively co-plan solution-based procedures and actions. Complexity should be faced with complex tools and methodologies.

Capone addresses, in “Centrality of the Mediterranean consumer to move towards sustainable food systems and diets”, the centrality of Mediterranean consumer of the future for a “Change of route” towards more med sustainable food systems.

It is highlighted the need of a careful analysis of the Med socio-economic context with different types of societies, with inequalities between Northern and Eastern Med countries, and differences in terms of food consumption, marked by different abilities to consume.

It is pointed out that social, cultural, and economic inequalities existing in the countries bordering the Mediterranean, and especially in large urban agglomerations, inevitably have repercussions on food environment and on food consumption patterns, thus characterizing different types of consumers whose aware choices represent a priority element for the transformation of food systems. Consumers represent the engine that moves all elements of the food system. It poses the question what will be the consumer’s approach to food, and more specifically, to the Mediterranean Diet in the near future? However, how can we transmit this food culture to today’s young people and future generations?

Involving all stakeholders from different sectors will help provide enormous potential for amplifying consumer voices, through the implementation of communication actions aimed at appropriate training and information, linked not only to the nutritional and health sustainability but also to the economic, environmental, and cultural sustainability. A greater contribution can be provided by collective catering in its various forms and types to influence young people, who will be potential consumers with future purchasing powers. The cultural dimension is presented as the root of the current problem related to nutrition.

Recognizing that citizens and consumers navigate within a complex food environment, it becomes imperative to provide them with assistance, support, and guidance. One instrumental approach to facilitate this process is through the formulation of “Voluntary Guidelines for the Sustainability of the Mediterranean Diet.” Such guidelines serve as a significant tool in promoting informed decision-making among individuals, fostering sustainable dietary practices, and nurturing a deeper understanding of the Mediterranean diet’s environmental and social implications. To implement SFS-MED transformative actions, it is pointed that any sustainability challenge to be faced inevitably requires multi-stakeholder partnerships such as the SFS MED Platform initiative, by bringing on the ground more collaborative efforts for coping with several inter-sectoral challenges towards SDGs achievements.

The SFS-MED Platform multi-stakeholder mechanism represents a key tool for a systemic approach to build trust and commitments based on shared understanding and inclusion, providing a space for dialogue at different levels.

Bizri and Hamzé address the intricate landscape of agriculture and food systems in the Eastern and Southern Mediterranean Arab (ESMA) countries in their contribution entitled “Agriculture and Food Systems in the Eastern and Southern Mediterranean Arab countries (ESMA).” They stress the critical necessity for these nations to embrace collaborative intra- and inter-regional policies that steer them towards more equitable and sustainable trajectories.

The authors underscore the historical heritage of ESMA countries as the birthplace of the Mediterranean Diet, forged through ancient agricultural practices. However, in the face of climate change, ongoing political conflicts, and governance challenges, urgent socioeconomic policy transformations are imperative. Central to this transformation is the restructuring of agricultural and food systems, alongside scientific, technological, and innovative institutions, to offer continual support.

Future policy transformations, together with related reforms and concrete interventions based upon novel and tried paradigms will have to tackle the needs of expanding, marginalised and impoverished populations in the ESMA countries, taking into account rising numbers of refugee and internally displaced communities (IDPs), as top priorities.

Specific initiatives are outlined for ESMA countries, encompassing improvements in agricultural productivity, sustainable resource management, hunger eradication, resilient food systems, rural income generation, crisis resilience, and prevention of transboundary threats. However, the realization of these initiatives hinges on the adoption of innovative technologies, adequate resource allocation, and enhanced regional and international collaboration, elements lacking in previous decades.

In conclusion, Bizri and Hamzé advocate for a comprehensive approach that integrates technological innovation, resource allocation, and collaborative efforts to address the multifaceted challenges facing ESMA countries and pave the way towards a sustainable future.

Zdruli and Ziadat address, in “Promoting food security in the Mediterranean through integrated land use planning and sustainable management of land and water”, the challenge of the growing Mediterranean population, and, on the other hand, land and water resources reaching their limits.

It is pointed out that Mediterranean population will increase three-fold by 2025 compared to what it was 70 years ago, while the region continues to feed its people largely through imports that make it vulnerable to global markets and international conflicts.

Water shortages and competition for its use, land scarcity and deterioration of agricultural land, increasing climate constraints and weather disruptions, rapid changes in food demand in the production context with limited opportunities, marginalization of rural regions and frequent contempt towards farming populations are unfortunately heightening food tensions in the Southern and Eastern Mediterranean.

Pressures on water resources, vulnerability to climate change and nutritional challenges are expected to increase among the Southern Mediterranean countries, while Northern Mediterranean countries are expected to contrast and, sometime to stymie, these challenges.

It is highlighted that the Mediterranean is facing enormous challenges, yet there are several opportunities. Reversing the current trend is possible through the implementation of a suit of sustainable responses and actions with integrated to be planned at all levels to take scale. Caring for neglected soils, degraded lands, addressing drought and coping with water scarcity can be addressed through the adoption of new technologies and management approaches. Of paramount importance, it is highlighted that the Mediterranean, as whole, must be engaged in actions that conserve the limited natural resources such as land and water and promote their sustainable use and management.

With good will from all the stakeholders and political support, it is highlighted that the region has the capacity to make a change of route and put food security as a cornerstone of its policies for the many

years to come. There are plenty of good examples of sustainable land and water management throughout the region. They need to be widely disseminated and replicated following the experience of the Soil Deal for Europe mission that is promoting the establishment of Living Labs and Lighthouses as places of research, communication, and replication. It is pointed out that agriculture could in some way mobilize a new Euro-Mediterranean cooperation by putting agri-food issues back at the middle of multilateral cooperation and intra-social relations at national and international level.

Di Terlizzi explores, in “Changing the route: improving the application of One Health in the framework of Mediterranean food systems”, the holistic One Health approach from a higher attention to the interconnectedness of anthropogenic and environmental phenomena. The article highlights that deep interconnectedness of human, plant and animal systems and the wider environment (including ecosystems) are closely linked and interdependent with intertwining of environmental, health, socio-economic and geopolitical challenges.

It is pointed out that this approach, while on the one hand encourages policy actors to address global food issues in a holistic manner, thus balancing the health of people, animals and the environment, on the other hand bring uncertainty when it comes to taking practical political decisions.

The contribution highlights multiple and densely intertwined challenges behind it: environmental (droughts, biodiversity loss, pollution), geopolitical (conflicts and retaliation), and socio-economical (inequalities, demographic crises). The region is also in a post-nutrition transition state, where the prevalence of under-nutrition phenomena is dangerously overshadowed by overweight, obesity, and non-communicable chronic diseases.

The article dwells on some practical choices that can bring the region’s institutional actors closer to a change, for example: adopting territorial policies aimed at re-establishing the urban-rural linkage, adhering to pluralist models of the Mediterranean diet, creating and supporting “farmers’ markets”, investing in applied research and technical experimentation related to biodiverse, sustainable and innovative food patterns.

In addition to supporting such interventions, the article calls the national and international policy-making community to coordinate their wills in a constant and shared manner, to preserve the coherence of efforts in support of sustainable food systems in the Mediterranean.

The article recalls the conceptual model of the “Human Pole” by CIHEAM Bari, based on the recognition of multidimensional and intertwining causes of food insecurity that identifies the human figure, understood at both the individual and collective levels, as the best actor entitled to transform, within a holistic perspective, an interweaving of problems into an interweaving of virtuous dynamics. The human being is seen no longer as a potential source of instability for ecosystems, but as a lever of a re-composition and rehabilitation of social, political and environmental fractures of which food insecurity is only one of the possible manifestations.

The author aims to motivate the need for a change of route in order to better apply the concept of One Health in the context of sustainable food systems in the Mediterranean area.

Mathiesen addresses, in “Aquatic blue nutrition, the environment and sovereignty”, the need to take stock regularly and determine if a change of route for the Mediterranean Diet is needed. From its first appearance on the World Scene as a recommended traditional healthy diet, a lot has changed. We know now much more about the benefits of diets and nutrition. Knowledge is now much more positive regarding the Mediterranean Diet. New knowledge about fish and aquatic blue foods has put them higher on the agenda. The environment is changing rapidly. Agriculture/food production is one of the biggest contributors to CO2 release. In this respect not all foods are equal in effects on Climate Change. The

Aquatic Blue Sector's high quality production systems have the lowest comparative carbon footprints. This should affect how we promote and support food production including aquaculture and fisheries. The article, by posing the question of "how to alter course concerning the Mediterranean Diet", sheds light on the recommendations put forth during Session 9, titled "SFS-Med Blue Growth: Beneficial Production and Consumption with Less Environmental Pressure," at the 3rd World Conference on the Mediterranean Diet. One key recommendation is the promotion of increased incorporation of Aquatic Blue Foods into the Mediterranean Diet food pyramid (#1). Additionally, it suggests leveraging the FAO Ecolabelling Guidelines to establish a unified label certifying the origin, heritage, sustainability, and nutritional value of Mediterranean Diet Aquatic Blue food products. Supported by a modern, standardised, and economic data gathering system in the Mediterranean region; (#2) on the technical level by improving sustainable fisheries management and promoting sustainable aquaculture along with promoting short value chains, local markets, and consumption in the spirit of Blue Transformation; and (#3) further promote local coastal management training at various appropriate and practical levels. Aiming at transferring knowledge and through innovation creating new knowledge appropriate to the challenges in the Mediterranean region as well as nearby and similar regions. These recommendations are presented to be not exhaustive but as starting point for implementing them based on discussion, data gathering, analysis and innovation, knowledge creation and transfer. The Mediterranean Region, as well as adjacent and similar regions, can move fast forward and carry a torch to better livelihoods in coastal communities, as well as further inland, for the coming future.

Stefanova and Iannetta address, in "Agroecological innovations as an entry point for the transformation of food systems in the Mediterranean Region and the revitalization of the Mediterranean Diet", the potential of food systems as a driver for achieving the Sustainable Development Goals. It is required a systems approach to establish transformational agendas. SDG-oriented research and innovations that are expected to play a major role for food system transformation.

In this respect, agro-ecology as a science, a practice and a political movement is highlighted as a promising holistic approach to innovation. By focusing on skill-oriented technologies and the capability of using ecosystem services as productive factors, agro-ecological innovations have proven to contribute to food security and environmental sustainability in different farming and community settings across the globe. The article explores the relevance of the agro-ecological approach to innovation for the efforts connected with the revitalization of the Mediterranean Diet in the countries from the Mediterranean region. The agro-ecological approach to innovation has many elements which resonate positively with the characteristics of the Mediterranean Diet as a model nutrition/health outcome from sustainable food systems.

The agriculture is an entry point for the transformation of the entire food systems leading to sustainable dietary outcomes, which is particularly relevant from the perspective of the Med Diet revitalisation efforts. The most relevant aspects of agro-ecology are those related to the establishment of markets for agro-ecological products and the training of local partnerships between producers and consumers. Despite that, knowledge co-production is a cornerstone of the agro-ecological approach to innovation, little attention has been directed towards the diminishing knowledge-producing capacities among citizens who are not directly engaged in the food production process. Despite this, the conventional linear models of knowledge transfer, primarily reliant on labels to inform consumers, face scrutiny, particularly from Civil Society Organization (CSO) stakeholders.

The Med Diet pattern relates to the lifestyle of poor communities, which needed to adapt to a limited resource base. Food production, preparation and recycling behaviours were widespread among all community constituents practicing traditional Mediterranean diets in the past as well as was the food

related knowledge. Such behaviours reflect a lifestyle conditioned by the natural resource base of the respective territorial contexts and hence, resources that today appear of little economic interest were not simply neglected the way it happens nowadays.

The Mediterranean diet as a lifestyle implies the importance of practice-based knowledge not only from the perspective of food production but also from the perspective of food consumption.

Brunori, Arcuri, Cavicchi, De Conno, Galli, Massari, Mattioni, Vasile address, in “Shaping micro and macro food environments: the role of Mediterranean diet, the transformation of food environments as one of the keys for a food system transformation. Food environments are highlighted as emergent properties of food system interactions, as actors, rules, artifacts, coalesce into local patterns that enable and constrain people’s behavior; structures of everyday life that constitute people’s life worlds. Food environments are pointed out as subsystems of broader food systems, shaped and influenced by the broader food system, and shape and influence food-related activities of individuals, households, communities. To apply this approach to food environments, two types are highlighted: ‘micro’ food environments, which exert their influence over individuals and households, ‘macro’ food environments, which constitute the frameworks for the reproduction of a multiplicity of food environments.

The mediterranean diet can address a knowledge gap between types as a resource for ‘soft power’, that resonates with people’s lifeworld and demonstrates that pathways for change are feasible. The Mediterranean Diet values and principles can be turned into resources for transforming micro and macro food environments. At the local level, the Mediterranean diet can affect ‘micro-environments’ by promoting diet diversification based on Mediterranean Gastronomy. By promoting plant-based food, traditional varieties, traditional gastronomy, the Mediterranean diet is a powerful driver of behavioral change. At macro level, the Mediterranean diet can provide a “consensus framework” to make the concept of “sustainable diets” closer to local knowledge and routines. The article poses challenging questions to address the dilemma linked to food environments: when intervening on food environments, how to avoid a paternalistic approach to diets? How to reconcile individual freedom, cultural diversity, and directionality of change?

Meybeck, Cintori, El Bilali,, Boschini and Gitz explore, in “Reconcile Mediterranean diets with contemporary lifestyles”, some of the drivers of the recent evolution of diets and how they can be addressed to reconcile Mediterranean diets with contemporary lifestyles. The article analyses trends and discourses affecting food systems and cultures, driven by globalization and urbanization and at the same time by growing concerns for health and for sustainability, often linked, as well as by growing interest in territorial and cultural identities. The article examines how the nutrition /health benefits of the Mediterranean diet for nutrition and its positive contribution to sustainable food systems can be leveraged and combined with the positive perception of Mediterranean foods, landscapes, cultures and lifestyles, to change attitudes, engage various categories of stakeholders and ground collective action. The centrality of food environments and cultures are highlighted with the key roles of education and convenience. Areas of actions are pointed out to catalyse favourable dynamics and trigger changes towards more sustainability and better adherence to the Mediterranean Diet. Mediterranean consumers are increasingly concerned about the impacts of diets on their health as well as on the environment and on social issues like sustaining local producers, with an increasing perception of the role of food consumption choices not only on nutrition, but also on both economic, social and environmental sustainability. There is a growing and wider recognition of the cultural and territorial dimensions of food, creating trends and opportunities for the promotion and revitalization of the Mediterranean diet.

A broad range of actors benefit from the positive image of the MD, of Mediterranean foods, landscapes and lifestyles, underscoring the recognized benefits of the MD, in an innovative way with modern, contemporary lifestyles, making the MD not a habit of the past but a favoured, easy and convenient choice for all within food environments of the future.

Burlingame addresses, in “Change of route toward voluntary guidelines for the promotion of the Mediterranean diet”, the need of a voluntary code or set of useful guidelines to promote adherence to the Mediterranean diet, and as a model for sustainable diets in other agro-ecological zones.

It is pointed out that the Mediterranean diet as originally documented in the 1950s, and sixties is rapidly diminishing as the influence of fast- and ultraprocessed foods is eroding traditional diets and food systems the world over. It is highlighted that a voluntary code or set of guidelines could be useful to promote adherence to the Mediterranean diet, and as a model for sustainable diets in other agro-ecological zones.

Recommendations from the High Level Panel of Experts for the UN Committee on World Food Security are examined for their relevance to the Mediterranean diet. Several ‘codes’ are evaluated for attributes, influence and impact, and how they can be applied in constructing a draft code for the Mediterranean diet, and by extension as a model for sustainable diets.

It is pointed out that results show that guidelines and codes of conduct, whether binding or voluntary, provide useful guidance for stakeholders and rights holders across sectors, disciplines, and social structures.

In addition, there are many agreed and measurable targets and indicators for monitoring compliance with/adherence to the Mediterranean diet. However, debate continues over how best to measure adherence to the Mediterranean diet. As the merits of individual indicators and composite indices are debated, promoting adherence to a sustainable Mediterranean diet needs to be undertaken even in the absence of the ability to measure adherence.

A voluntary code or set of guidelines could be useful to promote adherence for sectors (health, age, environment), for professional groups (educators, food technologists, nurses, doctors, farmers), and for consumers.

Regardless of the mechanism or thematic emphasis within the broad subject of the Mediterranean diet, the urgency of action is the common, but heretofore neglected, call.

It is highlighted that the proliferation of ultra-processed foods and the accompanying effects on human and planetary health have sharpened the focus on the imperative for a set of guidelines for a ‘change of route’, i.e., the restoration of the Mediterranean diet, and as a model for achieving the SDGs, the 2030 Agenda, and beyond.

Delarue addresses, in “Assessing the adherence to Mediterranean Diet Current status and perspectives”, the utility of the indexes of adherence to the Mediterranean diet and their ability to assess its adherence in various study populations, and to relate it to diseases or mortality risk in many countries. Findings show that people around the Mediterranean area tend to abandon the MedDiet way of life and of the increase in consumption of ultra-processed foods which several studies strongly suggest or demonstrate their deleterious effects on human and planetary health. The article points out that currently, more than 30 indexes have been developed, which are not generally concordant between them as concluded in papers aiming to compare them. Almost all were dedicated to evaluating its beneficial health effects. However, such a huge number of indexes is highlighted as a barrier to help to its promotion, because the determinants of adherence to a diet are not limited to its health effects

but also to advertising, packaging and labelling; physical accessibility in stores and other settings; perception of health; individual taste; convenience and cultural norms, sustainability, and costs. The author highlights the need to try to develop a methodology to obtain a single index of Med-Diet, dedicated not to assess its beneficial health effects and its sustainability, but also to promote and better measure all aspects of Med-Diet, which is facing all over the last decades the competition of Western diet pattern rich in UPF. Such an index should include all the aspects characterizing the Mediterranean way of life and recognized as an intangible heritage by UNESCO. Thus, such an index should not be limited to score only food groups, but all the characteristics of the Mediterranean way of life, providing that affordability is not neglected in the index as an important determinant of adherence.

Labellarte, Volpe, Miano and Petruzzella explore, in “Living Labs for Mediterranean local system food transition”, the potential of open innovation collaborative approaches, namely Living Labs, integrating quadruple-helix actors, in fostering sustainable local food systems, also highlighting why it is important to favour the establishment of labelled Mediterranean Living Labs, especially in the southern shore. In this sense, the ENoLL certification of MEDIL, a Living Lab hosted by CIHEAM Bari, could set a turning point, urging other Mediterranean countries to embrace Living Labs for cooperative innovation.

The paper, then, illustrates the Living Lab methodology’s application in the Metropolitan City of Bari, where a participatory approach guided the formulation of a food policy, demonstrating the effectiveness of Living Labs in co-designing solutions for local food systems. The article showcases the advantages and the achievable results of participatory processes using the Living Lab approach to co-design and implement solutions to favour the transition towards more sustainable and resilient Mediterranean local food systems.

The Living Lab is presented as an efficient approach to valorise the most relevant human resources, while maintaining high representativeness of local communities through the quadruple helix approach. Moreover, given its versatility, a Living Lab is pointed out can be applied in any sector, favouring tailored solutions thanks to the participation of citizens and end-user in the co-creation process.

Given the lack of Living Labs in the southern shore of the Mediterranean, strengthening their activation and labelling could help in increasing opportunities for cooperation toward a common response to the innovation needs of the Mediterranean countries. This objective can be achieved through the promotion of partnerships and the provision of technical aid, training, and capacity development, as well as exploring possibilities to utilize established networks and partnerships to promote the advancement of Living Labs. At the same time, southern Mediterranean countries should contribute with a supportive policy, regulatory framework, extending various forms of support to entrepreneurs, researchers, and key stakeholders involved in the inception and operation of Living Labs. Moreover, harness existing regional and international networks can facilitate cross-border collaboration between Living Labs in different countries, promoting the exchange of ideas and experiences.

Actively nurturing partnerships and collaborations between Living Labs and other stakeholders within the broader innovation ecosystem is vital, as it can help drive forward advancements and socio-economic progress.

Riccaboni, Cresti, De Micco, Stanghellini and Tozzi address, in “Technological, social and organisational innovations as key drivers for sustainable agrifood systems”, innovation as essential for our environment, the future of our societies and our food systems.

Agri-food systems are presented at the center of the global debate on sustainable development, for a variety of reasons, among which their impact on climate change and biodiversity, the importance that

food security is assuming worldwide, the correlation of food with the use of natural resources (e.g. land, water, energy), as well as the health of individuals and communities.

Technological innovation is highlighted as a key factor in the path towards more sustainable agri-food systems, with attention given also to social innovation. Good examples of it are a stronger cooperation among value chain actors, new market opportunities for sustainable farmers and more rigorous measurements, traceability systems and certifications of sustainability. Such social innovations are particularly useful in a context of smallholders and small food companies as in the case of the Mediterranean region, and are crucial for more sustainable productions, which are at the core of the Mediterranean diet.

The article stresses the need that is pivotal for firms to guarantee the transparency and sustainability of their value-chain to the different stakeholders involved (i.e. consumers, smallholders, suppliers, investors and public authorities). To this end, key factors enabling such a transition should focus on: the implementation of adequate measurement systems of companies and value chains' sustainability, to improve both the management of internal performance and sustainability reporting; traceability, of both the origin of the product and the related processes; certifications, as formal tools that ascertain the reliability of the information disclosed. Such factors and, even more importantly, their integration are also instrumental to the promotion of sustainable and healthy diets, such as the Mediterranean diet.

The article illustrates cases and best practices where measurement systems, traceability and certifications and their integration have enhanced sustainability of agri-food production with positive impacts in terms of economic revenues, citizens' trust, and quality of production.

The experiences of living labs, farmers' market and urban policies are underscored in the article, in a framework of cooperation among different actors in the value chain.

The measurement of sustainability performances, certifications and traceability mechanisms are seen very useful for addressing the challenges of the fair ecological transition in the agrifood sector, by pointing out that agri-food systems are at the centre of the global debate on sustainable development.

El Moujabber and El Dikah explore, in "Fostering the role of women, youth, and inclusive sustainable livelihoods in the Mediterranean food systems", the necessity to foster the active participation and empowerment of women and youth in the Mediterranean food systems, while simultaneously promoting inclusive and sustainable livelihoods. Achieving food security and sustainable development requires a paradigm shift that embraces marginalized groups as significant contributors, particularly women and youth.

The first part of this article delves into the challenges faced by women and youth in the Mediterranean food systems, and the urgency to addressing issues ranging from limited access to resources, gender-based disparities and the absence of robust policies to attract youth engagement in the sector. Highlighting the centrality of successful initiatives, the article emphasizes the importance of various measures, including skill development programs, gender-responsive research, and more inclusive policy frameworks, to amplify and integrate the voices of women and youth in decision-making processes across the food systems.

The second part of the article underscores the importance of inclusive and sustainable livelihoods in the context of Mediterranean agriculture. In the Mediterranean region, amidst environmental, economic, and social challenges facing food systems, significant gaps require bold and determined actions, moving away from conventional "business as usual" approaches. The article highlights successful initiatives, engaging all stakeholders in collective efforts such as Gender Transformative Approaches

(GTAs). For youth, robust actions are imperative to make agriculture and food systems more attractive, profitable, and rewarding. International consensus and policy recommendations can guide policymakers, researchers, and practitioners in fostering environments that harness the energy and skills of youth. In addressing climate change, despite women's leadership in grassroots climate movements and their vulnerability to climate change, gender integration into climate plans, policies, and strategies remains inadequate.

Promoting a robust research agenda and investing in gender-responsive research, along with developing tools and guidelines aligned with Mediterranean region priorities, is crucial. Leadership and accountability play key roles in promoting inclusivity and sustainability in food systems.

All actors and stakeholders must be held accountable, particularly for achieving gender equality and youth engagement.

Piscopo, Nitzan, Belahsen, Donini, Galli, Trichopoulou, and Berry address, in “Increasing resilience of food systems and the Mediterranean Diet in times of crisis, using the Sociotype framework”. The Sociotype framework, as a summary ecological construct to organize the multiple, dynamic, reciprocal inputs from the environment that interact with the genotype to determine the expression of phenotypic behaviours such as coping with stress. It has three domains - Individual, Relationships and Context - which are discussed in the article using food systems related examples, research, processes and actions: Setting up multi-stakeholder partnerships for designing systemic food policies and developing the knowledge base and infrastructure for implementation; Ensuring that food systems are sustainable along the entire food chain—from production to consumption – and reduce food losses and waste; Adopting the One Health approach for promoting resilient and sustainable fishing and farming; Facilitate agriculture which implements the best sustainable ecosystem services and practices, drastically reducing use of water and energy and of potentially harmful pesticides and fertilizers; Utilise cereals, pulses and aquatic foods more efficiently and revive and promote traditional recipes; Ensure the right of all members of the population to healthy, adequate, affordable and culturally acceptable food; Develop systems for continuing provision of free school meals to children even in times of crises; Monitor regularly the safety of the food supply chain to be free of pathogens; Legislate (and incentivize) the food industry to produce healthy (minimally processed foods), with less added sugars, trans fats, salt and additives, and which are reasonably priced; Consider price control of basic healthy sustainable foods which fit a MedDiet eating pattern; Regulate for informative food and nutrition labelling on packaging and food provision contexts; Legislate for honest and transparent marketing, especially prohibiting advertising of high fat, high, sugar, high salt ultra-processed foods to children; Provide certification programs for journalists trained in quality science communication for the public; Improve the provision of education on healthy lifestyles (including physical activity), nutrition and sustainable MedDiet food preparation for public health, education and culinary professionals and trainees, as well as in lifelong learning and active aging programs, and for students throughout compulsory schooling and in post-secondary and higher institutions.

Molinaro addresses, in “Flavours of Sustainability: The Identity Cuisine Initiative”, the Identity Cuisine as a cultural holistic approach and a strategic communication model linking sustainable chains of food production, traditional balanced consumption, and natural primary prevention through a salubrious lifestyle, whilst strengthening the communities' identity, particularly in the Mediterranean region.

Food is presented as a basic element of collective identity, providing a sense of social belonging and a

meeting point between peoples through the rediscovery of different historical culinary memories, also thanks to the women's crucial role in facilitating dialogue, social harmonization, and peace-making processes.

Social prosperity depends on the ability to think together and co-create the best solutions through an educational system teaching students at all levels how a healthy lifestyle affects well-being. Different collective identities can express and discover each other.

The identity cuisine may represent a tangible solution that would permit strengthening identities and rediscovery of traditional customs. Indeed, it does not only reinforce connection between nutrition and general wellness, encompassing commitment to fostering current food production and consumption towards more sustainable alternatives.

It also contributes to enhancing harmonization of different cultures whilst preserving a sense of self-identity amid local communities, which is particularly challenging to maintain in an ever-growing globalised society.

Provenzano addresses, in "Mediterranean Science and technology diplomacy: a solution for sustainability and transforming food systems", education, research and innovation as policy tools with multiple positive impact.

They are key for answering the needs of shifting job markets, that require updated know-how and skills, and provide the necessary groundwork for uptaking and developing technologies able to support the green transitions. Effectively, they are building blocks for adapting the societies to new and established challenges, creating opportunities for the Mediterranean Youth.

Science is also a privileged fields for cooperation, advancing common interests and creating new bridges across regions and countries. This applies particularly to food systems in the Mediterranean, in dire need of a green transition able to support jobs, increase food security, and adapt against climate change and degrading environmental conditions.

The link between food systems, research and innovation, and the 2030 Agenda for Sustainable Development has been explored at regional level through the SFS- MED Platform.

This article aims to present how academia and science are essential tools for new "diplomacies" based on research, technology and skills that belay the current global multilateral arena, particularly in the context of a systemic transformation of sustainable food systems in the Mediterranean.

The article briefly presents food systems as a lever for implementing the SDGs, subsequently it puts forward science and technology diplomacy as part of the transformative toolbox. It details the main initiatives at the EU and Mediterranean level more relevant to the topic at hand. Applying Science to multilateralism and foreign policy is a way of creating a "common language", a baseline upon which mutual understanding of aims and trajectories can be made easier. This is an incredibly important tool for a region where dialogue is not always easy, and where crises and mistrust are sometimes difficult to overcome.

On food systems in the Mediterranean, one of the frameworks of reference where science is already built-in is the process of the World Conferences on the Mediterranean Diet, a gathering which held their third edition at CIHEAM Bari in October 2022³.

"A change of route", the title given to the Second World Conference on the Mediterranean Diet and

3 https://www.medfoodcultures.org/308/the_second_world_conference_on_the_revitalization_of_mediterranean_diet_palermo_15_17_may_2018.html

again quoted in the Third conference, remains a paradigm indicating a destination, for which a vehicle is needed. If this were to be considered akin to a sailing ship, then we could visualize science as the wind accelerating towards its destination.

Egal addresses, in “Mediterranean cities and local governments for food systems transformation”, the emergence of cities and local governments and confirmed the importance of urban-rural linkages for territorial development and of food systems transformation as an entry point for sustainable development. The role of small and intermediate cities is pointed out to be a priority in the coming years, as they are key in connecting rural and urban areas and are projected to grow much faster than megacities. Mediterranean cities therefore have a key role to play to ensure health and resilience of both urban and rural populations in a context of natural resources crisis, conflicts and migration.

Each is connected to its territory by specific urban rural linkages and a combination of long and short food networks. They bring local knowledge, practices and experience which provide a basis for strategic planning at local and bioregional level. This will require joint participation of all actors, and of the private sector, as well as effective networking and partnerships at national, thematic and Mediterranean level for technical support, knowledge management and data collection, funding, action research and advocacy. Present institutional structures and procedures however remain an obstacle for joint action in the Mediterranean region and multi-level governance is therefore a priority.

A change of route is therefore urgently needed to overcome institutional and technical silos and bring together actors which until now have been taking the lead from a variety of entry points, acknowledging their contribution and experience within a broader territorial framework.

Food systems transformation will require effective networking and partnerships at national, thematic and Mediterranean level for technical support, knowledge management and data collection, funding, action research and advocacy.

An essential dimension is to systematically promote functional urban-rural linkages, urban-rural balance and partnerships for social and environmental sustainability, culture and human rights. While a variety of institutions might be interested in supporting such a network which could help overcome existing gaps and alleviate tensions, it could only be launched by Mediterranean cities and local governments themselves. And rather than creating yet one more structure, this could be an opportunity to build upon and enhance synergy of existing networks and partnerships such as the SFS MED platform could be instrumental in exploring cities willingness to launch such a network.

Koohafkan addresses, in “Agricultural and Food Heritage Initiative for Promoting Community-Based Sustainable Food System and Diets”, the launch of a “Mediterranean Food Heritage Initiative” based on experience of GIAHS-Partnership Initiative, in support to traditional agricultural systems (rich in biodiversity), local knowledge, landscapes and cultural values. It is highlighted that small holders and family farmers, as custodians, are fundamental actors of the revitalization of the Mediterranean diet, together with chiefs, regional cuisines and collective caterings. It is pointed out that the agriculture sector is responsible for ensuring the sustainable production, equitable commercialization and distribution of foods that are nutritionally adequate, safe and environmentally friendly produced.

Dietary shifts that have occurred in urban areas are currently extending to rural communities as well, where people have abandoned traditional food systems and diets based on locally grown crop varieties and animal products in favour of “westernized” diets.

It is highlighted that local communities and indigenous people who retain knowledge of the land, water, biodiversity, maintain many of the traditional food systems and food resources, rooted in historical

continuity within their region of residence, and include traditional foods accessed within knowledge from their natural environment including farming and wild harvesting.

It is acknowledged that Mediterranean traditional food systems are adaptive, nutritionally rich, biodiverse. They are subsistence, risk averse, socially and culturally rooted.

Many rural communities in Mediterranean developing countries that continue to grapple with serious development problems still cherish their food culture and their traditional food systems, which are indeed their natural and cultural heritage.

It is highlighted that protecting, revitalizing and using the Mediterranean diet food heritage and its documented health-giving attributes, would contribute significantly to sustainable development goals. The article underlines the need of strategies for sustainable food systems and diets, by emphasizing the positive role of biodiversity in human nutrition and poverty alleviation, promoting nutrition-sensitive development and diversified food-based approaches.

The launch of a “Mediterranean Food Heritage Initiative” based on experience of GIAHS-Partnership Initiative, is highlighted for capitalizing on its achievements, networks and potentials, along with a feasibility study to be extended to traditional food, nutrition, culinary and medicinal systems. with the goal of supporting income generation activities by labelling GIAHS and NIAHS products and services, agri-tourism promotion, marketing food heritage festivals and celebrations.

Ridolfi boosts, in “Finance and SDG driven investments as fundamental Push Factors for Sustainable Food Systems”, Artificial Intelligence “bots” and big data Platform SFS: as a proposal for Mediterranean cooperation and beyond, and, to achieve SFS at scale, the finance for food systems must change.

The article highlights that the approach of value chain can be useful but to improve at scale sustainability and transparency, mainstreaming SDG via sustainable finance is the key.

The correlation of food systems with the use of natural resources and in particular land, water, energy, the correlation with CO2 emissions, the impact of food on health of individuals and communities confirm that what happens in food systems is paramount.

What happens in food systems for sustainability is a function of the related finance issues, both for investments and for the working capital. SDGs related financiers should ask questions before providing loans or equity, therefore the science related to SDG measurement must be made simple for companies and for loan officers of banks to use assess and apply them.

The article explores few examples to demonstrate the win-win approach for financiers in applying sustainability criteria. For consumers in mature markets, the appeal of sustainability is already increasing. Yet the financial sector is doing too little to mainstream sustainability via incentives, discounts, conditionality in their business which will outreach the millions of small companies in our planet with no resources to address sustainability.

The author of the article highlights the feasibility and practicality of promoting sustainability in food systems by leveraging data analysis techniques with artificial intelligence (AI). This approach enables the verification of indicators associated with positive improvements in Sustainable Development Goal (SDG) targets in a clear manner. By analyzing the quantitative aspects of a project or program, AI can compare them with available databases and benchmark the SDG targets achieved against market performances. Applying AI techniques will allow to “mine” and “dig out” the data both from project results and databases to be compared also proposing PROXIES. The use of the SFS-MED platform by financial actors will allow them to apply criteria and valuation ex ante to finance investments that privilege and support sustainability therefore promoting and scaling up sustainability in a massive way.

Dernini explores, in “A rethinking of the Mediterranean diet as a cross-cutting SCP accelerator for an SFS-MED transformation bridging sustainable food consumption and production”, an SFS-MED multidisciplinary change of route towards more sustainable food systems. A new innovative SFS-MED approach is required for coping with multiple and interdependent challenges facing the Mediterranean. It is highlighted that there is not a clear common understanding on what sustainability means, and less on how to assess interactions and trade-offs between its three economic, social and environmental pillars.

is the author highlight the need of a common agreed shared vision and alignment towards the identification of a feasible SFS-MED approach, by considering different realities and establishing a common language and understanding.

It requires the implementation of the SFS-MED Platform conceptual framework, through an inclusive multi-stakeholder collaborative effort, based on knowledge (scientific as well as local) and partnership, linking food consumption and production through the Mediterranean diet as a Sustainable Consumption and Production (SCP) accelerator.

The Med-Diet 4.0 framework, with multiple sustainable benefits is highlighted as a “change of route” from to be healthy diet to move to acknowledge as also a sustainable diet model, in order to activate a broader spectrum of stakeholders from other sectors interested to the revitalization of the Mediterranean diet.

This Change of Route is requiring a new transdisciplinary rethinking, a change in the mindset, overcoming silos of disciplines, different levels of specialization, and fragmented sectoral approaches. It requires bringing together sciences and humanities and connecting the peoples. Transdisciplinary cross-cutting research on the interlinkages and overlapping areas between the sciences and humanities are urgently needed, through innovative SFS-MED Platform and living labs environments, towards enabling necessary conditions for an effective SFS-MED shift at country and regional levels.

There is a need of a change of route in the Mediterranean diet narrative, in the context of the current 21st century transformation, by bringing together sciences and humanities, connecting them with the peoples, taking into high consideration that the young are the future, who are representing the highest ratio of the population in the Southern/Eastern Mediterranean countries. The mobilization of sciences, innovation and humanities is necessary to jointly develop new S&T and R&D as cross-cutting accelerators for SFS-MED Platform transformative actions.

Increasing awareness and mobilizing action regarding the pivotal role of consumers in the transformation of SFS-MED is a challenging task within the framework of Sustainable Consumption and Production. This necessitates the establishment of a new, innovative SFS-MED food environment as part of the implementation of actions within the SFS-MED Platform.



CHALLENGES AND SOLUTIONS: FROM THEORY TO ACTION





MED-PLATFORM
BARI

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SFS MED-PLATFORM INITIATIVE
AN AFFILIATED PROJECT



One planet!
with care

Sustainable
Food Systems



**REVITALIZATION OF
MEDITERRANEAN DIET**
3° WORLD CONFERENCE





MOVING FORWARD

We are what we eat.

Ludwig Feuerbach

The paper shortly describes the novel 2030 CIHEAM strategic vision starting from the actual complexity of the food systems in the Mediterranean, the description of the main critical points and a proposed roadmap for future initiatives within the frame of the SFS-MED Platform.

THE CONTEXT

The global commitment of the international community for a shift towards more sustainable food systems has increased significantly over recent years, with numerous UN and Ministerial Declarations, international reports and scientific articles supporting this transformational change.

Today it's clear that more sustainable food systems will be vital for all populations of the world. To accelerate more sustainable development in the Mediterranean region, fostered by the 2030 Agenda, transformative changes in food systems are imperative. Urgent action is due to escalating water scarcity, degradation of land and marine resources, the impacts of climate change, and the ongoing nutrition transition. Additionally, challenges such as youth and women unemployment, demographic shifts towards urbanization, vulnerability of rural livelihoods, political conflicts, and migration underscore the necessity for immediate intervention. It's essential to address these issues while acknowledging the diverse cultural dimensions prevalent across the region.

In order to cultivate more sustainable food systems, it is essential to foster innovative multi-stakeholder strategies and transdisciplinary knowledge sharing between the Northern and Southern shores of the Mediterranean region. This necessitates a heightened emphasis on scientific research and data collection for impact assessment, alongside capacity building and innovation efforts encompassing technological, institutional, and social dimensions.

More than before, the Mediterranean region is facing unprecedented and interdependent environmental, economic, and social challenges that affect food security, health, nutrition, and sustainability, and thus the livelihoods of all Mediterranean people.

The Mediterranean is marked by the heterogeneity among, and within, its countries and a growing gap between the advanced economies in the Northern shores and the less developed ones in the Southern/Eastern ones. Population growth with demographic changes, urbanization, and globalization, are all driving increased food demand and influencing food choices, which have resulted in profound changes in the food production/processing patterns, as well as in the food consumption patterns and lifestyles.

Sustainable food systems present significant economic and social prospects in the Mediterranean region, fostering more regional opportunities. This is especially pertinent for small-scale farmers

and fishermen, as well as for youth and women, in rural areas heavily impacted by migration to urban centers. Hence, there is a pressing need for a shared understanding of an integrated approach to sustainable food systems, tailored to the Mediterranean context. This approach should be collaboratively developed through inclusive multi-stakeholder efforts, emphasizing knowledge sharing and partnerships, to effectively address the complex, interconnected challenges facing the region.

AN INNOVATIVE VISION

The vision is drawn following the implementation of the previous declarations of the meetings of Food, Agriculture and Fisheries Ministers of the CIHEAM Member countries.

It shares completely the Matera G20 statement and fully operates in the direction of: 1. Aiming to the last decade of action of the 17 SDGs of the 2030 Agenda of the UN; 2. Fighting for food security in the Mediterranean and beyond; 3. Build strong and efficient partnership committed to crisis solutions; 4. Stimulating youth and women empowerment and entrepreneurship approach through innovation; 5. Supporting social programs at the local level and stimulating financial efforts and investments in terms of food security, food sustainable systems and nutrition; 6. Facing climate changes and its impact on fragile ecosystems, vulnerable communities and human beings; 7. Supporting open trading oriented actions, access to markets at different scales; 8. Promoting a One Health approach based on scientific knowledge and research collaborations; 9. Encourage and sustain international and multi-stakeholder partnership and networking.

CIHEAM strategic plan 2030 is somewhat oriented to a large extent to SDG 2 No hunger, SDG 4 Quality education, SDG 9 Industry, Innovation and Infrastructure, SDG 10 Reduced inequalities, SDG 11 Sustainable Cities and Communities, SDG 12 Responsible production and consumption, SDG 13 Climate action, SDG 14 Life below, SDG 15 Life on land and SDG 17 Partnership for the Goals; interpreting the Mediterranean Sustainable Food Systems as a whole, a conceptual model but also a functional product of innumerable real actions in which the production of food moves towards human consumption in respect of the environment, durable management of natural resources, social and economic considerations, rural and urban community dynamics, trade practices, food distribution, access, and ultimately, human wellbeing.

In a synthetic way, we strongly believe that food systems strongly connect two large biological entities. From one side Nature, which includes land and water, soils, biodiversity and climate; on the other side Human beings in variable frameworks of socio-economic and cultural drivers. A very simple equation links the production and the consumption of food. The relationship though is extremely complex either because the production of food is related to intricate systems of different domains or because the consumption is not simply an individual act but involves aspects and conditions proper of the socio-economic environment to which it belongs to. A graphical and simplified representation is shown in the next figure.



In this framework, you have on the left side the environmental system where natural resources are used for food production and on the other side the food environment, linked closely to human communities and to consumption.

The variability of the natural systems and of the food environments are typical of different geophysical regions and country contexts and therefore, even though interconnections among different systems may be providing useful information, a country specific approach may enable closer observations and analyses.

MODEL STRUCTURE

Between the two extremes, all the different phases of the system (food transformation, storage and delivery, security, consumer and social aspects, nutrition) assume variable significance as a function of any specific interest or observation. The complexity of this model, indeed extremely simplified with respect to reality, allows a reader to follow on two main tracks:

1. Each specific step or ring of the chain is strongly affected by several factors, some of which related to the environment and some of them depending on strictly local conditions (water scarcity, droughts, access to energy or technology); therefore, the interrelation among the various factors produce fatally a large number of possible combinations and conditions;
2. Science and Technology (S&T) is a continuous and ubiquitous factor affecting the quantity and the quality of the general “reaction”. Scientific research shows its paramount importance in these systems, enabling and stimulating even the smallest and single process, providing need-based solutions, converting focused analysis to broader cases and fields of application. At the same time the transfer of technology allows closer collaborations between public and private entities, to develop plans of sustainable solutions, and to accompany companies, especially young enterprises in reaching solutions for the development of their future goals.

CLOSE-UP ANALYSIS

It is worth considering the need of a close-up observation of each single “sphere” of the model. The spheres, representing specific phases of the food systems, show variable dimensions and definitions which may change further according to the site specific point of view or objectives of a study. Indeed, for instance, an analytical examination of water sustainability in crop production within a particular watershed may prove significantly more pertinent than merely focusing on the market aspect of the produce. On the contrary, the aspects of food mobility and transportation can occasionally represent the most valuable asset of that specific production chain.

Each of the chain rings allows its own conceptual dimension and different methodological approach. In fact,

a single domain clearly represents a specific and complete universe with peculiar actors, process characteristics, internal and external drivers and conditioning factors. The domain of food mobility for example presents several connections with food production, storage and transport issues, logistic infrastructure, distribution and access to food, delivery and many other specific links to the overall framework. Hence, the analytical approach devoted to a single element of the chain can be scaled up to a higher level or to the global one.

SCIENCE AND TECHNOLOGY (S&T)

Research outputs, need-oriented solutions, applied technology are the real engine of all processes, both in hard and in human sciences. The scientific research together with the creative thinking approach represent the most significant and novel motor of development of single processes and of the human communities in general. The new frontier of scientific thought has to be closely associated with the specific needs and expectations of the local communities and territories. In Mediterranean countries, recognizing the imperative for cultivating innovative professionals capable of spearheading technological transfers into practical applications is paramount. These individuals serve as vital conduits, bridging the gap between research institutions and private enterprises, especially those led by young entrepreneurs, often operating as mediators in both language and codex. A stronger connection between the scientific approach, the scaling factor of the prototypes, the structural change of the educational drivers and the development of an innovative business model may provide a strong stimulus in the development of small and bigger communities, also through the evolution of communities of practice and living labs.

It is also extremely important to mention that S&T drivers apply to each individual domain even though presenting case-specific characteristics and methodological means and approaches. In other words, the development of a specific sensor for the biological activity may need differing equipments and analytical tools with respect to a detailed study of the socio-economic characteristic on the mobility and trades of a food produce, but both share the need of novel and innovative scientific and technological methodologies which move forward the actual level of knowledge.

SCIENTIFIC AND TECHNOLOGICAL TRANSFER - NOVEL INNOVATIVE APPROACH

The classical model of connection between fundamental or applied research on one side and private businesses on the other side has shown very clearly a very limited utility in producing growing and empowering steps for the benefit of local or regional mediterranean communities. This approach shows indeed a negative structural problem, which can be synthesized as follows: The researcher releases theoretical or applied solutions/outputs that are generated by own cultural backgrounds, overall vision of the development of his own discipline and of the surrounding environment, and proposes them to potentially interested stake-holders.

A novel approach may consider a different working environment in which all the actors and the stakeholders contaminate themselves, share various approaches, backgrounds and experiences and actively co-plan solution based procedures and actions. Participating planning can be possibly adapted to several fields, education, training, scientific research, and cooperation programmes. The one direction approach is abandoned in favor of a shared experience and project working, combining the knowledge deriving from differing cultural and technical backgrounds of the operators.

COMPLEXITY

Complexity should be faced with complex tools and methodologies. The typical triple helix system, comprising academia and research, private bodies and institutions, is naturally enriched by the pre-

sence of the human dimension, usually through the participation of associations and communities of all kinds which join through their experiences and programs in various fields of activities. And, only recently, given the extraordinary attention to the environment and the severe impacts of climate changes in particular, the system has evolved in the new theoretical figure of the quintuple helix (academia, institutions, companies, communities, ecosystem).

THE SFS-MED PLATFORM WITH A “COUNTRY AND REGIONAL ORIENTED VISION”

CIHEAM is firmly engaged in the relaunching of the Platform either in terms of stakeholder and community participation, in terms of the enrichment of the tools and the financial means necessary to provide additional impetus to the SDGs achievement in the Mediterranean countries, refreshing the concepts generated by the declaration of the Matera G20 meeting.

The SFS-MED Platform is a very useful and versatile tool in attracting international institutions and country authorities and offering them a sharing environment of discussion and exchanges in terms of food policies and regulatory aspects, use and management of natural resources, food production, transformation of food and non food products, food consumption, sustaining enabling conditions for the development of business, promoting trades and international connections, ensuring sustainable approaches to the social, economical and environmental solutions.

The enrichment and the empowerment of the SFS-MED multi-stakeholder community will guarantee a more dynamic and sharing environment and the definition of appropriate indicators and parameters necessary to describe real impacts and implications of the evolution of each specific domain of the framework model.

EDUCATION AND PROFESSIONAL EMPOWERMENT

Academic educational plans are largely oriented towards a unidirectional approach, that is the direct transferring of knowledge and information towards a sufficiently homogeneous cohort of students, usually coming from high school studies. Many existing exceptions take into account the professional experience of the professor and/or the experience of private entities, if any, which provide hints on the applicative aspects of the discipline.

In view of the changing socio-economic and working environments, the migration aspects, the request of professional skills and the needs of identifying new technical figures, several additional factors should be added to complete and actualize the overall picture.

In fact, the educational programmes as well as the research world are nowadays looking forward to an integrative approach in order to render different worlds able to communicate and understand each other. The evolution of this model brings quickly to a multi-stakeholder approach in almost all the fields of human knowledge. The presence of public institutions and authorities together with local and global private entities in the knowledge arenas strongly enrich the theoretical framework and produce direct consequences towards more adequate analyses, accurate elaborations and clear vision of the main tendencies of issues generated by the surrounding environments. The education methodologies develop therefore towards multi-dimensional and combined vision where challenges are shared through co-planning and co-programming activities to face solution-based objectives and outputs. The participation of various actors to the construction of a modern educational and professional plan contributes clearly to various goals: 1) multidimensional analyses of occurring problems; 2) sharing competences and experiences among individuals with different backgrounds; 3) needs to mediate among proper languages and definitions; 4) analysis and definition of specific challenges; 5) planning appropriate Technology Readiness Levels and output calibrations; 6) constructing novel professional figures and job profiles especially investing on youth.

YOUTH EMPOWERMENT

The investment of CIHEAM in the young generation has first priority in the overall picture. Through educational programs and professional and research training, we are able to activate virtuous cooperation programs with main focuses deriving from interests and needs of local administrations and communities, from the enterprises, as well as from the job environment.

The demand for education is still very strong and growing. We are able to provide students the necessary theoretical and applied background to continue to MSc or PhD programs throughout our wide networks and connections. It is important to consider that the real professional positioning of young individuals in the job market is fed by the growing interest of public and especially private entities in expertise at the academic or research level that are developed on solution based approaches. A classical solution of the job market is the acquisition of young individuals by private companies and their insertion in working places, providing them with specific educational and training programs with a very high level of specificity and focused goals. Therefore, for the previously mentioned reasons, novel professional figures, such as innovative managers and brokers, technology transfer officers and others, are becoming extremely important. Their educational programs can also be oriented to achieve these professional profiles by using a learning-by-doing approach, by re-modelling the study course toward solution-based challenges, and by project working and co-working processes.

A WAY FORWARD

Every meal we consume reinforces the profound connection we share with nature. Eating serves as a direct link to ecosystems, plants, fungi, and animals that have accompanied us throughout the course of evolution. It offers a hint into what distinguishes and unites us from other species. Our relationship with food defines our identity and essence.

In light of this, the philosophical assertion of Ludwig Feuerbach, the father of German rationalism, evolves from “we are what we eat” to the contemporary notion that “to eat is an agricultural act.” This reframing underscores the broader implications of our dietary choices, highlighting our role in shaping agricultural practices and their impacts on the environment, society, and ourselves.

CIHEAM action is firmly connected to this scientific, educational, cultural and cooperative framework. A special emphasis is placed on the diverse food chains, which serve as focal points for addressing the multifaceted aspects of sustainability within production systems and the food environment. These systems face threats from climate change as well as socio-economic, political, and humanitarian crises. To tackle these challenges, various pillars of activity such as post-university education, professional training, scientific research, and international cooperation are well developed through CIHEAM and the 4 Mediterranean Agronomic Institutes, in coordination with our partners in the region.

CIHEAM serves as a representative entity for countries and communities, both directly and indirectly connected to the Mediterranean Region. It adeptly aligns with the demands and requirements emanating from vulnerable rural communities and territories. By doing so, CIHEAM plays a crucial role in addressing the challenges and fostering sustainable development in these regions, ultimately contributing to the well-being of the Mediterranean basin and its inhabitants, within a One Health approach.

L'uomo è ciò che mangia.

Mangiare è un atto agricolo.

Mangiare è un atto politico.

Teodoro Miano
Secretary General CIHEAM

CENTRALITY OF THE MEDITERRANEAN CONSUMER TO MOVE TOWARDS SUSTAINABLE FOOD SYSTEMS AND DIETS

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ABSTRACT The “Change of route” towards more sustainable food systems requires a careful analysis of the socio-economic context as in every area of the planet there are different types of societies, from growing ones to developed ones that have reached levels of food satiety. In the Mediterranean region, for example, there are different economic and social disparities made evident by the analysis of macroeconomic indicators which highlight a great heterogeneity between countries and an increasingly growing gap between developed economies and those that are less so. This leads to inevitable repercussions on the economic, social, environmental, and nutritional dimensions of the populations living in the region. In particular, the change in food consumption patterns, as well as economic factors, and therefore the ability to consume, are determined by the ability to produce and the ability to exchange. Sociocultural factors are also of great importance as food choices, given the same economic conditions, can be different depending on their belonging to different cultural models. But these variables that influence dietary change depend in turn on global socioeconomic change, that is, on population, the degree of economic development and international trade. A further element to consider is represented by the “Mediterranean consumer of the future”. In fact, the inequalities highlighted lead us to think that there are also differences in terms of food consumption, marked by the different ability to consume. Nutrition is a complex social fact, based above all on satisfaction, that is, on the satisfaction of hunger, but also on the pleasure of the palate, on the consumption of symbols and social signs. It, therefore, varies considerably from one social group to another. Within this society, lifestyles will be increasingly characterized by great speed in carrying out daily activities, different social strata in terms of gender, age, culture, and traditions. In this reality, what will be the consumer’s approach to food, and more specifically, to the Mediterranean Diet in the near future?

Keywords Mediterranean inequalities, Mediterranean Diet, Mediterranean Sustainable Consumptions and Productions (SCP), Mediterranean Food Systems, Food environment, Future Mediterranean consumer.

LA CENTRALITÉ DU CONSOMMATEUR MÉDITERRANÉEN DANS L'ÉVOLUTION VERS DES SYSTÈMES ET RÉGIMES ALIMENTAIRES DURABLES

RÉSUMÉ Un « Changement de cap » vers des systèmes alimentaires plus durables nécessite une analyse détaillée du contexte socio-économique, car dans chaque région de la planète, il existe différents types de sociétés, allant des sociétés en expansion aux sociétés développées qui ont atteint des niveaux de satisfaction alimentaire. Dans la région méditerranéenne, par exemple, de multiples disparités économiques et sociales sont mises en évidence par l'analyse des indicateurs macroéconomiques qui révèlent une grande hétérogénéité entre les pays et un écart de plus en plus important entre économies avancées et moins avancées. Cela entraîne inévitablement des répercussions sur les dimensions économique, sociale, environnementale et nutritionnelle des populations de la région. En particulier, l'évolution des modes de consommation alimentaire, ainsi que les facteurs économiques, et donc la capacité à consommer, sont déterminés par la capacité à produire et la capacité à échanger. Les facteurs socioculturels sont également déterminants puisque les choix alimentaires, à conditions économiques égales, peuvent différer selon les modèles culturels dans lesquels ils s'inscrivent. Or, ces variables qui influent sur les modifications du régime alimentaire dépendent elles-mêmes de l'évolution socio-économique globale, c'est-à-dire de la population, du degré de développement économique et du commerce international. Un autre élément de réflexion est le « consommateur méditerranéen de l'avenir ». En effet, les inégalités évoquées nous amènent à penser qu'il existe également des différences sur le plan de la consommation alimentaire, liées à une capacité de consommation différente. Se nourrir est un fait social complexe, relevant avant tout de la satisfaction, c'est-à-dire du rassasiement, mais aussi du plaisir du palais, de la consommation de symboles et de signes sociaux, bref des comportements très variables d'un groupe social à l'autre. Dans cette société, les modes de vie seront de plus en plus caractérisés par une grande rapidité dans l'accomplissement des activités quotidiennes, par des couches sociales différentes en termes de sexe, d'âge, de culture et de traditions. Dans cette perspective, quelle sera l'approche du consommateur à l'égard de l'alimentation, et plus particulièrement de la diète méditerranéenne, dans un avenir proche ?

Mots-clés Inégalités méditerranéennes - Diète méditerranéenne - Consommations et productions durables (CPD) méditerranéennes - Systèmes alimentaires méditerranéens - Environnement alimentaire - Consommateur méditerranéen de l'avenir.

1. INTRODUCTION

The Change of Route towards sustainable food systems requires a careful analysis of the context from which we start as each area of the Planet presents very different social, economic, cultural, and environmental peculiarities which must be considered to outline the right path to be undertaken.

In fact, there are different types of societies, from growing ones to developed ones that have now reached levels of food satiety.

In the Mediterranean region these inequalities are very marked and have a strong impact on food consumption patterns. This results in different consumers with different needs which also give rise to a different approach and awareness of food.

The objective of this article is to explore, on the basis of the experiences carried out by CIHEAM, in collaboration with the FAO, the UfM and other international institutions and organizations through a cycle of conferences, seminars, workshops and dialogues of the UN summit on systems food, what will be the role of the Mediterranean consumer in the future as it could represent the real driver of the transition towards more sustainable diets and food systems in the area considered using a food model, i.e. the Mediterranean diet, as a SCP lever to link consumption and production in a sustainable way.

Finally, it is also suggested to implement some actions taking into consideration that any challenge to be faced towards sustainability inevitably requires the promotion of a multi-stakeholder partnership.

2. MEDITERRANEAN INEQUALITIES

In the Mediterranean region there are profound economic and social disparities that emerge from the analysis of macroeconomic indicators. In fact, they highlight a great heterogeneity between countries and an increasingly growing gap between developed economies and those that are less so.

For example, the comparison of the Gross Domestic Product per capita (GDP/capita) between the Mediterranean countries highlights how in those of the European Union it is almost three times higher than that of the countries of the South and over four times that of the countries of the East. France's GDP per capita is today approximately 12.5 times higher than that of Morocco and the same value is equal to 10.8 between Italy and Egypt. That is to say that a French citizen and an Italian earn on average every year 41,000 dollars and 33,000 dollars respectively, while Moroccan and Egyptian citizens earn around 3,000.

These values highlight a first profound difference between the Mediterranean economies which inevitably has repercussions on the social, environmental and nutritional dimensions of the populations living in the region.

Furthermore, the Mediterranean population¹ has almost doubled in sixty years. It was 244 million inhabitants in 1960 and 327 million in 1980. In 2000 the population reached 420 million, reaching 507 million inhabitants in 2020 (i.e. approximately 7% of the world population).

However, a more in-depth analysis highlights that this increase only affected the populations of the

1 The 22 Mediterranean countries considered in table 1.

Tab.1 - Gross Domestic Product per capita in Mediterranean countries.

	Country	GDP pro capite
Euro-Med countries	French	41760
	Italy	32946
	Malte	30650
	Spain	29961
	Slovenia	26170
	Chipre	27719
	Portugal	23030
	Greece	19974
Eastern Mediterranean countries	Croatia	14949
	Montenegro	8703
	Macedonia	6096
	Serbia	7397
	Bosnia Herzegovina	5741
	Albania	5372
Southern Mediterranean countries	Türkiye	8957
	Algeria	3980
	Lebanon	9654
	Tunisia	3287
	Egypt	3046
	Jordan	4386
	Morocco	3345
	Libya	5019

Source: our calculations based on World Bank data

Southern shore, where the growth rate (70%) was much higher than that of the Mediterranean countries of the Northern shore (25%).

What emerges is a Mediterranean cut in two: weak growth in the North and demographic explosion in the South (+209 million people in 60 years). For every additional inhabitant in the North of the Mediterranean, there are more than four in the South. United Nations demographic projections estimate that in 2050 the population of Mediterranean countries will reach around 650 million inhabitants.

The highlighted data indicate that the transformations taking place in the Mediterranean lead to an increase in the population in the countries of the southern shore where the countryside of some areas, although still populous, risks being marginalized; while in the Mediterranean countries of the EU, but

Tab. 2 - Evolution of the Mediterranean population (1960-2020)

	Country	1960	1980	2000	2020
Euro-Med countries	French	46814237	55340782	60912498	65255278
	Italy	50199700	56433883	56942108	60480665
	Malte	326550	316645	390087	441386
	Spain	30455000	37491165	40567864	46776338
	Slovenia	1584720	1901315	1988925	2079390
	Chipre	572930	685406	943286	1188099
	Portugal	8857716	9766312	10289898	10199257
	Greece	8331725	9642505	10805808	10429737
Eastern Mediterranean countries	Croatia	4140000	4588000	4426000	4106953
	Montenegro	480579	572608	604950	628147
	Macedonia	1488667	1924197	2034819	2083911
	Serbia	0	0	7516346	8744858
	Bosnia Herzegovina	3225668	4179855	3766706	3280503
	Albania	1608800	2671997	3089027	2879277
Southern Mediterranean countries	Türkiye	27472331	43975921	63240121	84422510
	Algeria	11124888	19337715	31183660	40606052
	Lebanon	1804926	2605293	3235366	6006668
	Tunisia	4176266	6368167	9699197	11403248
	Egypt	26996533	44099142	69905988	95688681
	Jordan	932257	2374422	5103130	9455802
	Morocco	12328532	20019847	28849621	35276786
	Libya	1448417	3219466	5355751	6293253
		244.370.442	327.514.643	420.851.156	507.726.799

Source: our calculations based on United Nations data (2020)

more generally throughout Europe, the main challenge is represented by the aging of the population and demographic contraction.

The different evolution and rapid demographic growth in the Mediterranean region already highlight important repercussions not only on a social level in terms of immigration, aging of the population in the north and unemployment in the south, but also on an economic level.

2. MEDITERRANEAN FOOD CONSUMPTION PATTERNS

Food consumption patterns, in addition to economic factors and therefore the ability to consume, are determined by the ability to produce and the ability to exchange. The latter, which in turn provide the total availability of food, depend on the level of production and international exchange of food needs of a population. A Food Consumption Pattern refers to the way in which individuals organize themselves to consume food; it also refers to dietary practices, the nature and quantity of foods consumed. Not only. Sociocultural factors also have a great influence on eating patterns. In fact, if it is true that food choices are made within the power of consumption, determined directly by purchasing power², it is also true that two individuals, placed in similar economic conditions, can consume differently depending on their belonging to different cultural models. Therefore, even with an identical consumption

2. Ratio between income allocated to food expenditure and food prices.

power, culture differentiates the way of eating and the relationship with food which can be ritual, habitual, symbolic, religious, or ethnic. Eating habits then derive from tastes acquired and transmitted through experience and persist over time when no agricultural or food innovations occur. In a historical dimension there are no habits, but dietary changes caused by the transfer of products or species.

But these variables that influence dietary change depend in turn on global socioeconomic change, that is, on population, the degree of economic development and international trade.

In the scenario described the role that the Mediterranean consumer assumes, and will assume in the immediate future, is of priority importance for moving towards more sustainable food systems since sustainable consumption and production in the agri-food sector is a holistic concept oriented by consumer. It refers to the integrated implementation of sustainable models of food consumption and production, respecting the carrying capacity of natural ecosystems. It therefore requires consideration of all aspects and stages of a product's life, from production to consumption, and includes issues such as sustainable lifestyles, sustainable diets, food losses and food waste management and recycling, voluntary sustainability standards and behavioral environmentally friendly methods that minimize negative impacts on the environment and do not jeopardize the needs of present and future generations. Sustainability, climate change, biodiversity, water, food and nutritional security, right to food and diets are all closely connected.

It is therefore a priority to focus attention on the "citizen/consumer" as we are all consumers, and we are all the ultimate reason why food is produced. For this reason, giving greater emphasis to the consumer has an enormous potential to impact the sustainability of food systems.

The right consumer behaviour can make a notable contribution to the transformation of food systems through conscious and informed choices which, in turn, could also be the subject of targeted policies and incentives.

Promoting active consumer involvement in the food systems agenda can offer interesting insights into food consumption trends and market demands, as well as a better understanding of the real constraints to food affordability, safety and quality that hinder diets healthy and sustainable in the Mediterranean.

Only by analysing the evolution and needs of the consumer will it be possible to manage and direct production towards greater sustainability and at the same time move towards more sustainable diets and food systems.

4. DIFFERENT TYPES OF CONSUMERS IN THE MEDITERRANEAN. THE SOCIOECONOMIC INEQUALITIES HIGHLIGHTED PREVIOUSLY LEAD US TO THINK THAT THERE ARE DIFFERENCES IN TERMS OF FOOD CONSUMPTION MARKED BY THE DIFFERENT ABILITY TO CONSUME BETWEEN THE TWO AREAS.

The two types of economy, subsistence, and market, which characterize the Mediterranean region, inevitably result in a different approach to food by two different types of consumers. In the northern area of the Mediterranean, we can foresee that soon the citizen and consumer will have to act in a society characterized mainly by the elderly, extremely polarized (with increasingly richer citizens on one side and increasingly poorer on the other), multi-ethnic, with serious environmental emergencies and highly urbanized. And since the urban environment is, and will be in the future, the place where industrial, local, or imported products are distributed, the urban consumer will be more receptive to the consumption model typical of a market economy. Urbanization and pluri-activity, the latter necessary to raise the standard of living, will increasingly contribute to reducing the size of families,

to changes in the way of consuming and to food choices increasingly oriented towards industrial and increasingly “processed” foods such as meat, dairy, fruit, and vegetables.

To explain this evolution, a well-known economist, Ernst Engel, comes to our aid, whose law still explains the relationship between the evolution of incomes and consumption expenditure. He explained that: “as income grows, the expenses dedicated to the different budget items change in percentage; those that were intended for essential needs (for example, nutrition) will decrease, while expenditure on luxury items will increase. Two elements derive from this: the first, that as income increases, spending on food consumption grows less than proportionally; the second, that eating styles change, producing substitution effects: that is, within the family food shopping basket, some products are replaced with others considered of greater value and quality. As populations become richer, starchy products (such as rice and flours) and unprocessed products in their diets are replaced by products with a higher protein content (such as meat, milk, and derivatives) and by processed and higher value-added products, promoting a process of convergence of diets at a global level.

Furthermore, pluri-activity will increasingly lead to the use of collective catering which will replace the traditional family group in the life of everyone, which is already happening today. The taste of the future consumer will therefore be formed outside the family, where nutrition is simplified, industrialized, and almost never reflects Mediterranean traditions.

Little reference to traditions, display of wealth, prestige and power, harmony between body and mind, great attention to natural resources, food waste and respect for the environment will most likely be the basic needs of this society.

Within it, lifestyles will be increasingly characterized by great speed in carrying out daily activities and by social strata diversified in terms of gender, age, culture, and traditions.

In the south of the Mediterranean region, however, we find a context with socioeconomic characteristics very different from those described previously and where attention to natural resources and environmental sustainability cannot be achieved without first having achieved the social and economic one. In fact, human societies satisfy their needs starting from the most basic ones (hunger, thirst, etc.). Only when the latter are satisfied can they begin to actively address environmental concerns. Considering that poverty represents a very important obstacle to progress in this direction.

If we relate what has just been stated to the economic data highlighted in the openings of this work we can understand how, especially in the internal and marginal areas of the south of the region, the context is completely different as the priorities are linked exclusively to the satisfaction of primary needs.

In Tunisia, for example, the recent crises that have affected the entire world have had an extremely negative impact on the social context, upsetting the balance and dynamics of families, especially in the most vulnerable areas of the country with an increase in the poverty rate of approximately 4.5%, which is equivalent to around half a million new poor. The consequence of this was a notable increase in the unemployment rate, especially among young people between the ages of 15 and 24 who represent approximately 16.5% of the Tunisian population and, above all, in perspective, consumers of the immediate future. According to the Tunisian National Institute of Statistics (INS), the youth unemployment rate reached 41.7% at the end of 2021. Late entry into the world of work and the uncertainty of a dignified

future lead to strong concerns as these young people are inactive, that is, they are not enrolled in school or a training course, nor do they have a job, but they are still more serious is that they represent the highest percentage of “dangerous” work and are the group most at risk of conflict with the law.

These conditions, in addition to affecting the social, cultural, and economic aspects of the Mediterranean countries considered, will also have an inevitable impact on the future profile of the citizen and consumer of the South whose priority will not be represented by the choice of the quality product to include in one’s diet or of the environmental needs to be satisfied, but rather by the satisfaction of its primary needs.

5. THE MEDITERRANEAN CONSUMER

Based on the considerations made and given the heterogeneity of the region that emerged from the previous pages, to simplify, let’s consider a single “future Mediterranean consumer”. It will be part of an elderly, feminized, multi-ethnic, highly economically polarized, urbanized society, characterized by extreme mobility and with serious environmental emergencies.

In such a society, “space” and “time” will be the elements that will most influence the food models of the future. The first because extreme mobility will increasingly induce consumers to eat out, with inevitable consequences in the possibility of choosing their own diet. The second is that the reduction in time available will lead to the consumption of ready and quick meals.

Already today we are witnessing the “simplicity of preparations” and the loss of “rituals” (breakfast, lunch and, above all, family dinner).

As evidence of what has just been stated, we can see that the new trends in the field of real estate construction interpreted by engineers, architects and designers relegate to increasingly smaller spaces what once represented the beating “heart” of the home, that is, the kitchen.

How consumers will feed themselves in the immediate future, what food model they will follow and how they will consider the Mediterranean Diet are some of the issues that need to be asked today to imagine the type of food demand that will inevitably impact food systems. and which can contribute to the transition towards greater sustainability.

In the wake of the environmental issues raised in recent years relating to climate change and in favour of sustainable development, consumers will be increasingly attentive to preserving the natural resources and the environment, reducing greenhouse gas emissions, waste, and food losses, etc.

Beyond the universally shared positive aspects relating to sustainable development, a unilateral vision could however mislead young consumers, as such a vision would lead to considering food systems, and therefore food production, as the main cause of CO₂ emissions, failure to respect animal welfare, groundwater pollution, wild deforestation, etc. which is only partially true.

Such beliefs would lead to the consumption of foods completely different from those that man has had in his diet for millennia and inevitably to a strong downsizing of the cultural aspects of food, those linked to traditions, the importance of agroecosystems and agricultural landscapes and, more generally, of the agri-food system.

But only by starting from a food culture attentive to the values of sustainability in all its forms can we

deal with the great food emergencies of our century such as respect for natural resources, food safety, prevention of various pathologies. Culture has always been a multiplier of results, and limiting oneself only to the identification of technical-scientific solutions to emerging problems means having a short-term vision as it does not affect the root causes of the difficulties.

On the other hand, the disappearance of the cultural dimension seems to be the consequence of a process through which man is losing his genuinely human identity, projecting him towards something difficult to interpret.

This is perhaps the most appropriate moment to rethink the relationship human-food.

But to reconstruct the relationship it is of primary importance to consider the context in which this relationship develops, and therefore the Food Environment, as the choices we make regarding food and its impacts, are strongly shaped by the contexts in which they are accomplished. The Food Environment as defined by HLPE refers to the “physical, economic, political and socio-cultural context in which consumers interact with the food system to make their decisions about the acquisition, preparation and consumption of food.”

Consequently, the most effective and fair way to change citizen/consumer behaviour is to modify the structural factors that guide food choice.

The food environment includes both the preferences that people bring to food systems and the broader contexts within which food decisions are made.

This means that food choices are not based on the best available information and that, although the potential for consumer action is not negligible, food choices are constrained by sociocultural, economic, and political issues that are beyond the control of the individual.

In concrete terms, what appears to be a free choice of the citizen/consumer is not because, even if they wanted to adopt sustainable eating habits, they would have difficulty doing so in current contexts as they must face various obstacles, such as, for example, lack of information, price of food products, limited availability etc.

The considerations made make us understand the weakness of citizen-consumers when faced with the mechanisms of the food system. Therefore, it is a priority to act with determination on the food environment so that all products that contribute to healthy and sustainable diets are recognised, easily available, accessible, and affordable.

As is easy to understand, to move towards favourable food environments, it is necessary to involve different actors at different levels, from the individual farmer to local and regional authorities, to food industries, to collective catering, to large-scale food distribution up to national governments.

Furthermore, involving all stakeholders has enormous potential to amplify consumer voices to decision makers. This can help provide a deeper understanding of consumer rights and needs for more sustainable diets in the Mediterranean.

Consumers should be at the centre of all elements of the food system, from food research to food pro-

duction and supply, as well as the food industry, environment and marketing. But to do this we need a correctly informed citizen/consumer who has a food culture based on tradition.

For this reason, one of the most important actions to implement for an effective Change of Course is linked to correct information, especially in schools. That is, information that considers all aspects linked to food sustainability, not only those linked to the environment and human health and nutrition, but also those linked to the local economy, and above all, to the social and cultural aspects of food.

Unfortunately, however, today in families, the place where food culture and traditions have always been handed down in the Mediterranean, for reasons linked to changes in lifestyles (meals outside the home, mobile phones and lack of dialogue, women's work, etc..) rarely does one have the opportunity and the availability of time to transfer those food traditions well interpreted by the Mediterranean Diet. It is therefore our belief that the role of the family today can be integrated, and in some cases even replaced, by collective catering in its various forms and types. In this way it could contribute to renewing young people's identity and belonging to a shared intangible cultural heritage, thus encouraging an intersectoral and intergenerational dialogue to be reproduced daily.

Meals served in schools, universities, hospitals, prisons, and social programs have enormous potential to contribute to sustainable and healthy food consumption and food production by ensuring greater access to local, affordable, diverse, safe and sustainable food nutritious.

6. WHAT CHANGE OF ROUTE?

The Change of Route therefore identifies itself with a vast operation of re-evaluation of relationship man-food which can no longer be postponed responding to the needs and aspirations of citizens.

The Mediterranean Diet represents a cultural food model instrumental to our objective which intends to recover and reevaluate the man-food relationship from a sustainability perspective. This diet rich in plant-based and local foods have been associated with significant improvements in health benefits related to non-communicable diseases and nutritional status. It has also been recognized as a sustainable diet for its lower environmental impact on land, water and energy use and positive climate mitigation potential. Furthermore, its social and cultural relevance has led UNESCO to recognize it as an intangible cultural heritage of humanity.

In fact, since 2011 CIHEAM and FAO have started, through the organization of a cycle of seminars, workshops and international conferences, a cooperation program on the sustainability of food production and consumption with a focus on the sustainability of food systems and diets in the Mediterranean area, using the Mediterranean Diet as a case study. Within the World conferences on Revitalization of Mediterranean Diet food and nutritional security was linked to sustainability through the Mediterranean Diet to accelerate the United Nations Agenda 2030.

But for it to be truly a useful tool it is necessary to study the mechanisms that regulate sustainability through a multidisciplinary methodological approach based on appropriate indicators linked to the pillars of sustainable development.

Recovering the man-food relationship also means spreading the culture of taste, transferring knowledge and "savoir faire" by developing intercultural and intergenerational dialogue and knowing

how to live, enhancing conviviality, protecting local agricultural biodiversity while remaining open to contamination, recovering renewed ancient flavours, and adapted to contemporary taste.

This must be done with the full awareness that it is necessary to change the daily paradigm of our individual nutrition. This means that we must eat in a different way than we do today, as natural resource and health problems are evident.

7. CHANGING ROUTE THEREFORE STARTING WITH A CHANGE IN PERCEPTION OF THE MEDITERRANEAN DIET AS A SCP LEVER

But to change perception, careful and correct training and information is necessary, as the benefits of Mediterranean Diet in most cases are well known to professionals but only superficially, if not completely obscure, to other social strata of the population such as the housewife, the lawyer, the engineer, the student, the pensioner, etc.

Only by raising awareness and correctly informing all components of the “Food environment” can concrete results be achieved to Change of Route towards more sustainable diets and food systems for our planet.

To face these challenges, the support of science and research is essential to highlight the sustainable social and cultural benefits inherent in this dietary model. And about that the SFS MED Platform, led by FAO, Centre International de Hautes Etudes Agronomiques Méditerranéennes (CIHEAM), Union for the Mediterranean (UfM) and Prima Foundation aims to provide an integrated sustainable food systems approach, context-specific for the Mediterranean, as a multi-sectorial science-based innovative response to the multiple and interconnected challenges facing Mediterranean countries for accomplishing, at the same time, several SDGs and accelerating the 2030 Agenda in the region. The Platform is foreseen to be an outstanding initiative for dialogue and action on both shores of the Mediterranean, at the crossroads of three continents, to redesign the future of tomorrow’s food systems, starting from the resilience of the urban-rural food supply linkages, by fostering a collective multistakeholder action for transforming food systems by improving their sustainability, as part of the Decade of Action for the SDGs, following the 2021 UN Food Systems Summit.

The goal is to identify interconnectivities among various challenges, drivers, processes, outcomes and trade-off, for shaping the context-specific priority transformative actions of the SFS Med Platform, to impact food systems positively, at every stage, from production, processing, distributing, and marketing to consumption of food.

8. CONCLUDING REMARKS

The social, cultural, and economic inequalities existing in the countries bordering the Mediterranean, and especially in large urban agglomerations, inevitably have repercussions on food environment and on food consumption patterns of the populations of the region, thus characterizing different types of consumers whose aware choices represent a priority element for the transformation of food systems. For this reason, consumers represent the engine that moves all elements of the food system, from food research to production, as well as the food industry, environment, and marketing.

Involving all stakeholders from different sectors helps provide enormous potential for amplifying consumer voices. To achieve this objective, we need a citizen/consumer who has a good food culture, who is trained and well informed. This is why we have proposed some concrete actions.

Implementation of communication actions aimed at correct training and information starting from schools with programs and contents that disseminate homogeneous concepts linked not only to nutritional and health sustainability but also to economic, environmental, and cultural sustainability.

Above all, the cultural dimension seems to be the crux of the current problem related to nutrition. Food culture represents the most effective lever for redefining the relationship between man and food. Only by starting from a food culture attentive to the values of sustainability in all its forms can we deal with the great food emergencies of our century such as respect for natural resources, food safety, prevention of various pathologies.

But how can we transmit this food culture to today's young people and future generations? We believe that a great contribution can be provided by collective catering in its various forms and types since, by replacing and integrating what has always been the role of the family in passing down food traditions and cultures, it can influence young people, who will be the potential consumers with future purchasing power, contributing to the renewal of identity and belonging to an intangible cultural heritage of the Mediterranean.

However, it must be considered that the citizens/consumers move within the food environment and to do this they have to be helped, supported and guided. This is the role of policy makers, development program managers, researchers and stakeholders of the food system, i.e., all interested parties who must initiate interventions and actions to change unsustainable eating behaviours in their countries, linking food and nutritional security to their specific priority sustainability challenges at regional, national and local levels.

The tool that can provide an important contribution to this process is represented by the SFS MED Platform and by the development of the "Voluntary Guidelines for the Sustainability of the Mediterranean Diet".

The Platform will foster, within the framework of the UN One Planet Sustainable Food Systems Programme, more multistakeholder partnerships by bringing on the ground their collaborative efforts as key Platform flagship transectorial transformative actions for coping, at the same time, with several intersectoral challenges towards SDGs achievements.

To implement an action plan articulated in these points, it is of primary importance to promote a multi-stakeholder partnership at national and regional level to build trust and commitments based on shared understanding and inclusion.

Addressing trade-offs between economic, environmental, and social objectives that are often competing requires negotiation between different communities and actors who have different interests, awareness, resources and powers.

The multi-stakeholder mechanism represents a key tool for a systemic approach and can provide a space for dialogue at different levels.

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AGRICULTURE AND FOOD SYSTEMS IN THE EASTERN AND SOUTHERN MEDITERRANEAN ARAB COUNTRIES; FAULT LINES AND PATHS TOWARDS A SUSTAINABLE FUTURE

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ABSTRACT Eastern and Southern Mediterranean Arab (ESMA) countries¹ were the birthplace of the first agricultural revolution with practices that fed what we have now come to refer to as the Mediterranean Diet. Thus, for several past millennia, ESMA and almost the entire Middle Eastern diets were based on cereals, and legumes, with smaller contributions by livestock and poultry products as well as fruit varieties produced on rain-fed and irrigated land. Relatively clement climatic conditions in the past combined with long, warm and dry summers rendered the ESMA region ideal for a wide range of crops; including olives, citrus, vineyards, tubers and cereals. However, with climate change, coupled to continuing conflicts and inadequate governance all ESMA countries are now in urgent need of radical socioeconomic policy transformations. Such transformations are nowhere more sorely needed than in reshaping the future of agricultural and food systems as well as science, technology and innovation institutions that ought to provide them with direct and constant assistance. Future policy transformations, together with related reforms and concrete interventions based upon novel and tried paradigms will have to tackle the needs of expanding, marginalised and impoverished populations in the ESMA countries, taking into account rising numbers of refugee and internally displaced communities (IDPs), as top priorities.² In view of the fact that malpractices anywhere on Mediterranean shores could readily threaten countries and communities all around its basin, optimal benefits may be attained only through active cooperation among of all components of the Mediterranean innovation ecosystem. On the other hand, the ESMA countries in particular, would need to implement collaborative intra- and inter-regional policies that ensure transition to far more equitable and sustainable futures. Current dependence by ESMA countries upon imported agricultural and food products may only be tackled through widespread use of innovative agricultural and food processing practices as well as novel cooperative schemes, that will subsequently reduce the impact of wildly fluctuating commodity prices as well as ensure improved food security and gainful employment for sizeable segments of the populations.

Keywords Agriculture and food systems (AFS) - Eastern and Southern Mediterranean Arab (ESMA) countries - Strategies for innovative inputs.

AGRICULTURE ET SYSTÈMES ALIMENTAIRES DANS LES PAYS ARABES DE L'EST ET DU SUD DE LA MÉDITERRANÉE : LIGNES DE FAILLE ET PERSPECTIVES D'AVENIR DURABLE

RÉSUMÉ Les pays arabes de l'Est et du Sud de la Méditerranée (ESMA) ont été le berceau de la première révolution agricole avec une longue tradition de la diète méditerranéenne. Ainsi, pendant plusieurs millénaires, l'ESMA et la quasi-totalité des régimes alimentaires du Moyen-Orient ont été basés sur les céréales et les légumineuses auxquelles s'ajoutent une plus petite contribution des produits de l'élevage, des volailles et certaines variétés de fruits produits sur des terres arides, pluviales et irriguées. Les conditions climatiques relativement clémentes du passé, combinées à de longues saisons sèches, ont rendu la région ESMA idéale pour un large éventail de cultures, comme les olives, les agrumes, les vignes, les tubercules et les céréales. Cependant, avec le changement climatique, associé à des conflits politiques persistants et à une gouvernance inadéquate, tous les pays de l'ESMA ont désormais un besoin urgent de transformations politiques et socio-économiques radicales. De telles transformations s'avèrent indispensables pour garantir l'avenir des systèmes agri-

1. The term “ESMA Arab countries” is used here in reference to nine Arab countries of the Eastern and Southern Mediterranean, namely: Algeria, Egypt, Jordan, Lebanon, Libya, Morocco, Palestine, Syria and Tunisia.

2. An estimated 59 percent of the world's current population of refugees originated from ESMA and neighbouring countries of the Middle East. Additionally, a sizeable proportion of internally displaced persons continue trying to survive as internally displaced people (IDPs).

coles et alimentaires ainsi que les institutions scientifiques, technologiques et d'innovation mandatées pour leur fournir une assistance adéquate et constante. Les transformations politiques en perspective, ainsi que les interventions basées sur des paradigmes nouveaux capables de répondre aux besoins croissants des populations marginalisées et appauvries des pays de l'ESMA tenant compte, également, des communautés de réfugiés et de personnes déplacées à l'intérieur de leur propre pays (PDI). Étant donné que les mauvaises pratiques pourraient affecter la majorité des pays et communautés des deux rives de la Méditerranée, des bénéfices optimaux ne pourront être obtenus que grâce à une coopération active entre tous les acteurs de l'écosystème d'innovation méditerranéen. D'un autre côté, les pays de l'ESMA en particulier, devraient mettre en œuvre des politiques de collaboration intra- et interrégionales garantissant une transition cohérente vers un avenir beaucoup plus équitable et durable. La dépendance actuelle des pays de l'ESMA à l'égard des produits agricoles et alimentaires importés est un défi stratégique qui ne peut être traité que par le recours à des pratiques agricoles et de transformation alimentaire innovantes, ainsi qu'à de nouveaux programmes de coopération capables de réduire l'impact des fortes fluctuations des prix des matières premières, de garantir une meilleure sécurité alimentaire et des opportunités d'emploi rémunérateurs pour les différentes catégories de la population.

Mots-clés Agriculture et systèmes alimentaires (ASA) - Pays arabes de l'Est et du Sud de la Méditerranée (ESMA) - Stratégies pour les intrants innovants.

1. INTRODUCTION

Despite witnessing numerous upheavals throughout their history, Eastern and Southern Mediterranean Arab (ESMA) countries have only rarely been through such troubled times as the ones they have witnessed over the past decade. This, at a time when advances in human knowledge and tools provided by modern technology ought to enable countries around the world to tackle the challenges they face on so many fronts, including those that currently plague ESMA agriculture and food systems.

Thus, instead of assembling means for poverty reduction, food security, improved health care and education; all of which being prime objectives of the Sustainable Development Goals (SDGs) to which they all have pledged to attain by 2030, ESMA countries along with many others around the world are witnessing serious retrogressions on all the above fronts. Inadequate policies, which are to blame for the severe shortcomings that plague socioeconomic development in the ESMA countries, are in essence the products of dysfunctional and corrupt systems of governance, rarely if ever assembled or chosen by their current populations.

Rather, in most cases, they represent extensions of structures planted during past colonial eras as well as remnants of religious and sectarian strife, used now by various parties both within and outside their borders, in order to further their own ends. The net result is that socioeconomics of the ESMA countries continue to be captive to rentier systems intent upon maintaining status quo at all conceivable levels and every direction, despite apparent and urgent needs for change.

Clearly, among all other national systems of production and services, agricultural and food systems assume priority, due to their importance in securing livelihoods and ensuring adequate measures of food security and economic stability. Historically, and despite past and current setbacks, agriculture played, and continues to play a vital role in the Mediterranean region's socioeconomics.³ ESMA countries are no exception, as more than one fifth of populations in half of the region's countries are employed by the agricultural sector, rendering significant contributions to gross domestic product (GDP).

The fact that large swathes of land in the Middle East is desert and semi-arid land with soil quality in

3. The Mediterranean region generally refers to the all countries surrounding the Mediterranean Sea in addition to Portugal and Jordan.

Lebanon	2.86	195
Libya	3.76	225
Morocco	1.69	52
Palestine	8.10	273
Syria	9.68	92
Tunisia	1.18	50
Average values	3.60	122
Neighbouring countries		
Cyprus	3.34	693
Israel	0.80	312
Malta	3.17	878
Turkey	0.79	95
The World, MENA and Arab countries		
World	0.70	77
Arab World	1.37	85
MENA countries	0.79	58
Notes: (1) Figures presented in this table date back to 2019 for most countries, with the exception of Syria, in whose case they go back to 2010. (2) No figures were available for Somalia.		
Sources:		
1. Populations and GDP from the World Bank's Development Indicators for 2019.		
2. Food import figures were also obtained from the World Bank's World Bank data accessed June 2022. [2]		

many arable parts having deteriorated over many decades of malpractice, is to be born in mind at all times.⁴ Infrequent rainfall renders rain-dependent agriculture risky with highly unpredictable yields. As populations continue to multiply, demand for food grows, leading to higher percentages of food items consumed by countries of the Middle East being imported, with limited exports in return.

2. ESMA ECONOMIES

While values of the gross domestic product (GDP) for several countries including Algeria, Egypt and Jordan remained relatively stable over the period 2018 - 2022, other countries, including Lebanon, Libya, Syria and Tunisia suffered considerable declines.⁵ Combined with the political conditions that these countries are going through, their government authorities would be far less capable of engaging in partnerships that would certainly require considerable infusion of expert human and financial resource allocations.

Combined together, ESMA economies, as measured by their GDP, represents under 34 % of their Arab

neighbours' economies and just over 1% of the entire World's GDP. This, might be taken as motivation for international, regional, national as well as community directed initiatives, aimed at placing these countries' agricultural production and food processing activities on more sustainable and environmentally sound paths.

This might also be expected based upon comparison of GDP per Capita figures for ESMA countries, to those of the entire group of Arab countries, the world as well as selected country groups for the period 2018-2020. Thus, average values of ESMA GDP per capita figures fell at around:

- 72% of the average GDP per Capita for all the Arab countries;
- 63% of the average GDP per Capita for all the MENA countries;
- 59% of the average GDP per Capita for all countries around the world and
- 23% of the average GDP for the EU countries.

Given the state of their economies and wealth distribution, it is unlikely that the ESMA countries would be capable of providing considerable resources towards much needed overall development, research, technology transfer and even effective partnerships aimed at enhancing their agricultural and food systems. In other words, while it would be unwise to rule out some positive contributions to these systems by at least some ESMA governments, it would be somewhat imprudent to pin too much hope upon massive and positive changes

4. In Jordan, for example, only 2.7 percent of available land is currently arable.

5. With particular regard to the situation in Syria, no figures were available for 2020. However, it would be safe to assume that Syria's economy has witnessed severe regressions over the past decade and that things became even worse over the past 3-4 years.

in the near future. This would place international donors, local benefactors and capable civil society institutions at the forefront, with regard to financing reform of agricultural and food systems in the region.

Given the ESMA countries current situations, and while it is likely that local business enterprises might contribute limited resources, it would be essential to thoroughly examine such business initiatives; ensuring that they do not negatively affect small and medium sized actors. Since such initiatives would render such actors hostage to schemes that mainly benefit “the well-connected” business enterprises, while enhancing inequality and creating even more adverse conditions for food security.

2.1. FOOD IMPORTS BY ESMA COUNTRIES

Table (1) presents values of food imports by ESMA countries, their percentages relative to their GDPs and shares per Capita for ESMA countries, four of their closer neighbours, the World, the Arab and MENA countries. Food imports of the ESMA countries as a percentage of their GDPs range between a minimum of 0.58 % for Egypt as well as 8.10 and 9.68 %, respectively, for Palestine and Syria. Libya, Jordan and Lebanon occupy intermediate positions with their food imports in 2019 respectively estimated at 3.76, 3.08 and 2.86 % of their respective GDPs, while Morocco, Algeria and Tunisia occupied even lower positions, as they imported food products respectively equivalent to 1.69, 1.50 and 1.18 percent of their GDPs. As shown by Table (1), in 2019, on average the ESMA countries imported more than five times the world’s average as a percentage of their GDP. Additionally, with an average value of per capita imports estimated at US\$122, the ESMA countries food imports were around US\$45 higher than the average value for countries around the world.

Table (1); Food imports as percentage of GDP and share of food imports per Capita in ESMA countries, four of their neighbours and selected country groups (2019) ¹		
	Food imports as percentage of GDP	Food imports (US\$ per Capita)
Arab countries ²		
Algeria	1.50	62
Egypt	0.58	23
Jordan	3.08	127

3. FOOD SECURITY IN THE ESMA COUNTRIES

As shown by a variety of indicators, the ESMA countries are underperforming in a variety of key food security dimensions. Thus, according to a report published in 2021 by the United Nations Economic and Social Commission for Western Asia (UN-ESCWA) and the Food and Agriculture Organisation of the United Nations (FAO); wheat yields are a mere 50 percent of potential values.

Frame (1); Inequality in the Middle East

According to a 2018 study by the World Inequality Lab on available income and wealth data for fifteen countries in the region, including Egypt, Iran, the Gulf countries and Turkey, the Middle East is the most unequal region in the world. Estimates of income inequality in this region for the years 1990 to 2016 indicated that, during this period, 64 percent of the total regional income went to the top 10 percent of income earners in the Middle East, compared to 37 and 47 percent in Western Europe the United States, respectively. According to this study, regional income inequality in the Middle East is as high as in countries suffering acute income inequality, such as Brazil and South Africa. [2] Hence, it is to be expected that any further deterioration of ESMA economies would certainly be met with enhanced food insecurity for a larger proportion of their populations than would be expected elsewhere.

Additionally, access to wholesome food is hampered by high and increasing poverty, estimated at

close to 30 percent, of the region's population.⁶ [1] High unemployment, particularly among women and youth - at 20 and 26.5 percent, respectively, is certainly one of the factors in need of urgent attention. Conflicts and political instability renders these and other challenges even more menacing, particularly when compounded with climate change as well as poor infrastructures that persistently hinder food production and distribution. In effect, high levels of inequality among segments of a country's population have been shown to contribute to diminished food security in many ESMA countries.⁷ See Frame (1).

Addressing ESMA food security challenges is in need of fresh and far more innovative modalities than these countries have implemented over the past few decades. Key issues that ought to be urgently handled include:

- enhancing agricultural productivity through adoption of a host of novel/smart and tested technologies;
- ensuring greater cooperation with national and regional research facilities in order to address challenges posed by currently inadequate agro-food systems (security, safety, sustainable);
- reviving agricultural cooperative and enable their interventions through government and international support, easy credit facilities and more effective links to national and international cooperation programmes.

As indicated below, in section 5 which briefly tackles initiatives aimed at a better future, attaining tangible results on these fronts would require creation of fresh partnerships including a variety of actors while ensuring widespread benefits, with priority given impoverished and marginalised communities rather than the few wealthy and "connected," as has hitherto been the case.

4. AGRICULTURE IN THE ESAMA COUNTRIES

Comparing value added by agricultural, forestry and fishing (AFF) activities as a percentage of GDP in eight ESMA countries, to corresponding values for four of their close neighbours, the World and selected country groups over the past three decades, indicate significant declines by AFF activities in Egypt, Lebanon, and Palestine, between 1990 and 2020.⁸ On the other hand, Algeria and Syria witnessed significantly increased value added by AFF activities. However, it is highly likely that the increase in value added by agriculture, forestry and fishing, at least in Syria during the past decade, is linked to declining value added by other sectors in this country's economy due to the conditions that the country has been going through since 2011.⁹

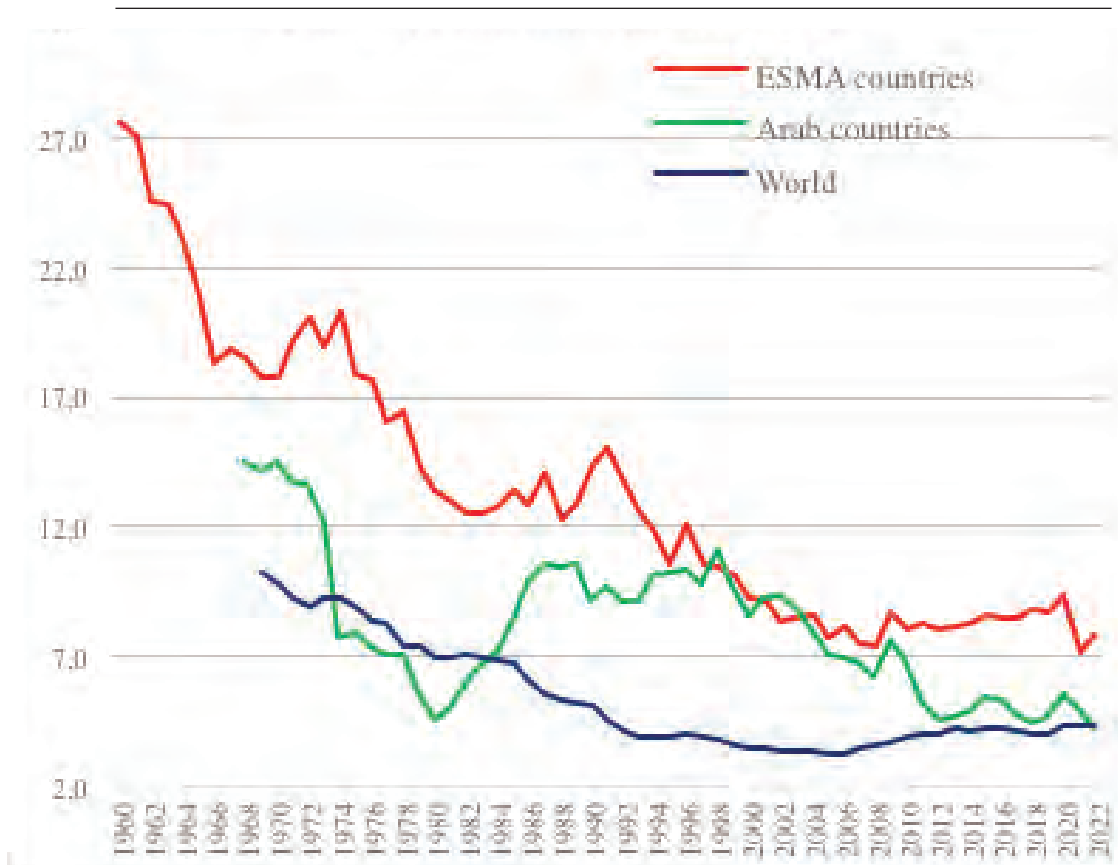
As indicated by Figure (1), value added as a percentage of GDP by AFF activities in ESMA countries declined considerably between 1960 and 2020 for all ESMA countries with the exception of Syria and to a much lesser extent Algeria. In the case of Egypt, for example value added by AFF activities during 1960 – 2020 went down from around 27.6 to 11.6% of the country's GDP. Tunisia and Morocco witness

6. Regional and world poverty rate estimates for 2018 were revised in April 2022 by a World Bank publication. [3] Figures for individual countries are not available, hence it is not possible to compute poverty rates for ESMA or the entire group of Arab countries. However, figures for the Middle East and North Africa might provide a reasonably close estimate. Based on data presented in this report and considering a poverty line of US\$1.9. Thus, around 7 percent of the population of this region, or 27 million persons are below the poverty line. These figures go up to around 20 percent and 60 million if a poverty line of US\$3.2 and go up further to 44 percent and 170 million, based on a poverty line of US\$5.5. 7. Values of the Gini coefficient for the ESMA countries, covering the period 1998-2019, indicate high levels of inequality for all ESMA countries.

8. It is mainly agriculture and, to a much lesser degree fishing, that contribute to value added here, as forestry activities are exceedingly limited throughout the region.

9. In the case of Syria, it is also likely that mass migrations from non-rural regions enhanced the proportion of AFF activities' contribution to GDP.

Figure 1; Value added by agriculture, forestry and fishing in the ESMA and Arab countries as well as the world



sed smaller recessions; of around 11% during 1965 and 2020. While in Lebanon, value added by AFF activities went down by more than 50 percent between 2000 and 2020¹⁰. In summary, taking all ESMA countries together with the exception of Syria value added by AFF activities went down by at least two percentage points between 1990 and 2020.¹¹

The importance of contributions by AFF activities to the socioeconomic welfare of ESMA economies is underlined by comparison of value added by these activities in these activities compared to their average contributions across the world. Thus, value added by AFF activities in the ESMA countries, with the exception of Syria amounted to 10.8 percent in 1990 against 5.0 percent for the entire world, and to 8.8 percent in 2019, against 4.0 percent for the entire world. Clearly, other contributions by AFF activities in social and food security terms go beyond mere economic feedback, which is highlighted by value added as a percentage of GDP.

Water scarcity is one of the major obstacles that face future AFF activities. Thus, precipitation across

10. It is also worth noting that value added by AFF activities as a percentage of GDP witnessed significant declines in ESMA neighbours, such as Turkey and Malta and throughout the world over the past few decades.

11. In comparison with other Arab countries, AFF activities provide much higher contributions to value added as a percentage of GDP. Thus, in 2019 value added by these activities in the ESMA countries, with the exception of Syria, amounted to around 8.4 percent as opposed to 4.7 percent for the entire group of Arab countries.

the ESMA countries is subject to high annual and seasonal variability, causing frequent droughts and severe problems for crop production and food supply stability. Nevertheless, ancient irrigation practices are predominant by almost all ESMA countries, while, scarce arable land and diminishing water supplies provide compelling reasons for the adoption of numerous innovations in order to ensure acceptable measures of self-sufficiency. Even more extreme conditions are expected as consequence of climate change, enhancing the need for novel approaches, with shared difficulties providing incentives for greater cooperation on several front, least of which is the exchange information and joint research targeting more effective irrigation methods. [5]

However, in targeting novel irrigation methods, based, for example, upon pressurized, drop and sprinkler systems, it would be essential to recognise the implications of enhanced energy requirements as well as carbon emissions. The intensification of agricultural activity in response to rising demand for food at affordable costs around the Mediterranean region, underscores the need for low cost, reliable, efficient irrigation systems that avoid the use of fossil fuels for groundwater pumping, within policy frameworks that recognize trade-offs between water saving, reducing CO₂ emissions and intensifying food production. Hence, effective irrigation methods for the future in the ESMA countries would need to maximise utilisation of solar and wind power for pumping and pressurised irrigation systems.

4.1. ESMA AGRICULTURAL AND FOOD POLICIES

Over the past two decades most ESMA countries did in fact formulate agricultural and food policies as well as strategies for their implementation. However, detailed reviews of such policies and strategies indicate numerous inadequacies; most prominently with regard to requisite statistical activities, follow up modalities, midcourse corrections and final assessments. Indeed, literature on this subject is replete with examples of policies and strategies that lack provisions for interim and final assessment of goals achieved as well as limited if any final evaluation modalities, indicating results attained, lessons learned and feedback for future action. The most plausible explanations of this state of affairs probably reside in lack of resources, political divisions as well as interventions seeking continuation of the status quo by powerful interest groups, including active food importers.

In effect, improved future policies and implementation strategies would have to rest upon detailed analysis of the water, food and energy needs as well as subsequent pollution across all ESMA countries. Such analysis would naturally require considerable field as well as laboratory research activity, for which many of the countries in the region appear to be ill-prepared, calling for greater international as well as more effective intra-regional assistance and cooperation. The fact that continued failings due to inadequate policies would result in undesirable outcomes for the entire Mediterranean basin should provide a strong impetus for adoption of novel and more effective collaboration on many issues, with agricultural and food systems at the forefront.

Statistical studies and subsequent research on freshwater resources and on the distribution of sectoral water uses around the Mediterranean region emphasise the close relationship between water resources management and land-use management key to integrated sustainable and rational water use. Additionally, all available indicators point to the need for ESMA countries to adopt novel development policies and implementation strategies aimed at:

- Improved governance, with particular regard to agricultural production and food systems;
- More effective interactions between research and society, including entrepreneurs and innovators;
- Fresh modalities for the transfer, adaptation, adoption and sharing of relevant technologies on many fronts;
- Steady progress towards the millennium's sustainable development goals (SDGs).

There is no doubt that the development and implementation of such strategies will face numerous challenges. First among which are low resource levels. Secondly, with regard to adoption of innovative technologies, there are numerous problems due to inadequate means for healthy interaction between research centres and technology adaption and development facilities, on the one hand, and beneficiaries from their travails, both public and private, on the other. Clearly, such interaction is of the essence for positive socioeconomic development while adhering to norms that ensure quality standards, effective utilisation of available resources and sharing of benefits reaped in the process.

At any rate, initiatives aimed at ensuring better futures for AFF activities would need to be carried out while ensuring close collaboration among all concerned parties, including research organisations, small and medium enterprises, local and central authorities as well as national and regional non-governmental organisations (NGOs) and programmes supported as and where needed by the international community. Additionally, future initiatives would need to be designed in a manner that promotes income generation for the deprived masses in marginalised and impoverished communities, before profits for the wealthy few.

5. INITIATIVES FOR A BETTER FUTURE

While agricultural and food production systems in many, if not all ESMA countries, are fraught with numerous problems, it is well to indicate that some initiatives are being launched with the aim of improving current practices, particularly in aid of small- and medium scale farmers and food processors. Nevertheless, considerably greater investments and fresh partnerships will be essential for training programmes and attaining improved extension services, enabling adoption of novel AFF practices that embody novel and smart technologies.

Among grassroots training platforms, the Ghaletna Project in Lebanon,¹² provides local families with seedlings and agriculture training to improve self-sufficiency.

However, in order to meet challenges that face impoverished communities far more is needed with municipalities, cooperative, experts and the private sector fostering greater awareness and providing adequate training with specific AFF technologies that allow higher yields, safer products and greater sustainability. [6]

Along similar lines, a farming initiative was launched in a municipality near Bethlehem reacted to surging unemployment and poverty rates by distributing various herb and vegetable seedlings for residents to plant in their backyards. [7] Based on the success of this initiative, the Palestinian Agriculture Ministry went on to distribute over one million seedlings, while the Applied Research Institute in Bethlehem (ARIJ) contributed 40,000 seedlings as well as helped provide advice on basic techniques and equipment. The lack of access to land encouraged the community of refugee and displaced to take up gardening initiatives, helping them build planting boxes and miniature greenhouses in order to be able to grow crops throughout the year. In effect, home gardens enable impoverished communities of basic sustenance.

Nevertheless, current initiatives aimed at improving agricultural and food processing (AFP) activities fall far short of models now being targeted by several developing as well as developed countries, including the Quadruple Helix and Live Lab approaches, which are briefly discussed below. [9]

12. "Ghaletna" initiative was launched in 2020 with the intention of disseminating modern farming techniques and delivery of surplus yields to families in need. The word "Ghaletna" is Arabic for our crop. [7]

5.1. NEW MODELS FOR ESMA AGRICULTURAL AND AGRO-FOOD PROCESSING SYSTEMS

Models for creating, sharing and implementing knowledge ought to strengthen and reinforce partnerships and networking at various levels, overcoming cultural and geographical/territorial boundaries and creating novel innovation cultures. Adoption of “open” models that involve all the actors of targeted ecosystems, as in the Quadruple Helix and Living Lab approaches [9], whereby people of all ages and socioeconomic backgrounds would need to be placed as top priorities. The design and implementation of such models would require research efforts aimed at:

- In-depth analysis of current innovation activities and identifying measures aimed at overcoming their limitations;
- Development of effective tools for improving cooperation among all community actors and beneficiaries and not just research facilities and national/local enterprises. [9]

Steps taken in both directions would greatly benefit from active involvement of the widest range of potential stakeholders within the entire Mediterranean innovation ecosystem.

Despite the normative view that collaborations within Quadruple Helix and Living Lab initiatives among government, academia, industry and civil society are prescribed for enhancing the uptake of agricultural and food processing innovations, there is scarce knowledge of what might sustain such collaborations from the perspective of stakeholders with varying agenda items. In order to address this knowledge gap, it would be essential to acquire clear understanding of the expectations as well as the perceived benefits and challenges of such collaboration, at the very outset.

Managing collaboration initiatives embedded within Quadruple Helix and Living Lab models by ESMA countries would need to be guided by policies that bridge gaps between expectations and actual goals attained upon implementation; thereby ensuring optimal stakeholder satisfaction and sustainable collaboration. [8] It goes without saying however, that such policies may not be formulated and implemented before radical changes have been made towards good governance.

6. CONCLUDING REMARKS

Unlike other countries around the Mediterranean, Eastern and Southern Mediterranean Arab (ESMA) countries have had more than their fair share of autocratic governments, dictatorships and internal as well as regional conflicts. Together with a heavy heritage of consecutive colonial eras and extremist religious movements, their past has left deep marks on all aspects of economies and societies, impeding much needed changes on numerous fronts. Actions taken by ESMA countries over the past decade with regard to meeting challenges faced by their underperforming agricultural and food sector may be summed up as “too-little-too-late.”

Among challenges facing food and agriculture in the developing world; listed in a 2017 report by the Food and Agriculture Organisation of the United Nations [10], the following in particular ought to be met by ESMA countries through initiatives aimed at:

- Improving agricultural productivity to meet rising demand and deteriorating environmental condition due climate change and intensification of natural hazards;
- Building sustainable natural resource bases, with particular regard to soil quality as well as adequate and unpolluted water for irrigation;
- Ensuring that improvements are available to all citizens, thereby eradicating hunger and malnutrition;
- Rendering food systems more efficient, accessible and resilient;

- Enhancing income earning opportunities in rural areas and addressing the root causes of migration to urban centres;
- Building resilience to protracted crises, disasters and conflicts;
- Preventing transboundary threats to emerging agricultural and food systems. [10]

Clearly, very few of the above recommendations may be implemented without adoption of novel and proven technologies and innovative inputs as well as dedication of adequate resources, embarking upon more effective regional and international collaboration ventures than has been the case for so many decades. Additionally, devoid of good governance at every juncture within agricultural and food systems, it is more than likely that things may get much worse than they have been so far.

With particular regard to science, technology and innovation (STI) inputs designed to improve the performance of agriculture and food systems, it is well to keep in mind that serious challenges currently face all ESMA, as well as other Arab countries. In effect, the capacity of STI systems in the region for addressing inclusive and sustainable development goals are still woefully insufficient. In this respect, it would also be well to keep in mind that STI activities and related inputs are not mere commodities to be purchased. Rather, to be truly useful, STI capabilities need to be acquired, adapted to local needs and further developed as needed in a manner that reflects positively on the status and future prospects for Arab societies (Bizri and Hamze, 2020).

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CHANGING THE ROUTE: IMPROVING THE APPLICATION OF ONE HEALTH IN THE FRAMEWORK OF MEDITERRANEAN FOOD SYSTEMS

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ABSTRACT The holistic approach to global food problems results from a higher epistemological attention to the interconnectedness of anthropogenic and environmental phenomena. The concept of One Health advocated by the United Nations, while on the one hand encouraging policy actors to address global food issues according to the same holistic approach, balancing the health of people, animals and the environment, on the other hand may remain unclear when it comes to taking practical political decisions. Looking at the current context of the Mediterranean area, the scientific literature agrees that the peoples of the region are in a state of post-nutrition, where the prevalence of under-nutrition phenomena is dangerously overshadowed by overweight, obesity, and non-communicable chronic diseases. The reasons behind are multiple and densely intertwined: environmental reasons (droughts, biodiversity loss, pollution), geopolitical reasons (conflicts and retaliation), socio-economic reasons (inequalities, demographic crises), etc. By interrogating the conjunction of the aforementioned issues, the article aims to motivate the need for a change of route in order to better apply the concept of One Health in the context of sustainable food systems in the Mediterranean area. On these bases, the article dwells on some practical choices that can bring the region's institutional actors closer to the desired change, such as adopting territorial policies aimed at re-establishing the urban-rural linkage, adhering to pluralist models of the Mediterranean Diet, creating and supporting "farmers' markets", investing in applied research and technical experimentation related to local, sustainable and innovative food patterns.

Keywords One Health – Mediterranean Diet – sustainable food systems

CHANGER DE ROUTE : POUR UNE MEILLEURE APPLICATION DE ONE HEALTH DANS LE CADRE DES SYSTÈMES ALIMENTAIRES MÉDITERRANÉENS

RÉSUMÉ L'approche holistique aux problèmes alimentaires mondiaux résulte d'une plus grande attention épistémologique à l'interconnexion des phénomènes anthropogéniques et environnementaux. Le concept One Health prôné par les Nations Unies, s'il encourage d'une part les acteurs politiques à aborder les problèmes alimentaires mondiaux de manière holistique, équilibrant ainsi la santé des personnes, des animaux et de l'environnement, suscite d'autre part l'incertitude lorsqu'il s'agit de prendre des décisions politiques pratiques. Si l'on examine le contexte actuel de la région méditerranéenne, la littérature scientifique reconnaît que la région se trouve dans un état de transition post-nutritionnelle, où la prévalence des phénomènes de sous-nutrition est dangereusement couverte par le surpoids, l'obésité et les maladies chroniques non transmissibles. Les raisons en sont multiples et étroitement imbriquées : environnementales (sécheresses, perte de biodiversité, pollution), géopolitiques (conflits et rétorsions), socio-économiques (inégalités, crises démographiques), etc. En interrogeant la conjunction des questions susmentionnées, le chapitre vise à motiver la nécessité d'un changement d'itinéraire afin de mieux appliquer le concept de One Health dans le contexte des systèmes alimentaires durables dans la région méditerranéenne. Sur ces bases, le chapitre s'attarde sur certains choix pratiques qui peuvent rapprocher les acteurs institutionnels de la région du changement souhaité, à savoir : l'adoption de politiques territoriales visant à rétablir le lien urbain-rural, l'adhésion à des modèles pluralistes de régime méditerranéen, la création et le soutien de "marchés de cultivateurs", l'investissement dans la recherche appliquée et l'expérimentation technique liée à des modèles alimentaires biodiversifiés, durables et novateurs.

Mots-clés One Health – Diète méditerranéenne – Systèmes alimentaires durables.

1. INTRODUCTION TO ONE HEALTH. FROM PLURALISM TO RE-COMPOSITION ¹

"There is no common world. One must compose it." Recalling the pluralist pragmatism theorized by the famous American psychologist and philosopher William James, these words of Bruno Latour help

1. Special thanks to Marinella Giannelli, Policy Officer (CIHEAM Bari) and Andrea Guida, Junior Expert (CIHEAM Bari), for their helpful contribution in the writing of this paper.

to understand the conceptual basis of ecological thinking and its possible transliterations into the crucial areas of contemporary living, first and foremost the food sector (Latour, 2011). A thinking that draws on two fundamental ontological assumptions to give rise to a practical-political conclusion. First assumption: existence is studded with a multiplicity of subjectivities, cultures, ideologies, opinions, feelings, passions and religions. Second assumption: the relationships that are created among the subjectivities that inhabit these “living – material as well as spiritual – worlds” are not necessarily peaceful, but rather can be – and in fact are – conflicting or at least inconsistent. Hence the eminently practical and political conclusion of ecological thinking: if the existent is multiple and often contradictory, peaceful synthesis among its elements is far from an ineluctable outcome. Instead, the pacification of existing presupposes an effort, a willingness, an operation to “recompose” plurality not around a single entity, but within a system of peaceful coexistence and mutual benefit. Does not recomposing the plurality of existing mean to take a holistic perspective in the face of the interconnectedness of anthropic and environmental phenomena, the concatenation of the needs of human societies with those of animal, plant and even robotic societies? And so, shifting the discourse to the topic of food security, is it fair to ask how is it really possible to ensure human access to healthy food without at the same time safeguarding the biodiversity of the animal and plant systems that coexist with the former?

The idea of a deep interconnectedness of human, plant and animal systems has had an ever-increasing place in the way contemporary political institutions have interfaced with the phenomena of our time. Efforts by national and international institutions are increasing precisely due to a deeper awareness of decision makers over the inadequacy of particularistic interests to meet global challenges. Recently, this view was reiterated by UN Secretary General Antonio Guterres in stark words addressed to the member states of the General Assembly: “Now we are rapidly moving toward a multipolar world. This is, in many ways, positive. [...] But multipolarity alone cannot guarantee peace,” and also “We cannot effectively address problems as they are if institutions do not reflect the world as it is,” he said in his September 19, 2023 address.²

And just as, in line with what has been theorized by ecological thinking, international institutions have noted the problematic nature of the plurality of the existing, in the same way they have endeavored to equip themselves with a holistic approach in order to operate a “re-composition” action. One example among all is the emergence of the “One Health” principle. First introduced in the medical-epidemiological field, as early as the 1960s and again in the 2000s, to indicate the multidirectional interaction of the spread of diseases between humans and animals, this principle was later reworked by the United Nations agencies (the Food and Agriculture Organization - FAO, the United Nations Environment Programme - UNEP, the World Health Organization - WHO, and the World Organization for Animal Health - WOAH). As specified by the One Health High-Level Expert Panel (OHHLEP, 2022), the expert body formed in 2021 by the four aforementioned agencies to provide technical advice and guidance useful for the full implementation of the One Health principle, the latter is to be understood as “an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals, and ecosystems. It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and interdependent” (Adisasmito et al. 2022). Again: interdependence and unification, pluralism and re-composition.

2. Secretary-General’s address to the General Assembly. 19th September 2023. Available online at: <https://www.un.org/sg/en/content/sg/speeches/2023-09-19/secretary-generals-address-the-general-assembly>.

The issue of food security is the focus of some of the major efforts made by the international community to fully implement the One Health principle. Indeed, the One Health Joint Plan of Action 2020-2026, signed by the four agencies that make up the OHHLEP, has as one of its priority objectives to “Promote awareness, policy changes and action coordination among stakeholders to ensure that humans, animals and ecosystems achieve health and remain healthy in their interactions with and along the food supply chain” (FAO et al. 2022). In keeping with the pragmatic spirit that accompanied the theoretical and then normative formulation of the goal just enunciated, the 3rd World Conference on the Revitalization of the Mediterranean Diet convened in the fall of 2022 at CIHEAM Bari to make a technical and scientific contribution to ongoing efforts aimed at addressing food security issues in the Mediterranean macro-region. Specifically, Session 11 (“SFS as a trigger for One Health to promote resilience and sustainable growth in the Mediterranean and beyond”) of the conference focused on the issue of effective application of the One Health principle within the food framework of the Mediterranean basin, trying to answer two major questions: *What is the current scenario of the food situation in the Mediterranean region? What initiatives, in science as well as in policy, would make it possible to counteract the factors that undermine the region’s food health, and thus bring about a more effective application of the One Health principle within Mediterranean systems?*

2. THE ENVIRONMENTAL, GEOPOLITICAL AND SOCIOECONOMIC FACTORS BEHIND THE FOOD IMPASSE IN THE MEDITERRANEAN

What is the current scenario of the food situation in the Mediterranean region? This was the first question that guided the discussions in the panel “SFS as a trigger for One Health to promote resilience and sustainable growth in the Mediterranean and beyond”. The answer: the current food situation of the populations living in the area corresponds to a “post-nutrition transition state” scenario. As elaborated by Popkin (2006), the post-nutrition scenario is the concluding pattern of a linear process that began from a food context in which agriculture was underdeveloped and famine was more or less widespread, and passed successively through rapid growth of the agricultural sector and economies, with sometimes explosive acceleration of lifestyles and food consumption.

This acceleration comes in the form of a situation in which the prevalence of under-nutrition (wasting, food insufficiency and underweight) and micro-nutrient deficiencies is dangerously overshadowed by the prevalence of overweight, obesity and non-communicable food-related chronic diseases (post-nutrition transition state, precisely). In itself, the process is not limited to the Mediterranean area, but has been and continues to be global in scope, occurring in cases of rapid and uneven economic growth of low-income national economies. However, as Popkin and Ng (2022) further explain, only by focusing on a local dimension is it possible to identify the specific factors that have intervened to push a specific region toward a particular nutrient pattern.

Concerning Mediterranean populations, in the face of access to healthy food precluded to at least 40 percent of urban residents (UN, 2018), it is recorded that most deaths due to Non-Communicable Diseases are associated with cardiovascular diseases that are associated with risk factors such as diabetes, smoking, high blood pressure, high BMI, stress, high cholesterol levels, poor nutrition, and insufficient physical exercise (Al-Jawaldeh and Abbass, 2022). A dense web of issues underlies such a “post-nutrition transition state” scenario, from environmental to geopolitical, to socio-economic ones:

A) Environmental issues. The overexploitation of natural resources is accompanied by the adverse effects of climate deterioration, resulting in water shortages, desertification, drought, loss of biodiversity,

uncontrolled urbanization and marine pollution. The areas that make up the Mediterranean region, however, are not all affected equally by environmental phenomena. Regarding drought in particular, the average reduction in rainfall is expected to remain constant at around 4 percent in northern coastal countries, but around 27 percent in southern and eastern ones (Mombiela, 2010). As an example, the severe droughts that hit Syria, especially in the northeastern regions, between 2007 and 2009 severely tested the resilience of the local agricultural sector, with major impacts on both food availability and socio-political stability in the region. In similar cases, although there is no unanimity in recognizing a linear causality between environmental phenomena and political crises, scholars increasingly agree in identifying a strong relationship between the adverse effects of climate change and the episodes of severe famine that may fuel instability (Eklund et al., 2022). Finally, alongside long-term environmental processes, catastrophic events of an episodic nature contribute to exacerbate the scarcity of resources in some areas of the macro-region, as recent events in North Africa testify.

B) Geopolitical issues. Civil conflicts and political instability continuously affect the Mediterranean basin, not least in the Southern and Eastern shores. But it is exceedingly important, especially in the present context, to recall the geopolitical dynamics that contribute from outside to foment imbalances endogenous to the Mediterranean, with heavy impacts on the food security of populations. Among these dynamics, the war between Russia and Ukraine has certainly played a major role. As a result of the so-called “special operation” launched by Moscow on February 24, 2022, in fact, grain trade flows that were usually exported from the two Eastern European countries to Southern Europe, North Africa and the Middle East have suffered a serious setback.

The supply of these primary resources, already made difficult by recent global inflationary spirals, has been only partially cushioned by the trade agreement signed between the two warring parties, an agreement that has not been renewed since July 2023. The countries of North Africa and the Middle East (MENA) may be affected by these developments, since although they represent only 4 percent of the world population, they account for 30 percent of world wheat purchases, with half of that percentage coming from imports from Ukraine and Russia before the war (Abis and Demurtas, 2023).

To be sure, a direct link between the outbreak of war in Ukraine and worsening food security in the Mediterranean and Africa is yet to be proven. However, the literature seems to agree that the most recent international tensions and conflicts tend to fuel inflationary spirals, resulting in difficulties for the most vulnerable consumers to have access to food of high nutritional value (Welsh, 2023). Similarly, the spiral of violence that hit Palestine and Israel in October 2023 heightens further concerns about the geopolitical risks intrinsic to food security in the area.

C) Socio-economic issues. From a socio-economic perspective, that of the Mediterranean region is now defined as a multilayered context of “inequalitarian drift.” On the one hand, divergences in the historical development trajectories of the sub-regions has given rise to a fundamental demarcation between a more prosperous and advanced Northwestern shore and a less developed and often backward Southeastern one, however imperative it is to point out how increasing levels of inequality have indiscriminately touched the two shores over the past fifteen years.

Consider, for example, that 37 percent of the entire population lives in Portugal, Spain, France and Italy, and that these countries produce 70 percent of the whole gross product and consume 60 percent of the total commercial energy of the whole Mediterranean region (Daniele and Malamina,

2019). At the same time, important inequalities can also be observed at the intra-regional level, with wealth concentration in the hands of the richest 20 percent of the population at medium to high levels compared to the world average of 57 percent—for example, with a 32 percent in Morocco and at 24 percent in Slovenia (ibid.).

Finally, worsening the overall picture are the strong demographic imbalances across the macro-region, which run the risk of entrenching the current inequalitarian drift when followed by mass migration flows. Thus, high rates of urbanization (60 percent; EU, 2023) and youth unemployment (between 30 and 40 percent; ILOSTAT, 2023) are echoed by the depopulation of rural areas and the loss of citizens' purchasing power.

The intertwining of the environmental, geopolitical and socio-economic issues just summarized, underlying the “post-nutrition transition state” observed in the Mediterranean basin, makes the application of the One Health principle a highly ambitious objective. As such, according to what was agreed in Session 11 of the 3rd World Conference on the Revitalization of the Mediterranean Diet, a real “change of route” on the part of institutions would remain unthinkable without preserving, in the decision-making fora, the same holistic approach adopted during the problem analysis phase.

3. ELEMENTS OF A CHANGE OF ROUTE TOWARDS SUSTAINABLE FOOD SYSTEMS IN THE MEDITERRANEAN

What initiatives would make it possible to counteract the factors that undermine the region's food health, and thus bring about a more effective application of the One Health principle within Mediterranean systems? Session 11 of the Conference tried to answer the above question by proposing a series of interventions and actions that, revolving around a “re-composition principle” such as the revitalization of the Mediterranean Diet, would allow safeguarding the plurality of subjectivities currently coexisting within the food systems of the macro-region. Interventions and actions in both the scientific and policy spheres that, anchored in the goal of revitalizing the Mediterranean Diet, can act to protect not only the health of the individual taken individually (a), but also the health of human societies as a whole (b) and of animal and plant societies (c), with a view to a fuller implementation of the concept of One Health.

A) Health of the individual. The high beneficial value of the Mediterranean Diet for the health of individuals is widely documented in the relevant literature. Recently, Muscogiuri et al. (2022) highlighted how it is “the healthiest dietary pattern available to prevent several non-communicable diseases, including cardiovascular disease and type 2 diabetes”. Its composition, indeed, positively modulates the gut microbiota and immune system, significantly decreasing inflammation mediators, common ground for many obesity-related disorders. As an example, Cariello et al. (2020) found that consumption of Extra-virgin olive oil could be an adjuvant nutritional-therapeutic option to decrease inflammatory bowel diseases.

The valorization of the breakthroughs achieved in the medical field has resulted in great steps forward in the direction of increasing institutional recognition of the Mediterranean Diet, as evidenced, moreover, by its inscription on UNESCO's Intangible Cultural Heritage of Humanity list in 2010. Further and continuous efforts in the dissemination of scientific knowledge remain unavoidable, however, especially considering the high degree of influence that globalized diets, which are poorly nutritious and often harmful, exert on food consumption habits. In parallel, nutrition education must be complemented by accompanying the consumer within a social and economic system that encourages the adoption of healthy eating habits, as the next point illustrates.

B) Health of human societies. Bringing consumers closer to healthy eating habits inherent in the Mediterranean Diet cannot be separated from supporting an economic and social functioning system that is also healthy. As noted in Section 2, at the root of the “post-nutrition transition state” that characterizes contemporary Mediterranean societies are in fact dynamics of strong economic inequality. These dynamics are embodied in the exodus from rural to urban areas, as well as in the overpopulation of cities and the resulting phenomena of unemployment, poverty and worsening sanitation.

On the contrary, choosing to adopt the Mediterranean Diet also as a social and economic regulatory principle means enhancing the resources offered by individual territories. In other words, it means breaking down the invisible barrier that has been created between city and countryside: revitalizing the latter to give vitality to the former (UNSCN, 2020). A very concrete and effective model in this regard today is provided by “farmers’ markets”, a reality that CIHEAM Bari is committed to supporting and spreading with the endorsement of the World Farmers Markets Coalition. Farmers markets work as a fundamental bond of city and countryside since they act in two directions: on the one hand, they bring communities and individuals closer to healthy and sustainable food consumption, made of local and certified products. On the other hand, they bring work populations closer to the often-forgotten income opportunities that the territory of their respective rural areas can offer. The end result, in full accord with the One Health principle, is a holistic response to the socially understood problem of food security: a community that chooses to stay in its territory because it benefits from an economic, cultural, and nutraceutical point of view from adopting the Mediterranean Diet.

C) Health of animal and plant ecosystems. Finally, a greater inclination toward a food production and consumption system that is anchored in the Mediterranean Diet is highly convenient for the health of animal and plant ecosystems. This is so since the Diet itself, in order to retain its nutraceutical value, must rely on natural systems that are as diverse as possible. From this point of view, the research sector, especially when applied to technological innovation, can make a decisive contribution at least in two ways: by protecting present biodiversity and by recovering biodiversity that has been lost over time. In the first case, as mentioned in Section 2, the Mediterranean region is facing an intensification of climate change-related phenomena that aggravate ecosystem conditions, including drought. However, some recent efforts in science and technology have indicated possible avenues for the creation of water resource harvesting systems in arid areas, for their more efficient use, as well as for reuse (Katerji et al., 2008).

In the second case, speaking of rediscovering biodiversity, a very advanced branch of applied research in the food sector is engaged in promoting the identification of local ancestral crops that have been lost due to recent globalization processes, the so-called “neglected under-utilized crops” (Talabi et al., 2022). The rediscovery of crops such as the moringa plant in the Sahel region, for instance, can have significant value in terms of food security, biodiversity, environmental adaptability and sustainability, but are often neglected or underutilized due to various factors, including lack of research and development, limited commercialization, or preference for more traditional crops. Promoting research for the development and use of neglected crops is important to harness their potential for food, nutrition and agricultural sustainability, and to generate income opportunities among local communities, especially in regions of the world that can benefit from crop diversification and adaptation to changing environmental conditions.

4. CONCLUSIVE REMARKS

The practical interventions proposed in the preceding sections summarize some effective attempts to purposefully address the intertwined socio-economic, environmental, and political issues that underlie the perilous food status of Mediterranean people.

In addition to supporting such interventions, so as to broaden their scope and enable their continuous updating, the national and international policy-making community is called upon to coordinate their wills in a constant and shared manner, so as to preserve the coherence of the efforts made in support of increasingly sustainable food systems in the Mediterranean. From this point of view, seeking to recall one last time the holistic “re-composition” approaches that were briefly summarized in the introductory section of the paper, it may be useful to mention, as a concluding remark, the conceptual model of the “Human Pole” promoted by CIHEAM Bari. The Human Pole approach, in fact, while based on the recognition of the multidimensionality and intertwining of the causes of food insecurity, identifies the human figure, understood at both the individual and collective levels, as the actor best entitled to transform, according to a holistic perspective, an interweaving of problems into an interweaving of virtuous dynamics. The human being, in other words, can be seen no longer as a potential source of instability for ecosystems, but as a lever of a re-composition and rehabilitation of social, political and environmental fractures of which, including in the Mediterranean region, that of food insecurity is only one of the possible manifestations.

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PROMOTING FOOD SECURITY IN THE MEDITERRANEAN THROUGH INTEGRATED LAND USE PLANNING AND SUSTAINABLE MANAGEMENT OF LAND AND WATER RESOURCES

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ABSTRACT The Mediterranean population will triple by 2025 compared with 70 years ago. On the other hand, land and water resources have reached their limits, and there is little or no scope to expand cultivation to new croplands. The region continues to feed its people largely through imports, making it vulnerable to global markets and international conflicts such as the war in Ukraine. It is therefore vital that the Mediterranean region, and North Africa and the Middle East in particular, take steps to conserve the limited natural resources such as land and water and to promote their sustainable use and management. This is possible through the implementation of policies that support such actions. Other actions include integrated land use planning, and environmentally friendly agricultural practices such as climate smart, regenerative agriculture, and organic farming. Experience shows that there are many good examples of sustainable land and water management throughout the region. These need to be widely disseminated and replicated following the experience of the Soil Deal for Europe mission, which promotes the establishment of Living Labs and Lighthouses as places for research, communication, and replication. With the goodwill of all the stakeholders and political support, the region has the capacity to change route and make food security a cornerstone of its policies for many years to come.

Key words Ecosystems, food security, climate change, resource management, population pressure

PROMOUVOIR LA SÉCURITÉ ALIMENTAIRE EN MÉDITERRANÉE PAR L'AMÉNAGEMENT INTÉGRÉ DU TERRITOIRE ET LA GESTION DURABLE DES TERRES ET DE L'EAU

Résumé La population méditerranéenne va tripler d'ici 2025 par rapport à ce qu'elle était il y a 70 ans. Toutefois, les ressources en terre et en eau se raréfient et il est donc difficile, voire impossible, d'étendre les cultures sur de nouvelles surfaces. La région continue de nourrir sa population principalement grâce aux importations, avec pour effet une grande vulnérabilité face aux marchés mondiaux et aux conflits internationaux, tels que la guerre en Ukraine. Par conséquent, la Méditerranée dans son ensemble et la région de l'Afrique du Nord et du Moyen-Orient en particulier doivent impérativement s'engager dans des actions visant à préserver les ressources naturelles déjà limitées et à promouvoir leur utilisation et leur gestion durables. Cela implique la mise en œuvre de politiques de soutien à ces actions. D'autres interventions peuvent aussi être envisagées, à savoir l'aménagement intégré du territoire et des pratiques agricoles respectueuses de l'environnement, notamment l'agriculture climatique intelligente, l'agriculture régénératrice et l'agriculture biologique. L'expérience montre qu'il existe de nombreux exemples efficaces de gestion durable des terres et de l'eau dans toute la région. Ils doivent être disséminés et répliqués à grande échelle en suivant l'expérience de la mission « Soil Deal for Europe » qui encourage l'établissement de laboratoires vivants et de phares comme lieux de recherche, de communication et de réplique. La région pourra changer de cap et faire de la sécurité alimentaire la pierre angulaire de ses politiques pour les années à venir, à condition que tous les acteurs concernés fassent preuve de bonne volonté et bénéficient du soutien politique nécessaire.

Mots-clés Écosystèmes - Sécurité alimentaire - Changement climatique - Gestion des ressources - Pression démographique.

1. INTRODUCTION

Land degradation and desertification are considered major threats for the present (Geason, et al., 2003) and the future (Daliakopoulos et al., 2017) of Mediterranean arid and semiarid agro-ecosystems. Long-term anthropogenic pressure on forest (Baeza et al., 2007) and agricultural lands (Santana, et al., 2010; Kosmas et al., 2015) combined with abiotic factors such as high topographical and climatic

variability (Scarascia-Mugnozza, 2000), but also, frequent extreme events such as fires, floods and droughts (Buma et al., 2011; Zdruli, 2014) create an uncertain and unstable living environment which has been demonstrated to increase poverty and force domestic and even cross-border migration (Weinthal et al., 2015).

Together with land degradation, climate change threatens the biological systems (Rosenzweig, et al., 2008) and the natural resources that sustain agriculture and forests, such as water and soil (Gerber et al., 2013). The global trend of accelerated dryland expansion (Koutroulis et al., 2019) and shifting of large portions of land to a dryer climate (Sherwood et al., 2014) is well documented, and especially for the Mediterranean climate change hot-spots. Climate model projections indicate a high level of susceptibility to water stress (Ludwig et al., 2011) with a corresponding increase of drought frequency and intensity (Dai, 2012) eventually leading to a dryer climate as shown also by regional climate models (RCMs) that have demonstrated an evolution of the Mediterranean region towards an arid (Figure 1) climate (Allam et al., 2020).

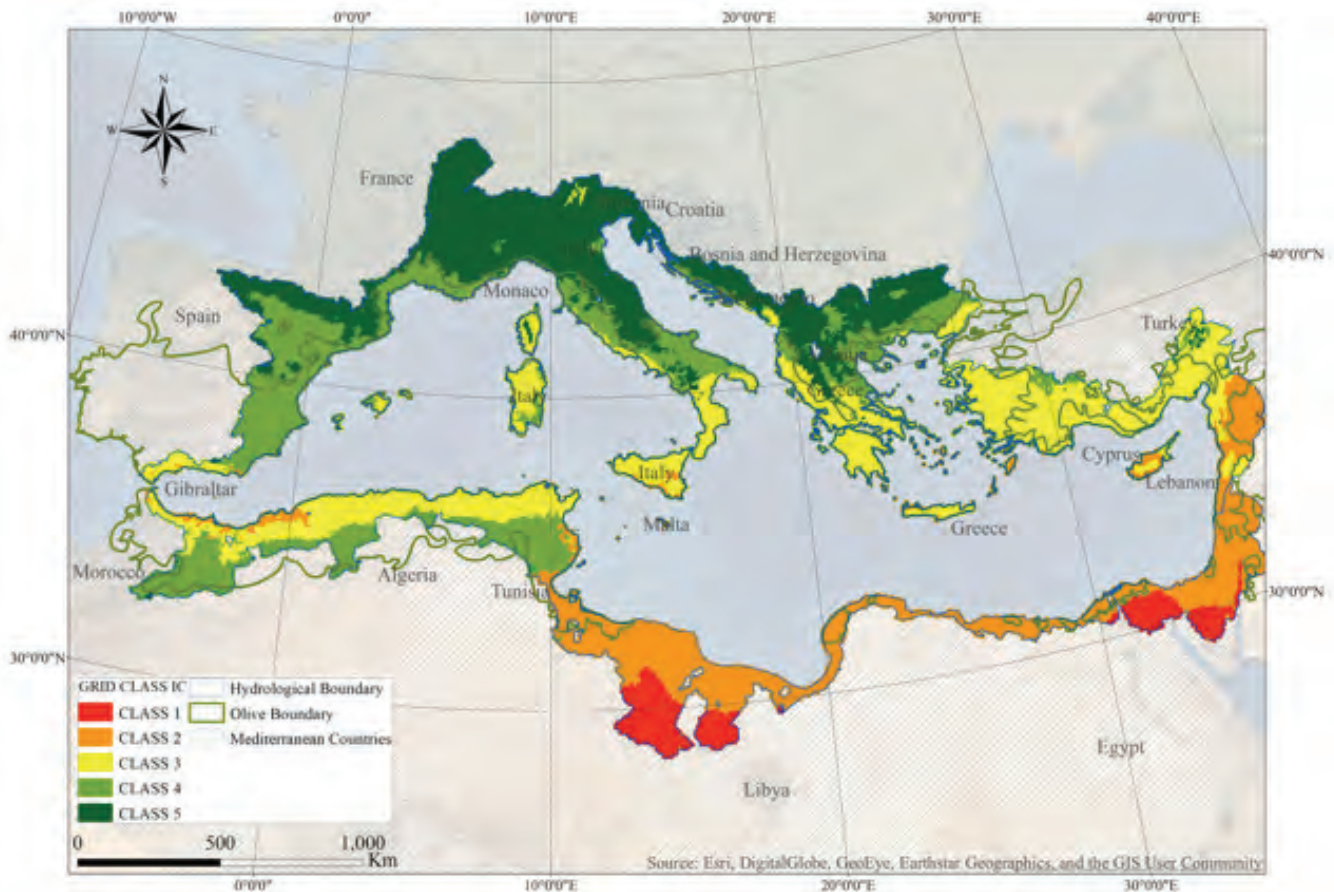


Figure 1. Distribution of dry and wetter areas in the Mediterranean based on gridded indices using WordClim-2 monthly data. Source: Allam et al., 2020 (Class 1 is the drier and Class 5 the wetter).

In addressing these human- and climate-induced threats, deeper scientific knowledge and better environmental monitoring allows the scientific community to improve their assessments of the status

of drivers (Koniak et al., 2011) and trends (Pausas, et al., 2009) in land degradation and desertification, and to propose innovative sustainable land and water management (SLWM) solutions and ecosystem restoration actions. Nevertheless, to sustainably restore degraded land and soil and to eventually achieve Land Degradation Neutrality (SDG 15.3), the key is to make solutions not only effective from an environmental point of view, but also socially acceptable and economically viable (Daliakopoulos et al., 2019). Remaining knowledge gaps, coupled with socio-economic barriers and suboptimal policies, hinder affected communities in adopting - and stakeholders from investing in - good land management and restoration practices (Cerdà et al., 2018) that will allow local ecosystems to continue supporting their livelihoods. Participatory assessment, exploration and bottom-up implementation can support new knowledge and a deeper level of learning of the participating actors by contextualizing the existing knowledge on good practices.

Such transformative learning is required to reform the current approaches of land management to a climate-smart, sustainable, and integrated resource management (Lotz-Sisitka et al., 2017). A new generation of Information Communication Technology (ICT) tools can be applied to foster strategic decision making for water (Micotti, et al., 2014) and land management, integrating spatial big data analysis (Carbonneau et al., 2020), indicators, models, and visual analytics tools into multi-actor platforms (Munoz et al., 2015) where shared solutions can be easily identified and implemented, and their impacts monitored in time and space.

All the above cannot be achieved without investing and improving land and water management and through the implementation of policies that support sustainable land use planning and resource management. These aspects will be addressed in the following sections.

2. INTEGRATED LAND USE PLANNING AND SUSTAINABLE LAND MANAGEMENT AS A LEVERS OF FOOD SECURITY IN THE MEDITERRANEAN

Land and water resources are central to agriculture and rural development and are deeply and intrinsically linked to the Mediterranean regional challenges of food insecurity and poverty reduction, as well as to rapid urbanization trends and climate change adaptation and mitigation. Furthermore, the degradation and depletion of natural resources, all of which affect the livelihoods of almost 300 million people in the region are paramount indicators to consider.

In the past 70 years, Mediterranean's population will increase by three-fold (<https://www.grida.no/resources/5900>). The population in 1970 was 276 million, reached 412 million in 2000 (a 1,35% increase per year) and to 466 million in 2010, while is predicted to reach 529 million by 2025. The most extreme increases will be in the MENA (North Africa and Middle East). Egypt, the most populated country in the region has today 109 million people against 92 million that had in 2016, let aside decades before. Current projections indicate that Mediterranean's population will reach more than 611 million by 2050 (IEMed, 2020), with almost three-quarters living in the region's cities and coastal areas. This translates into increased demand for food, with urban populations demanding diversified diets.

Population growth, coupled with changing consumption patterns, exerts significant pressures on scarce land and water resources. The Mediterranean is one of the world's regions predicted to be most affected by climate change, which is already altering crop productivity and growth cycles. An increase in mean temperatures, floods and droughts affects smallholders the most, as well as poorer populations with low capacities to adapt and populations experiencing conflict. Land and water resources – the basis of the

food production – are finite and are under severe stress. To address these challenges, future agricultural production will need to be transformative, becoming more productive and sustainable, focused on farming systems and crops that most efficiently use water resources. An increase in innovative approaches in response to the impacts of climate change is urgently required, and climate-smart practices must be scaled up and out. The variety of situations that characterize Mediterranean’s agricultural landscapes (Koniak et al., 2011) from irrigated and rainfed systems to drylands and rangelands, as well as forest-based systems and important agricultural subsystems and associated ecosystems (mountain agriculture, oases, inland fisheries and aquaculture, deltas, and coastal areas, urban and periurban agriculture) require important interventions. Many areas in the Mediterranean are experiencing high population densities, putting water and land resources under increasing pressure and increasing the region’s reliance on food imports and virtual water. This has severe consequences in food supplies and is the best driver for conflicts and social unrest.

The region has already reached the upper limits of production growth under the current resource constraints. The ‘food systems at risk’ are now drawing the attention to focus for urgent and concerted remedial interventions, including public and private investments, not only on a regional scale but also locally, where the consequences of inaction on agricultural livelihoods are likely to be the greatest. There is a pressing need for appropriate policies, institutions, and investments to respond to water scarcity and land degradation, and to ensure sustainable and productive food systems management, while assuring acceptable levels of economic development.

The major drivers of regional change include demands driven by demographics, land degradation, water-use challenges, urbanization and accompanying changing consumption patterns, climate change impacts and declining public and private investments in agriculture (Ziadat et al., 2022). A stronger focus on the urban-rural interface is called for, using both modern technologies and nature-based solutions. Numerous examples of actions already under way in different Mediterranean countries illustrate the potential for replication. These examples include wastewater reuse, bioeconomy and circular economy approaches, climate-smart agricultural approaches, digital monitoring of land and water resources, territorial but also decentralized planning approaches, and knowledge sharing at different levels. Since many issues are transboundary, the need for territorial planning and negotiating mechanisms is significant for the whole region.

The growing demand for food is placing increasing pressure on land and water resources. FAO estimates that agriculture will need to produce in 2050 almost 50 percent more food, feed, and biofuel than it did in 2012 (FAO, 2021). Recognition and actions are needed to redirect the focus onto the land, on which over 95 percent of the world’s food is produced. Land use planning and, more broadly, land resources planning (LRP) are needed at different levels of decision-making to promote sustainable and efficient use of resources and to cope with current and future challenges of population growth and increasing demands. Such planning aims for a systematic assessment of land potential and alternatives for optimal land and water use and improved economic and social conditions through participatory processes. These processes involve different sectors and stakeholders and generate multiple benefits and opportunities for local and national economies and private/public investments (FAO, 2021).

The concept of land use planning has evolved over the years. Whereas in the 90s rural planning mainly focused on a better management of biophysical factors affecting crop production, nowadays planning must consider measures for mitigating or adapting to climate change, combating land degradation, and conser-

ving biodiversity. Moreover, the way land use planning is nowadays carried out has changed, thanks to technological advances over the last 30 years, particularly in geographical applications (remote sensing, GIS, Google maps) and global digitalization (use of the Internet and related tools as means of communication). In response to these developments and demands from a range of stakeholders (planners, policymakers, governments, institutions, communities, technical specialists, etc.) for tools that support participatory land resources planning, FAO has developed the Land Resource Planning (LRP) Toolbox, which provides an inventory and information about tools and approaches to support the planning requirements of different stakeholders, working at different levels in different regions and sectors. These planning tools constitute a continuing field of development and require therefore regular updating.

Land use planning takes many forms and needs to be flexibly adapted to suit specific national, regional, or local circumstances. There is no blueprint for defining exact steps and procedures for each situation. Guidelines therefore remain the best option to navigate the diversity and complexity of land use situations around the world. A wide consultation process is ongoing to update the “Guidelines for Land Use Planning” (FAO, 1993), to enhance the considerations of emerging issues, building more integrated approach, which assist the users in promoting sustainable use of resources.

3. WATER RESOURCE MANAGEMENT AS A LEVER TO FOOD SECURITY

The Mediterranean Region exhibits significant contrasts in its demographic and hydrologic features that have shaped the water management policies of the Mediterranean countries. Although awareness is raising with respect to sustainable water management, the extent to which it is applied in practice is debatable. Conflicts and non-renewable water extraction in water scarce parts of the region like the Southern and Eastern rim countries are exposed as overriding management issues. Furthermore, climatic variations are superimposed on natural hydro-stress and water dependency on external resources in most of the cases.

Decision-making process needs measurable, comparable, and reliable tools to be able to make trade-offs when facing conflicting issues. Indicators are valuable tools for understanding the trends and challenges encountered in water resources management. The Contracting Parties to the Barcelona Convention adopted in November 2005 the Mediterranean Strategy for Sustainable Development (MSSD). Integrated water resources and demand management constitute the priority among the range of actions of the adopted strategy. Increasing efficiency by reducing losses and wasteful use is expected to help stabilize water demand in the Southern and Eastern part of the Mediterranean countries (Burak and Margat, 2016).

It is typical for the Mediterranean countries and especially for the South and Eastern ones to endorse a water management strategy that is characterised by a supply and demand approach financed by public funds. In that context, each user of water resources especially, surface water, has the responsibility to for its own decision making. On the other side, many traditional practices have evolved thanks to civil engineering management. But with the increase of water needs, also the environmental issues have emerged. They relate to water quality deterioration and a reduction supply of the groundwater aquifers. Problems are exacerbated due to growing urbanisation and an inefficient wastewater treatment, accompanied by poor on non-existing solid wastewater treatment facilities and pollution control. Overall, institutions and entities in charge of water management were mostly concerned with cost recovery that in most cases do not pay attention to environmental issues or to the wellbeing of the aquifers. Therefore, this brings to inadequate cost recovery and incapacity to finance services that are linked to water delivery for irrigation and sanitation.

Many Mediterranean countries, nevertheless, have documented several practices dealing with implementation of water governance reforms. However, the road to sustainability is still long and greater efforts should be made towards sustainable water governance at various levels, including local, regional, and national levels that are inspired by the Integrated Water Resource Management (IWRM) principles. It is true that still many Mediterranean countries suffer from the lack of suitable operation strategies. This includes weak implementation of policies, obsolete technologies in water use and inefficient capability to face water challenges. All of this is further constrained by limited financial resources, especially in the Southern Mediterranean countries. It should be clear that there is not a “fit-for-all” approach for every country and region, therefore, policies and practices to be implemented should be developed according to local conditions. Finally, water is a topic that involve different socio-economic contexts and should be dealt as such.

The whole Mediterranean region offers an amazing place to observe how countries with different political and socio-economic backgrounds (North vs South) interact dynamically in the water sector. The northern countries have shifted away from traditional supply-side strategies to demand-side strategies that aim at water saving, improved water use efficiency and introduction of new modern technologies. This change of policy is based on the Water Framework Directive that is considered as one of the most typical examples of environmental legislation globally. This Directive is based on the principles of ecosystem management approach and has introduced new criteria in water management. They are based on the principles of cost-recovery, citizen participation and equitable transboundary river basin management (Ferragina, 2010). The Southern countries are placed in much different socio-economic, political, and technological context and much needs to be done, so they could adjust and enhance their water management strategies to a higher level.

Water stress levels, calculated as the ratio between total freshwater withdrawn by all major sectors and total renewable freshwater resources, after considering environmental flow requirements, is high in all Mediterranean countries. Climate change, including weather extremes and variability of temperatures and rainfall patterns, which is already affecting agrifood systems and natural resources is expected to accelerate hunger and poverty in rural areas.

The Near East and North Africa regions are expected to be one of the hotspots for worsening extreme heat, drought, and aridity. Climate projections in the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (IPCC, 2014) show that under a moderate scenario, temperatures will increase by 3°C by the end of the century, while under a more severe, but highly likely scenario, the temperature increase would be of +4°C. These data, coupled with projections of decreasing rainfall by up to 20 percent indicate that water scarcity will be exacerbated, while agricultural production reduced.

These are all very worrying scenarios that food security in the Mediterranean and particularly in the MENA region will be severely threatened. The change of route that the third world conference on revitalization of the Mediterranean diet held in Bari in September 2022 emphasized in its final deliberations require a drastic change in the way land and water resources are used. The region cannot afford to continue degrading them. Sustainable land and water management should be the norm and not the choice. Only by sustainably managing land and water will be possible to achieve various environmental, social, and economic goals. Only this way will be possible to improve the health of the ecosystems, enhance food security, and improve the livelihoods of rural communities while reducing environmental degradation.

Furthermore, the implementation of the Water-Energy-Food-Ecosystem Nexus (WEFE Nexus) approach that highlights the interdependence of water, energy and food security and ecosystems – water, soil, and land is particularly important to underpin that security. The Nexus approach is based on the principle of mutually beneficial responses that are based on understanding the synergies of water, energy, and agricultural policies. It also provides an informed and transparent framework for determining the proper trade-offs and synergies that maintain the integrity and sustainability of ecosystems. By implementing WEFE the Mediterranean countries will benefit greatly.

Another important aspect of Mediterranean food systems relates to the involvement of women and youth in the production of commodities and their distribution. Across the Mediterranean, women contribute to food systems at multiple levels, be it as food producers, innovators, researchers, consumers, or decision-makers. As such, they can play a key role in the “green transition” of Mediterranean food systems.

However, as documented by the new comprehensive FAO report (FAO, 2023), significant gender gaps persist that undermine the potential of women for equal participation in the green transition. For example, while the market demand for “green skills” is expected to increase across the Mediterranean, many women and girls still face considerable challenges in accessing specialized male-dominated education and training (e.g. STEM or agriculture-related subjects), agricultural support and financial services, green job opportunities, and innovative and climate-smart technologies and practices. At the same time, wide gender gaps are still observed in political participation and decision-making in many countries, and more specifically in natural resource governance mechanisms, relevant policy processes and climate negotiations.

To achieve a green and equal transition of the agri-food labour market, investments are needed in upskilling and reskilling women in green sectors and supporting the STEM school-to-work transition. Gendered budgeting, sex-disaggregated data, and women’s leadership in the decision-making process are among the needed changes towards more inclusive and resilient Mediterranean food systems.

4. CONCLUSIONS AND RECOMMENDATION

Mediterranean is facing enormous challenges, yet there are lots of opportunities. Population is increasing fast while the availability of resources is scarce, and they are still being used unsustainably in many cases. It is unavoidable that under these scenarios the region will not be able to feed its own people and will continue to rely heavily on food imports (Puma et al., 2015). Furthermore, it is important to underline the essential role that agriculture plays for the equilibrium of Mediterranean region. Agriculture is not only about food, is about viticulture, horticulture, biofuels, drinks and much more. Food is a primary need for all living beings on earth.

However, water shortages and competition for its use, land scarcity and deterioration of agricultural land, increasing climate constraints and weather disruptions, rapid changes in food demand in the production context with limited opportunities, marginalization of rural regions and frequent contempt towards farming populations are many invisible conflicts that are unfortunately heightening food tensions in the Southern and Eastern Mediterranean (Abis, 2018). Pressures on water resources, vulnerability to climate change and nutritional challenges are expected to increase among the Southern Mediterranean countries, while Northern Mediterranean countries are expected to contrast and, sometime to stymie, these challenges (Antonelli et al., 2022).

The important role of farmers that feed everybody on Earth must be better recognized. In turn, farmers rely on climate change, economic conditions, geopolitical stability, scientific progress, and policy-making processes. This means that often agricultural policy or geopolitical changes could be elements of perturbation for a profession that requires extreme stability and predictability (Abis and Demurtas, 2023).

In the Mediterranean region, as in many regions around the world, the obstacles to food security are well known, for instance water scarcity, lack of arable land, climate uncertainty, heterogeneous demography, geopolitical instability, internal and external conflicts. But, most of all, there are two variables that are rising as destabilizing factors. The first is climate change, that affect sea and land, impact seasonality, yields, agriculture production, animal, and plant health. The second one, is the geopolitical barometer, where international relations have been strained for a while, particularly after the COVID-19 pandemic and the war in Ukraine (Abis and Demurtas, 2023).

It is therefore important that agriculture could in some way mobilize a new Euro-Mediterranean cooperation by putting agri-food issues back at the middle of multilateral cooperation and intra-social relations at national and international level, underlying the importance to choose what to eat as a bastion of world freedom to create a common food identity (Abis and Demurtas, 2023).

The future of the food systems and food security overall will be secured, as best possible under the difficult circumstances of the Mediterranean, when the right equilibrium will be established between the sustainable use and management of the land and water resources and the important role that farmers will play in towards these goals. They must be aware that soil health, water management and crop production are part of the same equation and all of them must be addressed simultaneously and with the best care possible.

Reversing the current trend is possible through the implementation of a suit of responses and actions. Land and water governance must be more inclusive and adaptive. Technical solutions to mitigate land degradation and water scarcity are unlikely to succeed without it. Integrated solutions need to be planned at all levels if they are to be taken to scale. Planning can define critical thresholds in natural resource systems, leading to the reversal of land degradation when wrapped up as packages or programs of technical, institutional, governance and financial support. Caring for neglected soils, degraded lands, addressing drought and coping with water scarcity can be addressed through the adoption of new technologies and management approaches (FAO, 2021).

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AQUATIC BLUE NUTRITION, THE ENVIRONMENT AND SOVEREIGNTY

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ABSTRACT Since everything is subject to change, it is essential to take stock periodically to determine if a change of route is needed for the Mediterranean Diet. Much has changed since it first appeared on the World Stage as a recommended traditional healthy diet. We now know much more about the benefits of diets and nutrition, and our knowledge about the Mediterranean Diet is much more positive. New knowledge about fish and aquatic blue foods has put them higher on the agenda. This needs to be reflected in the way we promote the consumption of food, including aquatic blue foods. The environment is in a state of rapid change, much more so than was the case at the time of the introduction of the Mediterranean diet. Agriculture/food production is one of the largest contributors to CO2 emissions (FAO, 2020). In this respect, not all foods are equal in terms of their impact on Climate Change (FAO, 2022). The high-quality production systems of the Aquatic Blue Sector have the lowest comparative carbon footprint (Jiang et al., 2022). This should affect the way we promote and support food production, including aquaculture and fisheries. Politics is a never-ending source of change. The Russian invasion of Ukraine has shown us how food can be used as a weapon of war. It has shown how monopolies on food commodities in international trade can threaten Food Sovereignty in countries far away from the conflict due to the narrow range of consumption. This should prompt us to rethink how we promote food production and local varieties, including local Aquatic Blue Production.

Keywords Aquatic blue food, nutrition, environment, sovereignty, data, management training

ALIMENTATION BLEUE, ENVIRONNEMENT ET SOUVERAINETÉ ALIMENTAIRE

Résumé. *Dans un monde en constante mutation, il est indispensable de dresser un bilan ponctuel pour évaluer si la diète méditerranéenne nécessite un changement de cap. En effet, après avoir été présentée pour la première fois sur la scène mondiale comme un régime alimentaire sain, traditionnel et à recommander, la diète méditerranéenne a beaucoup changé. Nous sommes aujourd'hui beaucoup plus conscients des bienfaits des comportements alimentaires et nutritionnels et notre vision de la diète méditerranéenne est sans aucun doute plus positive. Les connaissances acquises sur les poissons et les aliments bleus ont favorisé leur mise en valeur et il faut tenir compte de ces évolutions quand il s'agit de promouvoir la consommation d'aliments, y compris les aliments bleus. Les changements environnementaux sont rapides et dépassent largement les prévisions réalisées lorsque la diète méditerranéenne a été lancée. L'agriculture/la production alimentaire sont parmi les plus grands contributeurs à l'émission de CO2 (FAO, 2020). Cependant, tous les aliments n'ont pas les mêmes effets sur le changement climatique (FAO, 2022). L'empreinte carbone des systèmes de production de haute qualité du secteur alimentaire bleu est comparativement la plus faible (Jiang et al., 2022). Un tel constat devrait influencer sur la manière dont nous promovons et soutenons la production alimentaire, y compris l'aquaculture et la pêche. La politique est une source inépuisable de changement. Le conflit russo-ukrainien nous a montré comment la nourriture peut être utilisée comme une arme de guerre. Il a aussi révélé comment les monopoles sur certaines matières alimentaires dans le commerce international peuvent menacer la souveraineté alimentaire dans des pays situés très loin de la zone de conflit à cause d'un faible niveau de consommation. Il y a tout lieu de repenser la manière dont nous soutenons la production alimentaire et les variétés locales, y compris la production locale d'aliments bleus.*

Mots-clés Alimentation bleue - Nutrition - Environnement - Souveraineté - Données - Formation à la gestion.

1. INTRODUCTION

Since the Seven Countries Study in the Mediterranean in the 1950s (Keys, 1980) we have known which foods were more or less frequently consumed in the Mediterranean area. This led to the defining of the Mediterranean Diet as a diet pattern rich in plant, with high to moderate intake of fish and seafood, moderate consumption of eggs, poultry, and low intake of red meat.

The Mediterranean Diet is a tradition and heritage of that region and represents the exchange of foods, culture, and peoples over millennia all around countries of the Mediterranean Basin. However, the

tradition itself is now progressively eroding but studies have shown the traditions clear health benefits. The pioneer Seven Country Study and numerous other epidemiological studies have established health benefits associated with adherence to what is called the Mediterranean diet pattern.

This healthy traditional Mediterranean diet pattern has been popularised since 1995 using the world-famous pyramid representation that graphically highlights the food groups to be consumed daily, weekly, or less frequently (Bach-Faig, Berry et al, 2011) This has then along the way been slightly revised and improved upon. A major milestone was the recognition of the Mediterranean diet as an Intangible Cultural heritage of humanity by UNESCO in 2010 (UNESCO, 2010).

2. THE ENVIRONMENT IN THE PRESENT ERA AND WHAT SHAPED IT.

It can be said that our thinking on the environment entered a new era after the Rio 1992 United Nations Conference on Environment and Development (The Earth Summit) and its follow-up the Rio+20 in 2012. The major outcomes were of course the Rio Declaration with its 27 universal principles, the Convention on Climate Change and the Convention on Biological Diversity. A part of this ideological package in the Oceanic or the Blue sector was then the FAO Code of Conduct on Responsible Fisheries and the UN New York Fish Stocks Agreement based on the UN Convention on the Law of the Sea. Further followed in time by the Ecosystem Approach to Fisheries, the FAO Ecolabelling Guidelines, and the FAO Port State Measures agreement.

These declarations, conventions, agreements, approaches, and guidelines can be said to have changed our thinking on the environment and how food production and resource use affect the environment. Not least regarding the Oceans and Aquatic Blue Food. This can then also affect how we think about and act in relation to the Mediterranean diet.

3. FISHING AND FISH FARMING, THE WORLD, AND THE MEDITERRANEAN

Fishing is an ancient practice possibly dating back to the ages before our own species Homo sapiens sapiens even appeared on the Global Scene, to the time of Homo habilis 1 900 000 to 800 .000 years ago. (Mathiesen, 2016) To put this timeline in perspective Homo sapiens appeared 200 000 years ago and by this time we had started to wear cloths, moved away from home, that is out of Africa and further afield. Fishing was certainly quite well advanced 40 000 years ago, but agriculture didn't start until 20 000 years later and by that time trade in fish had certainly been established. However, there were still some very interesting beasts around during this period like woolly rhinos, mammoths and sabre toothed cats. In addition, a lot of climate change was still to be experienced. Techniques were very simple to begin with, hand gathering, spearing, possibly angling, and netting and trapping came later (TJPitcher, 2016).

Fishing then developed steadily through the ages and became basically an important part of most ancient societies and is accredited in China to folklore hero Fu Xi , Europe has its own champion in the Greco-Roman God Neptune with his fishing trident and, as everybody knows, fish and fishermen have their important place in the Bible.

It is also clear that trade in general developed early and to a large extent around fishing and the trade in fish was also often linked to and related to the trade in salt (Heritage of Japan.wordpress.com). This is not surprising since when permanent settlements started to appear fishing communities were perhaps less self-sufficient than others for many items and therefore needed to trade more than

others. This is not at all at odds with their still hunter-gatherer nature since they are known to trade extensively with outside communities (SALanoué, 2002).

One can say that fishing was an integral part of all the Mediterranean societies and their culture and trade in the period 1 000-500 BC, and later extending further north. Such was the extent of the activities that changes in stock productivity were seen as early as the first century AD and at the beginning of the second millennium AD local sources could not supply growing cities of Europe like London for example (TJPitcher, 2016). In fact, trade in certain products and trade-links in these products that still exist today can be over a thousand years old as is the case in the trade between the Nordic Countries and Italy in dried cod, the stock fish.

Aquaculture is much younger than capture fisheries and much younger than agriculture. The cradle is undoubtedly in China and in the second millennium BCE even though eels may have been raised as early as 6 000 BCE in Australia. Farming is thought to have started when fish, probably the common carp ended up accidentally in flooded rice paddies after bad weather. A fortunate genetic mutation later during the Tang dynasty led to the emergence of goldfish. However, aquaculture was known in various areas of the world such as Japan and Hawaii, and the Romans also bred fish in ponds. This tradition migrated to monasteries in central Europe which in that way kept themselves stocked with fish, kept alive in ponds, in spite of the long distance from the ocean. Aquaculture as we know it today has however evolved from the late 19th century, but the production levels we know today only started appearing after 1950. In spite of great production strides in salmonids in western countries China is by far the greatest aquaculture producer by volume in a global aquaculture production which now totals half the fish supplied for human consumption (FAO, 2015) (Rapanall, 1988)

4. NUTRITION AND AQUATIC BLUE FOOD

Recent finding provides broad evidence on the potential of aquatic foods to reduce food and nutrition insecurity and tackle malnutrition in all its forms.. (Golden et al, 2021)

Seafoods improve human health through at least three pathways. This can be done by reducing micronutrient (for example, vitamin A, calcium, and iron) deficiencies that can lead to subsequent disease. Also, by providing the dominant source of the omega-3 long-chain polyunsaturated fatty acids docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA), which may reduce the risk of heart disease and promote brain and eye health. More controversially it can do so by displacing the consumption of less-healthy foods that can cause adverse health outcomes. In the paper by Golden et al on seafood and nutrition there are also relevant policy recommendations which are worth considering.

First, in countries in which there are high burdens of micronutrient deficiencies, the supply chains and availability of aquatic foods may be strengthened by improving fisheries management; enhancing sustainable aquaculture; and building more equitable national and regional trade networks.

Second, the promotion of a diversity of nutrient-rich aquatic foods in sustainable aquaculture systems, in designing national food-based dietary guidelines, and for public-health interventions targeting particular nutritional deficiencies among vulnerable populations living in particular geographies.

Third, incentivizing access and affordability of aquatic foods in countries experiencing a rapid nutrition transition.

Fourth, prioritizing aquatic foods in social protection programs, including food assistance, school meal

programmes, and safety nets for the most nutritionally vulnerable, including pregnant and lactating women, young children in the first 1,000 days of life, and older people. (Golden et al, 2021)

All worth considering when taking stock of if there is a need for changing the route for the Mediterranean Diet (Ridolfi et al, 2020).

5. THE ENVIRONMENTAL FOOTPRINT OF AQUATIC BLUE FOOD

The Blue Food Assessment also looks at seafood and freshwater production, Aquatic Blue Foods, in relation to the environment and production impact on the environment. (Gephart et al, 2021). This assessment finds, as is evident, that the food system is a major driver of environmental change, emitting a quarter of all greenhouse gas emissions, occupying half of all ice-free land, and responsible for three quarters of global consumptive water use and eutrophication. Yet, it still fails to meet global nutrition needs, with 820 million people lacking sufficient food and with one in three people globally overweight or obese. As a critical source of nutrition generating relatively low average environmental pressures, Aquatic Blue Foods present an opportunity to improve nutrition with lower environmental burdens, in line with the Sustainable Development Goals to improve nutrition, ensure sustainable consumption and production, and sustainably use marine resources.

To compare Aquatic Blue Foods with terrestrial foods, the Blue Food Assessment estimated stressors for industrial chicken produced in the USA and Europe in the same way as fore Aquatic Blue Foods and find it falls in the middle of farmed Aquatic Blue Foods, with similar stressors as tilapia. Because chicken typically has lower stressors than other livestock, it follows that many Aquatic Blue Food groups compare favourably to other animal-sourced foods. Notably, groups generating among the lowest stressors (for example, bivalves and small pelagic fishes) also provide the greatest nutritional quality across all forms of aquatic foods. The authors further elaborate that within the diversity of Aquatic Blue Food production there are numerous opportunities to reduce environmental stressors. Also, that as a young and rapidly growing sector, there are many promising technological innovations in aquaculture (for example, recirculating aquaculture systems, offshore farming and novel feeds) (Gephart et al, 2021).

However, less charismatic interventions may represent greater potential for rapid and substantial impact reductions. These include policy or technological interventions that improve husbandry measures (especially reducing disease and mortality) and lower FCRs. Improved management in salmon aquaculture demonstrates considerable sustainability benefits through disease and area management plans and improved stock management with precision aquaculture and automation. Furthermore, selective breeding, genetic improvements and high-quality feeds can all reduce FCRs. (Golden et al, 2021)

6. THE SPECIAL CASE OF FOOD SOVEREIGNTY

When taking stock of the situation of the Mediterranean Diet and thinking about changing route (Ridolfi, et al, 2020), we need to think about the future and indeed the future of global food production and trade. Three actual and potential megatrends then come to mind.

The trend towards healthier foods with a focus on a higher proportion of quality protein and omega 3 FAs coming from fish or other Aquatic Blue Foods. As mentioned before in this articlee.

The un-precedented pressure on the terrestrial environment including climate change, water mana-

gement and biodiversity. Leading to potential food systems disruptions due natural disasters, crop failures and potentially due to further Covid 19 type events. Also as mentioned earlier in this chapter. Then the three food systems shocks experienced globally in just over ten years i.e., (#1) the food price crisis around 2010, (#2) the potential logistics disaster faced during Covid 19 both affecting food transport as well as food workers' transport. (#3) And now the continuing crisis and potential disaster faced due to the creation of the double bottle neck of the emphasis on a very few major cereal and pulse crop commodities.

With production concentrated in a few very favourable natural and technical surroundings but in politically very unstable areas as in the case of the major cereals in the Ukraine and Russia after the Russian invasion of the Ukraine. Jeopardizing globalisation in general and the security of global food systems value chain in particular! The answer to all these three megatrend challenges is increased diversity in products and locations of production, and greater food sovereignty. And where better to look for the solutions than to the oceans and the aquatic freshwater systems which cover over 70% of the Earth's surface. Where also the nutritional quality is greater (Gephart et al, 2021) and the environmental impacts of food production are less than on land as cited earlier in the chapter. Even also providing positive eco contributions under certain circumstances (Golden et al, 2021). Let's remember also that almost all food produced originates from the sunlight's primary production and therefore 70% of the suns primary production potential to produce food lies in the oceans and aquatic freshwater systems. Yet the oceans and freshwater systems only deliver today less than 2% of the global food production in carbohydrate or energy terms and less than 20% in animal protein terms.

7. WHAT NEEDS TO BE DONE?

From the proceeding stock taking, of the history of Aquatic Blue Foods and the origin and emphasis of the Mediterranean Diet and developments since its advent. It is clear, that from the beginning in the 1950s the Mediterranean Diet was right in its inclusion of Aquatic Blue Foods. However, developments since then have shown that Aquatic Blue Foods are even more important than was thought then and not just in regard to nutrition but also when it comes to the lighter or even positive environmental impacts their production has relative to comparable terrestrial foods. In addition, the potential variety has a special value in the opportunities it presents for improvements and how it can support food sovereignty which can be politically important in itself. Furthermore, the international community through its work and various conference outcomes over the last four decades is much better equipped to promote better production and consumption practices than before.

How do we then change route in relation to the Mediterranean Diet? I would like to take inspiration in the recommendations of Session 9 "SFS-Med Blue Growth: Beneficial Production and Consumption with Less Environmental Pressure" at the 3rd World Conference on the Mediterranean Diet, organized by CIHEAM Bari in September 2022 (Dernini & Capone, 2022). These recommendations are on three levels. First (#1) on the policy level by promoting greater inclusion of Aquatic Blue Foods in the Mediterranean Diet food pyramid and by setting up an Aquatic Blue Food multi-stakeholder platform for that effect. In addition to take advantage of the FAO Ecolabelling Guidelines and set up a common label to certify the origin, heritage, sustainability, and nutritional value of Mediterranean Diet Aquatic Blue food products.

Supported by a modern, standardised, and economic data gathering system in the Mediterranean region. Secondly (#2) on the technical level by improving sustainable fisheries management and promoting

sustainable aquaculture along with promoting short value chains, local markets, and consumption in the spirit of Blue Transformation. Lastly (#3) further promote local coastal management training at various appropriate and practical levels. Aiming at transferring knowledge and through innovation creating new knowledge appropriate to the challenges in the Mediterranean region as well as nearby and similar regions.

These recommendations are by no means exhaustive but if we start implementing them based on discussion, data gathering, analysis and innovation, as well as knowledge creation and transfer. The Mediterranean Region, as well as adjacent and similar regions, can move fast forward and carry a torch to better livelihoods in coastal communities, as well as further inland, for the coming future.

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AGROECOLOGICAL INNOVATIONS AS AN ENTRY POINT FOR THE TRANSFORMATION OF FOOD SYSTEMS IN THE MEDITERRANEAN REGION AND THE REVITALIZATION OF THE MEDITERRANEAN DIET

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ABSTRACT The potential of food systems as a driver for achieving the Sustainable Development Goals have been acknowledged in occasion of the UN Food Systems Summit held in 2021. To achieve this a systems approach is needed to establish transformational agendas. In particular, SDG-oriented research and innovations are expected to play a major role for food system transformation. In this respect, agroecology as a science, a practice and a political movement has been recognised as a promising holistic approach to innovation. By focusing on skill-oriented technologies and the capability of using ecosystem services as productive factors, agroecological innovations have proven to contribute to food security and environmental sustainability in different farming and community settings across the globe. After the promotion of the ten elements of agroecology by FAO and the acknowledgement of the thirteen principles of the agroecological approach to innovation by CFS, agroecological innovations have been gaining an increasing support by public policy makers at local, national and international levels as well as being adopted in formal research and education settings. The objective of this paper is to explore the relevance of the agroecological approach to innovation for the efforts connected with the revitalization of the Mediterranean Diet in the countries from the Mediterranean region. To do so we examined the existing institutionalization processes of agroecology. Our findings show that agroecology could be particularly relevant for the countries on the both shores of the Mediterranean Sea if its normative base impacting food consumption and co-creation of knowledge is further elaborated through appropriate participatory and reflection processes.

Keywords agroecology - SDG - normative principles - innovation - institutions.

LES INNOVATIONS AGROÉCOLOGIQUES COMME POINT D'ENTRÉE POUR LA TRANSFORMATION DES SYSTÈMES ALIMENTAIRES DANS LA RÉGION MÉDITERRANÉENNE ET LA REVITALISATION DU RÉGIME MÉDITERRANÉEN

RÉSUMÉ Le potentiel des systèmes alimentaires en tant que moteur pour atteindre les Objectifs de Développement Durable a été reconnu à l'occasion du Sommet des Nations Unies sur les Systèmes Alimentaires tenu en 2021. Pour y parvenir, une approche systémique est nécessaire pour établir des agendas transformationnels. En particulier, la recherche et les innovations orientées vers les ODD sont censées jouer un rôle majeur dans la transformation des systèmes alimentaires. À cet égard, l'agroécologie en tant que science, pratique et mouvement politique a été reconnue comme une approche holistique prometteuse en matière d'innovation. En se concentrant sur les technologies orientées vers les compétences et sur la capacité d'utiliser les services écosystémiques comme facteurs de production, les innovations agroécologiques ont prouvé qu'elles contribuent à la sécurité alimentaire et à la durabilité environnementale dans différents contextes agricoles et communautaires à travers le monde. Après la promotion des dix éléments de l'agroécologie par la FAO et la reconnaissance des treize principes de l'approche agroécologique de l'innovation par le CFS, les innovations agroécologiques bénéficient d'un soutien croissant de la part des décideurs politiques aux niveaux local, national et international, tout en étant adoptées dans des cadres de recherche et d'éducation formels. L'objectif de cet article est d'explorer la pertinence de l'approche agroécologique de l'innovation pour les efforts liés à la revitalisation du régime méditerranéen dans les pays de la région méditerranéenne. Pour ce faire, nous avons examiné les processus d'institutionnalisation existants de l'agroécologie. Nos conclusions montrent que l'agroécologie pourrait être particulièrement pertinente pour les pays des deux rives de la mer Méditerranée si sa base normative impactant la consommation alimentaire et la co-création de connaissances est élaborée davantage grâce à des processus participatifs et de réflexion appropriée.

Mots-clés Agroécologie - ODD (Objectifs de Développement Durable) - Principes normatifs - Innovation - Institutions.

1. INTRODUCTION

Contemporary food systems are full of contradictions. They are the primary driver of the depletion of critical land resources on which they depend (Benton et al., 2021; UNCCD, 2022). Globally, about half of the agricultural land is degraded, agriculture accounts for 70% of fresh water use and drives 70%

of the terrestrial and 50% of the freshwater biodiversity loss and food systems release more than 30% of GHGs (UNCCD, 2022). This fact alone threatens to gradually invalidate their social and economic achievements in terms of improved labour productivity and food security.

The agricultural industrialisation in both developing and developed countries has left behind many resource poor farmers resulting in depopulation dynamics and in rural poverty. Globally, the prevalence of hunger in 2022 remained far above the pre-COVID levels, with food insecurity being higher in rural areas than in urban areas and access to healthy diets getting equally critical along the urban-rural continuum even in developing countries (FAO et al., 2023). At the same time, especially in the Global North, surplus overproduction and consumerism culture drive food waste and malnutrition due to overconsumption (De Schutter, 2017; WWF, 2022).

These persistent and long-lasting contradictions have resulted in numerous calls for food system transformation. Such calls pelage not simply for reducing negative environmental, social and health impacts of food systems, but advocate for mobilising the potential of food systems as a driver for achieving the Sustainable Development Goals (SDGs) and the objectives of the United Nations conventions on Climate Change (UNFCCC) and Biological Diversity (UNCBD). Agroecology is at the hearth of these calls, as it affects not only technological and market dimensions in sustainability transitions, but also the dynamics of governance, control and power that, differently from transitions, are the main targets of food system transformations (Anderson and Maughan, 2021).

The objective of this paper is to examine the recent institutionalization processes of agroecology by identifying networked organizations which have engaged with agroecology as a solution for achieving the objectives of Agenda 2030 and discuss their characteristics in relation to the efforts related to the revitalization of the Mediterranean Diet by the international community formed around the SFS-MED platform.



Figure 1. Principles of Agroecology and transformation of food systems (Adapted from (Adapted from Wezel et al., 2020).

2. AGROECOLOGICAL APPROACH TO INNOVATION AND THE MED DIET REVITALISATION EFFORTS

At present, the most diffused definition of agroecology is in terms of three empirical dimensions, that is, science, practice and social movement (Wezel et. al., 2009). As mentioned in (Loconto and Fouilleux, 2019), such definition of agroecology can be interpreted as expressing the complex interplay between knowledge, practice and politics.

The recent agroecology institutionalisation processes in the framework of UN organisations led to the identification of 10 elements of agroecology and 13 principles, aligned with them of the agroecological approach to innovation (FAO, 2018; HLPE2019; Wezel et al., 2020). Figure 1 shows the 13 principles of the agroecological approach to innovation together with the analytical framework introduced by Gliesman(2007) which describes the main stages of food systems transformations based on agroecology. Although, the link between agroecology and consumption is less straightforward and have emerged to a lesser extend in the participatory and evidence summarisation processes by FAO and HLPE, the agroecological elements and principles and the Mediterranean diet as a sustainable dietary model share a number of common characteristics as displayed in Box 1.

Box 1. Agroecological Approach to Innovation and the Mediterranean Diet.

-Worldwide, agroecology is rooted in agricultural heritage systems based on peasant or family farming (FAO, 2018).

- Agroecology is an innovation approach adapted to the needs of family farmers (FAO, 2018). In the Mediterranean Region there are still a lot of family farmers, despite the historical trends of declining of numbers of farms and increasing the average size of the remaining ones (Moreno-Pérez et al., 2011). The economic sustainability of many such farms is heavily dependent on input subsidies and they need to build resilience mechanisms that let them adapt to policy, market and climate change (EC, 2022; 2022a; 2023).

- Agroecological strategies at field, farm and landscape levels based on diversification and crop-livestock-tree integration promote adaptive forms of management to natural and climatic conditions, which enhance the natural resource base and promote recycling behaviours (FAO, 2018). Diversity, locally-adapted sources of food and recycling of nutrients among humans, animals and crops are also cornerstone features of the Mediterranean Diet (Dernini, et al., 2019).

- Agroecology can promote decent rural employment and is particularly beneficial for youth and for the creation of decent labour opportunities in rural areas, since it struggles for change in the farmer role preserving his control over the labour process and transforming farmers from consumers of innovations in active agents in the innovation processes (De Schutter, 2017, FAO, 2018). This is a key aspect for the revitalisation of the Mediterranean Diet in the Mediterranean Countries.

- Agroecological products are intrinsically linked with nested local markets and local partnerships between producers and consumers such as Community Supported Agriculture (FAO/INRA, 2018). Such kind of markets are important for the revitalisation of the Mediterranean Diet as they create short circuits between constituents of the local communities promoting both the development of circular economies as well as more responsible consumption culture.

The next section provides an overview of the institutionalisation process of agroecology.

3. INSTITUTIONALIZATION OF AGROECOLOGY AS A SOLUTION FOR FOOD SYSTEM TRANSFORMATION TOWARD THE SUSTAINABLE DEVELOPMENT GOALS

Following an iterative process based on desk research, 7 networked organizations which have engaged with agroecology as a solution for achieving the objectives of Agenda 2030 and which have relevance for one or more countries from the Mediterranean Region have been identified. By networked organization we mean a partnership with legal personality composed by other legal persons or partnerships between legal or natural persons.

As a starting point we have chosen the “Knowledge for Policy” (K4P) portal of the EU Commission¹ where grey literature sources and other on-line resources with policy relevance are collected as part of knowledge support services to policy-making institutions from the EU. The starting point was this EU information portal since it offers a regional perspective on the institutionalization process of agroecology. In fact, the EU already has programs that involve large proportions of the countries from the Mediterranean region. Moreover, the EU is a member of multilateral organizations such as FAO and supports by financial means other international organizations such as CIGAR. In the end, some of the EU member countries are from the Mediterranean Area. This process has been complemented by web search to identify other networked organizations which explicitly link agroecology with the global agendas.

The results are listed in table 1 and further detailed in Annex 1.

Organisation	Long Name	Geographic coverage	Member organisations	Med Countries
FAO	Food and Agriculture Organization	Global	195 National States + EU	All
CFS	Committee on World Food Security	Global	140 National states	All
IFAD	International fund for rural development	Global /Developing Countries	177 National States	All
CGIAR System	Consultative Group on International Agricultural Research	Global /Developing Countries	15 International Research Centres	All (except Portugal)
EU	European Union	Europe	27 National States from Europe	North Mediterranean countries
AFSA	Alliance for food sovereignty in Africa	Africa	36 members (regional networks of farmers, indigenous peoples, consumers, and NGOs)	African Mediterranean Countries
URGENCI	Urban-Rural networks: GENERating New forms of exchanges between Citizens	Global	33 Local networks from 33 countries	Italy, Turkey, France, Portugal, Morocco, Lebanon, Algeria, Spain; Specific initiatives in the Med Region

1. https://knowledge4policy.ec.europa.eu/home_en

Arguably, it was FAO which initiated the process of institutionalization of agroecology with the organization of multi-stakeholder dialogues in the period 2014-2018, which resulted in a definition of agroecology based on 10 common elements shared by the participants in these dialogues and in the launching in 2018 of the Agroecology scaling up initiative (FAO, 2019; Loconto and Fouilleux, 2019). This initiative provides a framework for coordinated action within the UN system (for example IFAD contributes to it), supporting FAO members through policy informing and the creation of technical capacities. A second important cornerstone in the process of agroecology institutionalization has been the report of HLPE, which defined 13 principles of the agroecological approach to innovation followed by the policy recommendations of CSF (HLPE, 2019; CFS, 2021; Anderson and Maughan, 2021).

Agroecology is one of the current 33 portfolio initiatives for major prioritized investments of the CGIAR system (CGIAR, 2022, see also Annex 1). Furthermore, the CIFOR-ICRAF partnership of two CGIAR research centers CIFOR and ICRAF, and CIRAD, the French agricultural research and international cooperation organization, have established a Transformative Partnership Programme on Agroecology (AE-TPP) as part of the Action Plan to strengthen the relationships between CGIAR and France. Transformative Partnership Platforms allow implementing collaborations and mobilizing funding with key partners and donors of the CGIAR system and are conceived as a form of organizational innovation in the strategic framework of CIFOR-ICRAF. The AE-TPP is also one of promoters and key constituents of the Agroecology Coalition² established at the UNFSS summit and which supports its expansion and implementation. Arguably, all these are follow-up processes of among others, the HLPE report, to which CGIAR has contributed through its former research program on Forests, Trees and Agroforestry³.

Agroecology have been considered also by EU institutions. EU has adopted a directionality principle for its innovation policy aligning it with the objectives of the EU Green Deal strategy which constitutes the main European contribution to Agenda 2030, UNFCCC and UNCBD. In particular, agroecology appears central to meeting the EU objectives regarding global food security and promoting strengthened partnerships with FAO and CGIAR (EC, 2020; 2022; 2022a; 2023). A significant initiative in this respect is the DeSIRA Innovation Partnership (Development Smart Innovation through Research in Agriculture)⁴ supporting the International Cooperation policy of the EU. Furthermore, agroecology has been considered also in the transformation of EU food systems in relation to the objectives of the EU Green Deal and in particular the Farm-to-Fork strategy (EC, 2020). The agroecological approach to innovation appears important in addressing environmental degradation in EU, the economic sustainability of the fishery and aquaculture sectors, the economic resilience of EU family farms as well as the medium- and long-term food security of the union (EC, 2022; 2022a; 2023). In this respect, an important research and Innovation initiative is the Horizon Europe partnership on Agroecological Living Labs and Research Infrastructures which address the EU food system transformation by supporting the Farm-to-Fork strategy (SCAR-AE, 2022).

Last but not least, agroecology is both a means and a goal in itself pursued by food sovereignty social

2 <https://agroecology-coalition.org>

3. <https://www.foreststreesagroforestry.org/2011-2021crp/>.

4. https://international-partnerships.ec.europa.eu/policies/programming/programmes/desira-development-smart-innovation-through-research-agriculture_en

movements, CSOs and NGOs across the globe, which promote a rights-based political agenda centered on the right for food. We identified two CSO networks with legal personality and with relevance for the Mediterranean region, AFSA and URGENCI (see table 1 and Annex 1). Both of them are active participants in the Nyeleni process. It is arguable that the food sovereignty social movements were able to influence the processes shaping the current dynamics in institutionalizing agroecology that led to the establishment of the 10 elements and the 13 principles of agroecology (Loconto and Fouilleux, 2019; Anderson and Maughan, 2021). For this reason, in our opinion CSOs and NGOs are part of the institutionalization process of agroecology, despite their raising preoccupation of corporate capture of their concept as a result of its institutionalization and uptake by policy and formal science institutions (De Schutter, 2017; Mier Y Terán Giménez Cacho et al., 2018; Van Der Ploeg, 2021; FIAN, 2023)

4. DISCUSSION

The recent agroecology institutionalization process in the framework of UN organizations, has made emerge in an explicit way a distinct normative dimension of agroecology (which we shall call “principle” after the HLPE report). It allows to extend the popular tripartite definition of agroecology into a four dimensional one: science – practice – social movement – principle. It reflects new more inclusive forms of governance (such as the consultative mechanisms adopted by the CSF reform) which allow for bottom-up organization and participation.

The 13 principles of agroecology along this new dimension represents a shared vision on how agroecological food systems should be in order to orient food systems toward sustainability and the SDGs. Their recognition by multilateral and public governance institutions make visible the normative character of innovations and it is arguable that such normativity is not pertinent only to the agroecological approach to innovation but it is an intrinsic feature of innovation in general. This has been the case also in the 1960ies, when the desired structural transformation of the agricultural sector in developing countries has shaped the technological, organizational and social dimensions of the innovations of the Green Revolution (Lele et al., 2021) although no explicit normative principles had emerged for this alternative to agroecology development pathway.

As mentioned in Section II, the agroecological approach to innovation has many elements which resonate positively with the characteristics of the Mediterranean Diet as a model nutrition outcome from Sustainable Food Systems (Dernini et al., 2019). However, the consideration of consumption models has received limited attention by the entire institutionalisation process. The focus of many of the examined initiatives is often limited to agriculture, making it look comparable and often similar to other approaches and perspectives on sustainable agriculture with much more limited scope (e.g., climate-smart agriculture, sustainable intensification, precision agriculture, etc.).

The agriculture as an entry point for transformation of the entire food systems leading to sustainable dietary outcomes, which is particularly relevant from the perspective of the Med Diet revitalisation efforts, is less evident in the current dynamics shaping the institutionalisation processes. In this respect, the most relevant aspects of agroecology are those related to the establishments of markets for agroecological products and the formation of local partnerships between producers and consumers. Despite that knowledge co-production is a cornerstone of the agroecological approach to innovation, little attention has been paid on the loss of knowledge producing capacities by those citizens, which are not directly involved in the food production process, although the linear knowledge transfer models based on labels to inform them is often questioned especially by CSO stakeholders. Furthermore, little has been said about

the consumerist lifestyles, especially in developed countries, which both justify and drive unsustainable production and unhealthy dietary patterns (De Schutter, 2017).

An important normative question has also received limited attention – should production be conditioned by natural resources or by the consumption lifestyle? The Med Diet pattern is connected with the lifestyle of poor communities which needed to adapt to a limited resource base. Food production, preparation and recycling behaviours were widespread among all community constituents practicing traditional Mediterranean diets in the past as well as was the food related knowledge. Such behaviours reflect a lifestyle conditioned by the natural resource base of the respective territorial contexts and hence, resources which today appear of little economic interest were not simply neglected the way it happens nowadays. The Mediterranean diet as a lifestyle implies the importance of practice-based knowledge not only from the perspective of food production but also from the perspective of food consumption. This aspect remains undermined in the current agroecology institutionalisation dynamics.

Finally, the normative principle knowledge co-production, which bears important differences with other approaches and perspectives on sustainable food systems, appears far less clear with reference to those society constituents who obtain their food primarily on consumer markets. While, it is unquestionable that agroecology strives for changing the role of the farmer from a passive consumer of innovations to a co-producer of knowledge, it is far from clear whether such normative goal implies also changing roles of those constituents of contemporary societies which are not directly involved with food production or farming. If so how should they change, from mere consumers of food to what?

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ANNEX 1: Description of networked organizations listed in Table 1.

FAO: The Food and Agriculture Organization is a specialized agency of the United Nations, based in Rome, that leads international efforts to defeat hunger. Based on a participatory process, which lasted from 2014 till 2018, FAO launched the Agroecology scaling up initiative in 2018 (FAO, 2019; Loconto and Fouilleux, 2019).

CFS: The Committee on World Food Security is an international and intergovernmental platform, serving the UN System, based on multi-stakeholder approach with specific mechanisms for participation of different types of non-governmental actors (e.g., civil society organisation, private sector, international organisations, research institutions, philanthropic foundations, etc.). It is one of the governing bodies of

FAO and as such it does not have a separate legal personality but is rather a subsidiary of FAO. It works in tandem with

a science-policy interface, the HLPE (High Level Panel of Experts) on food security and nutrition, which summarises the existing evidence on topics of competence for CFS (CFS, 2009). The CFS process has been requested in 2016 by the Civil Society Mechanisms of the CFS and have been concluded by the CFS policy recommendations on agroecology and other innovative approaches (CFS, 2021; Anderson and Maughan, 2021).

IFAD: The International Fund for Agricultural Development is an international financial institution and specialized United Nations agency based in Rome, which provides grants and low-interest loans supporting small-scale rural producers and transforming rural areas. Among other it provides funding for agroecological projects in the developing countries (IFAD, 2021) and contributes to the FAO Initiative on Scaling Up Agroecology.

CGIAR: The CGIAR System (the former Consultative Group on International Agricultural Research) is a global partnership for research for development in developing countries. It consists of 15 research centres situated in 89 countries, whose main objectives are the transformation of food, land, and water systems to address the climate crisis. CGIAR has been established in 1971 as a network of 4 international agricultural research centers with primary objective disseminating the achievements of the Green Revolution in developing countries (Lele et al., 2021).

EU: The Farm-to-Fork strategy (EC, 2020) pursues expansion of agricultural land under organic farming (25% of the agricultural land by 2030 and has also input reduction targets (of 50% for fertilizers and 25% for pest control inputs). The Green Deal and Farm-to-fork strategy promote also measures for cutting down food waste and dietary change, which are necessary in order to avoid negative effects of the Farm-to-fork strategy implementation on the food security of developing countries, although it is not clear till which extend such measures are compatible with the agroecological approach to innovation (WWF, 2022). These targets are reflected by Horizon Europe, the main research and innovation programme of the EC for the programming period 2021-2027 as well as by other programmes supporting capacity development and investments at sub-national scales. Finally, the Farm-to-Fork strategy promotes the agroecological approach to innovation in the international cooperation policy of the EU.

AFSA: the Alliance for Food Sovereignty in Africa is the biggest civil society movement in Africa, bringing together about 200 Million people among small-scale farmers, fishers, indigenous people, faith communities and consumers from 50 African countries, including the Mediterranean Countries from North Africa. Its main objective is to influence policies and promote African solutions for food sovereignty centered on small family farming and production systems based on agroecology and indigenous practices, while opposing the industrialization and commodification pathway of African agriculture and food systems connected with land grabs, ecosystem destruction and displacement of indigenous people. AFSA has been launched in 2011 at the UNFCCC COP 17⁵. AFSA has many initiatives related to agroecology which include the production of evidence, advocacy with policy makers and farmers, as well as building strong network of networks to scale up its political action.

URGENCI: The Urban-Rural networks: GEnErating New forms of exchanges between Citizens is the international grassroots network of all forms of regional and Local Solidarity-based Partnerships for Agroecology (LSPAs), of which Community Supported Agriculture (CSA) is the best-known iteration⁶. It is a global organization, established in 2006 and recognized as a legal person in France. It is a network of networks consisting of farmers and other citizens with the role of consumers. Urgenci receives support from the Charles Leopold Mayer Foundation (Web site) and grants from EU, French regions as well as UN support. The main objective of URGENCI is to strengthen knowledge exchange, learning and capacity building between LSPAs across the world.

5. <https://afsafrika.org>.

6. <https://urgenci.net>.



SHAPING MICRO AND MACRO FOOD ENVIRONMENTS: THE ROLE OF MEDITERRANEAN DIET

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ABSTRACT One of the keys to food system transformation is the transformation of food environments. Food environments are emergent properties of food system interactions, as actors, rules, artifacts, coalesce into local patterns that enable and constrain people's behavior. They are structures of everyday life that constitute people's lifeworlds. Food environments are subsystems of broader food systems. They are shaped and influenced by the broader food system, and shape and influence food-related activities of individuals, households, communities. At the same time, transformation of food environments can contribute to the broader system transformation. The multilevel approach, one of the most considered approaches to transition, proposes a theory of change that takes into consideration bottom-up dynamics, based on 'innovation niches' that provide alternative models and challenge the dominant models through scaling up and replication. To apply this approach to food environments, we consider two types: 'micro' food environments, which exert their influence over individuals and households, 'macro' food environments, that constitute the frameworks for the reproduction of a multiplicity of food environments. How can the 'Mediterranean diet' concept affect micro and macro food environments in a strategy of food system transformation? We must consider that one of the most relevant barriers to behavioral change is knowledge. Knowledge gap can be articulated into a) awareness gap, that is a gap of understanding of the link between behavior and health (of own body and of the planet); b) motivation gap, that is a gap that links awareness to the willingness to change. In most cases, this gap is related to trade-offs between the benefits of the change and the expected costs necessary to obtain the change; c) action gap, which is related to the access to suitable solutions to a recognized problem. The Mediterranean diet can address this knowledge gap. It is a resource for 'soft power', that resonates with people's lifeworld and demonstrates that pathways for change are feasible. Even though daily diets are far from its principles, the narrative that the Mediterranean diet underpins provides a resource to fill the knowledge gap. In terms of awareness gap, it shows a link between diets and body and planet health; it provides motivation to act as it creates a coherence between values and behavior embedded into local culture; it also can provide actionable knowledge as it is based on a knowledge reservoir related to local gastronomy. The Mediterranean Diet values and principles can be turned into resources for transforming micro and macro food environments.

Keywords food environment, food policies, nutrition knowledge gap.

MOLDAGE DES ENVIRONNEMENTS ALIMENTAIRES MICRO ET MACRO: LE RÔLE DU RÉGIME MÉDITERRANÉEN

RÉSUMÉ Ce texte explore le rôle central des environnements alimentaires dans la transformation des systèmes alimentaires, mettant en avant leur influence sur les individus, les ménages et les communautés. Une approche multinationale, intégrant à la fois des dynamiques ascendantes et des moteurs externes tels que le changement climatique, est proposée pour des politiques transformatrices. Deux types d'environnements alimentaires, 'micro' et 'macro', sont identifiés, ayant des influences distinctes sur les individus et les cadres généraux, respectivement. Le concept de 'régime méditerranéen' est examiné comme un catalyseur potentiel pour la transformation des systèmes alimentaires, comblant les lacunes de connaissance et offrant un récit qui aligne les valeurs sur le comportement. Les valeurs et principes du régime méditerranéen sont présentés comme des ressources pour le changement tant au niveau local que national, favorisant la diversification alimentaire et remettant en question les schémas conventionnels de production-consommation. L'importance d'une approche directionnelle dans les politiques de transformation est soulignée, utilisant le régime méditerranéen comme cadre de consensus pour les stratégies publiques, privées et civiques. Des politiques spécifiques ciblant les environnements alimentaires 'micro' et 'macro', incluant des conseils en matière de politique alimentaire, l'agroécologie et des politiques d'approvisionnement public, sont détaillées. Le texte insiste sur la nécessité de la continuité et des valeurs à long terme dans les efforts de transformation, plaidant pour des interfaces entre la science et la politique afin de fournir des preuves et des modèles pour des prises de décision éclairées.

Mots-clés Environnement alimentaire, politiques transformatrices, interfaces science-politique

1. INTRODUCTION

One of the keys to food system transformation is the transformation of Food Environments. The notion of Food Environment represents an emerging and still evolving research topic (Turner et al., 2018). It is identified as a critical place in the food system to implement interventions to support healthy and sustainable diets (SAPEA, 2023), because it contains “the total scope of options within which consumers make decisions about which foods to acquire and consume” (Downs et al., 2020:3).

The food environment is indeed defined as a “key constituent of the food system” (SAPEA, 2023). Recently Downs et al. (2020:4) elaborated an increasingly used definition of food environments, aimed to be applicable to low-, middle-, and high-income countries: “the consumer interface with the food system that encompasses the availability, affordability, convenience, promotion and quality, and sustainability of foods and beverages in wild, cultivated, and built spaces that are influenced by the sociocultural and political environment and ecosystems within which they are embedded”. The food environment can be defined as an “interface” in the sense that it “mediates the acquisition of foods by people within the wider food system” (SAPEA, 2023:35), and it is placed between an external and an individual domain (Turner et al., 2018). Therefore, the food environment is unique for each individual (and community), but it is also widely influenced by the food system of reference (SAPEA, 2023).

The emergence of what has now been referred to as the “digital” food environment (Granheim et al., 2022) is also worth noting. The term refers to a variety of online food shopping forms ranging from pure e-commerce, “brick&click” retail (both online and physical stores), to click&collect, and home delivery, among others. Data shows that, especially since the beginning of the COVID pandemic, online shopping from supermarkets and other grocery stores has increased in many countries (Khandphur et al., 2020). Given the novelty of the trend, little evidence exists on the influence that digital retail shopping interfaces have on consumer food behavior and/or dietary outcomes, and few tools exist so far to adequately measure the link between the two (Glanz et al., 2023).

The food environment represents a fundamental dimension on which to intervene for a sustainable transformation of food systems. This entails an integrated and holistic approach, which contextualizes individual choices regarding food acquisition and consumption in a wider system, highlighting how the various dimensions, the system itself and its drivers and outcomes influence such choices (HLPE 2017). As a matter of fact, using a “food system” approach to address food-related sustainability issues implies considering the multiple interrelations among different drivers contributing to determining food systems outcomes at different scales. Among the multiple drivers assessed in a recent FAO (2022) report, changes in consumption and nutrition patterns over time play a key role in determining possible future patterns of food systems. They represent a consequence of the complex interaction of a wide number of factors, including income, prices, demographic changes, urbanization, trade, technologies, but also cultural traditions, social norms and modifications of lifestyle, and ultimately individual preferences and beliefs (FAO, 2022).

As for the wider food system, it is important to note that the food environment can be approached at different levels, from the individual to the household or community, from local to global level (Caspi et al., 2012). Each level requires specific attention and approaches in monitoring and assessing the different properties of food environments, within a wide range of possible objectives and perceived measuring methods (Downs et al., 2020). As already noted, food environments provide rules and resources to consumers, influencing individual actors’ behavior. Shaping food environments to make them more conducive for sustainable diets, can hence be part of broader strategies to transform sustainable food

systems. In this paper, we claim that making the role of the food environments on nutrition visible can be an important step towards food system transformation, as it can open the way to the problematization of an issue that is often considered as a 'general law'. For example, it can challenge the idea that the 'nutrition transition' is only related to economic factors such as income growth (see also Barosh et al., 2014) and urbanization. At the same time, it may challenge the notion of individualized, private solutions to poor nutritional health, and raise public awareness over underlying causes not always being rooted in personal choices on what to purchase and eat (Boling and Cervini, 2023). This approach helps contextualize possible changes in dietary habits in relation to the food systems and environments in which they are embedded, while also holding institutions accountable.

Given that an important component of the food environment is the system of values and knowledge in which consumers are embedded, we argue that the Mediterranean Diet(s), intended as a set of cultural norms and dietary habits that affect daily practices, can have a transformative role, providing a countervailing force to powerful actors in the food system in the shaping of food environments.

2. MICRO AND MACRO FOOD ENVIRONMENTS

Food environments are emergent properties of food system interactions, as actors, rules, and artifacts coalesce into local patterns that enable and constrain people's behavior. They are structures of everyday life that constitute people's lifeworld. The symbolic components of the food environments, like cultural norms, are as important as physical components, albeit less studied. As an analytical tool, the food environment can be studied at two levels, macro and micro: 'macro' food environments constitute the frameworks for the reproduction of a multiplicity of 'micro' food environments, that exert their influence over individuals and households.

Macro food environments should be studied by considering the meta-rules, the broader infrastructures and the strategies of global players. At the basis of the current macro food environment, in western countries there is the current food system based on industrial agriculture, centered upon crop monocultures, concentrated animal feeding operations (CAFOs), use of genetically uniform varieties or breeds, vertical and horizontal segregation of product chains, highly mechanized, and intensive use of external inputs. Industrial agriculture has co-evolved with the evolution of processing and distribution, so that national food systems have been transformed into specialized production of large volumes of homogenous, standardized products for national and international markets, with actors organized into global value chains. Many authors have stressed the influence of these trends on food habits (Reardon and Timmer, 2012; Mason and Lang, 2017; Popkin, 2004; Gomez et al., 2013; Reardon et al, 2021). The food industry, encouraged by the favorable regulatory and economic environment, has disrupted traditional diets leveraging on the power of fat, sugar, and salt to push consumption levels up (Nestle, 2019). Supermarkets and fast-food chains have made packed food, soft drinks and animal proteins abundant and affordable.

Concentration, specialization and simplification of the food system, and verticalization of production-consumption patterns into specialized value chains, have shaped the mix of products that consumers can find in the retail spaces. One of the outcomes of this trend has been cultural erosion, as industrial agriculture and modern food systems "have increased the cognitive distance between producers, consumers, and their environments" (Jacobs et al., 2020 p. 27). Moreover, the design of food has been characterized by the prominence and prevalence of ultra-processed and calorie-dense foods, mainly rich in added fats and sugars (Armelagos, 2014). Micro food environments should be studied by considering the specific rules, actors, and artifacts that individuals and households interact with to carry out daily food-related activities.

Local actors have some degree of control on them: innovation at the micro level can challenge the dominant models and provide alternatives that, eventually, can modify the macro food environment through scaling up and replication. Alternative systems of provision, initiated in the last century by farmers, civil society organizations and local administrations, have opened spaces for consumption and production models not complying with the rules of the dominant food players, and have diversified food supply, introduced new meanings for product quality, allowed the emergence and consolidation of new business models, and contributed to change the public discourse on food (see e.g. Maye and Kirwan 2010). They have acted upon food environments by addressing both material and symbolic components. New products, logistics, infrastructures have in fact been accompanied by new discourses about food. Engaging with these alternative food networks, consumers have become aware of their potential roles as citizens and have given a new meaning to food co-production and consumption.

Alternative food networks have affected, at least in part, 'conventional' food players, who have progressively adapted their operations to the emerging consumers' preferences. If 30 years ago it was impossible to find local food and organic food on the shelves of supermarkets, now these items are a strategic component of the competition between retail networks. Food designers and technologists have begun to focus their designs on recognizing the nutritional and health properties (e.g. absence of contaminants) of food as a factor in determining choice (Kang et al., 2015); they have designed packaging with information based on nutritional facts, such as sustainability labels and organic identity, and demonstrated that these are important factors determining consumer choice (Barreiro-Hurlé et al., 2010). The focus on certificates of origin, recyclable packaging and claims of local, traditional, ethical and environmentally friendly products have also become increasingly dominant in food choice (Annunziata & Scarpato, 2014). Finally, the design of the physical environment, such as the design of supermarkets or local shops, has increasing influence on consumer choice (Glanz et al., 2005).

An additional dimension which has been receiving attention in the last 10 years is social interaction in food spaces, like restaurants, food retailers, educational kitchens, canteens. For example, eating in the company of other people influences the quality and quantity of food consumed (Pollard et al., 2002). Given the growing demand, retail networks have adapted their procurement policies and logistic infrastructures to host a greater diversity of products. In many cases, however, this has meant a 'conventionalization' of alternative food practices. For example, several for-profit platforms (e.g. Oncini et al., 2020) imitate in many ways the ideas at the basis of the Solidarity Purchasing Groups model. At the same time, the opening of new markets and the need to satisfy a growing demand have pushed 'alternative' actors to adopt more conventional operational modes (Pratt, 2009).

3. TRANSFORMATIVE FOOD POLICIES AND THE FOOD ENVIRONMENT

Policies can directly affect the macro as well as the micro food environments. Public policies that provide incentives to specific production mixes affect the relative availability and affordability of food categories. At macro level, the WTO agreements and the 'Codex Alimentarius' set of standards have constituted the frame of references for the development of food systems in the world (Boutrif, 2003). The European Common Agricultural Policy has heavily supported production systems based on livestock, cereal and sugar production, while penalizing protein crops, fruits and vegetables. Urban policies have encouraged the privatization of urban food systems and their concentration into integrated supply chains (Reardon et al., 2021). Deregulation has allowed publicly managed markets being replaced by supermarkets and private logistic platforms, which have progressively concentrated food supply

into a limited number of large size shops and have subordinated other actors of the food system into vertical supply chains. These macro trends have influenced micro food environments, which have been progressively dominated by retail and fast-food chains both at physical and symbolic level, replacing traditional food-related routines, competences, values.

One of the main objectives of the Food system transformation will have to rebalance the power between the private, public and social sectors, identify sustainability and public health as the main goals of the food system. The transformation of food systems, however, needs transformative policies, which challenge existing policies and governance patterns, and build new models. Transformative policies have three main components: directionality, reflexivity, and market integration (Brunori, 2023).

With regard to directionality, public policies should be able to balance the power of the food industry, for which influencing consumers' choice is the key goal, and nudging consumers' behavior toward more healthy diets, while making them also more accessible. At macro level, this implies aligning food-related policies in many fields (agriculture, health, environment, urban planning) to a concept of 'sustainable diets'. Of interest here is the fact that local-level action is made possible, or at least facilitated, by policies introduced at macro level. For example, the funds made available at federal level in the USA – the Healthy Food Financing Initiative (HFFI) – have given local communities the instruments to change the urban food environments. Zoning policies have been implemented to limit the availability of fast foods around schools in several cities in the UK (Keeble et al, 2019). This points to the need to find ways of aligning micro and macro levels of action to ensure coherence and sustained impact over time.

Reflexivity implies a capacity of the social and institutional bodies to learn from experiments. The key component of reflexivity in policies is the creation of 'fora' that allow for exchange of information and for discussion. Food councils, community-based organizations that bring together stakeholders from various sectors, including farmers, consumers, and policymakers, collectively addressing local food system challenges and promoting sustainable practices, are key initiatives to stimulate reflexivity. In fact, they aim to foster collaboration and develop strategies to enhance the overall well-being of their communities through improved food systems (Harper et al, 2009; Scherb et al., 2012).

In the last 20 years, changes at micro level have been strongly affecting the broader policy framework, and many of the principles introduced here have now turned into the broader public space. Initiatives led by Civil Society Organizations (CSOs) can indeed be taken up and extended as part of social learning processes. Examples in this sense include the attempts to systematize some local initiatives as part of local food policies. This was one of the priorities of the first Italian intermunicipal food policy *Piana del Cibo* (in Lucca city-region, Tuscany). The Food Policy built on existing innovative initiatives and programs of local agriculture, urban gardening, and food education previously developed at experimental level, and provided a sort of 'umbrella' framework under which they could be coherently organized and linked to common goals (Arcuri, Minotti and Galli, 2022).

Markets are a key component of food environments. Several examples exist of changes at the level of micro food environments spearheaded by local authorities – from the introduction of Farmers' Markets or Green Carts in low-income areas of New York with an explicit aim of making fresh fruits and vegetables more available among segments of society prone to unhealthy diets (Cohen & Ilieva, 2015). Other examples of micro food environment changes range from community-supported agriculture (CSA), solidarity purchase groups (GAS), to more privately-owned and business-like activities (Grando

et al, 2017). Such local food initiatives can introduce a new way of “communicating” food, as they provide spaces to learn new ways of valuing food. In taking part to local food networks, people change their social practices related to buying and consuming food and consequently modify their purchasing and consumption routines (Brunori et al, 2012; Fonte, 2013).

Another driver of market integration is public initiatives, often in collaboration with Civil Society Organizations (CSOs). Food stamps, school meals and actions meant to diversify the retail infrastructure at local level have the power to directly influence individuals’ and households’ behavior. Public procurement as well as civil society initiatives developed from the bottom-up are two such examples, which should not be seen as completely detached from one another, since they involve actors often working together. For instance, in one of the first public food procurement strategies, the Programa de Aquisição de Alimentos (PAA) in Brazil, rural social movements and CSOs have been playing a crucial role in its implementation at local level and, in various phases, have called for its extension (Grisa and Porto 2015). Also in Europe there has been an increasing trend to outsourcing of food aid to CSOs and the non-profit sector. In Italy, the role of CSOs became particularly visible during the COVID-19 pandemic, when most food aid interventions relied on their voluntary work, raising questions around the limited role and capacities of institutions (e.g. Grassi 2022).

4. KNOWLEDGE GAPS AND THE MEDITERRANEAN DIET AS A DRIVER OF TRANSFORMATION

We build here on more general considerations that have been made around the capacity of food to bear social messages. In other terms, as discussed by Appadurai (1981, 494), food is a “highly condensed social fact” and a “powerful semiotic device”. Food also holds symbolic features, as exemplified in relation to the use of traditional food products in an increasingly globalized (food) environment, and their role in the preservation of specific identities and cultural manifestations (e.g. Souza Mendonça Menezes and Thomé da Cruz 2017).

A transformation of food systems is a process that affects behaviors, mindsets, paradigms infrastructures, institutions. There is no possibility of transformation without consensus on the need to change. Culturally embedded dietary principles can provide a ‘consensus framework’ on which to build public, private and civic strategies (Brunori et al., 2013). We argue that the Mediterranean diet, as a knowledge and values repertoire, is linked to the communities that have practiced it for centuries. We build on the idea that the notion of Mediterranean Diet encompasses a variety of context-specific variations – cultural specificity and linkage to various traditions being at the very basis of its definition.

These communities have played a key role in preserving and promoting the Mediterranean diet and, in addition to individual benefits, they contribute to environmental sustainability by producing and consuming local and seasonal foods, thereby reducing their ecological footprint. Their deep connection to the land, sea and culinary traditions is a valuable legacy for future generations, demonstrating that the Mediterranean diet is much more than a dietary practice: it is a balanced way of life, a bond between people and the land that promotes both individual and collective well-being. In the Mediterranean area, local traditional food products can be studied for their nutritional and cultural properties and re-discovered by the local population through awareness-raising campaigns and by supporting the development of specific supply chains and markets.

At the local level, many communities involved in the Mediterranean diet are organized in associations, cooperatives and cultural initiatives, meant to preserve and promote traditional and sustainable food practices.. A variety of research, development and sustainability projects promote the Mediterranean diet and involve local communities, often supported by governmental institutions, universities, and

non-governmental organizations. Institutional support to the Mediterranean diet is also epitomized in several Mediterranean countries specific adopting national or regional policies with the aim of preserving and promoting it. These may include awareness-raising campaigns (Quarta et al 2021, Biasini et al 2021), educational programs (BCFN 2021, MIUR&FEI 2018, Massari et al 2021, Cadel and Massari 2021, Antonelli et al 2021), and measures to support sustainable rural development and agricultural practices (Maybek et al 2017). For example, in Morocco, in the last decades, Argan oil production and supply chains were at the center of important interventions aiming at fostering rural development through new (women-led) agricultural cooperatives as well as promoting territorial consumption of healthy and nutritious products building on local knowledge (Roumane 2017).

5. FILLING THE KNOWLEDGE GAP

Knowledge holds the power to change the way to deal with food. Filling knowledge gaps is a key to transformation, and food environments play an important role in knowledge production and reproduction. Knowledge gaps can be articulated into a) awareness gaps, that is, lack of understanding of the link between behavior and health (of one's own body and of the planet); b) motivation gaps, that link awareness to the willingness to change: in most cases, this type of gap is related to trade-offs between the benefits of the change and the expected costs of the change; c) action gaps, related to the access to suitable solutions to a recognized problem. These three gaps are invoked at political level to oppose more incisive policies to change the food environments, and at the same time are powerful factors of resistance to change by individuals.

The Mediterranean diet has the potential to address food-related knowledge gaps. It is a resource for 'soft power', that resonates with people's lifeworld and demonstrates that pathways for change are feasible. In terms of awareness gap, it shows a link between diets and body and planet health; it provides motivation to act, as it creates a coherence between values and behaviors embedded into local culture; it can also provide actionable knowledge, being based on a multidisciplinary knowledge reservoir related to local gastronomy. Indeed, elements of the Mediterranean diet, especially in relation to the skills and tastes that Mediterranean populations still have in spite of their lack of adherence to it, persist to date and are embedded in people's habits and routines, such as the importance given to conviviality, the preference for food cooked from scratch, or the lingering taste for cooked vegetables as side dishes in restaurants (Censis/Coldiretti, 2010, Castaldi et al 2018, Petersson et al., 2021). How can the Mediterranean diet be mobilized to fill the knowledge gap by shaping food environments? In table 1 we have identified some examples.

We hereby elaborate on table 1 by providing some examples of the ways in which the Mediterranean diet can be incorporated in food practices as a driver of transformation. While interventions in this sense also exist in relation to the public sector (e.g. Mediterranean diet and public procurement, Mediterranean diet and rural development programs, etc), we focus specifically on cases based on food businesses and restaurants.

The Mediterranean diet can be embodied into innovative menus of restaurants and haute cuisine chefs: world-famous chefs are experimenting with the ingredients of the Mediterranean diet to create innovative and sophisticated dishes. They often try to creatively reinterpret traditional Mediterranean dishes, using advanced presentation techniques or unusual flavor combinations, but their signature cuisine is increasingly becoming (thanks in part to TV shows) a kind of Mediterranean coefficient, whereby criteria of lightness, seasonality, territoriality, imagination and craftsmanship are recognized worldwide thanks to their fame. For instance, Massimo Bottura, from Modena, has transformed the local tradition by reducing the calories content and, above all, the saturated fats in traditional recipes, winning the title of the best chef in the world. The chef Niko Romito has launched a movement often referring to the Mediterranean diet as a "gastrono-

Components of the knowledge gap	Example	Role on the food environment
awareness gap	Educational programs in different contexts (e.g. schools; public kitchens, train the trainers, ...)	Increasing food literacy and access to it
	Culinary events and new local food narratives (including museums, exhibitions and themed performances)	Increasing the capacity of local communities to develop food storytelling
	Recipe platforms (specialized magazine, books, ebooks, online tutorials, recipes from chefs as influencers...)	Improving gastronomy knowledge
	Training programs for professionals (e.g. young chefs in professional schools and chefs working in restaurants but also public canteens; civil servants in charge of tenders for PFP, food innovators, communicators/journalists and activists, CEOs and innovative startups, ...)	Increasing capacities of different professionals in applying MD principles in the respective fields
motivation gap	Inclusion/engagement activities and events	Making MD part of, culturally accessible and understandable in various contexts, from territorial culinary events like popular food festivals to institutional settings, through Public Food Procurement, Living Labs and food literacy programs
	Cooking experience, innovative and experimental cuisine	Giving MD a higher 'status' and visibility, also in TV programs
action gap	interactive food and eating experiences	providing practical examples to consumers
	new food products or 'redesigning' traditional foods/meal/recipes/products to fit the modern menu and increasing new dietary patterns (e.g. vegetarian or vegan diets)	providing alternatives for choice (in shops and restaurants, and online)

Table 1. How Mediterranean diet can fill the knowledge gap (MD: Mediterranean Diet)

mic evolution”, strongly supported by communication, which has led people to pay more attention to the quality of vegetables that tell the story of the territory, even in public catering (his is the research and food design experiment applied in hospital canteens).

There are also transdisciplinary collaborations on Mediterranean diet in the kitchens of some very famous restaurants (for example, El Cellar de Can Roca, Mugartiz, Glass Hostaria, elBulli), which use their development kitchens as small laboratories where the kitchen staff, supported by scientists, dedicate themselves almost full-time to the creation of new dishes and the development of alternative techniques (Pérez-Lloréns, 2019). The use of new ingredients and innovative equipment has provided opportunities to modify traditional recipes, and this way of working has entered mainstream professional consciousness and is increasingly documented in books and scientific literature (Tan, 2020).

Some food companies and fast-food chains have been developed to meet the growing demand for healthy food inspired by the Mediterranean diet. “Mediterranea”, for example, is the food retail format that promotes the diet with a healthy and gourmet offer. It sells ready-made salads, pre-cooked meals and snacks based on dried fruits and whole grains, all packaged according to the principles of the Mediterranean diet. In 2012, the “Mediterranean Diet Friendly Restaurants” network was also launched, with the aim of promoting and uniting restaurant operators in the Mediterranean area through a collective system of recognizable quality. Fispmed Onlus, in partnership with major international certification bodies, manages the control system for the use of the ‘Mediterranean Diet Friendly Restaurant’ logo to guarantee the market and supports the companies through institutional and product communication activities (Dietamed Project, 2023¹).

Some restaurants (e.g., Porta Messina, Poke restaurants) and “gourmet delivery services” (e.g., “Componi la tua cena”, Vita Meals, Genuino) offer interactive experiences where customers can create their own meal according to the principles of the Mediterranean diet. In these formats, customers are encouraged to choose from a variety of vegetables, grains, oils and proteins to create a personalized and healthy meal, or, as happens with “Frisella”, they are involved in spreading and preserving the local Mediterranean culture. The latter case illustrates how a systemic food design project that combines historical research with food experimentation has been able to create new ecosystems that include the goals of the local municipalities, producers, distributors and environmental resources. Online recipe platforms and apps dedicated to the Mediterranean diet have also recently appeared. These resources offer innovative recipes that combine Mediterranean ingredients in creative ways.

Finally, culinary events such as food fairs and festivals often include eating design experiments inspired by the Mediterranean diet, such as artistic food installations, unique culinary creations and creative presentations of traditional Mediterranean dishes. In 2017, in southern Italy, a food designer created ‘Sementino’, a legume-based snack celebrated for its crunchiness, which was initially launched at Slow Food festivals and local fairs. It was designed to encourage small local communities to develop territorial storytelling and build new relationships between producers and consumers. (Massari et al 2022) The development of innovative foods based on the ingredients of the Mediterranean diet has also become an objective for large companies, for example, to create snacks based on olives or fermented foods. ‘I Legumotti’ is a product based on legumes, produced by the company Barilla (Massari et al 2022). It is an example of the application of design thinking

1. <https://www.dietamed.net/>

methods to a product, with the aim of guaranteeing consumers a more nutritious and sustainable diet with plant-based proteins (Fruitbook Magazine, n.d.). This project was the result of a partnership between a leading brand in the Italian food industry (Barilla) and a large distribution company (Esselunga).

Furthermore, food and wine tourism encourage tourists to experience authentic Mediterranean cuisine in local restaurants, thus supporting the local economy and promoting sustainable production. (Aleffi & Cavicchi 2018; Cavicchi & Santini 2019). Regular UNESCO dissemination describes how foreign perceptions of Italian identity have shifted towards those foods now recognized by the international scientific/medical community as characteristic of the Mediterranean diet.

6. CONCLUSIONS

In this paper we have introduced a reflection on how the Mediterranean diet, as well as other culturally embedded dietary principles, can be drivers of food system transformation. We have argued that the Mediterranean diet values and principles can be turned into resources for transforming micro and macro food environments. At the local level, the Mediterranean diet can affect 'micro-environments' by promoting diet diversification based on Mediterranean Gastronomy.

By promoting plant-based food, traditional varieties, traditional gastronomy, the Mediterranean diet is a powerful driver of behavioral change. The blurry and multiple definitions of the Mediterranean diet can, on one hand, allow us to bring together context-specific interpretations and incorporate under the same umbrella various gastronomic traditions, habits, and lifestyles, but also skills and conviviality dimensions.

At macro level, the Mediterranean diet can provide a "consensus framework" to make the concept of "sustainable diets" closer to local knowledge and routines. The Mediterranean diet, intended as a constellation of locally adapted knowledge and routines based on common principles, also helps to address the dilemma linked to food environments: when intervening on food environments, how to avoid a paternalistic approach to diets? How to reconcile individual freedom, cultural diversity, and directionality of change? If we avoid using it as a tool for nationalistic/elitist hegemony or as a form of 'defensive localism', the Mediterranean diet can be a principle that generates alternatives to conventional patterns of production-consumption.

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RECONCILE MEDITERRANEAN DIETS WITH CONTEMPORARY LIFESTYLES

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ABSTRACT All over the world diets are changing, with an increasing influence of the Western diet, towards more calorie intake, more highly processed and refined foods, more animal products, and higher contents of sugars, salt, and fat with considerable impacts on nutrition, driving increasing overweight, obesity and related health issues. Mediterranean countries are not exempt from this phenomenon. Adherence to the Mediterranean diet is declining; the Mediterranean diet and Mediterranean food systems are under threat, which hinders the sustainability of regional food systems in all dimensions of sustainability: environmental, economic and social. The purpose of this paper is to explore some of the drivers of the recent evolution of diets and how they can be addressed to reconcile Mediterranean diets with contemporary lifestyles. It briefly analyses trends and discourses affecting food systems and cultures, driven by globalization and urbanization and at the same time by growing concerns for health and for sustainability, often linked, as well as by growing interest in territorial and cultural identities. It then examines how the benefits of the Mediterranean diet for nutrition and health and its positive contributions to sustainable food systems can be leveraged and combined with the positive perception of Mediterranean foods, landscapes, cultures and lifestyles, to change attitudes, engage various categories of stakeholders and ground collective action. Recognizing the centrality of food environments and cultures and the key roles of education and convenience, it finally proposes areas of actions that can catalyze favorable dynamics and trigger changes towards more sustainability and better adherence to the Mediterranean Diet.

Key words Mediterranean food culture, Mediterranean diet adherence, food environment, Mediterranean food environments, lifestyle

RÉCONCILIER LES RÉGIMES ALIMENTAIRES MÉDITERRANÉENS AVEC LES MODES DE VIE CONTEMPORAINS

RÉSUMÉ *Partout dans le monde, les régimes alimentaires changent, avec l'influence croissante du régime occidental, vers un apport calorique plus élevé, plus d'aliments ultra transformés, davantage de produits d'origine animale et des teneurs plus élevées en sucres, sel et graisses, avec des impacts considérables sur la nutrition, provoquant une augmentation du surpoids, de l'obésité et des problèmes de santé qui y sont associés. Les pays méditerranéens ne sont pas épargnés par ce phénomène. L'adhésion au régime méditerranéen est en déclin ; le régime méditerranéen et les systèmes alimentaires méditerranéens sont menacés, ce qui compromet la durabilité des systèmes alimentaires régionaux dans toutes les dimensions de la durabilité : environnementale, économique et sociale. Le but de cet article est d'explorer certains des moteurs de l'évolution récente des régimes alimentaires et comment ils peuvent être abordés pour réconcilier les régimes méditerranéens avec les modes de vie contemporains. Il analyse brièvement les tendances et les discours affectant les systèmes et les cultures alimentaires, induits par la mondialisation et l'urbanisation et en même temps par les préoccupations croissantes pour la santé et la durabilité, souvent liées, ainsi que par l'intérêt croissant pour les identités territoriales et culturelles. Il examine ensuite comment les bénéfices du régime méditerranéen pour la nutrition et la santé et ses contributions positives aux systèmes alimentaires durables peuvent être exploités et combinés avec la perception positive des aliments, des paysages, des cultures et des modes de vie méditerranéens, pour changer les attitudes, impliquer diverses catégories de parties prenantes et fonder l'action collective. Reconnaissant le caractère central des environnements et des cultures alimentaires ainsi que le rôle clé de l'éducation et de la commodité, il propose enfin des domaines d'action qui peuvent catalyser des dynamiques favorables et déclencher des changements vers plus de durabilité et une meilleure adhésion à la diète méditerranéenne.*

Mots-clés *Culture alimentaire méditerranéenne, adhésion au régime méditerranéen, environnement alimentaire, environnements alimentaires méditerranéens, mode de vie*

1. INTRODUCTION

The characterization of the Mediterranean Diet (MD) as an archetypal diet in the Mediterranean region was grounded on descriptions of diets at the end of the 1950s in some poor rural areas in the Mediterranean. It is now promoted as a model in terms of nutritional and environmental values, as well as for remarkably making the most in terms of efficiency, diversity and resilience, of the demanding productive environment in the Mediterranean.

All over the world diets are changing, with an increasing influence of the Western diet, towards more calorie intake, more highly processed and refined foods, more animal products, and higher contents of sugars, salt, and fat, leading to an adverse nutrition transition driving increasing overweight, obesity and related morbidity issues. Mediterranean countries are not exempt from this phenomenon. Adherence to the MD is declining; the sustainability of the MD and of Mediterranean food systems are under threat.

The purpose of this paper is to explore some of the drivers of the recent evolution of diets and how they can be addressed to reconcile the MD with contemporary lifestyles. It first considers how some of the global changes may play a role in the erosion of the MD and what are the dynamics at play. It also highlights some of other global recent trends about the perception of food that might resonate with the MD and that can be exploited to promote it and ground resistance to its erosion. It then looks at the positive perception of the MD, of its nutritional and other benefits, of Mediterranean foods, food cultures and lifestyles in order to identify opportunities for linking these different notions and to engage actors that benefit from their promotion to facilitate the adoption of the MD by consumers.

2. GLOBAL TRENDS AND DISCOURSES ARE AFFECTING FOOD SYSTEMS AND CULTURES IN THE MEDITERRANEAN

Economic development, globalization and urbanization are transforming lifestyles as well as food systems, changing consumer behaviors and diets; away from traditional dietary patterns relying on staple grains, legumes, vegetables and fruits to dietary patterns that include more processed foods, away-from-home foods, animal-source foods, refined carbohydrates, edible oils and sugar-sweetened beverages, a process that has been named “the nutrition transition” (Popkin, 1993).

Multiple factors lead to the increased consumption of cheap processed foods, promoting unhealthy eating habits. The urban environment offers more food choices from supermarkets, informal markets, and restaurants, but not always overall favoring quality and diversity. . Nutritious foods can also be more expensive than energy-dense options, with their relative prices varying by region and income level. Convenience is a significant factor, as urban lifestyles, shifts in employment for men and women, and longer commuting times have reduced time spent on preparing food and cooking at home and increased demand for pre-prepared foods. Consumption patterns vary across the rural-urban spectrum, but overall, there is a global trend towards convenience and processed foods, challenging traditional dietary norms and health (FAO, 2023). These changes are accompanied by changes in the food culture, with an erosion of collective, social meaning traditionally associated with food and a growing influence of marketing and media. Erosion of skills and competencies to cook and prepare food domestically – both linked to lower cooking knowledge intergenerational transmission, especially within the family, and less time and practice overall spent on home cooking also leads to higher consumption of ultra-processed foods as shown by studies in the US and UK (e.g. Lam and Adams, 2017, Montsivais et al., 2014).

The Mediterranean region is passing through a nutritional transition in which problems of undernutrition coexist with overweight, obesity and food-related chronic diseases, with alarming negative impacts on health systems (FAO, CIHEAM, 2015). People from Mediterranean countries are progressively including low-nutrient energy-dense foods (such as sugared soft drinks, sweets, bakery products, salted snacks) and changing food processing methods (such as refinement of flour) towards a less healthy diet (Castro-Quezada et al., 2014). The abandonment of traditional habits and the emergence of new lifestyles associated with socio-economic changes pose important threats to the preservation and transmission of the MD to future generations. A systematic review of the scientific literature available on MD adherence among adults living in Mediterranean countries showed low to moderate adherence to MD in the past 10 years (Obeid et al., 2022). A study on adherence to the MD among Spanish children and adolescents from 1998–2000 to 2019–2020 concluded that eating habits were deteriorating between age classes as well as between periods for a same cohort. In particular, a higher consumption of refined baking products for breakfast and fast-food meals was observed across age classes (Herrera-Ramos et al., 2023).

Profound changes in contemporary diets are driven by both “push” factors, the development of the food industry, global brands of foods, fast foods and retailers and by “pull” factors driven by changes in lifestyles that modify food consumption. Foods that were traditionally rare and expensive, like sugar, fats and meat, reserved for special occasions are now abundant and cheap while having conserved the attractiveness of when they were a luxury. New dietary preferences are dictated by a new lifestyle transformed by urbanization, new organization of labor and time as well as by changing organization of family life, with a growing participation of women in economic life, fewer household members, fewer generations living together, and desocialization (Hervieux, 2008).

There is overall less time for food, to shop, to cook, to eat. Food competes for time with work, transport, leisure. Changes in the organization of the day and of families have important consequences on meals and meal patterns well described in Egypt for instance (Hassan-Wassef, 2004). The results of a study in Spain on a small number of families seem to support a correlation between a disrupted pattern of conviviality (i.e., less time spent on family meals, meals not at the table, digital distractions during meals, meals not the occasion for pleasant conversations) and a lower adherence to the MD (de la Torre-Moral, 2021).

3. CONNECTING THE DOTS: BRINGING TOGETHER THE RECOGNIZED BENEFITS OF THE MEDITERRANEAN DIET, FOODS, LANDSCAPES, CULTURES AND LIFESTYLES

3.1. EMERGING DISCOURSES AND TRENDS DRIVEN BY GROWING CONCERNS FOR HEALTH AND FOR SUSTAINABILITY

Concerns about the impacts of these broad diet changes on nutrition and health have led public health authorities at both global and national levels to promote more healthy eating practices. It has led to the promotion of a minimal daily consumption of vegetables and fruits by the World Health Organization relayed by various national authorities, the development of national food-based dietary guidelines and measures in favor of nutritional labels on packaged foods in various countries. Recent years have seen a multiplication of actors involved in the food and health discourse including experts in nutrition and health but also food industry marketing, chefs, news media, and food bloggers, creating a confused information landscape with often polarized and conflicting messages (Van Royen et al., 2022).

The global interest in dieting has given way to a multiplication of “fad diets”, each presented as the silver bullet to lose weight. Most of them recommend modifying the intake of macronutrients to specific pro-

portions and/or to intake or avoid particular foods, with potential negative impacts on nutrition and health (Spadine and Patterson, 2022). A systematic review showed the importance of social and media influence in the adoption of fad diets (Spadine and Patterson, 2022). Among the most promoted diets figure: Atkins diet, ketogenic diet, Paleolithic diet, vegan, vegetarian diet, intermittent fasting and detox diet. Some authors also include the Mediterranean diet in such a list, noting however that, contrarily to the others mentioned, it does not have negative impacts but, on the contrary, multiple health benefits (Tahreem et al., 2022).

The understanding of the importance of the impacts of food systems and food consumption on the environment has also given way to the promotion of diets that are more environmentally sustainable, generally advocating for less animal products, seasonal products, less transformed and sourced locally. Inspired by such motives, as well as by animal welfare concerns, are the MD, flexitarian, pescatarian, vegetarian and vegan diets that all promote less to no consumption of meat and other animal products. Their promotion is often articulated around the idea “good for health and good for the planet”. The desire for more healthy foods, often combined with environmental concerns, also expresses itself in the promotion of certain categories of foods, like fruits and vegetables, and of certain characteristics like fresh, “natural”, and organically produced. The organic food movement benefits fully from this conjunction of perceptions of healthy and good for the environment. In essence, the concept of “healthy food” is multifaceted, with consumers forming perceptions based on a blend of nutritional content, societal beliefs, personal values, and individual experiences (Liñán et al., 2019).

3.2. GROWING RECOGNITION OF CULTURAL AND TERRITORIAL DIMENSIONS OF FOOD

Contradicting the globalization and homogenization of diets and in reaction to it there are also tendencies to recognize and promote the diversity of food cultures, of ethnic cuisines, exotic foods, traditional foods and the links of foods with specific areas of production, landscapes and practices. Such tendencies manifest themselves in the media, in the proliferation of restaurants and shops specializing in traditional or exotic foods.

Various means enable to better link foods and landscapes of production: markets, farmers markets, agrotourism and gastronomic tourism (Meybeck and Gitz, 2021). For instance, an agritourism program was initiated in more than 50 villages in Cyprus in 1991 to diversify the tourism offer with the traditional Cypriot cuisine promoted as a mediator of Cyprus’s identity (Kaufmann et al., 2012). Various labels are built upon the link between a specific food and the territory where it is produced. In the South of Europe such labels are a privileged way to relate products to sustainability (Meybeck and Gitz, 2014). A study by the European Commission (2021) noted that the sales value of a product with a protected name was on average the double of comparable products without the certification.

In the Mediterranean area, there is a strong tradition of festivals, often linked to religious feasts, where communities celebrate food, conviviality and their own cultural identity. Festivals showcase a community’s history and culture, and promote local produce deeply linked to specific territories. Historically, they have been platforms for both social and commercial interactions, becoming a crucial part of the tourism and leisure sector (Ascione & Fink, 2021). In Greece, the panigiria are characterized by region-specific gastronomic specialties accompanied by traditional music and dance. The sagre are considered one of the main touristic events in rural Italy, mobilizing about 1 billion euro and 1 million people every year (Frontefrancesco, 2020).

Slow food, a global movement initiated in Italy in 1986, promotes traditional local foods, production and cultures in opposition to industrial and fast foods. Slow Food has implemented over 10,000 projects in 160 countries, with 1 million activists (Slow Food, 2023). Its Foundation for Biodiversity is present in 79 coun-

tries with 654 presidi, the majority of which are in Mediterranean countries (Fondazione Slow Food, 2023). For instance, the presidio of the oasis Djebba el Olia oasis in Tunisia supports producers in promoting 17 antique fig varieties and conserving the complex agroforestry system. During the Elkarmous Festival in August, the Djebba community and Tunisians across the country celebrate the fig and its varieties. In Morocco a presidio supports the Mussel Wakkad Tigi production system. Mussels harvested by women in the Souss Massa region are smoked to be preserved and used as a key ingredient in tajine, a classic Maghreb dish cooked in a special clay pot (Fondazione Slow Food, 2023).

3.3. THE VARIOUS BENEFITS OF THE MEDITERRANEAN DIET ARE INCREASINGLY BEING PROMOTED

The Mediterranean diet is a dietary model constructed by scientists (Dernini et al., 2012). It is widely considered as a healthy dietary pattern and a greater adherence to the Mediterranean diet has been associated with significant improvements in health and nutritional status (FAO, CIHEAM, 2015), with a lower incidence of mortality from all-causes, and lower incidence of morbidity including cardiovascular diseases, type 2 diabetes, certain types of cancer, and neurodegenerative diseases (Castro-Quezada et al. 2014). The Mediterranean diet has also been recognized as a sustainable diet because of its low environmental impact (FAO, CIHEAM, 2015).

To capture all these positive contributions a comprehensive Med Diet 4.0 framework has been proposed: (i) major health and nutrition benefits; (ii) low environmental impacts and richness in biodiversity; (iii) high sociocultural food values; and (iv) positive local economic returns (Dernini et al., 2017). The promotion of the MD increasingly uses these recognized benefits building upon the “good for me good for the planet” image. Several of the dietary guidelines of Mediterranean countries make explicit reference to the MD model. The Turkish ones note that the MD is recommended for healthy nutrition (Ministry of Health of Turkey, 2006). Those of Spain (2022) note that the MD is aligned with the recommendations.

The dietary guidelines of Lebanon contain multiple recommendations that explicitly refer to the traditional Lebanese diet (Hwalla et al., 2013). The dietary guidelines of Malta, titled “Healthy eating the Mediterranean way!” explicitly refer to the Mediterranean diet and lifestyle (Ministry of Health of Malta, 2015). They highlight that it contains many dishes that are easy to prepare and tasty. The MD promotion can also be grounded on the positive perception of Mediterranean foods, landscapes, cultures and lifestyles as has often been noted that consumers tend to amalgamate different quality attributes of food (sustainability, health and even taste) into a single appreciation of ‘quality’ (Meybeck and Gitz, 2014).

4. CATALYTIC AREAS OF ACTION

4.1. RECOGNIZE THE CENTRALITY OF FOOD ENVIRONMENTS AND CULTURES

One’s diet is the result of a multitude of choices all along the day, week, year -what to buy, how to cook, what to eat, how often, how much, with whom- all of which are driven by multiple interacting factors: both internal (physiological, psychological, skills and capabilities...) and external (availability, price, social environment...). The latter constitute what is being often described as the “food environment”. Swinburn et al. (2013) defined the food environment as the “collective physical, economic, policy and sociocultural surroundings, opportunities and conditions that influence people’s food and beverage choices and nutritional status” (Swinburn et al., 2013:2).

Other definitions are more restrictive, focusing mainly on physical dimensions (Turner et al., 2018, Downs et al., 2020). For the HLPE (2017, p28) “Food environment refers to the physical, economic, political and

socio-cultural context in which consumers engage with the food system to make their decisions about acquiring, preparing and consuming food”. It further explains that the food environment consists of the physical spaces where food is purchased or obtained, the way they can be accessed, the determinants of consumer food choices and the political, social and cultural norms. Without entering into a detailed conceptual discussion, we propose to retain here the broader definition of the HLPE (2017) that in fact precises the one of Swinburn et al. (2013). It allows to distinguish two broad areas in the food environment: physical and economic availability and access on the one hand and the social and cultural factors that influence choices on the other hand; recognizing their links.

Swinburn et al., (2013) have identified three main influences on food environments: food industry, governments, and society. We propose here to go a step further in the identification of the actors that can play a role in influencing food environments, both cultural and physical, to support adherence to the MD. A broad range of actors have an interest in the MD, Mediterranean foods and lifestyles (see Figure 1):

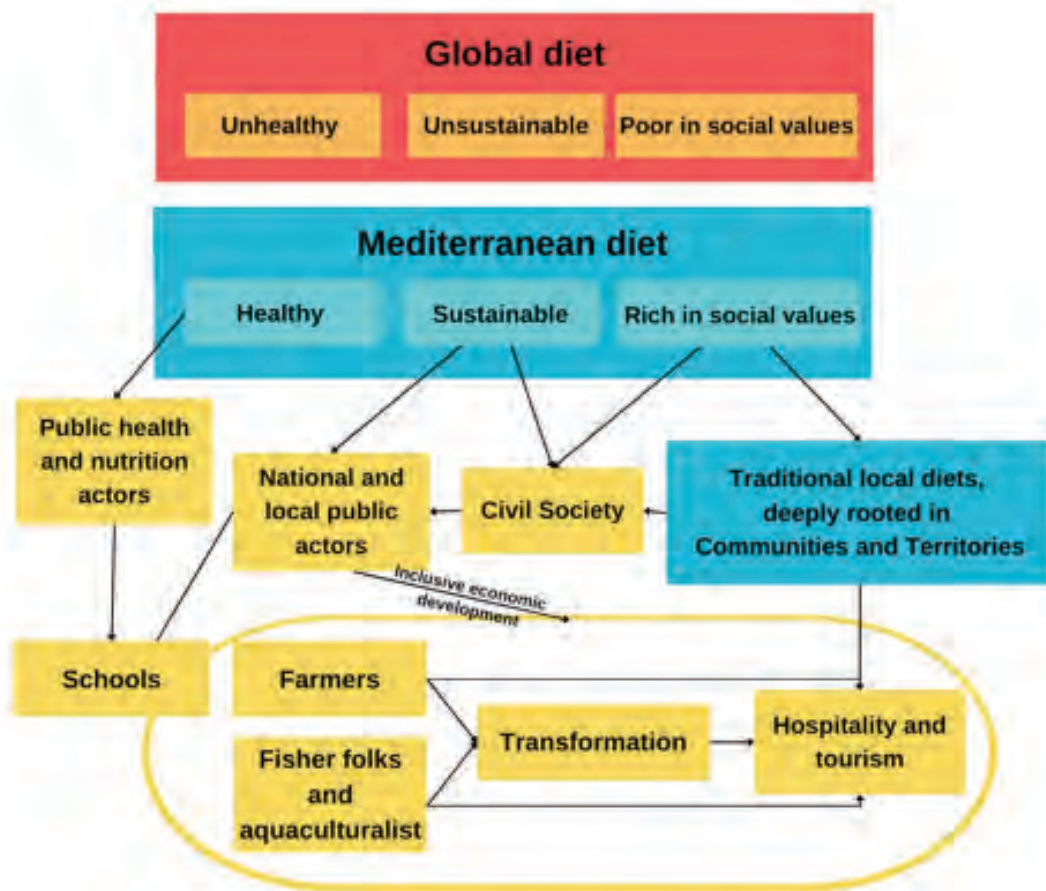


Figure 1: Actors (in yellow) interested in the promotion of the MD

All these actors can contribute to a coherent discourse associating the MD and its multiple benefits, for health, the environment, biodiversity, as well as local communities and cultural identities linked to Mediterranean foods, landscapes and lifestyles. Such a discourse, uniting stakeholders of food-related communication (van Royen et al., 2021) would be critical in facilitating MD adherence by reducing confusion and providing the consumer with a clear guide that also responds to its desire for a simple quality

message, good, good for health, good for my community and good for the planet, facilitating its food choices. It could also help the MD gain more visibility and weight in the overall confusing landscape of “fad diets”. The actors can also, by their activities, facilitate adherence of people to the MD by increasing the convenience of the MD, making it easier, less costly in time and money.

4.2. EDUCATE

The role of the family in the transmission of information about food is decreasing, giving more importance to school and external sources (Hervieu, 2008). Schools play a crucial role in the daily food intake of children, and an increasingly crucial role in their food education and also indirectly, through the children, on families’ and communities’ food practices.

In Italy, the nutrition guidelines for school meals are based on the principles of the MD (Ministero della Salute, 2021): a portion of seasonal fruits and seasonal vegetables at least once a day, recommended use of extra virgin olive oil, meat no more than twice a week, legumes and fish each at least once a week. The guidelines also support sobriety by defining portions’ size, according to age, and prohibiting double servings. Lunch is recognized as one of the most important educational moments of students’ school day. For instance, awareness about food waste was promoted by involving children directly in its quantification (Boschini et al., 2018).

In Tunisia, since 2016, the “National caravan for consumers’ education in school environments” tours about 20 schools per year to sensitize elementary school students (10-12 years old), teachers and educational staff about sustainable and healthy consumption patterns and enable them to acquire the necessary knowledge to become responsible, informed, and influential consumers. With a focus on the MD, the main themes of the Caravan include health, nutrition, physical activity, sustainable consumption and food waste, promoting olive oil and whole cereals. The initiative is a partnership between the National Institute for Consumer Affairs (INC), the Ministry of Education, the National Institute of Nutrition and Food Technology (INNNTA), the National Agency of Sanitary and Environmental Control of Products (ANCSEP) and various NGOs.

4.3. FACILITATE ADHERENCE

Reconciling the MD with contemporary lifestyles requires also to make it understandable, concrete, accessible, and easy to adopt for modern consumers. Souk el Tayeb is a farmers’ market in Beirut that was launched in May 2004 to create a space for farmers across the country to sell their organic products. The vision inspiring the initiative was to create a platform that joins different people and stakeholders in celebrating food cultures and traditions while promoting and supporting the Lebanese agri-food sector. Souk el Tayeb farmers’ market joined forces with Tawlet, the farmers’ kitchen, to celebrate food traditions that unite communities and support small-scale producers. Campagna Amica, created in 2008 at the initiative of Coldiretti, the biggest organization of farmers in Italy, is very successful in linking consumers to producers through farmers’ markets and agritourism. Campagna Amica is engaged in promoting the Mediterranean diet and the biodiversity associated to it. In 2015, the network comprised 10,000 selling points, with an estimated turnover of 15 billion euros and 4 to 8 million consumers all over Italy (Fondazione Campagna Amica, 2016). An estimated 14 million people visited Italian agritourisms in 2023 (Campagna Amica, 2023).

With the transformation of working rhythms and longer transports, most lunches are now taken out of home and an increasing amount of food is also bought prepared to be consumed at home. Like the

schools for children, the places where these meals are taken, enterprise canteens or local restaurants, provide a significant amount of daily food intake and can inform eating practices of workers. The cooks preparing these daily meals, the “daily cooks”, are major actors for the revitalization of the MD. They can make the traditional recipes that require a long preparation, compensating for the lack of time devoted to cooking in modern lifestyles. The workplace becomes a place where to eat and be informed about food, in line with the evolutions of modern life. Some big private companies are also organizing information and training of their employees on nutrition. In Italy, they can benefit from fiscal incentives for the provision of wellness services to employees.

Communities and local public actors can play a key role in initiating and coordinating these activities, from schools to markets. The notion of “territorial food projects” (PAT) was introduced in France by the law for the future of agriculture, food and forests of 14 October 2014. PATs are designed in a concerted way with all actors, producers, transformers, retailers, local public authorities and consumers to construct a territorial food system, develop agriculture and improve the quality of food consumption in the area. They can be initiated by public authorities, by groups recognized as “groups of economic and environmental interest”, by farmers and other actors. They are grounded on a shared diagnosis of agriculture and food consumption in the territory and on the identification of concrete actions to be implemented (Gitz, 2016). This mechanism is used to federate actors to promote the MD and facilitate adherence as in the PAT of the Marseille region for instance. The PAT of the Luberon promotes “the Mediterranean food at the heart of agroecological transitions” with the support of the regional natural park and public health authorities.

5. CONCLUDING REMARKS

Socio-economic development, globalization, urbanization, as well as social and family mutations, transformed dietary patterns and consumer behaviors, causing an erosion of adherence to the MD. However, Mediterranean consumers are increasingly concerned about the impacts of diets on their health as well as on the environment and also on social issues like sustaining local producers, with an increasing perception of the role of food consumption choices not only on nutrition, but also on both economic, social and environmental sustainability. Meanwhile, there is a growing and wider recognition of the cultural and territorial dimensions of food. The latter trends create opportunities for the promotion and revitalization of the Mediterranean diet. A broad range of actors benefit from the positive image of the MD, of Mediterranean foods, landscapes and lifestyles. They can underscore the recognized benefits of the MD (health-nutritional, environmental, social, economic) and emphasize the linkages between foods, landscapes, cultures and lifestyle. They can also contribute to reconciling the MD in an innovative way with modern, contemporary lifestyles. Their activities can make the food environment in the Mediterranean, physical, socio-economic and cultural, conducive to the MD and the choices that it implies. The final aim is to make the MD not an habit of the past but a favored, easy and convenient choice for all within food environments of the future.

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CHANGE OF ROUTE TOWARD VOLUNTARY GUIDELINES FOR THE PROMOTION OF THE MEDITERRANEAN DIET

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ABSTRACT The Mediterranean diet as originally documented in the 1950s, and sixties is rapidly diminishing as the influence of fast- and ultraprocessed foods is eroding traditional diets and food systems the world over. A voluntary code or set of guidelines could be useful to promote adherence to the Mediterranean diet, and as a model for sustainable diets in other agroecological zones. Recommendations from the High Level Panel of Experts for the UN Committee on World Food Security are examined for their relevance to the Mediterranean diet. Several 'codes' are evaluated for attributes, influence and impact, and how they can be applied in constructing a draft code for the Mediterranean diet, and by extension as a model for sustainable diets. The results show that guidelines and codes of conduct, whether binding or voluntary, provide useful guidance for stakeholders and rights holders across sectors, disciplines, and social structures.

Keywords: sustainable diets, code of conduct, voluntary guidelines, Mediterranean diet, adherence

CHANGEMENT DE CAP VERS DES LIGNES DIRECTRICES VOLONTAIRES POUR LA PROMOTION DE LA DIÈTE MÉDITERRANÉENNE

Résumé *A l'heure actuelle, la diète méditerranéenne, telle qu'elle a été documentée à l'origine dans les années 1950 et 1960, connaît un recul important alors que la restauration rapide et les aliments ultra-transformés concourent à l'érosion des régimes alimentaires et des systèmes alimentaires traditionnels dans le monde entier. Un code de conduite ou des lignes directrices volontaires pourraient encourager l'adhésion à la diète méditerranéenne et fournir un modèle à suivre pour la diffusion de régimes alimentaires durables dans d'autres zones agroécologiques. Dans cet article, nous avons analysé les recommandations du groupe d'experts de haut niveau du Comité des Nations unies sur la sécurité alimentaire mondiale afin de déterminer si elles sont pertinentes par rapport à la diète méditerranéenne. Divers « codes » ont été évalués en fonction de leurs qualités, de leur influence et de leur impact, et de leur utilité en vue de l'élaboration d'un projet de code pour la diète méditerranéenne et, plus généralement, d'un modèle pour des régimes alimentaires durables. Les résultats montrent que les lignes directrices et les codes de conduite, qu'ils soient obligatoires ou volontaires, peuvent fournir des orientations utiles aux parties prenantes et aux ayants droit tous secteurs, disciplines et structures sociales confondus.*

Mots-clés *Régimes alimentaires durables - Code de conduite - Lignes directrices volontaires - Diète méditerranéenne - Adhésion.*

1. INTRODUCTION

Globally, there are hundreds of agreed texts in the form of guidelines, goals, targets, treaties, codes of conduct, declarations, action plans and recommendations covering a variety of topics. High on the global agenda, and still requiring urgent action at all levels, are the decades' old agreements on climate change (UNFCCC, 1992), biodiversity (UNEP, 1992), and relatively more recently, on sustainability generally (United Nations, 2015). Each has relevance to and implications for nutrition, diets, and food systems.

Other key international instruments of relevance to the development of voluntary guidelines for promoting the Mediterranean diet provide direct and explicit recommendations, or models, from which to extrapolate. As examples, the Universal Declaration of Human Rights (United Nations, 1948), The Code of Conduct for Responsible Fisheries (FAO, 1995), and the Right to Food (FAO, 2005), can be viewed as foundational for framing a voluntary code. Others can be viewed as models or templates, as in the case of International Code of Marketing of Breast-Milk Substitutes (WHO, 1981) and the Framework Convention on Tobacco Control (WHO, 2003). In addition, science/policy convergence bodies provide recommendations that can be directly applied.

There are many agreed and measurable targets and indicators for monitoring compliance with/adherence to the above codes. However, debate continues over how best to measure adherence to the Mediterranean diet. As the merits of individual indicators and composite indices are debated, promoting adherence to a sustainable Mediterranean diet needs to be undertaken even in the absence of the ability to measure adherence. A voluntary code or set of guidelines could be useful to promote adherence for sectors (health, ag, environment), for professional groups (educators, food technologists, nurses, doctors, farmers), and for consumers (Burlingame, 2019).

2. EVIDENCE-BASED POLICY RECOMMENDATIONS TO INFORM VOLUNTARY GUIDELINES

Policy-setting bodies throughout the world have defined their mandates as ‘evidence-based’ or science-based. The High Level Panel of Experts on Food Security and Nutrition (HLPE), as the UN’s science-policy interface, has delivered policy recommendations concerning the Mediterranean diet specifically, and sustainable diets generally, in their eighteen reports from 2011-2023. Additionally, research on the Mediterranean diet has informed a range of HLPE and CFS policy recommendations. The Mediterranean diet has been emphasized and cited in relation to nutrition and food systems (HLPE, 2017), agroecology (HLPE, 2019), the role of livestock (HLPE, 2016), the Global Narrative (HLPE, 2020), and critical and emerging issues (HLPE, 2022).

- Agroecology: Mediterranean diet, and diet per se, is a food system
- Nutrition and Food Systems: Mediterranean diet is a model of a sustainable diet
- Forestry: examples of silvopastoral/agroforestry systems
- Livestock: 18 mentions, with emphasis on meat/dairy and illustrated with the 1995 iteration of the Mediterranean Diet Pyramid

Thirteen principles for scaling-up agroecological innovations have been consolidated in the report ‘Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition’ by the HLPE. These principles are recycling; input reduction; soil health; animal health; biodiversity; synergy; economic diversification; co-creation of knowledge; social values and diets; fairness; connectivity; land and natural resource governance; participation (HLPE, 2019). Aligning these principles within the current MED Diet 4 Framework (Dernini et al., 2017) can guide the processes of scaling-up agroecological innovations across the Mediterranean Region to be able to realize the transformative potential of the agroecological approach to innovation when addressing the environmental societal challenges.

The 2023 HLPE report on equity (HLPE, 2023), cites research on the Mediterranean diet in relation to cultural norms that directly influence food choice and consumption and, therefore, nutritional outcomes, and uses it as an example of a food culture that prioritizes fresh foods such as fruit, vegetables and nuts, healthy oils and optimal amounts of animal-source proteins (Martínez-González et al., 2015).

In the Global Narrative report (HLPE, 2020), the HLPE proposed two new dimensions to the formal definition of food security: ‘sustainability’ and ‘agency.’ Sustainability is the fundamental, indispensable element that requires immediate action to safeguard the future of the Mediterranean ecosystems and thus, the Mediterranean diet. Agency is the dimension that addresses the role of individuals and communities, giving them a voice in policy development and implementation and adds a rights-based element to food security and nutrition (Clapp et al., 2022).

3. INTERNATIONAL CODE OF MARKETING OF BREAST-MILK SUBSTITUTES

One of the most powerful codes ever drafted by a UN agency, and ratified by most countries in the world, is the International Code of Marketing of Breast-milk Substitutes (World Health Organization,

1981). This code calls on governments and other actors to protect, promote, and support breastfeeding. It is a response to a longstanding concern that the aggressive marketing and promotion of commercial milk formulas undermines breastfeeding and harms infant, child and maternal health in all countries. In other words, it is a code to promote adherence to breast-feeding, and as such, it can be drawn upon to provide a model for promoting adherence to the Mediterranean diet (Burlingame, 2019)

This code consists of articles containing quite specific guidelines to follow for compliance but begins with a preamble setting out the general justification.

This preamble has been used a model for a sustainable diets' preamble, which in turn is applicable to the Mediterranean diet. Table 1 illustrates the concordance between the Code and sustainable diets. The mother and baby couple is considered as analogous to an ecosystem in sustainable diets in this illustration. Specific guidelines can then be applied in the articles, tailored to sectors, e.g., health and agriculture; and/or disciplines, e.g., public health, nutrition; and/or social entities, e.g., school, hospitals, communities, families.

Table 1. Comparison of the preamble from the International Code of Marketing of Breast-milk Substitutes with the draft preamble for voluntary guidelines for the Mediterranean Diet. [Adapted and modified from (Burlingame, 2019)]

Recognizing that the health of infants and young children cannot be isolated from the health and nutrition of women...	Recognizing that the health of humans cannot be isolated from the health of ecosystems;
Conscious that breast-feeding is an unequalled way of providing ideal food for the healthy growth and development...	Conscious that food is an unequalled way of providing ideal nutrition for all ages and life cycles/stages;
Recognizing that the encouragement and protection of breast-feeding is an important part of the health, nutrition and other social measures...	Recognizing that the conservation and sustainable use of food biodiversity is an important part of human and ecosystem well-being;
Considering that, when mothers do not breast-feed...there is a legitimate market for infant formula... and that they should not be marketed or distributed in ways that may interfere with the protection and promotion of breast-feeding;	Considering that when ecosystems are not able to support sustainable diets, there is a legitimate use of supplements, RUTF, and fortificants; and that they should not be marketed or distributed in ways that may interfere with sustainable diets;
Recognizing further that inappropriate feeding practices lead to infant malnutrition, morbidity and mortality... and that improper practices in the marketing of breast-milk substitutes and related products can contribute to these major public health problems.	Recognizing that when ecosystems are able to support sustainable diets, nutrition programmes, policies and interventions supporting the use of supplements, RUTF, fortificants, and infant formulas are inappropriate and that the marketing of these and related products can contribute to major public health problems.

Code Responsible Fisheries

Another important code with Mediterranean diet relevance, both generally and specifically, is the Code of Conduct for Responsible Fisheries (FAO, 1995). This nearly-30 year old Code has even more relevance now in the era of the SDGs, with the key sustainability dietary item being seafood (Altiok et al., 2021; Cardinale et al., 2017).

Here again, the preamble, along with the introduction and individual articles, can be used as a model for Mediterranean diet guidelines. Table 2 shows extracts from the Code with minor word changes to align with the Mediterranean diet (and sustainable diets generally).

Table 2. Examples of text from the Code of Conduct for Responsible Fisheries with modifications applicable for voluntary guidelines for the Mediterranean Diet.

Text from the Code of Conduct for Responsible Fisheries	Modified text applicable to voluntary guidelines for the Mediterranean diet
<p>...aquatic resources, although renewable, are not infinite and need to be properly managed, if their contribution to the nutritional, economic and social well-being of the growing world's population is to be sustained.</p>	<p>...Mediterranean fish stocks, although renewable, need to be properly managed if their contribution to the nutritional, economic, and social well-being of the Mediterranean population is to be sustained.</p>
<p>The Code recognizes the nutritional, economic, social, environmental and cultural importance of fisheries and the interests of all those concerned with the fishery sector.</p>	<p>The Code recognizes the nutritional, economic, social, environmental and cultural importance of Mediterranean Sea and the interests of all those concerned with the fishery sector.</p>
<p>Article 11: States and relevant organizations should sponsor research in fish technology and quality assurance and support projects to improve post-harvest handling of fish, taking into account the economic, social, environmental and nutritional impact of such projects.</p>	<p>Mediterranean countries and relevant organization around the Mediterranean should sponsor research in fish technology and quality assurance and support projects to improve post-harvest handling of fish, taking into account the economic, social, environmental and nutritional impact of such projects.</p>
<p>Article 11: ...ensure that their policies and practices related to the promotion of international fish trade and export production do not result in environmental degradation or adversely impact the nutritional rights and needs of people for whom fish is critical...</p>	<p>...ensure that their policies and practices related to the promotion of Mediterranean fish trade and export production do not result in environmental degradation or adversely impact the nutritional rights and needs of Mediterranean people for whom fish is a critical part of the Mediterranean diet.</p>
<p>Article 12: States should recognize that responsible fisheries requires...a sound scientific basis to assist...in making decisions...appropriate research is conducted into all aspects of fisheries including...nutritional science...taking into account the special needs of developing countries.</p>	<p>Mediterranean countries should recognize that responsible fisheries requires...a sound scientific basis to assist...in making decisions ...appropriate research is conducted into all aspects of fisheries including...nutritional science...taking into account the special needs of developing countries in the Mediterranean basin.</p>
<p>Resolution: Recognizing the vital role of fisheries in world food security, and economic and social development, as well as the need to ensure the sustainability of the living aquatic resources and their environment for present and future generations...</p>	<p>Resolution: Recognizing the vital role of fisheries for food security in the Mediterranean region, and economic and social development, as well as the need to ensure the sustainability of the Mediterranean diet for present and future generations...</p>

4. CONCLUSIONS

Regardless of the mechanism or thematic emphasis within the broad subject of the Mediterranean diet, urgency of action is the common, but heretofore neglected, call. The proliferation of ultraprocessed foods (Dinu et al., 2022), and the accompanying effects on human and planetary health (Prescott et al., 2023), have sharpened the focus on the imperative for a set of guidelines for a 'change of route', i.e., the restoration of the Mediterranean diet, as a sustainable diet for Mediterranean populations and as a model for achieving the SDGs, the 2030 Agenda, and beyond.

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ASSESSING THE ADHERENCE TO MEDITERRANEAN DIET: CURRENT STATUS AND PERSPECTIVES

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ABSTRACT The main utility of the indexes of adherence to Mediterranean Diet (MedDiet) is their ability to assess MedDiet adherence in various study populations, and to relate it to diseases or mortality risk in many countries, including non-Mediterranean countries. In that, they have succeeded because the beneficial health effects of MedDiet have been demonstrated in several populations including outside the Mediterranean region. Currently, more than 30 indexes have been developed, which are not generally concordant between them as concluded in papers aiming to compare them. There are differences in country-specific food habits that affect calculating and comparing scores, differences in availability of baseline data for harmonizing/standardizing methodologies, and lack of consensus on what to measure and how it should be measured. In view of the finding that people around the Mediterranean area tend to abandon the MedDiet way of life and of the increase in consumption of ultra-processed foods which several studies strongly suggest or demonstrate their deleterious effects on human and planetary health, it is of major interest to try to develop by consensus a methodology permitting to obtain, if possible, a single index, integrating what is the MedDiet for the 21st century, which could help to better assess every aspects of MedDiet including sustainability, in order to help to promote it at individual level and through policies including all sectors.

Keywords Mediterranean diet – MedDiet indexes – Adherence assessment – Mediterranean lifestyle – Methodology.

ÉVALUATION DE L'ADHÉSION À L'ALIMENTATION MÉDITERRANÉENNE : SITUATION ACTUELLE ET PERSPECTIVES.

RÉSUMÉ La principale utilité des indices d'adhésion à l'alimentation méditerranéenne est leur capacité à évaluer l'adhésion dans diverses populations étudiées et à la mettre en relation avec des pathologies ou le risque de mortalité dans de nombreux pays, y compris les pays non méditerranéens. Ils y sont parvenus car les effets bénéfiques de l'alimentation méditerranéenne sur la santé ont été démontrés dans plusieurs populations, y compris en dehors de la région méditerranéenne. À l'heure actuelle, plus de 30 indices ont été publiés, qui ne concordent généralement pas entre eux, comme le montrent les études visant à les comparer. Il existe des différences dans les habitudes alimentaires propres à chaque pays qui affectent le calcul et la comparaison des indices, des différences dans la disponibilité des données source pour harmoniser/standardiser les méthodologies, et un manque de consensus sur ce qu'il faut mesurer et comment il faut le mesurer. Face au constat que les populations du pourtour méditerranéen tendent à abandonner le mode de vie méditerranéen et à l'augmentation de la consommation d'aliments ultra-transformés dont plusieurs études suggèrent fortement ou démontrent les effets délétères sur la santé humaine et planétaire, il est d'un intérêt majeur d'essayer de développer par consensus une méthodologie permettant d'obtenir, si possible, un indice unique, intégrant ce qu'est l'alimentation méditerranéenne du 21^{ème} siècle, qui pourrait aider à mieux évaluer tous les aspects de l'alimentation méditerranéenne, y compris sa durabilité, afin d'aider à la promouvoir au niveau individuel et au travers des politiques incluant tous les secteurs.

Mots-clés Régime méditerranéen – Indices MedDiet – Évaluation de l'observance – Mode de vie méditerranéen.

1. INTRODUCTION

The Mediterranean diet has its origins in antiquity, from the foods and dietary patterns of countries surrounding the Mediterranean basin. The diet has evolved depending on the successive civilizations overtime, agricultural production, economy, climate and the standard of living of the time (Trichopoulou, 2012) before production and consumption of ultra-processed foods (UPF) characterizing the Western diet became widespread inside Mediterranean region due to industrialization and globalization.

The health beneficial effects of MedDiet have been reported in many epidemiological studies (Trichopoulou et al., 2014) and several randomized clinical trials such as, for coronary heart disease (CHD), Lyon Diet

Heart study (de Lorgeril et al., 1999), PREDIMED study (Estruch et al., 2018), and CORDIOPREV study (Delgado-Lista et al., 2022). A recent meta-analysis of 16 prospective cohort studies concluded that a higher adherence to MedDiet was associated with a lower CVD incidence (HR 0.76, 95% CI 0.72 to 0.81, total mortality (HR 0.77, 95% CI 0.74 to 0.80), and CHD (HR 0.75, 95% CI 0.65 to 0.87) (Pant et al., 2023). There is also evidence confirming the inverse association of adhering to MedDiet with overweight and obesity (Dominguez et al., 2023), type 2 diabetes (Sarsangi et al., 2022), and altered cognitive function (Valls-Pedret et al., 2015). MedDiet has also been shown to decrease total, CHD and cancer mortality in Greece (Soltani et al., 2019).

2. ADHERENCE TO MEDDIET

Even in Crete, one of the cradles of Mediterranean way of life, a nutrition transition had occurred between 1960 and 2005. The Cretan farmers in the valley of Messara in Southern Crete ate less bread, vegetables, fruit, and olive oil and conversely much more meat; an increase in sedentariness was also observed as compared with 1960. Mean body weight was 63 kg in 1960 and 83 kg in 2005. The prevalence of obesity (BMI \rightarrow 30 kg/m²) was 2% in 1960 and 41% in 2005. This shows that the traditional Cretan MedDiet was already exchanged for a Western diet within 45 years (Vardavas et al., 2010). This is not the only example. The diets currently consumed in Mediterranean countries are progressively being modernized and influenced by Western dietary habits, and there is a decreasing adherence to a 'traditional' Mediterranean diet pattern especially in the youngest. Vilarnau et al. (2019) compared, using the Mediterranean Adequacy Index (MAI), MedDiet adherence between 1960 and 2011 in 41 countries divided into Mediterranean and non-Mediterranean country groups. Between 1960 and 2011, MAI decreased in both Mediterranean Europe and the Southern Mediterranean. It is worth noting that Greece showed the largest decrease in MAI with a drop in ranking from first place to tenth. The Italian MOLISANI study, which collected information on 25 000 people living in the Molise region showed that adherence to MedDiet was related to material resources, nutritional knowledge, exposure to mass media, and education level (Bonaccio et al., 2012a; Bonaccio et al., 2012b; Bonaccio et al., 2013; Bonaccio et al., 2014). The higher these parameters, the greater the adherence to MedDiet. Such observations have been made in several Mediterranean and non-Mediterranean countries.

3. INDEXES OF ADHERENCE TO MEDDIET

The main utility of these indexes is their ability to assess MedDiet adherence in various populations, and to relate it to diseases or mortality risk, in many countries including non-Mediterranean countries. Indexes are composite constructs based on dietary components, combining foods and nutrients to obtain valid operational variables that analyze the association between the quality of diet and its health effects (Zaragoza-Martí et al., 2018). Historically, the first was the MedDiet Score (MDS) defined by Trichopoulou et al. (1995) to assess the association between MedDiet adherence and mortality in a population of elderly people in Greece. The MDS (0-9 points) consisted of eight components: six beneficial components (monounsaturated/saturated fat ratio, vegetables, fruits and nuts, legumes, fish, cereals), two harmful components (meat/meat products, dairy products), and moderate alcohol consumption (5-25 g/d for women, 10-50 g/d for men). One point was assigned to positively weighted items if consumption was superior or equal to the sex-specific median, and one assigned to negatively weighted items if consumption was inferior to the sex-specific median. The MDS was further modified by the same authors to include fish consumption as a beneficial component (Trichopoulou et al., 2003).

These indexes have been the most widely used (Zaragoza-Martí et al., 2018). The MAI was defined by Fidanza et al. (Fidanza et al., 2004) for the Seven Countries study report on CV mortality after 25 years

of follow-up. The PREDIMED Screener score (0-14 points) was defined (Estruch et al. 2018) to evaluate the primary prevention effects of MedDiet on CHD events in a high CV risk population.

Several other indexes of adherence have emerged over the years. Searching PubMed through October 2014, Hernandez-Ruiz et al. (2015), in their review, found 22 indexes with differences regarding the number of components (7-28), scoring (0, 1, 2, 3, 4, 5, 8, or 10, if adherent), range (0-100), and type of components (foods, food groups, nutrients, and/or lifestyle factors). Fruits and vegetables were the most common beneficial components, and meats were the most common detrimental components. Moderate alcohol consumption was common to all indexes and was considered positive, but its definition differed among indexes: 10-20 g/day, or 5-25 g/day in women and 10-50 g/day in men, or 0 g/day in women and up to 10 g/day in men. Another difference between indexes was the scoring system and the cut-off points (in medians, terciles or established portions). Zaragoza-Martí et al. (Zaragoza-Martí et al., 2018) found 28 MedDiet adherence scores. Eighteen indexes were based on positive and negative components of MedDiet, 5 were based on the structure of MedDiet pyramid, 3 on the general characteristics of MedDiet and 1 on the Dietary Quality Index. High indexes indicated good adherence.

Only indexes by Gerber (2006) and Scali et al. (2001) were inverted with high indexes indicating low adherence. Zaragoza-Martí et al. (2018) underlined that the heterogeneity of indexes raises the potential for disparity in analyses, as well as confusion as to which specific score to choose. The aim of their review was to evaluate the conceptual suitability, applicability and psychometric properties of the 28 indexes. They reported that very few indexes fulfilled psychometric properties and applicability associated with indexes. None of them provided complete information about the process of transcultural adaptation. Applicability presented information gaps and reliability was deficient. Only 3 indexes, (Panagiotakos et al., 2006; Buckland et al. 2009; Sotos-Prieto et al., 2015) obtained better evidence but could not be considered as gold standard because they did not fill all quality criteria. Zaragoza-Martí et al. proposed that: a) a common criterion should be established to identify the components that make up MedDiet, b) unification of the number of components (nutrients, foods or food groups), classification categories for each population, measurement scale, statistical parameters (mean, median, terciles ...) and the contribution of each component (positive or negative) to the score total, c) further confirmatory analyses using biomarkers with a view to validating said dietary pattern.

Wingrove et al (2022) in their systematic review found 187 studies (only epidemiological and case-nested studies) using MedDiet indexes including 67 with index modification, 145 including less than 10 dietary components, 25 between 11 and 20, 47 assessing foods only, and 120 foods plus nutrients, 12 using absolute, 30 data-driven and 114 absolute plus data-driven cut-off points. Changing the number of food groups impacted the analysis of health outcomes of interest (McCann et al., 2001). Furthermore, as underlined by the authors, differences in the components that are included in MD indices and the use of absolute compared to data-driven cut-off points may contribute to differences in effect estimates across studies. Milà-Villaruel et al. (2011) evaluated the reliability of 10 MedDiet adherence indexes, including the MDS, MAI, and PREDIMED scores. They found that all 10 indexes satisfactorily assessed MedDiet adherence, but that there was a lack of internal consistency among the indexes, arguing for standardization. Sofi et al. (2014) proposed a literature-based adherence score in their meta-analysis of 27 cohorts, addressing the association of MedDiet with health status. Because of the heterogeneity of food groups and cut-offs, they use successive arithmetic calculations and obtained three consumption categories for each food group. This highlights the difficulty and the value of harmonizing the adherence indexes to allow for better comparability between studies. MEDLIFE index

was developed to take more into account the Mediterranean lifestyle (Sotos-Prieto et al., 2015). A specific score to assess adherence in children and adolescents has been created by Serra-Majem et al. (2004). The index ranges from 0 to 12, and is based on a 16-question test that could be self-administered or conducted by interview. Screening PubMed, it has been used in 323 studies, strongly suggesting, if not proving, that a single index can be sufficient.

So, we are now facing a huge number of indexes. Number of items may reach 100; food groups are different, cut-offs are different, some are based on MedDiet pyramid. Some indexes have been used in several hundred studies, others in only one.

Indexes, as underlined by Radd-Vagenas et al. (2017), vary according to the number and actual dietary elements assessed, cut-offs used for scoring, and the computation method. Some index tools include composite food groups such as fruit and nuts or legumes, nuts and seeds, whereas others incorporate foods not part of the 'traditional' MedDiet, such as sugary beverages and sweets. Some studies have used several indexes to assess the health benefits of MedDiet, highlighting the difficulties of interpretation associated with the use and development of such many indexes. We only take some examples here. Yiannakou et al. (2023), compared 4 indexes to assess the relationships between MedDiet pattern and breast cancer in a cohort of 1 579 women followed 18 years. Two indexes were based on the population-specific median intakes of MedDiet-related foods (alternate Mediterranean Diet (aMED) index and Mediterranean Diet Score (MDS) index), and 2 scores based on foods from the Mediterranean diet pyramid (Mediterranean Diet (MeDiet) index and Mediterranean Style Dietary Pattern (MSDP) index). Women with the highest compared to the lowest indexes had 45% less breast cancer risk when using MeDiet or MSDP, but no association was found when using aMed or MDS). Olmedo-Requena et al. (Olmedo-Requena et al., 2019) evaluated the agreement among 5 indexes in 4098 healthy Spanish subjects.

The high variability was found for the prevalence of subjects with a high level of adherence. The authors concluded: « as we have observed, the components included in a Mediterranean diet pattern adherence index can vary; consequently, the reliability of the indexes can be lowered. Therefore, the contribution of each component in the indexes, the number of components, and the scoring criteria should be established in order to improve the agreement among indexes. We would consider it essential that all authors use indexes of adherence to the Mediterranean diet with the same characteristics. Thus, by improving these indexes the higher correlations could will lead to stronger evidence of the inverse relation between the Mediterranean dietary pattern and the prevalence of several diseases ».

In summary, there are quite a lot of indexes with often not a good concordance between them (Zaragoza-Martí et al., 2018). Not only they are not concordant, but also, they have not been developed to promote a better adherence when adherence decreases over the last decades. This is detrimental because there is a competition with Western diet which includes ultra-processed foods (UPF). Introduced by researchers at Brazil's University of São Paulo, the concept of UPF refers food and drink products that are industrial formulations of mostly cheap sources of dietary energy and nutrients, along with additives.

These products are manufactured using a series of processes (hence "ultra-processed") and contain few whole foods, if any. UPF and drink products now dominate the food supply in high-income nations, and their sales and consumption have been steadily increasing in low- and middle-income countries (Vandevijvere et al., 2019). Although imperfect, the classification used is NOVA (Monteiro, 2019), so that we could put into balance more than 30 MedDiet indexes on one side and only one classification

of UPF on the other side. Contrarily to MedDiet whose health benefits have been demonstrated, more and more studies strongly suggest that dietary pattern with high intake of UPF has deleterious health effects (Isaksen et al., 2023; Mambriani et al., 2023; Yuan et al., 2023). There are many determinants of food choices: advertising, packaging and labelling; physical accessibility in stores and other settings; perception of health; individual taste; convenience and cultural norms, sustainability, and the cost of food especially for those on the lowest incomes (Darmon et al., 2015; Serra-Majem et al., 2020).

Most studies have shown that MedDiet is more costly than a dietary pattern rich in UPF (Lopez et al., 2009), so that it could be a barrier to adherence to MedDiet. Rao et al. (2013) performed a review and meta-analysis comparing the costs of healthier foods and dietary patterns to less healthy choices. They included 27 studies from 10 countries. Comparing extremes (top vs bottom quantile) of food-based diet patterns, healthier diets cost \$1.48/day (\$1.01 to \$1.95) and \$1.54/2000 kcal (\$1.15 to \$1.94) more than less healthy patterns. Several studies have evaluated the cost of MedDiet as compared to a less healthy dietary pattern (Lopez et al., 2009; Pastor et al. 2021; Alves et al., 2022; Rubini et al., 2022; Bouzas et al., 2023), and concluded to higher cost of MedDiet. Conversely, Bracci et al. (2023), compared in Australian households the cost of 3 diets: Australian Guide to Healthy eating (AGHE), MedDiet and typical Australian dietary intake (Western diet). Generally, the MedDiet baskets were the most affordable, ranging from \$78 to \$285 across households compared to the AGHE (\$75 to \$315) and the Western Diet (\$80 to \$313). A Quebec intervention study (Goulet J, et al. 2008) has shown that adopting a MedDiet led to increased cost related to vegetables, fruits, legumes, nuts and seeds, canola/olive oil, whole grains, poultry, and fish ($P \leftarrow$ or = 0.01) and to reduced dietary cost for red meat, refined grains, desserts and sweets, and fast food ($P \leftarrow$ or = 0.008) so that total cost was not different from the cost of their previous dietary pattern. When considering its health benefits, Saulle et al. (2013) concluded in their review that MedDiet was cost-effective.

4. CONCLUSION

Currently, more than 30 indexes of adherence to MedDiet have been developed. Almost all were dedicated to evaluate its beneficial health effects, and in that they succeeded. However, such a huge number of indexes could be a barrier to help to its promotion, because the determinants of adherence to a diet are not limited to its health effects but also to advertising, packaging and labelling; physical accessibility in stores and other settings; perception of health; individual taste; convenience and cultural norms, sustainability, and costs. The indirect proof of that is the general observation of a decreased adherence to MedDiet in populations living in Mediterranean countries.

The opinion of the author of this chapter is that we need urgently to try to develop a methodology to obtain a single index of MedDiet dedicated not to assess its beneficial health effects and its sustainability – which can be considered to have been scientifically demonstrated – but to help to promote and better measure all aspects of MedDiet, MedDiet which is facing all over the last decades the competition of Western diet pattern rich in UPF whose health deleterious effects and poor sustainability have also been demonstrated. Such an index should include all the aspects characterizing the Mediterranean way of life initially described by Ancel and Margaret Keys in 1975 and recognized as an intangible heritage by UNESCO in 2015. Thus, such an index should not be limited to score only food groups, but all the characteristics of the Mediterranean way of life contributing altogether to all its benefits provided that affordability is not neglected as an important determinant of adherence.

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LIVING LABS FOR MEDITERRANEAN LOCAL SYSTEM FOOD TRANSITION

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ABSTRACT The Mediterranean is a region facing numerous challenges which demands innovative solutions, especially in strategic yet vulnerable sectors like food, currently threatened by climate change and unsustainable production and consumption practices. Concurrently, population growth and urbanization exacerbate challenges, impacting access to nutritious diets and escalating urban poverty. To address these issues, cities play a pivotal role in planning and managing facilities for the entire food system and necessitate innovative approaches to co-design better human centred actions. This paper explores the potential of open innovation collaborative approaches, namely Living Labs, integrating quadruple-helix actors, in fostering sustainable local food systems, also highlighting why it is important to favour the establishment of labelled Mediterranean Living Labs, especially in the southern shore. In this sense, the ENoLL certification of MEDIL, a Living Lab hosted by CIHEAM Bari, could set a turning point, urging other Mediterranean countries to embrace Living Labs for cooperative innovation. The paper, then, illustrates the Living Lab methodology's application in the Metropolitan City of Bari, where a participatory approach guided the formulation of a food policy, demonstrating the effectiveness of Living Labs in co-designing solutions for local food systems.

Keywords Living Lab – participatory approach – food system transition – Open Innovation – local food policy

LES LABORATOIRES VIVANTS POUR LA TRANSITION DES SYSTÈMES ALIMENTAIRES LOCAUX MÉDITERRANÉEN

Résumé La Méditerranée est une région qui est confrontée à de nombreux défis exigeant des solutions innovantes, en particulier dans des secteurs stratégiques mais vulnérables comme le secteur alimentaire, actuellement menacé par le changement climatique et des pratiques de production et de consommation non durables. Parallèlement, la croissance démographique et l'urbanisation viennent aggraver ces problèmes, en influant sur l'accès à des régimes alimentaires nutritifs et en accroissant la pauvreté en milieu urbain. Pour faire face à ces enjeux, les villes peuvent jouer un rôle central dans la planification et la gestion des structures pour l'ensemble du système alimentaire et nécessitent donc des approches innovantes afin de co-concevoir des actions mieux centrées sur l'homme. Dans cet article, nous explorons le potentiel des approches collaboratives de l'innovation ouverte, à savoir les laboratoires vivants, qui intègrent les acteurs de la quadruple hélice, dans la promotion de systèmes alimentaires locaux durables, en soulignant également pourquoi il est important de favoriser la création de laboratoires vivants méditerranéens labellisés, en particulier sur la rive sud. En ce sens, la certification ENoLL de MEDIL, un laboratoire vivant installé au CIHEAM Bari, pourrait marquer un tournant, en incitant d'autres pays méditerranéens à adopter les laboratoires vivants pour l'innovation coopérative. Par la suite, nous allons illustrer l'application de la méthodologie des laboratoires vivants dans la ville métropolitaine de Bari, où une approche participative a permis d'orienter la formulation d'une politique alimentaire, démontrant l'efficacité des laboratoires vivants dans la co-conception de solutions pour les systèmes alimentaires locaux.

Mots-clés. Laboratoire vivant - Approche participative - Transition du système alimentaire – Innovation ouverte - Politique alimentaire locale.

1. INTRODUCTION

The Mediterranean is a “sea” of people, cultures, and territories, making it a fertile context for driving innovation in sectors deemed strategic yet vulnerable due to the multitude and complexity of challenges the current landscape presents. The broader food sector, including food security and the right to food, is undoubtedly one of the most affected by these challenges, thus requiring an innovative and collective effort to foster the resilience of an increasingly large and young population. Both terrestrial and marine environments face the consequences of recent anthropogenic alterations in their surroundings, endangering the capacity of Mediterranean countries to ensure food security. The primary catalysts of these transformations encompass climatic factors, pollution, unsustainable land and sea utilization practices, as well as the introduction of non-indigenous species. In most

regions, both natural ecosystems and human livelihoods find themselves in the crosshairs of these impacts (MedECC, 2020). In this scenario, the broader food system is also subject to the sway of socio-economic factors, a dynamic that holds true in Mediterranean nations as well (Reguant and Savé, 2016): the evolving patterns of population growth and urbanization, along with the scale and concentration of urban centres and their adjacent rural zones, are reshaping agrifood systems. These changes have profound repercussions on people's ability to access affordable, nutritious diets, and they directly impact the realms of food security and nutrition (FAO et al., 2023).

Urbanization is a complex and multidimensional phenomenon encompassing social, cultural, economic, and physical dimensions. It arises from the confluence of factors such as the increase in urban populations, the physical expansion of cities involving the reclassification of rural land as urban, and the migration from rural to urban regions (de Bruin and Holleman, 2023).

Such dynamics are particularly emergent in the Mediterranean region. The population of the Mediterranean countries amounted to approximately 571 million inhabitants in 2020. It has increased 2.5 times in 70 years and the projections estimates that the population is set to reach 700 million by 2050 (Abis, 2018; Doignon et al., 2023). This growth will occur mainly in cities, as the difference between the population living in rural areas and the population living in urban areas is steadily increasing in favour of the latter.

Annual Mediterranean rural and urban population at Mid-Year (thousands)

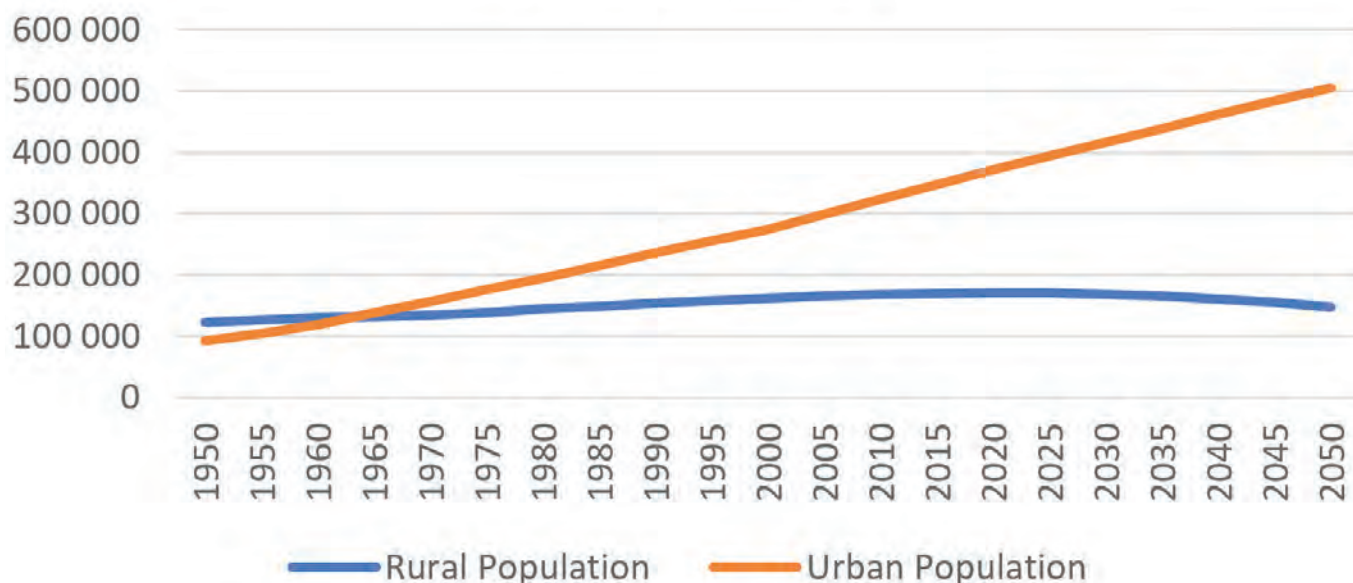


Figure 1. Annual rural and urban Mediterranean population projection. Source: own elaboration on UN World Urbanization Prospects 2018.

Nonetheless, the absence of substantial economic growth in rural productivity, as well as the stagnation in rural population, leads to land fragmentation, rendering farming plots unviable and creating a dearth

of livelihood prospects in rural regions. Consequently, rural residents seek out urban areas where opportunities, albeit constrained due to the overall economic stagnation, appear more promising, contributing to a surge in urban poverty. The process of urbanization, when not accompanied with concurrent economic growth, can be associated with adverse rural living conditions. These adverse conditions encompass poverty, limited employment opportunities or underemployment, inadequate infrastructure, restricted access to essential services, and food insecurity, often coupled with environmental degradation. Concurrently, the expansion of urban population strains the capabilities of urban infrastructure and essential services, pushing them to their maximum capacity. (FAO et al. 2023).

Therefore, cities must increasingly manage innovative plans and works to ensure services, spaces, facilities, and resources dedicated to the food system (food transportation, storage, preservation, consumption, and waste recovery), becoming places for experimentation and activation of multi-actor engagement to contribute to long-term policies aimed at ensuring safe, healthy, sustainable, and nutritious food for their residents and surrounding communities (Egal and Volpe, 2022). In order to establish more sustainable food systems in the Mediterranean region, it is imperative to envision fresh and inventive approaches involving the collaboration of multiple stakeholders. In this sense, polycentric and collaborative planning models have gained recognition for their effectiveness in addressing environmental concerns and attaining multifunctionality (Zingraff-Hamed et al., 2019), suggesting that food transition planning, design and implementation can achieve good efficiency when involving dialogues and co-creation with stakeholders. Robust collaboration involving various stakeholders from both the public and private sectors, as well as active citizen participation in the creation and execution of solutions, is acknowledged as a highly effective instrument in favouring the local food systems transition (Bodin, 2017; Wascher et al., 2023). To tackle intricate challenges and foster inventive solutions, recent research has underscored the vital role of partnerships and collaborative methodologies. Conversely, the absence or lack of institutionalized intersectoral collaboration can lead to impediments and bottlenecks in the implementation of measures (Zingraff-Hamed, et al. 2020). Among the approaches for involving multiple stakeholders to co-design and co-create new solutions, the Living Lab can be ascribed as one of the most relevant. In Europe, the practical application of Living Labs in real-life scenarios and actual experimentation became prominent in 2005 (Edwards-Schachter, 2012), when the concept garnered substantial interest from the European Union. By then, it has been acknowledged as a forward-looking approach to experimental and inclusive methods in planning, project design, and execution that catalyzes innovation (European Commission, 2008). For example, initiatives like Horizon 2020, as well as Horizon Europe, advocate for the adoption of the Living Lab approach, extending its application to several areas, also concerning food systems and related subjects (a dedicated online platform <https://food2030.eu/> has been recently created to network EU projects focused on food. Many of these projects frequently employ the Living Lab approach). Another example is the “EU Mission: A Soil Deal for Europe” which aims to establish 100 Living Labs and lighthouses to lead the transition towards healthy soils by 2030 (European Commission, 2023).

In scientific literature there is not a unique definition of Living Lab (Voytenko, 2016). That of ENoLL (European Network of Living Labs) is among those that best describe and summarize the Living Lab concept: a Living Lab is an “open innovation ecosystems in real-life environments using iterative feedback processes throughout a lifecycle approach of an innovation to create sustainable impact.” (ENoLL website). CIHEAM Bari already has relevant experience with the open innovation methodology for the creation and enhancement of startup and green innovation of enterprises (design thinking and venture clienting) to foster youth employment and enterprise competitiveness (Macario et al., 2023), thus the

implementation of the Living Lab approach favours the broadening of the application of such methodology, by declining it into participative approaches. The fundamental hallmark of the Living Lab methodology lies in its user-centric approach, which incorporates all pertinent stakeholders and end-users. Although the particular actors may vary depending on the focus, goals, and setting of the Living Lab, they can all be categorized based on the quadruple helix model, an extension of the conventional Public-Private Partnership concept, as outlined by Carayannis and Campbell (2009). The quadruple-helix model encompasses representatives from all segments of society: academia (universities or research and development centers); the public sector (government bodies, regional development agencies, policy-makers); industry (businesses of varying sizes, business clusters, and associations); citizen and civil society (encompassing all end-users, such as consumers and their respective associations). These actors collectively form the “Public Private People Partnership,” which facilitates genuine co-creation and impact. If the triple helix model delineates the optimal innovation environment as a fundamentally interconnected structure, fostering collaboration among entities from the realms of industry, government, and academia (Etzkowitz and Leydesdorff, 1995), the quadruple helix model recognize the pivotal role played by citizens in the innovation process (Borghys et al., 2020). This concept has been then revised by adding another helix: the quintuple helix model expands on the sectors and viewpoints of the quadruple helix, introducing a fifth helix dedicated to the “natural environments of society.

” This comprehensive approach seeks to tackle the challenges associated with socioecological transition in these domains (Carayannis and Campbell, 2010), including the environment as part of the stakeholders forming the Living Lab ecosystem. Regardless of their structure, Living Labs share six key common elements (Evans et al., 2017): orchestration (facilitating connections and partnerships with relevant stakeholders); multi-stakeholder Participation (Living Labs engage stakeholders from the quadruple helix model, using holistic approach); active User Involvement (Living Labs actively involve relevant stakeholders in all activities, ensuring that their feedback is captured and integrated throughout the entire innovation lifecycle); co-creation (values are co-created using a bottom-up approach, leading to greater adoption in the end); real-Life setting (Living Labs operate within the real-life environments of end users); multi-method approach (the methodological approach for each activity is chosen based on the expected outcomes and the stakeholders involved).

Thus, by using an iterative approach (Mastelic, 2019), the actors involved in the Living Lab ecosystem work together to co-design and co-create innovative solutions. The adaptability of the approach allows it to be used in different thematic areas, including the agri-food sector (Gamache et al., 2020; Hvitsand et al., 2022). To this end, the Living Lab approach resulted the most appropriate tool to co-design local food policies built on the specificities of territories and their actors.

2. LIVING LABS IN THE MEDITERRANEAN

By analysing the world largest Living Lab network, ENoLL (European Network of Living Labs, which since its formation labelled more than 480 Living Labs around the world), it is possible to count 168 current members Living Labs from 38 countries across the globe dealing with 10 different sectors. Living Labs can deal with one or more sectors: artificial intelligence; agriculture and agri-food; culture and creativity; energy; environment; health & wellbeing; social inclusion and innovation; education; industries & manufacturing; media (ENoLL website). In the Mediterranean region, Living Labs are mainly concentrated in the northern shore, while in the southern shore only Tunisia has an ENoLL certified Living Lab. The table below shows the Mediterranean countries of the north and south shores with at least 1 ENoLL certified Living Lab.

COUNTRY (NORTHERN SHORE)	N. OF LIVING LABS	COUNTRY (SOUTHERN SHORE)	N. OF LIVING LABS
Spain	25	Tunisia	1
France	19		
Italy	16		
Slovenia	2		
Croatia	2		
Bosnia and Herzegovina	1		
Montenegro	1		
Greece	5		
Turkey	3		
TOTAL	74	TOTAL	1

Table 1. Number of Mediterranean ENoLL certified Living Labs (all sectors): Source: own elaboration on ENoLL website, accessed 06 November 2023.

By sorting the Living Labs of the same countries which deal with “Agriculture and Agri-food” sector, results show that there is no Living Lab in the southern shore that addresses this theme.

COUNTRY (NORTHERN SHORE)	N. OF LIVING LABS
Spain	6
France	4
Italy	6
Slovenia	1
Croatia	1
Bosnia and Herzegovina	1
Montenegro	0
Greece	1
Turkey	2
TOTAL	22

Table 2. Number of Mediterranean ENoLL certified Living Labs dealing with Agriculture and Agri-food sector. Source: own elaboration on ENoLL website, accessed 06 November 2023.

Thus, a certain disparity emerges between European and non-European countries in the Mediterranean, which also reflects existing socio-economic differences and inequalities (Benyaklef, 1997; El Laithy, 2012; Zambon et al., 2017; Nilsson and Ramadan, 2020; Al Shami, 2021). Coherently with this vision and thanks to the experience in dealing with multi-actor ecosystems and bottom-up approaches, CIHEAM Bari, in 2022, following the application process, was certified as a member of ENoLL with its Living Lab “Mediterranean Innovation Rural Living Lab” (MEDIL). This Living Lab aims to become a catalyst for innovation ecosystems for the sustainable development of rural and coastal areas in the Mediterranean region. The certification of a Living Lab related to the agriculture and agri-food sector, hosted by an intergovernmental organization (CIHEAM Bari) which can count on 13 member states coming from both northern and southern shore of the Mediterranean can be a turning point not only in fostering the activation of other Living Labs in the area, especially in the southern shore, enhancing a

broader and more equitable Mediterranean representation within the world’s largest network of Living Labs (ENoLL), but also in increasing opportunities for cooperation among Mediterranean countries toward a common response to the innovation needs of the Mediterranean.

3. APPLYING THE LIVING LAB APPROACH FOR THE TRANSITION OF MEDITERRANEAN LOCAL FOOD SYSTEM: THE CASE OF THE METROPOLITAN CITY OF BARI

In 2020, with the launch of the H2020 EU project FoodSHIFT2030 (Food System Hubs Innovating towards Fast Transition by 2030), the Metropolitan City of Bari together with CIHEAM Bari activated a local Living Lab “Back to Land” participated by representatives of civil society organizations who were involved to identify needs, solutions, and visions to orientate the Metropolitan City of Bari toward a more sustainable local food system. Through a stepwise approach built on several steps (context analysis; scouting for organizations; consultation of stakeholders; gathering needs, solutions, and visions) a Manifesto for the local food system transition was delivered. For the context analysis, the indicator selection methodology was implemented by taking into consideration the relevant dimensions for measuring equitable and sustainable well-being of communities (National Institute of Statistics - ISTAT); measurable indicators; association with the Sustainable Development Goals of the UN Agenda (UN, 2015).

Measuring equitable and sustainable well-being of communities (ISTAT)	Measurable ISTAT indicators	Relevant SDGs
Economic well-being	-Demographic indicators -Disposable income -Average wages -Poverty and food aid	SDG 1 SDG 2
Environment	-Land use -Availability of green areas -Food waste	SDG 11
Landscape and cultural heritage/ Innovation, research and creativity (own elaborations)/ Productive activities (own elaborations)	-Agriculture census -Food Districts LAG -PDO, Organic Operators	SDG 2 SDG 17 SDG 12 SDG 15
Education and training	-Participation in the school system -Participation in the labor market -Educational poverty -Young people who are not working and not studying (NEET)	SDG 4 SDG 9
Work and life time balance	-Employment and unemployment	SDG 9
Health	-Health and health care	SDG 3 SDG 4

Table 3. Indicators. the 9 trajectories of the Manifesto for the food transition of the Metropolitan City of Bari Source: own elaboration on ISTAT indicators and SDGs.

Based on the context analysis, the scouting of innovative organizations focused on who had already concretely contributed to the food transition of the Metropolitan City of Bari with activities such as recovery of abandoned land; short supply chain; social inclusion practices; organic farming; citizen education and involvement; food waste reduction. Then, co-creation activities started, for which a 3-phase methodology has been applied (figure 2).

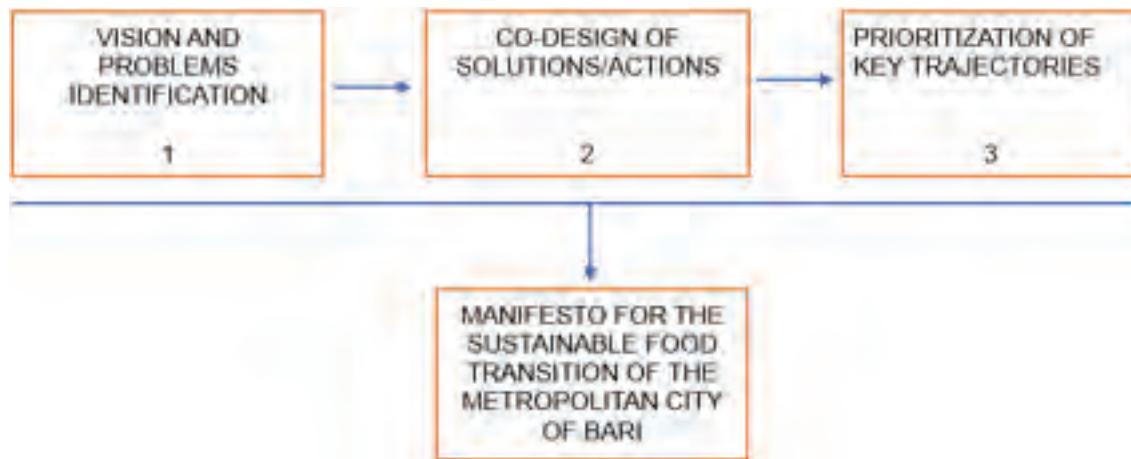


Figure 2. The 3-phase co-creation methodology. Source: adapted from Labellarte, et al. 2023.

It is worth noting that the same approach has been replicated in the cities of Taranto and Tirana, in a different context from the Metropolitan City of Bari, confirming its effectiveness (Labellarte et al., 2023). The quadruple helix actors involved were CIHEAM Bari (representing the “academia” helix); 10 selected organizations (representing the “business” and “civil society” helixes); the representatives of the Metropolitan City of Bari, which include 41 municipalities (representing the “government” helix).

The initial phase involved engaging participants in a brainstorming and backcasting activity to identify the desired vision, recognize obstacles hindering its realization, identify existing projects and activities contributing to problem alleviation, and pinpoint missing stakeholders to be involved. Following the collection and clustering of input, the brainwriting tool was employed during the subsequent phase to co-design solutions addressing the problems identified in the preceding stage. Participants were divided into three groups (based on the number of co-defined visions), each equipped with a sheet containing the vision and corresponding problems. In three rounds of 15 minutes each, participants had to formulate a solution for each problem within the vision. After each round, groups exchanged sheets and integrated solutions defined by other groups.

Then CIHEAM Bari team, having analyzed the results from previous meetings, presented several key trajectories that could serve as the basis for the food policy of the Metropolitan City of Bari. During the third and final phase, participants prioritized these trajectories. They were asked to assess, for each “recommended” trajectory, the relevance (i.e., how crucial its implementation was), feasibility (i.e., how achievable it was in terms of administrative, authorization, and regulatory considerations), and readiness (i.e., the time required for its implementation) (Labellarte, et al., 2023). The participatory journey resulted in the drafting of the Manifesto for the Food Transition of the Metropolitan City of Bari, articulated in 9 trajectories aimed at fostering the adoption of a metropolitan food policy.

N.	TRAJECTORY
1	Ensuring access to food and healthy nutrition
2	Ensure the accessibility and utilization of unused resources to generate collective welfare
3	Recognizing the collective value of agriculture and the rural landscape
4	Support and promote partnerships for the development of territories.
5	Support the new generation in the development of innovative businesses in the agrifood supply chain
6	Educate about food.
7	Promote the sustainability of agrifood supply chain
8	combating food waste and recovering and reusing waste
9	Strengthen the dialogue with local communities that are protagonists of the food transition

Table 4. The 9 trajectories of the Manifesto for the food transition of the Metropolitan City of Bari Source: CIHEAM Bari and Città Metropolitana di Bari, 2022.

The approval of the Manifesto by the Bari Metropolitan Council allowed to start the procedures for defining the concrete actions to substantiate the defined trajectories and broaden participation by extending the number of representative actors of the quadruple helix. From May 2022, the first co-design workshop of the Metropolitan Food Policy actions was launched. Five subsequent workshops, also involving several local governments of the municipalities in the metropolitan area, allowed the collection of other useful contributions to the definition of the actions. To this end, co-creation activities were organized using the last two phases of the already mentioned methodology used for the co-design of the Manifesto. In the first phase, with the brainwriting tool, participants were asked to “translate” the trajectories in concrete and measurable actions. CIHEAM Bari, then, clustered the collected feedback and initiated the second phase in which participants prioritized the proposed actions according to their relevance, feasibility, and readiness. In parallel to physical meetings, feedback was also collected through a digital wall created on the ciba2030.it digital platform which will continue to collect proposals and contributions to maximize citizen involvement.

This extensive involvement has enabled the collection of a multiplicity of perspectives and experiences, providing a solid basis for the formulation of a participated and sustainable metropolitan food policy. The metropolitan food policy is innovative of its kind in that it refers to a territory that goes beyond the context of the single city, involving the 41 municipalities (characterized by different sizes and a relevant rural area) that are afferent to the Bari metropolitan area. The proposed actions of the food policy, approved by the Metropolitan Council on September 28, 2023, are as follows:

ACTION N.	ACTION N. AND TITLE	QUANTIFIABLE EXPECTED RESULT
1	Implementation of community HUBs to support vulnerable social groups	Guidelines for the implementation, management and sustainability of community HUBs. No.1 crowdfunding campaign. No.10 community HUBs implemented. N.20 initiatives related to social catering and fair trade sales.
2	International Food Open Innovation HUB to train a new generation of enterprises	No.1 International Open Innovation HUB implemented. At least no.10 B-Corp/Start-Up created. No.1 course on annual basis of specialized training. At least 40% foreign student participants per edition. At least no.10 international collaborations developed. At least no.15 new solutions co-designed.
3	Services and infrastructure to combat food waste	No.1 management plan for food collection, storage and distribution to combat waste. No.10 initiatives for food and non-food reuse of food scraps. Creation of No.1 contest on an annual basis for businesses that reduce food waste (including packaging). No.10 initiatives to raise awareness against food waste (at schools, school, and corporate canteens, restaurants, etc.). No.1 report on an annual basis to monitor waste recovered.
4	Farmers' markets and short supply chains	No. 5 multifunctional facilities (markets with kitchens), priority to the development of unused spaces. No.1 governance model for the implementation and management of multifunctional facilities (urban and peri-urban) No.10 short supply chains created (production and point of sale) No.1 reward mechanism for short supply chains in public procurement for school canteens.
5	Green regeneration of cities and rural cohesion (Biodistricts)	No.1 mapping of abandoned and/or unused spaces. No.1 approved plan for urban regeneration and connections with Biodistricts. No.15 co-designed and citizen-led initiatives for the redevelopment of mapped areas. No.25 people employed to manage the regenerated spaces. No.1 communication campaign for the enhancement of the spaces.
6	Organic/km0 school canteens	No.1 specification for green and public procurement. No.1 monitoring tool for quantification of wasted meals and waste containment. Guidelines for food counseling and monitoring of children's nutritional problems. No.10 extracurricular initiatives to promote and educate on an integrated approach to health.
7	Metropolitan Food Academy	Recovery of No. 1 building or structure to be used for the Metropolitan Food Academy. Conceptualization of at least no.7 facilities. No.1 communication campaign to promote the Food Academy.
8	Governance and tools for monitoring and continuous improvement-citizen participation in the implementation of local food policy	Establishment of the Metropolitan Food Assembly. No.1 monitoring plan defined and approved. At least No. 2 participatory meetings annually to inform and update with respect to Food Policy advancements, as well as to receive feedback from the community for its improvement.

Table 5. The actions of the Food Policy of the Metropolitan City of Bari. Source: CIHEAM Bari and Città Metropolitana di Bari, 2023.

4. CONCLUSIONS

This paper aimed at showcasing the advantages and the achievable results of participatory processes using the Living Lab approach to co-design and implement solutions to favour the transition towards more sustainable and resilient Mediterranean local food systems; The example of the Metropolitan City of Bari showed that planning, design, and implementation can achieve good efficiency when involving dialogues and co-creation with stakeholders. The Living Lab resulted a very efficient approach to valorise the most relevant human resources, while maintaining high representativeness of local communities through the quadruple helix approach. Moreover, given its versatility, a Living Lab can be applied in any sector, favouring tailored solutions thanks to the participation of citizens and end-user in the co-creation process.

Given the lack of Living Labs in the southern shore of the Mediterranean, strengthening their activation and labelling could help in increasing opportunities for cooperation among Mediterranean countries toward a common response to the innovation needs of the Mediterranean. The European Union should strengthen collaboration with (but also funding to) southern shore Mediterranean countries to establish Living Labs as a strategy for cultivating more sustainable and cooperative innovation ecosystems.

This objective can be realized through the promotion of partnerships and the provision of technical aid, training, and capacity development, as well as exploring possibilities to utilize established networks and partnerships to promote the advancement of Living Labs. At the same time, southern Mediterranean countries should contribute with a supportive policy, regulatory framework to favour the establishment of Living Labs, also allocating funding and extending various forms of support to entrepreneurs, researchers, and key stakeholders involved in the inception and operation of Living Labs. Moreover, harness existing regional and international networks can facilitate cross-border collaboration between Living Labs in different countries, promoting the exchange of ideas and experiences. Actively nurturing partnerships and collaborations between Living Labs and other stakeholders within the broader innovation ecosystem is vital, as it can help drive forward advancements and socio-economic progress.

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TECHNOLOGICAL, SOCIAL AND ORGANISATIONAL INNOVATIONS AS KEY DRIVERS FOR SUSTAINABLE AGRIFOOD SYSTEMS

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ABSTRACT Agri-food systems are at the centre of the global debate on sustainable development. In the path towards more sustainable agri-food systems, technological innovation is a key factor. However, attention should also be given to social innovation. Good examples include a stronger cooperation between value chain actors, new market opportunities for sustainable farmers and more rigorous measurement, traceability systems and sustainability certification. Such social innovations are particularly useful in a context of smallholders and small food companies as in the case of the Mediterranean region, and are crucial for more sustainable production, which is at the core of the Mediterranean diet.

Keywords Sustainability - Social Innovation - Measurement systems - Agri-food Value Chain.

LES INNOVATIONS TECHNOLOGIQUES, SOCIALES ET ORGANISATIONNELLES COMME MOTEURS CLÉS POUR DES SYSTÈMES AGROALIMENTAIRES DURABLES

Résumé Les systèmes agroalimentaires sont au cœur du débat mondial sur le développement durable. L'innovation technologique est un facteur clé dans le processus de mise en place de systèmes agroalimentaires plus durables. Toutefois, une attention particulière devrait également être accordée à l'innovation sociale. De bons exemples en sont une coopération plus forte entre les acteurs de la chaîne de valeur, de nouvelles opportunités de marché pour les agriculteurs durables et des mesures, des systèmes de traçabilité et des certifications de durabilité plus rigoureux. De telles innovations sociales trouvent toute leur utilité dans le contexte des petits exploitants et de petites entreprises alimentaires, comme c'est le cas dans la région méditerranéenne, et sont essentielles pour des productions plus durables, qui sont à la base du régime alimentaire méditerranéen.

Mots-clés Durabilité - Innovation sociale - Systèmes de mesure - Chaîne de valeur agroalimentaire.

1. INTRODUCTION

Agri-food systems are at the centre of the global debate on sustainable development, for a variety of reasons, among which their impact on climate change and biodiversity, the importance that food security is assuming worldwide, the correlation of food with the use of natural resources, as well as the health of individuals and communities. As confirmed by the UN Food Systems Summit Stocktaking Moment event held in Rome in July 2023, food systems are fragile and urgent actions are needed, so as to avoid greater socio-economic disruptions and humanitarian crises.

Recent external factors such as geopolitical conflicts, high costs of energy, food and food related products have increased the tensions related to access, affordability and availability of healthy and nutritious food. Recognizably, the connection established for the COP28 between food and the implementation of the climate agreements shows the acknowledgement by the international community of the relevance of the sector.

In this framework, the Mediterranean region is a testbed for the world, as it mirrors the socio-economic and environmental complexities that we can register worldwide. The Mediterranean basin is a "climate change hot spot". Similarly, trends such as inequality within and among Countries, population growth, agricultural intensification, urbanisation and increasing of natural resource demand and consumption, impact negatively on rural communities and the fragile segments of the societies. Technological innovation has been acknowledged as a powerful tool to address food security and promote sustainable food systems. This was highlighted also in the outcomes of the recent Stocktaking

Moment of the UN Food Systems Summit. In chapter 1 some key issues in the field of technological innovation are illustrated.

However, technological innovation is not enough. Attention should be given also to social innovation, that is, according to OECD “the design and implementation of new solutions that imply conceptual, process, product, or organisational change, which ultimately aim to improve the welfare and wellbeing of individuals and communities”.

For this reason, chapter 2 of the paper is focused on the need to innovate in terms of three key issues:

- **Cooperation among Value Chain actors**
- **New market opportunities for sustainable farmers**
- **More rigorous measurements, traceability systems and certifications of sustainability**

The positive interaction and cross-fertilization among these factors is also vital for the future of our communities.

2. TECHNOLOGICAL INNOVATION

In recent decades, the global challenges related to food insecurity and the impact of climate change have become increasingly urgent. Promotion, adoption, effective use of technological innovation by small farmers, as well as the commercialization of knowledge and intellectual assets are critical elements to address such challenges.

Scientists and innovators have been called upon to develop impactful solutions, able to ensure a higher level of productivity and economic return for producers with lower exploitation of natural resources and an adequate amount of healthy and nutritious food for a growing number of population.

The ability to adopt innovation is a decisive factor to accelerate the transformation needed for more sustainable agrifood systems is critical also in terms of reduction of inequalities among countries and societies, while safeguarding natural resources and ecosystem and promoting the livelihood and an adequate economic return for farmers and producers. A critical gap to be addressed is the bottleneck that research and innovation encounter in developing research results into a marketable stage. Several obstacles still limit the knowledge sharing and full uptake by final beneficiaries of the innovations and research results offered by science and technological development. Services such as ad-hoc training and technology transfer are pivotal for enabling the different end-users to benefit from research results.

In this framework the experience of the Partnership for Research and Innovation in the Mediterranean Area (PRIMA) is illustrative, as it is engaged in continuing the support to more than 200 research and innovation projects through ad-hoc services, offered to the different investigators across the Mediterranean, in addition to the grants that each year the PRIMA Initiative ensures to the selected beneficiaries. PRIMA has in recent years promoted capacity building and knowledge sharing experiences in collaboration with dedicated institutions such as ICARDA and META, respectively on monitoring of project proposals' performance and on preparation of business plans. At the same time, PRIMA is also partnering with the Union for the Mediterranean in training activities for green skills related to the agrifood sector.

PRIMA has also initiated a collaboration with the International Center for Agricultural Studies of the Mediterranean-CIHEAM in order to deploy the innovations funded under PRIMA projects at larger scale, in specific territorial settings taking into consideration priorities and needs of the different stakeholders, engaging with a variety of local, national and international actors, both public and private ones. This

scale-up initiative, which has in Egypt the first pilot-experience, is meant to favour the uptake of innovations by farmers, communities and businesses. The upscaling initiative requires the ability to identify gaps opportunities, for which the identification of ad-hoc professionals such as the innovation brokers can be extremely useful.

In order to overcome inadequate technology-transfer mechanisms, specialised centres able to foster an entrepreneurial attitude and favour the transfer of research results to companies, SMEs and smallholders alike, are needed. The experience of the National Center for Agritech in Italy, strongly supported by public investment through the National Plan for Recovery and Resilience funded by Next Generation EU, is a concrete example in the direction of university-business collaboration in the key sector of agrifood. Agritech is illustrative also for its governance and structure, as it enhances the role of private sector, the cross-fertilization of ideas and the ability to offer multiple services such as an academy for specialised upskilling and reskilling, an accelerator to support start-ups and early stage innovations, a school for young researchers and talents, a pathway for innovation brokers and a technology transfer initiative with dedicated managers.

3. SOCIAL INNOVATION

It is widely recognized in literature, by experts, professionals and managers that to ensure more efficient, sustainable, and resilient food systems, the effort of all its actors and stakeholders, at various stages of the agrifood value chain, such as farmers, processors, retailers, distributors, research institutions, policy makers and consumers is needed. Collaboration is therefore crucial for optimising resource allocation, improving efficiency and ensuring sustainability, food quality and safety and resilience. At the same time, it may face several challenges, including information asymmetry, market power imbalances, and resistance to change.

Given that the vast majority of food transactions occur in domestic (local and national) markets, territorial markets are a privileged entry point and lever to address food security and, more generally, the promotion of sustainable food systems. Also because smallholder farmers are responsible for most of the food consumed in the world, as well as most of the investments made in agriculture.

In territorial markets smallholders and farmers cooperate to offer their products (usually fresh) directly to consumers, thus activating a short-value chain that is able to bring together attention to fresh products, an active engagement and horizontal interactions between consumers and producers, a lower impact deriving from logistics and transportations (thought still present) on the ecosystems and other positive externalities, in terms of promotion of social relations and protection of cultural traditions.

More importantly, the territorial markets also have the potential of rewarding farmers as leading actors of the food systems, placing them at the centre of a variety of relations and empowering them towards different stakeholders. Such farmers' markets, whose Campagna Amica promoted by Coldiretti (a major Italian farmers' association) is a successful example, play an important role also in terms of dietary-pattern as they can positively balance the three dimensions of accessibility, availability and affordability that are considered as key factors determining individuals' food habits. The experience of territorial markets, especially farmers' markets, have multiple benefits for both producers and consumers.

Similarly, a powerful instrument to promote an integrated approach along the value-chain is public procurement. Interestingly, municipalities and public entities can favour a model that is respectful of

the quality of the product, the need for a fair economic return to producers, taking into account at the same time the constraints in terms of natural resources, and the requests by citizens and consumers. The experience of urban food policies, whose the Milano Pact is a leading example, in delivering accessible, affordable, safe and nutritious food to a greater number of people worldwide is growing attention worldwide, thanks also to the catalytic role played by FAO and other international actors on this issue. The role of farmers markets and of urban food policies, as multistakeholders experiences themselves, can truly cross-fertilize each other with positive effects on the food systems as a whole.

Public-private partnerships can also enhance collaboration within the agrifood value chain by aligning the interests of both sectors to achieve common goals. Effective collaboration is often supported by clear regulatory and policy frameworks that establish standards for food safety, quality, and fair trade. An example of multi-stakeholder collaboration, aimed to set up a policy framework on the responsibility of all the actors towards a food systems transformation, is the initiative launched by the European Commission within the Farm-to-Fork strategy, called “Code of Conduct on Sustainable Food Businesses and Marketing Practices]”. The Code consists of a set of commitments to be adopted by the agrifood companies and association representatives of the sector, to promote sustainability, enhance consumer trust, reduce greenwashing, improve transparency, reduce food fraud, support responsible sourcing, promote healthy diets, and foster innovation. Such a code helps promote ethical, responsible, and sustainable behaviour in the food industry. Overall, the Code benefits businesses by enhancing their reputation and consumer trust while promoting ethical and sustainable behaviours. It also benefits consumers by providing them with more information and choices to make environmentally and socially responsible purchasing decisions.

At the national level, the Italian agrifood system is characterised by intense relationships among farmers, industries, retailers and consumers, also through their associations, useful to promote sustainable agriculture, quality products, and culinary traditions. These associations play a multifaceted role in fostering innovation, protecting local traditions, and ensuring the global recognition of Italy’s agrifood heritage.

An example of successful collaboration among associations is “Uniti nel cibo”, a document produced by the “Working Group on food supply chains - Towards the 2021 Food Systems Summit”, activated at the Italian Minister of Foreign Affairs and International Cooperation. It represents a collective effort to be translated into business and supply chain practices able to reconcile the pursuit of the social and environmental sustainability objectives with economic development.

Furthermore, Living Labs as collaborative spaces where stakeholders come together to co-create, test, and implement innovative solutions in real-world agrifood contexts are also worth noting. They are emerging as innovative and dynamic platforms to bridge the gap between academia, industry, and farmers.

Agrifood Living Labs are also referred as user-centric places, ostering interdisciplinarity, real-world testing, improved by ongoing adaptation and improvement, encouraging knowledge exchange among a diverse set of stakeholders.

Based on these characteristics, Living Labs can be conducive to the rapid development, test and adoption of innovative technologies and eco-friendly practices, thus promoting sustainability, resilience, knowledge transfer, safety and quality of product. As an example, the Agrifood Living Lab, coordinated by the

Santa Chiara Lab of the University of Siena, is an innovative model, different from the city-centered (or municipality-centered) model, since it is coordinated by a research and innovation center with a strong capacity to link with many stakeholders of the agrifood sector thanks to the already existing international and national networks which it takes part of.

While Living Labs face some challenges, including funding, coordination, and scalability, they promise great expansion and evolution by being instrumental to address diverse agricultural contexts and challenges. Living Labs are also able to ensure active participation of marginalised communities, smallholder farmers, and underserved regions.

In Europe, many Living Labs are clustered in the European Network of Living Labs (ENoLL), a collaborative, pan-European organisation that plays a pivotal role in fostering innovation, research, and development in various domains through the concept of Living Labs. ENoLL was established in 2006 and has since grown into a dynamic network of organisations, institutions, and practitioners dedicated to open innovation, user-centred design, and the co-creation of solutions in real-world environments. Among its key features we could include the knowledge sharing, the support to research and innovation, as well as policy advocacy. While still facing critical challenges, such as data privacy and security, scalability and integration with other initiatives, ENoLL are critical to share best practices, test and validate innovative solutions, showcase successful cases and foster multistakeholder approach to address emerging challenges.

As stated at the beginning, the concept of sustainability is critical to face environmental, social, and economic challenges and its importance has never been more apparent given that it encompasses highly relevant topics, from gender equality to human rights to climate change.

To accomplish the successful transition from business as usual to a sustainable business, it is crucial to adopt practices of sustainability performance measurement, traceability, and certification. Measurement primarily concerns company's internal sustainability performance, traceability extends beyond company boundaries, directly involving the firm's supply chain, while certifications enable the strengthening and evaluation of product or process sustainability. Actually, in order to support the development of sustainable agri-food supply and value chains, it is necessary to adopt an integrated approach that takes into account various aspects concerning both internal company processes and its value chain.

4. YOU CAN'T MANAGE WHAT YOU CAN'T MEASURE!

In the ever-evolving landscape of modern business, measurement has emerged as a critical cornerstone for success. The current volatile, uncertain, and changeable operating environment in which firms operate is affecting the way companies measure their performance. Sustainability is no exception: sustainability performance measurement has become increasingly important for businesses and organisations across various sectors. It involves assessing an organisation's efforts and impacts related to environmental, social, governance and economic sustainability. Moreover, the evidence suggests that the use of sustainability performance measurement systems has the potential to broaden company's sustainability initiatives through processes that enable innovation, communication, and reporting.

The measurement of sustainability performance for agri-food businesses is not an easy task, especially for small and medium firms. There are many challenges to face, ranging from sustainability data collection and management and the wide variety of products to meeting Stakeholders' expectations and regulations.

Many agri-food businesses, especially smaller ones, may lack the expertise and knowledge to effectively measure and manage sustainability performance. Agri-food businesses are typically characterised by lack of financial and human resources, little attention given to the formalisation and to the evaluation of processes, and short-term strategic planning. The difficulties in measuring sustainability performance

The implementation of rigorous sustainability measurement processes provides several benefits to agri-food companies. Firstly, it can help build reputation and trust, and meet Stakeholders' expectations, who are showing deeper interest in how companies are addressing sustainability issues. Secondly, sustainability performance measurement supports and improves risk management practices, since it supports companies in facing uncertainty. Moreover, it attracts talents and plays a key role in translating management commitment into real actions, which is particularly relevant for sustainability. Setting up and monitoring measurable sustainability goals can drive product development and process improvement, leading to cost reduction through energy efficiency, reduced waste, and resource optimization. .

When measuring sustainability performance, organisations can use a combination of frameworks, tools, methodologies, and standards to assess their impacts and progress toward sustainability goals. The variety of tools available raises the level of complexity for small and medium agri-food businesses and allows companies to engage in cherry-picking, a practice to be avoided since sustainability requires a balanced and integrated measurement of its various dimensions.

In order to implement a successful and useful measurement system of sustainability performance, it is necessary to refer to a specific framework of analysis. Among the most widely used and well-known sustainability frameworks are: the Agenda 2030, which, with its 17 Sustainable Development Goals and its 169 targets, provides guidance on areas, themes, and sustainability targets to be measured; the International Integrated Reporting Framework, which identifies the aspects to be measured and reported in an Integrated Report; finally, the United Nations Global Compact, which through its Ten Principles identifies the topics and aspects to be monitored in order to keep under control the company's responsibilities towards People and Planet, and to achieve long-term sustainability success.

These frameworks are widely applied and debated. However, it is often difficult for small and medium agri-food business to adopt them since they require the implementation of large and complex measurement systems and they might not strictly consider the peculiarities of the agri-food sector. Agri-food firms should rely on frameworks that embed ESG topics in a balanced way and that are specifically adapted and targeted to them. The Four Pillar Framework (4PF) is built exactly according to this logic and represents a valid support for agri-food companies in order to implement a rigorous and comprehensive sustainability measurement system.

This framework is the result of intensive academic research, ongoing field discussions involving companies in the sector and it was elaborated within the "Fixing the Business of Food initiative" by Santa Chiara Lab at the University of Siena, the Sustainable Development Solutions Network (SDSN), and Columbia University (Sachs et al., 2020). It is a holistic and operational approach, adaptable to sector-specific characteristics and different company sizes, aimed at providing businesses with a tool for analyzing their corporate sustainability, identifying best practices, and evaluating their level of corporate sustainability. The 4PF is developed around 4 Areas and 21 Topics, which are reduced to 17 for agri-food companies. The four dimensions of analysis proposed for the latter are:

1. Products, services and strategies that contribute to the achievement of the SDGs (assessing the impact that companies have on human health through their products);
2. Sustainability of operations and internal processes (evaluating the economic, social, and environmental impacts of business activities);
3. Sustainability of the supply and value chain (evaluating the company’s role in promoting sustainable practices along its supply chain and value chain);
4. Good corporate citizenship (assessing the company’s commitment to managing its ethical and social impact internally and within the communities in which it operates).

The following Figure (Figure 1) lists the 21 Topics of the 4PF, divided by Area. Four themes have been removed from the framework for agri-food companies compared to the general framework, which include child labor, forced labor, freedom of association and collective bargaining, and resource rights. These themes are more typical of large enterprises and multinationals.

Pillar 1 Products and strategies contributing to healthy and sustainable diets	Pillar 2 Sustainable Business Operations and Internal Processes	Pillar 3 Sustainable Supply and Value Chains	Pillar 4 Good Corporate Citizenship
1. Product portfolios contributing to healthy and sustainable diets. 2. Food security 3. Marketing and labeling 4. Food safety and air quality	5. Child labor 6. Forced labor 7. Freedom of association and collective bargaining 8. Non-discrimination and equality 9. Occupational health and safety 10. Resource rights 11. Living wages and incomes 12. Sustainable agricultural production 13. Climate change 14. Biodiversity 15. Water use 16. Waste 17. Animal welfare		18. Governance and Management 19. Policymaking influence 20. Tax 21. Litigation

Figure 1. The Four Pillar Framework

The 4PF is aligned with the key international and European non-financial reporting standards, with a particular reference to the GRI, SASB, and the recently developed ESRS standards by EFRAG (European Financial Reporting Advisory Group).

Once a reference measurement framework has been identified, companies are called upon to choose which sustainability indicators and metrics to focus their attention on. Rigorous measurements and data collection provide agri-food businesses with valuable insights into their processes. They can use

these data to make informed decisions about product development, process improvement, and resource allocation, ultimately enhancing efficiency and profitability.

Nowadays, a large variety of International Sustainability Standards are available, and they encompass a range of guidelines, principles and indicators that address environmental, social, and economic sustainability on a global scale. The choice depends on various factors, including their level of experience in sustainability measurement, whether they are subject to non-financial reporting obligations, and the purpose of the measurement itself.

Among the internationally recognized standards commonly adopted today, the Global Reporting Initiative (GRI) takes the lead. It is an international nonprofit organisation that provides a flexible and modular framework defining principles and indicators to measure and communicate ESG performance. Specifically, the GRI Standards consist of three general standards (Universal Standard) applicable to all organisations and thirty-five specific standards (Topic Specific Standards). Recently, the ISSB (International Sustainability Standards Board), which belongs to the IFRS Foundation, has published two Standards, the IFRS S1 – general requirements – and the IFRS S2 – climate-related disclosure. The European Financial Reporting Advisory Group (EFRAG) has developed the European Sustainability Reporting Standards (ESRS) and released 12 “sector-agnostic” standard drafts (2 cross-cutting and 10 topic-specific Standards), which are applicable regardless of the industry the company belongs to. The ESRS give relevance to the measurement of sustainability performance along the value chain, the use of natural resources, biodiversity, and climate change.

Besides these general standards, agri-food businesses can measure their sustainability performance using sector specific standards. The Sustainability Accounting Standards Board (SASB) provides specific standards for the agricultural sector. The GRI has elaborated specific standards for Agriculture, Aquaculture and Fishing Sectors, which will come in effect for reporting from 1 January 2024. They provide information about possible material topics and the sector’s most significant impacts on the economy, environment, and people, including human rights. The ESRS as well will include specific sector standards, among which a set of indicators for the agriculture and farming sector.

Summing up, the lack of standardised sustainability metrics and reporting frameworks in the agri-food industry can make it difficult to compare and benchmark performance across businesses. Moreover, the variety of available measurement standards, as well as their ongoing evolution, makes the task of measuring and assessing sustainability performance complex and challenging to be implemented rigorously, despite being essential for tracking progress, setting goals, and reporting on sustainability initiatives within the agri-food industry’s value chain.

5. TRACEABILITY IN THE AGRI-FOOD SECTOR: A TOOL TO IMPROVE AND SPREAD SUSTAINABILITY ALONG THE SUPPLY CHAIN

Traceability in the agri-food sector refers to the ability to track and trace the origin, production, processing, and distribution of food products through the entire supply chain. This includes knowing where raw materials and ingredients come from, how they are transformed into final products, and how those products reach consumers. It is a critical component of food safety, quality control, and ensuring compliance with regulatory standards. Efficient traceability systems often utilise technology, such as barcodes, RFID (Radio-Frequency Identification) tags, and blockchain, to create transparent and accountable supply chains, reducing the risk of fraud, counterfeiting, and foodborne illnesses.

Traceability of geographic origin is a specific form of traceability that focuses on recording and monitoring the geographic origin of a particular product throughout the production and distribution chain. This type of traceability is particularly relevant in the agri-food sector, where geographic origin can be an important factor in product quality, authenticity, and safety. Actually, it is often used to protect the reputation and quality of products associated with specific regions or to ensure compliance with regulations related to origin labelling, but also maintain consumer trust. For example, “DOP” (Protected Designation of Origin) and “IGP” (Protected Geographical Indication) are origin labels used in the European Union to indicate the geographic origin of agri-food products. These labels are an example of how geographic traceability can be used to promote and protect specific products based on their geographic origin.

Product or supply chain traceability refers to the ability to track and trace the entire lifecycle of a product or the components within a supply chain. This involves recording and monitoring the origin, production, processing, distribution, and any relevant information associated with the product or its components. In order to be implemented, it requires a rigorous and complex measurement system of sustainability performance along the supply chain, which can be supported by the blockchain, a specific type of distributed ledger technology. The latter offers the possibility to create document blocks. Each record is stored in a “block,” and these blocks are linked together in a chronological and immutable chain, promoting trust and accountability, since it is very difficult to alter or delete. Internet of Things (IoT) traceability systems can be used as well. They offer viable options for tracking the quality of food supply chains. Nonetheless, the majority of IoT solutions depend on the centralised server-client model, which poses challenges for consumers in accessing complete transaction data and tracing the origins of products.

Therefore, supply chain traceability is a tool that satisfies consumers and stakeholders’ increasingly demand for transparency in the supply chain and addresses sustainability issues like ethical sourcing, and fair labour practices. Among the Italian agri-food supply chain leaders, Barilla has affirmed its commitment to a sustainable supply chain for raw materials through the development and application of the Sustainable Agriculture Code (SAC) for the purchase of strategic raw materials. The projects implemented to apply the Code are managed by Barilla Sustainable Farming (BSF), which promotes more efficient cultivation systems aimed at obtaining safe and high-quality agricultural products, while also paying attention to environmental and social conditions and the economic well-being of farmers.. In order to implement systems aimed at monitoring traceability, rigorous and well-defined measurement processes must be in place. Rigorous measurements and traceability should therefore go hand in hand in helping agri-food businesses identify potential risks early, take appropriate actions to mitigate them and have better control over their supply chain. .

6. CERTIFICATIONS AND SUSTAINABILITY: THE NEED FOR INTEGRATION

Certifications play a crucial role in the agri-food industry for several reasons. They can focus on products or on the organisational processes. They help agri-food firms ensure the quality and safety of products and they support the compliance with regulations, fostering the implementation of risk management practices. Moreover, they are a trust signal for consumers and, as a result, they can open up new markets and give access to a wider customer base. Certifications can help agri-food firms showcase their commitment to sustainability principles, as they may require tracking and documentation throughout the supply chain. This can lead to better supply chain management and traceability, again reinforcing the virtuous cycle among measurement, traceability, and certifications.

As for sustainability, nowadays agri-food companies can choose among a variety of certifications, which can also be sector specific, based on their products, target markets, and values. Some of the common types of certifications for agri-food companies include: ISO Certifications, which are international standards that cover different aspects, such as quality management (ISO 9001), food safety (ISO 22000), and environmental management (ISO 14001); Fair Trade Certification, which ensures that products are sourced and produced in a way that promotes fair wages and ethical treatment of workers; FSC Certification (Forest Stewardship Council), related to responsible forestry practices, often relevant for companies producing packaging or using wood products. Equalitas is an example of a certification that is sector specific: it concerns the wine sector and assesses its sustainability implementing an integrated approach that evaluates the company's social, environmental and economic approach. Other certifications, such as the B Corp, or Benefit Corporation involve the whole structure and management of the company.

The main critical points in the development and implementation of agri-food certified quality systems concern the efficiency in the data collection process, the quality and reliability of the data, and their costs. Moreover, data required by certifications are often not aligned with international non-financial standards, thus requiring agri-food firms to exert an additional effort in data collection and management.

The agri-food industry's success and sustainability needs a multifaceted approach that integrates rigorous measurements, traceability, and certifications. Therefore, it is necessary to proceed with the standardisation and simplification of measurement methodologies so that they can serve as an effective and tangible foundation for building efficient processes of traceability and certification. Sustainability measurement, traceability of geographical origin, and certifications need to be managed in an integrated manner as they are interdependent. To implement this integration, it is necessary to reinforce intangible value drivers, such as the cooperation among the value chain actors, the co-creation and the sharing of innovative practices.

7. CONCLUSIONS

This article has highlighted innovation as a key factor to promote more sustainable food systems, which are essential for our environment, the future of our societies and the adoption of healthy and sustainable diets. Technological innovation is certainly crucial. However, also social innovation is needed. For this reason, the experiences of living labs, farmers' market and urban policies are underscored, in a framework of cooperation among different actors in the value chain. Also the measurement of sustainability performances, certifications and traceability mechanisms are seen very useful for addressing the challenges of the fair ecological transition in the agrifood sector.

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FOSTERING THE ROLE OF WOMEN, YOUTH, AND INCLUSIVE SUSTAINABLE LIVELIHOODS IN THE MEDITERRANEAN FOOD SYSTEM.

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ABSTRACT This article explores the necessity to foster the active participation and empowerment of women and youth in the Mediterranean food systems, while simultaneously promoting inclusive and sustainable livelihoods. The Mediterranean region, rich in cultural diversity and agricultural heritage, stands at the intersection of tradition and modernity. However, achieving food security and sustainable development requires a paradigm shift that embraces marginalized groups as significant contributors, particularly women and youth. The first part of this article delves into the challenges faced by women and youth in the Mediterranean food systems, and the urgency of addressing issues ranging from limited access to resources, gender-based disparities and the absence of robust policies to attract youth engagement in the sector. Highlighting the centrality of successful initiatives, the article emphasizes the importance of various measures, including skill development programs, gender-responsive research, and more inclusive policy frameworks, to amplify and integrate the voices of women and youth in decision-making processes across food systems. The second part underscores the importance of inclusive and sustainable livelihoods in the context of Mediterranean agriculture, confirming the role of eco-friendly practices, technological advances, and community-driven initiatives. The article advocates a holistic approach to ensure both economic growth and environmental preservation. By interweaving the narratives of diverse stakeholders, the article portrays a comprehensive picture of the transformative potential of inclusive and sustainable livelihoods. In conclusion, this article argues for a concerted effort to elevate the status of women and youth in Mediterranean food systems, recognizing them as catalysts for positive change. It argues that fostering inclusivity and sustainability is not only a moral imperative but also a strategic necessity for the resilience and prosperity of the entire region.

Keywords Food systems - Sustainable livelihoods - Gender inequalities - Women and youth empowerment - Mediterranean diet.

PROMOUVOIR LE RÔLE DES FEMMES, DES JEUNES ET DES MOYENS DE SUBSISTANCE DURABLES ET INCLUSIFS DANS LES SYSTÈMES ALIMENTAIRES MÉDITERRANÉENS

Résumé Dans cet article, nous allons réfléchir sur la nécessité d'encourager la participation active et l'autonomisation des femmes et des jeunes dans les systèmes alimentaires méditerranéens, tout en promouvant des moyens de subsistance inclusifs et durables. La région méditerranéenne, caractérisée par une grande diversité culturelle et un riche patrimoine agricole, se situe entre tradition et modernité. Toutefois, un changement de paradigme s'impose pour pouvoir atteindre les objectifs de la sécurité alimentaire et du développement durable, reconnaissant les groupes marginalisés, notamment les femmes et les jeunes, comme des acteurs à part entière. Nous allons tout d'abord parcourir les défis auxquels sont confrontés les femmes et les jeunes dans les systèmes alimentaires méditerranéens et insister sur les enjeux pressants tels l'accès limité aux ressources, les disparités entre les sexes et l'absence de politiques efficaces, qu'il faut aborder pour mobiliser les jeunes dans ce secteur. En rappelant l'importance de certaines initiatives de succès, nous allons également évoquer l'utilité de différentes mesures, notamment des programmes de développement des compétences, des activités de recherche sensibles au genre et des cadres politiques plus inclusifs, pour amplifier et intégrer les voix des femmes et des jeunes dans les processus de prise de décision concernant l'ensemble des systèmes alimentaires. Nous nous attarderons ensuite sur les moyens de subsistance inclusifs et durables dans le cadre de l'agriculture méditerranéenne en soulignant l'apport attendu des pratiques respectueuses de l'environnement, des avancées technologiques et des initiatives prises par les communautés. Nous proposerons par la suite une approche holistique visant à la fois la croissance économique et la préservation de l'environnement. En croisant les récits des différents acteurs, un bilan complet sera donc dressé du potentiel de transformation des moyens de subsistance inclusifs et durables. En conclusion, dans cet article, nous plaidons en faveur d'un effort concerté pour améliorer le statut des femmes et des jeunes dans les systèmes alimentaires méditerranéens, en reconnaissant leur rôle de catalyseurs d'un changement positif. La promotion de l'inclusivité et de la durabilité n'est pas seulement un impératif moral, mais aussi un impératif stratégique pour la résilience et la prospérité de l'ensemble de la région.

Mots-clés Systèmes alimentaires - Moyens de subsistance durables - Inégalités entre les sexes - Autonomisation des femmes et des jeunes - Diète méditerranéenne.

1. INTRODUCTION

The Mediterranean region is celebrated for its diverse cultural heritage, breathtaking landscapes, and culinary legacy. These facets have enabled the region to captivate the world for centuries, embodying heterogeneity in unity as the common Sea binds all Mediterranean countries in their diversity. However, beneath the shade of green olive trees and amid the exquisite natural scenery lies a complex web of key issues and challenges that, if not effectively addressed, will persist in threatening the sustainability of Mediterranean food systems. Those include persistent gender inequalities, the necessity of boosting the role of women and youth and the promotion of inclusive and sustainable livelihood within the agrifood system.

The 2021 Food Systems Summit underscored the presence of entrenched structural gender inequalities across food systems. It further affirmed that gender inequality contributes to food insecurity, emphasizing that gender equality and women's empowerment lead to enhanced food security and nutrition. Consequently, addressing gender injustice and genuinely empowering women is not only a fundamental prerequisite for the transformation of food systems but also an essential goal.

In the Mediterranean food systems, gender roles have historically been firmly delineated, with women assuming a more substantial role than men. While men primarily oversee cash crops, women attend to the daily needs of their households. Women play a crucial role in gathering wild plants for food and medicinal purposes, maintaining home gardens, selecting, managing, and storing seeds and crops, as well as tending to trees and small livestock (FAO, 2023a). Additionally, they participate in domesticating plants, engaging in small-scale fisheries and aquaculture, and preserving food. Women are typically responsible for food preparation, making them primary contributors to agriculture and longstanding pillars of the food value chain, encompassing food production, processing, and marketing. Through their involvement, women safeguard unique knowledge about local biodiversity, often passed down through generations. However, the role of women extends beyond these traditional responsibilities, as they also serve as innovators, researchers, and decision-makers. Thus, women emerge as key players in driving the green transition of Mediterranean food systems.

2. UNDERLYING CAUSES OF GENDER INEQUALITY IN MEDITERRANEAN AGRI-FOOD SYSTEMS:

In the wake of recent financial and Covid-19 pandemic crises, traditional gender-based roles in the Mediterranean have undergone significant transformations, influencing the participation of women and men in food systems. While men have become more engaged in activities traditionally associated with women at the household level, such as food preparation, women, despite their substantial involvement in food systems, continue to bear the brunt of risks and inequalities, especially in relation to food production, consumption, and food security when compared to men. Unfortunately, women often face greater obstacles in accessing land, water, livestock, as well as production inputs and services, including education, extensions, and credit. Moreover, their representation in decision-making processes concerning food and agriculture remains limited. This marginalization of women is primarily attributed to cultural and structural barriers, including unequal access to essential elements like education, training, and financial services, all of which are crucial for addressing and overcoming gender inequality challenges. Additionally, the exacerbation of negative impacts on women within food systems is intensified by poverty and low wages.

Drawing from the afore-mentioned disparities, we can identify four primary, interconnected causes that contribute to gender inequalities and perpetuate discrimination against women and girls in Mediterranean food systems:

1. **Limited Access to Resources:** Women farmers in the Mediterranean often encounter challenges in accessing crucial financial resources, including credits and loans. Additionally, issues surrounding women's rights to land act as a significant impediment to their economic empowerment within food systems.

2. **Unrecognized Women's Economic Leadership:** Women's economic leadership in food systems is frequently overlooked and further weakened by pervasive socio-cultural norms, gender biases, and stereotypes prevalent throughout the entire food system. These factors overshadow the substantial contributions and successes of women in the agricultural sector.

3. **Limited Access to Services and Technologies:** Women face restricted access to essential services, including marketing services and technologies, including digital tools. The absence of fair-trade practices and market incentives hampers women's capabilities to generate income and contribute to the economic development of their communities.

4. **Education and Training Barriers:** Women in many countries still encounter discrimination and difficulties in accessing education and training opportunities. Overcoming these challenges is crucial for empowering women and enhancing their participation in agri-food systems.

3. THE MEDITERRANEAN DIET: A MODEL OF SUSTAINABLE NUTRITION

Disparities in access to healthy diets, exemplified by the Mediterranean diet, underscore the challenges faced in promoting nutritional well-being. This diet, emblematic of the populations around the Mediterranean Sea, stands out for its rich biodiversity, nutritional benefits, and positive impact on sustainable agriculture in the region. While the Mediterranean diet is not a uniform nutritional model due to diverse histories, cultures, traditions, incomes, and dietary habits among Mediterranean nations, (Rguibi and Belhasen 2004, Dernini et al.,2012), it is widely appreciated as a lifestyle associated with food seasonality and local sourcing.

Recognizing the pivotal role of nutrition in body composition and its influence on mood, hormonal balance, and metabolism, dietary choices become crucial for overall well-being, encompassing both physical and psychological aspects. Evidence indicates that women play a central role in determining their households' diets across diverse social groups and contexts. Consequently, women, as primary food producers throughout the entire value chain, can take proactive roles in promoting the Mediterranean region's food diversity and instigating shifts toward mindful eating habits and healthy lifestyles. Achieving this transformation necessitates robust research and development programs, complemented by extensive awareness campaigns and the advocacy of change champions.

Conversely, food insecurity can disproportionately impact women's health and lifestyles compared to men's. In addition, promoting a holistic and person-centered care approach that encourages healthier lifestyles can significantly enhance the well-being of all family members. The holistic approach involves addressing not only the dietary aspects but also the broader lifestyle choices that contribute to overall health and resilience.

Considering these aspects, promoting gender equality in Mediterranean food systems and ensuring access to healthy diets is not only a necessity, given the pervasive intertwining of gender inequalities and injustices with food systems, but it is also crucial for achieving the United Nations Sustainable Development Goals 5 and 10. Delving into the dimension of gender inequalities in the global food crisis enhances our understanding of just and transformative food systems, contributing to their long-term sustainability. However, it is vital to emphasize that fostering gender equality and addressing gender

inequalities should involve the active participation and engagement of men. Raising awareness about the importance of gender equality is relevant and beneficial for the entire society, not solely for women.

4. GENDER -RESPONSIVE RESEARCH, A SLOW STRIDE!

To achieve this, there is a pressing need to promote gender-responsive research. This refers to scientific research that does not solely focus on women or gender relationships but considers gender as a significant variable in environmental and development studies (ICIMOD, 2009). Undertaking and funding gender-responsive research is essential for gaining a deeper understanding by incorporating women's viewpoints and perspectives on specific issues, often overlooked. The European Union has demonstrated significant interest and underscored the importance of integrating gender perspectives into European projects. Gender Equality Plans (GEP) have become eligibility criteria for securing Horizon Europe funding for projects and programs. At the European level, the Gender Equality Strategy 2020-2025 emphasizes the integration of gender-related aspects in Research and Innovation, aiming to address gender stereotypes, achieve gender balance in decision-making and politics, and close the gender gap.

In the realm of research, gender biases manifest in various dimensions. Women are rarely the subjects of studies, and gender bias persists in teaching and research, including gender studies. Transforming power relations in the production and circulation of knowledge is imperative, necessitating new ways of working, the introduction of subjects like feminist epistemology with innovative tools and methods, and collaborative, non-hierarchical approaches that recognize contributions, particularly from partners in the Global South. Despite these efforts, statistical data and indicators still reveal significant gaps between women and men in the agricultural sector, both in Europe and the Mediterranean area. In Europe, for instance, less than 30% of EU's farm managers are women, and their farms are smaller than those of their male counterparts. Only 30% of women work in agriculture (EC, 2023), with a higher likelihood of working in the informal economy and part-time positions. However, their participation in the informal rural economy is not statistically recognized. Rural women also have lower incomes than rural men, leading to a higher rate of migration from rural areas, particularly among highly-qualified women.

Similar data and issues persist in the Mediterranean area, where the work of women, as mentioned earlier, is undervalued, discredited, unpaid and mostly concentrated in the informal sector. In Egypt, for instance, less than a quarter of the total workforce is constituted by women, 71% of rural women work in unprotected environment and 70% of the total work without remuneration (FAO, 2021a); in Bosnia the gap in labor force participation between men and women reaches 30%, with the latter having to bear the burden of unpaid work in informal and shadow labor markets (FAO, 2021b). In Tunisia too, women have more difficulty in finding a job: in 43% of these cases, it comes down to supposed familiar responsibilities or to the opposition of the same families (13%) (FAO, 2022a). Finally, in Turkey women depend on their husbands and do not have access to economic freedom since, most of the times, they do not meet the financial standards required by banks for loans. In addition, predominant stereotypes about women's role in financial decision-making also complicate the process of obtaining credit (FAO, 2022b).

A significant bias affecting women in agriculture is their underrepresentation in research studies. Notably in the Mediterranean region, a major flaw identified in research lies in the tendency to compare female-headed households with male-headed households rather than considering the gender of who was managing farm activities. This oversight has led to various shortcomings, including the

failure to acknowledge the heterogeneity of women's status and situations within households, the unique challenges they may encounter compared to men and the prevalent circumstances in many contexts, where despite their active participation in agriculture work, they are not recognized as farmers. Moreover, traditional agricultural research projects frequently focus predominantly on male participants, resulting in an unbalanced understanding of the sector. This bias not only overlooks the diverse roles women play in agriculture but also hampers the effectiveness of policies and initiatives designed to support the entire farming community. Additionally, research biases are compounded by prevailing stereotypes and assumptions about gender roles. Women in agriculture are often pigeonholed into specific tasks, such as household duties or small-scale farming, neglecting their involvement in decision-making, agribusiness, technology and other leadership roles. These stereotypes perpetuate an incomplete narrative of women's contributions and hinder the recognition of their full potential within the agricultural sector.

5. YOUTH: TOMORROW'S LEADERS IN AGRICULTURE

Much like the oversight of women's roles, youth have a crucial role in meeting the challenges on food security. It is evident that the younger generation constitutes a crucial force in shaping and advancing food systems. Both young women and men play a vital role in tackling challenges related to food security, climate change adaptation and rural migration. Strategically investing in the youth as a valuable human capital is particularly essential in fragile areas, where their skill development can effectively confront pressing issues such as hunger, poverty, and malnutrition.

Despite their potential, high unemployment rates persist among young people, particularly graduates, deterring them from the agricultural sector. Currently, there are 1.2 billion individuals aged between 15 and 24. The majority of them struggle with the challenge of securing decent employment and are often compelled, especially when coming from low- or middle-income families, to seek work in the informal economy (95%). This reality significantly contributes to the rising percentage of young working poor (14% of the total in 2018) (FAO, 2023c). Encouraging youth participation and entrepreneurship in agriculture, thus, becomes imperative to not only sustain traditional farming practices but also infuse innovation and fresh perspectives into the industry. This approach fosters the intergenerational transfer of agricultural knowledge and ensures the industry's resilience.

To prepare the next generation of farmers, integrating young people into agricultural curricula is essential. Equipping them with the necessary skills to initiate and manage agricultural businesses promotes innovation and the adoption of sustainable farming practices. Moreover, recognizing the tech-savvy nature of young individuals, integrating technology into agriculture emerges as a powerful tool to attract them, transforming the sector into a more appealing and dynamic career choice.

Establishing mentorship programs that connect experienced farmers with young people can further boost their involvement. These programs facilitate knowledge transfer and provide guidance on overcoming challenges, creating a supportive network that encourages collaboration, the sharing of best practices, and a sense of community within the agricultural sector. By collectively acknowledging and harnessing the potential of young individuals in agriculture, we can ensure a resilient and thriving future for our food systems.

6. RECOMMENDATIONS FOR THE FUTURE

Effectively addressing the roles of both women and youth in food systems requires a focus on promoting

inclusive and sustainable livelihoods. This approach integrates various aspects of food systems to ensure people's access and right to food in a manner that fosters social inclusion and prosperity. Creating inclusive sustainable livelihoods necessitates addressing the needs of marginalized and vulnerable communities, including women, men, and youth, by providing them with equal access, opportunities, and removing barriers of discrimination and exclusion. This inclusive approach is fundamental for promoting social equity and reducing poverty.

Community-based initiatives, supported by local governments and NGOs, play a crucial role in tackling specific challenges faced by different regions. By fostering a sense of ownership and collective responsibility for the well-being of the community, these initiatives contribute to inclusive sustainable livelihoods. Empowering local communities is another key aspect, achieved through involvement in decision-making processes, support for community-based initiatives, and engaging young leaders in policy development. This approach enhances the overall well-being of local communities.

To address the challenges faced by women and young people in the agricultural sector, various practical measures can be implemented. Overcoming gender biases in research is imperative, both in terms of research concepts and methodology. Promoting gender-sensitive data collection on the localized nuances of the climate-migration-gender nexus informs targeted policies addressing distinct priorities for men, women, and youth. Involving young women and men in decision-making processes, both in institutions of public negotiation and local governments, is essential. Empowering them to present value-added proposals for local areas requires consideration of identities, relationships, and structures to facilitate systemic and transformative changes.

Climate policies should prioritize women's priorities in climate change, such as better access to agricultural assets and resources for building resilience. Similarly, policies should address migrant women's concerns in climate change, focusing on social and economic protection throughout migration and displacement due to climate change. Capacity-building of national partners to design and implement climate-migration-gender nexus policies is essential. Empowering women and youth as significant agricultural labor forces in the Mediterranean Basin involves boosting their skills, extending beyond technical training, to make them acknowledged agents of food security, climate change prevention, and adaptation.

In the realm of food systems, analyzing linkages between food production and consumption, agriculture and food security at macro (institutions and policy frameworks), meso (organizations and communities), and micro (individuals and households) levels is crucial. Addressing poverty, low access to land, and water is vital, especially for women. Improving factors may include familial agriculture, enhancing women's status within farming households, and shared decision-making between men and women from farming to meal preparation. These efforts collectively contribute to positive impacts.

7. CONCLUSION

In a world marked by ongoing conflicts, wars, crises, and setbacks to human rights and dignity, amid continuous efforts to achieve peace, food security, poverty alleviation, and combat the impacts of climate change, it is evident that gender equality, youth engagement, and inclusive sustainable livelihoods form an interconnected nexus. Global actors recognize these elements as prerequisites for sustainable food systems.

In the Mediterranean region, amidst environmental, economic, and social challenges facing food systems, significant gaps require bold and determined actions, moving away from conventional “business as usual” approaches. Examining successful initiatives, engaging all stakeholders in collective efforts, and leveraging global commitments and guiding policy frameworks are crucial factors for achieving equitable, sustainable, and just food systems.

Gender Transformative Approaches (GTAs) (FAO, IFAD and WFP, 2020) are increasingly recognized as essential. These approaches acknowledge that the roots of gender inequality lie in discriminatory social norms affecting policy formulation, decision-making processes, governance mechanisms, institutional management, service provision, and resource allocation within households and communities. While addressing symptoms of gender inequality, such as unequal resource access, is necessary, GTAs focus on the root causes by engaging both women and men as agents of change. This shift in approach seeks to revolutionize lives and has gained traction in the context of agriculture and food systems.

For youth, robust actions are imperative to make agriculture and food systems more attractive, profitable, and rewarding. International consensus and policy recommendations can guide policymakers, researchers, and practitioners in fostering environments that harness the energy and skills of youth. Five key policy recommendations (CFS, 2022) include creating an enabling environment for youth engagement, securing dignified livelihoods, ensuring equitable access to resources, promoting access to knowledge and education, and fostering sustainable and inclusive innovations.

In addressing climate change, despite women’s leadership in grassroots climate movements and their vulnerability to climate change, gender integration into climate plans, policies, and strategies remains inadequate. There is a growing need to ensure gender inclusion in disaster risk reduction plans, adopting an integrated approach to face climate risks. Mainstreaming gender into local climate resilience policies and practices, building on good practices, is essential.

Promoting a robust research agenda and investing in gender-responsive research, along with developing tools and guidelines aligned with Mediterranean region priorities, is crucial. For instance, more research is needed to understand the connections between gender and the Mediterranean Diet, a widely recognized model of a sustainable diet (Capone et al, 2021). Exploring why this diet is considered “gender-friendly” and its potential to address public health challenges, especially those faced by women, is essential.

Leadership and accountability play key roles in promoting inclusivity and sustainability in food systems. All actors and stakeholders must be held accountable, particularly for achieving gender equality and youth engagement. Robust accountability mechanisms should be in place, emphasizing impact assessment and gender analysis across value chains to improve transparency and reveal intersecting inequalities and complexities.

In brief, recognizing and enhancing the roles of women, youth, and inclusive sustainable livelihoods in the Mediterranean food system are integral steps in addressing the complex challenges faced by the region. These elements contribute to the development of a holistic and resilient food system that sustains agricultural traditions while adapting to contemporary needs, ensuring food security, environmental sustainability, and social equity for women and youth.

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INCREASING RESILIENCE OF FOOD SYSTEMS AND THE MEDITERRANEAN DIET IN TIMES OF CRISIS, USING THE SOCIOTYPE FRAMEWORK

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ABSTRACT This article uses the Sociotype framework to present insights and suggestions related to issues of food security and food systems, as they pertain to the resilience of a Mediterranean Dietary (MedDiet) pattern. The Sociotype framework was developed as a summary ecological construct to organize the multiple, dynamic, reciprocal inputs from the environment that interact with the genotype to determine the expression of phenotypic behaviours, such as coping with stress. It has three domains - Individual, Relationships and Context - which are discussed in this article using specific food systems-related examples, processes and research. Topics covered include the impact of crises on the general food supply and implications for policy; the novel idea of a Planeterranean Diet as a global extension of the MedDiet; strategies involving women to overcome diet-related stressors in challenging times; consumer attitudes and knowledge about sustainable fisheries and seafood consumption; and a potential MedDiet curriculum focusing on responsibility, frugality, creativity, and enjoyment. The article concludes with recommendations for policy action to promote food security and resilience by facilitating the consumption of a MedDiet within sustainable food systems.

Keywords Mediterranean Diet - Sociotype framework - Food systems - Resilience.

ACCROÎTRE LA RÉSILIENCE DES SYSTÈMES ALIMENTAIRES ET DU RÉGIME MÉDITERRANÉEN PAR TEMPS DE CRISE, EN UTILISANT LE CADRE CONCEPTUEL DU SOCIOTYPE

Résumé Dans cet article, nous allons nous appuyer sur le cadre conceptuel du sociotype pour présenter des réflexions et des propositions concernant les enjeux liés à la sécurité alimentaire et aux systèmes alimentaires, notamment la résilience d'un mode d'alimentation basé sur le régime méditerranéen. Le cadre conceptuel du sociotype est développé en tant que construction écologique sommaire pour organiser les apports multiples, dynamiques et réciproques de l'environnement qui interagissent avec le génotype pour déterminer l'expression des comportements phénotypiques tels que l'adaptation au stress. Trois niveaux - individu, relations et contexte - sont retenus en évoquant des exemples, des processus et des recherches liés aux systèmes alimentaires. Les sujets abordés incluent l'impact des crises sur l'ensemble de la chaîne d'approvisionnement alimentaire et les implications pour les politiques, l'idée novatrice d'un régime « Planéterranéen » comme extension mondiale du régime méditerranéen, les stratégies mobilisant les femmes pour faire face aux facteurs de stress liés à l'alimentation dans des périodes de difficulté, les attitudes et les connaissances des consommateurs par rapport à la pêche durable et à la consommation de poisson et de produits de la mer, et un éventuel cursus sur le régime diète méditerranéen spécialement tourné vers la responsabilité, la frugalité, la créativité et la convivialité. En conclusion, des recommandations sont avancées pour des actions politiques visant à promouvoir la sécurité alimentaire et la résilience en encourageant l'adhésion au régime méditerranéen dans des systèmes alimentaires durables.

Mots-clés Régime méditerranéen - Cadre conceptuel du sociotype - Systèmes alimentaires - Résilience.

1. SOCIO-ECOLOGICAL THEORY TO SOCIOTYPE FRAMEWORK

Human beings live, work and play in many contexts throughout the day, throughout the year and throughout their lifecycle. These contexts are complex and shaped by a multitude of factors which come into play continuously or at particular moments. They are laden with reciprocal interactions between people and different environments, both of which are characterised by many features. This is the essence of Bronfenbrenner's (2006) socio-ecological theory presented as a human eco-system where individuals function within a series of nested environments.

Over the years, this idea of multifactorial influences on choices and behaviours within a background of environments, has been adjusted and applied to different scenarios, with one example being the MedDiet 4.0 structure developed by Dernini et al (2017). In this framework, the MedDiet is proposed as a healthy, sustainable diet promoting human and planetary health where the four socio-cultural, economic, environmental, health-nutritional elements are addressed appropriately to facilitate timely, concrete and effective actions for short-term and long-term well-being. Donini and Berry (2023) took the MedDiet 4.0 one step further by overlaying it with the Sociotype framework and its three dimensions – individual, society and context – to show that one needs to involve individual commitment, interventions engaging the social environment, and the institutional context in order to enhance individual and population-wide adherence to the MedDiet. The sociotype interacts with the genotype to shape the phenotype which is the outward expression of a person's characteristics and behaviour. The Sociotype has been introduced as a theoretical ecological framework to help identify and underline the bio-psycho-social and environmental factors involved in understanding and coping with life challenges, such as times of major economic and social disruption (e.g. COVID-related shutdown) (Peng & Berry, 2021), as well as food insecurity (Peng et al, 2018) and other health issues (Berry et al, 2017).

This article, will have food security and resilience as its focus. Food security exists when “all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.” (FAO, 2008). In contrast, food insecurity exists when food is unavailable, inaccessible physically and economically, or not utilised efficiently. Drivers of food insecurity can be both natural and man-made and include conflicts, extreme weather events, earthquakes, floods and pests and diseases among others.

The article, therefore, aims to use the Sociotype framework to provide structure for a critical discussion and set of solutions for managing food insecurity and the erosion of the MedDiet in times of crisis, as happened during the COVID pandemic and as typified by the current ongoing conflicts. As an ecological framework embracing human functioning as individuals with personal traits, having multiple social interactions and bound by different institutional structures, the Sociotype will be used to explain and propose the strengthening of resilience of food systems in the Mediterranean. The article will focus on key elements along the food production- supply- consumption-retrieval/reuse cycle, ranging from the revisioning of the traditional MedDiet, to ecological footprint analysis related to aquatic foods, to the role of women in food security, to the need for education from an early age yet ongoing throughout the lifespan, all within a world of turmoil and distressing problems.

2. THE SOCIOTYPE FRAMEWORK: CONTEXT LEVEL WELLBEING AND FOOD SYSTEMS AS IMPACTED BY CONFLICTS AND WARS

Conflicts and wars can shape the world beyond the setup of geo-political boundaries and have a lasting influence that echoes into the generations to come. They have contributed to improvements in trauma and injury management, many of which are included in today's care of civilians. It is now time to have a wider vision, looking at health and well-being, including food security and nutrition, and use the lessons learned from conflicts and wars to improve our planetary health.

The COVID-19 pandemic and the war in Ukraine have highlighted the need to include food systems on the “action lists” for a better future. A war should be recognised as a disease in its own “right”: it injures, disables and kills more people in a shorter period of time than any other known disease. The attacks

on health care, interrupted supply chains, broken logistics, lack of funds and loss of infrastructure and workforce, further unbalance the ability of health systems to provide the necessary care in times when it is most needed. Exposure to all hazards put people in vulnerable situations. They may suffer from direct injuries and face outbreaks of communicable diseases through disruption in sanitation. Many do not have access to diagnosis and care for non-communicable diseases and they may face decreased preventive measures, including immunizations. The high demand for care of the increased patient load among refugees, internally displaced, and other conflict-affected people, including mental health treatment, social support, and rehabilitation, further burden the already overstretched health services.

An important factor that is often ignored in the above risk-laden scenario is the failure of food systems to ensure food and nutrition security. At times, the 'weaponization' of food (and energy) adds into the pull-and-push vectors, contributing to poor nutritional and health status among the conflict-affected people and beyond. The war in Ukraine and the Middle East are the latest examples. Whereas records show thousands of injured individuals and casualties, the figures are believed to be considerably higher since they do not include the indirect impacts of the war in and outside the battle areas, particularly the major implications for local, regional and global food security and nutrition. According to the World Bank (2022), before the war broke out in the Ukraine, Ukraine and Russia accounted for 29% of global wheat exports and 62% of sunflower oil. The war exacerbated food price inflation in emerging markets and developing economies and impacted some of the poorest and most vulnerable countries. Yet, the war in Ukraine has shaken the food system globally, as the "global food road" passes through Ukraine, depends on its products and feeds other areas, including countries in the Mediterranean basin. Dependency on cereals and other food importation from Ukraine has revealed the Mediterranean region's dependency and lack of resilience and this vulnerability has been highlighted in high-level fora. (FAO, 2022)

At the same time, assessing the impact of the most recent global crisis, the COVID-19 pandemic, shows that even some countries with the most sophisticated medical care were overwhelmed by the pandemic. The countries that were able to save lives and livelihoods were those that provided access to universal health care and invested in health, wellness and preparedness at all times. Unequivocally, populations that experience pandemics, wars and conflict in a good health and nutrition status can withstand and respond to the crisis better. These are the characteristics of resilient communities and it is evident that health, food, socio-cultural and economic systems need to work in tandem.

Recovery starts with the emergency preparedness. Resiliency can be an outcome of the emergency. Building on the lessons learned from the war in Ukraine and the COVID-19 pandemic calls for bringing everyone to the 'family table'. This can be seen as a great opportunity to 'step outside' and set up 'Mediterranean food systems without borders'. Countries in the Mediterranean region should enhance policy and governance aimed at nurturing our future generations using the food systems and One Health (OHHLEP, 2022) approaches to foster resilience. In turn, all actors within the food systems and One Health should cooperate, basing their harmonious actions on inclusion, equity and sustainability values. Preparing for a better future requires investing in enhanced research and innovation, allowing the "spicing" up of systems, structures and resources. Using a value-based criterion should increase local production and ethical exports to those in need, beyond borders, respecting food cultures and leaving no one behind.

3. SHIFTING FROM A MEDITERRANEAN TO A PLANETERRANEAN DIET

Conventionally, nutritional epidemiology has been concerned with individual nutrients and their impact on health and disease of population groups. (Thornton & Villamor, 2015) However, dietary pattern

analysis shows complex food interactions and health benefits, with emerging research in metabolomics and microbiome analysis enhancing our understanding of this complexity. In relation to this micro-level understanding, the impact of external factors on physiological status, as well as on food-related behaviours requires attention. To improve capturing the impact of diets as a whole, future dietary pattern analysis should include additional factors, embracing the various dimensions of sustainability as has already been recommended for the MedDiet. (Dernini, 2017)

The MedDiet, rooted in local cultures, embodies culinary evolution and cultural heritage. Traditional, locally sourced foods play a vital role in preserving this diversity. Voted the 'Best Diet' in 2023 and for six consecutive years by US News (2023), it is ironic that many Mediterranean populations are shifting away from this traditional diet (Grosso & Galvano, 2016; Obeid et al, 2022), leading to environmental challenges and health problems like obesity and non-communicable diseases. It is even more ironic that the influential EAT-Lancet Commission on Healthy Diets from Sustainable Food Systems acknowledges the consistent evidence of the benefits of the MedDiet. (Willett et al, 2019) The Eat-Lancet's universal (and somewhat controversial) healthy reference diet has many components which are similar to the traditional MedDiet which highlight the importance of preserving it in its nascent region and beyond. The MedDiet stands as a sustainable example, prioritising whole, minimally processed or unprocessed foods, promoting local and sustainable agriculture and reducing food waste, and stimulating local food production and economies. Its emphasis on plant-based foods (including pulses and wholegrains) reduces environmental impact and natural resource consumption compared to modern diets reliant on animal agriculture and highly-processed and ultra-processed foods.

Resilience to the potential demise of the MedDiet in the Mediterranean region could be partially bolstered by adopting the MedDiet beyond the Mediterranean shores, thus adding to its valorisation. At the same time, the traditional MedDiet offers potential solutions to modern food system challenges. Adopting a so-called 'Planeterranean diet' (Colao et al., 2022) could extend the beneficial effects of the MedDiet worldwide. If countries could identify locally sourced foods with similar qualities to those consumed in the MedDiet, this would be a first step toward a global Planeterranean diet. Promoting this diet could address challenges faced by populations moving away from healthy food patterns and help in reaching UN Sustainability Goals. Indeed, the UNESCO Chair on Health Education and Sustainable Development is backing the Planeterranean initiative. A preliminary research study involves gathering data on dietary habits and indigenous crops in five major regions: North America, Latin America, Africa, Asia, and Australia. This data will serve as the foundation for creating region-specific nutritional guidance that mirrors the nutritional qualities and health advantages of the MedDiet using local foods that are readily available in each of these regions. Whilst acknowledging the need for complex dietary shifts and collaboration among stakeholders, embracing the transferability of the MedDiet to a Planeterranean diet can lead to a healthier future, aligning food systems with sustainability goals and disseminating Mediterranean culinary heritage worldwide.

4. THE SOCIOTYPE FRAMEWORK: A SOCIAL TO INDIVIDUAL CONTINUUM FOOD SECURITY AND WOMEN'S EMPOWERMENT IN TIMES OF CRISIS

Food lies at the intersection of biodiversity, climate change, culture, human health and livelihoods. (Berry, 2022) Thus, even at the best of times unsustainable food production and consumption patterns are major drivers of environmental deterioration, directly and indirectly affecting the food security of populations. This situation is exacerbated by demographic and infrastructural pressures in times of crisis, with interruption of the food supply chain, such as happened due to the COVID pandemic, resulting in higher

food prices, inflation and falling incomes. Specifically, the pandemic caused shortage of farm workers, restriction in the transportation of farm commodities, shutdown of food production facilities, uncertainty of food quality and safety, food trade policies restriction, delays in transportation of food products, limitation to food accessibility, and changes in consumer demand and acquisition of food among others. (Alabi & Ngwenyama, 2023) Consequently, the prevalence of food insecurity, undernourishment and vulnerability to infections increased, especially among people already suffering from diet-related diseases (such as obesity, diabetes, cardiovascular diseases and some cancers).

It is well accepted that women are the predominant food producers, provisioners, preparers and preservers in normal times in many cultures. (FAO, 2023) Research has also shown that women are often key players in challenging periods with respect to assuring and managing the provisioning and preparation of food; and this task is influenced by multiple personal factors together with factors outside the home at the institutional and bio-physical level. (Dinella et al, 2023). In different countries, and congruent to the UN sustainable Goal 5: Achieve gender equality and empower all women and girls, gender equality is acknowledged as a necessary foundation for a peaceful, prosperous and sustainable world. (United Nations, online). With amelioration of food security as a focus, and appreciating the potential significant role of women and the need to safeguard their well-being for a positive ripple effect, Morocco adopted a number of policies and measures to address the crisis situations. These included rethinking food sovereignty, providing agricultural support, establishing social safety nets, and introducing commodity subsidies. Empowerment and education of women and their involvement in agricultural policies, strengthened their role in protecting resources and biodiversity, with impacts on personal and household income and in safeguarding culinary heritage, as well as personal and family health benefits.

5. EXPLORING AND LEVERAGING CONSUMER ATTITUDES AND PRACTICES IN RELATION TO FISH AND SEAFOOD

The UN Sustainable Development Goal 14 focuses on Life Below Water and how we need to simultaneously protect our waters and their ecosystems whilst also using marine resources and fishing practices more efficiently, in a sustainable manner for human flourishing. Indeed, the ultimate characteristic of a resilient food system is the co-existence of human and planetary benefits: co-benefits.

A resilient food system is thus one that supports human health and well-being while staying within planetary limits. Against this set goal, the current reality in the Mediterranean is that of primarily unsustainable (highly industrialised and relying on long supply chain), unfair (in providing appropriate revenue to food producers), unequal (in securing short and long term access to food to all), unbalanced (towards ultra-processed, land animal-protein-based and sugar-rich foods) and linear (in terms of food waste and loss) food systems.

Considering dietary choices as the ultimate indication of the sustainability of food systems, and that dietary decisions by consumers can cause a positive cascade effects throughout the whole food chain, a study was conducted in 3 countries to explore the role of consumers' attitudes towards, and knowledge of, fish and seafood alternatives as possible levers to help transitioning towards more sustainable food systems. Results from the 3 pilot countries, Croatia, Italy and Turkey indicate the need to increase efforts particularly at the Individual and Relationships levels of the Sociotype framework to ease a shift towards more fair, sustainable and resilient food systems.

Opinions about the most important aspects of seafood sustainability – whether fishing practices, seasonal consumption, or fish stock health – differed across countries. The biggest barriers to consumption of unfamiliar fish and seafood were price, unknown flavours and poor knowledge of potential cooking methods. Some consumers reported they would consider trying less familiar fish after they had learnt about the role and status of small-scale fisheries.

Key conclusions from this study were that any effort to increase the market penetration rate of sustainable fish and seafood (products) should involve improved public and targeted communication on the sustainability of these foods and artisanal small-scale fisheries, strengthening Fishers-Consumers and Fishers-Chefs reconnection via local markets, and education to raise curiosity about fish and seafood and enhance related cooking skills.

6. THE SOCIOTYPE FRAMEWORK: THE INDIVIDUAL COMMITMENT AND RESPONSIBILITIES BUILD FOOD SYSTEMS RESILIENCE THROUGH FOOD AND NUTRITION EDUCATION USING A SOCIO-TYPE APPROACH

For food systems transformation with the goal of building healthy, sustainable, flourishing and resilient foodways and dietary patterns, a promising point of departure is the concept of food literacy. Sumner (2012) defines food literacy as

“... the ability to ‘read the world’ in terms of food, thereby recreating it and remaking ourselves. It involves a full-cycle understanding of food – where it is grown, how it is produced, who benefits and who loses when it is purchased, who can access it (and who can’t) and where it goes when we are finished with it. It includes an appreciation of the cultural significance of food, the capacity to prepare healthy meals and make healthy decisions, and the recognition of the environmental, social, economic, cultural and political implications of those decisions.” (p.321)

Within this definition one can see the presence of resiliency in multiple ways – whether it is building personal resiliency to reduce health risk through consuming a more nutritious and sufficient diet, to resiliency as manifested by learning to carry out traditional food preservation techniques.

Yet these food literacy resiliency promoting skills should not be limited to adult populations. The values, attitudes and behaviours required for building responsible, empathic and healthy citizens can be nurtured via school-based food and nutrition education (SFNE) as envisioned by FAO (2020). SFNE replicates the main tenets of food literacy and is competency-based. The main goal is to help students develop and learn to take charge of their diet as feasible – both for their own health and for the health of others, and of the environment (now and in the future).

A potential strategy for reaching this goal is through developing a MedDiet curriculum based on a Sociotype approach whereby inter-related factors at different levels of the environment (Context, Social and Individual) are considered when planning the teaching and learning on a MedDiet type of healthy, sustainable eating. The curriculum will emphasise resiliency by basing it on the four elements of responsibility, frugality, creativity and enjoyment. Responsibility is about choosing to maintain and improve one’s health, to protect others’ well-being and to nurture /conserve planetary health. Frugality is concerned with appreciating the concept of sufficiency, maximising use of available food resources, avoiding waste and sharing excess food. Creativity can be manifested in ensuring sustainability of traditional dishes, exploring alternatives in a circular economy for food, food innovation and eating on a low budget. And enjoyment can focus on sensually appreciating a

diversity of food, growing and harvesting food and producing healthy snacks and drinks.

Each of the four elements will be presented in such a way so as to develop in young children the desired aptitude for demonstrating personal resilience whilst also supporting and sustaining resilience initiatives and structures embracing healthy, sustainable Mediterranean dietary foodways. The Sociotype framework will give structure to the complexity of the different food choices and behaviours involved. Table 1 presents examples of how responsibility and frugality could appear in this proposed curriculum.

The 'Mediterranean Diet curriculum emphasising resiliency' is a works in progress and will revolve around situated, experiential, entrepreneurial and pleasurable learning. Its ultimate goal is to nurture children and future youth and adults who have the competences to adopt, support and promote a healthy, sustainable MedDiet, showing resilience and agency based on responsibility, frugality, creativity and enjoyment. Meanwhile, a recent study with Israeli kindergarten children (Jakobovich et al, 2023) showed how skills-based interventions promoting healthier choices and practices, and implemented by trained teachers, are a promising approach to tackling childhood obesity and nurturing health-enhancing dietary and physical activity behaviours.

Focus Element	Skills	Intrapersonal (Child)	Interpersonal (Family)	Context, Community (School and beyond)	Global
Responsibility	Choosing to maintain and improve one's health, to protect others' well-being, to nurture /conserve planetary health	Eating all one's packed lunch and not wasting	Asking parents to buy seasonal and local vegetables and fruit	Contributing to school kitchen gardens where food grown is used in class, or to prepare food for homeless shelters	Learning about how food is grown in other countries and what is fair trade
Frugality	Appreciating the concept of sufficiency, maximising use of available food, avoiding waste, sharing excess food	Keeping a diary of amount of food eaten at each meal for a day and learning to read body cues and stop eating when one is full	Helping parents to plan the food shopping list by checking what is left in the cupboard and fridge and what is really needed	Interviewing a chef or farmer on how to make full use of different parts of vegetables and fruits	Investigating food banks and their value to help people be food secure whilst avoiding food waste

Table 1: Examples of how the proposed curriculum can integrate foci elements with skills and the Sociotype framework

7. CONCLUSIONS

The concepts discussed in this article may be translated into policy decisions (in the context sociotypic domain) to promote adherence to a Mediterranean dietary pattern as part of sustainable food systems. Policymakers need (to be helped) to recognise food systems as complex adaptive systems, and take action as follows:

- Set up multi-stakeholder partnerships for designing systemic food policies and developing the knowledge base and infrastructure for implementation.
- Ensure that food systems are sustainable along the entire food chain—from production to consumption and reduce food losses and waste.
- Adopt the One Health approach for promoting resilient and sustainable fishing and farming.
- Facilitate agriculture which implements the best sustainable ecosystem services and practices, drastically reducing use of water and energy and of potentially harmful pesticides and fertilisers.
- Utilise cereals, pulses and aquatic foods more efficiently and revive and promote traditional recipes.
- Ensure the right of all members of the population to healthy, adequate, affordable and culturally acceptable food.
- Develop systems for continuing provision of free school meals to children even in times of crises.
- Monitor regularly the safety of the food supply chain to be free of pathogens.
- Legislate (and incentivize) the food industry to produce healthy (minimally processed foods), with less added sugars, trans fats, salt and additives, and which are reasonably priced.
- Consider price control of basic healthy sustainable foods which fit a MedDiet eating pattern.
- Regulate for informative food and nutrition labelling on packaging and food provision contexts.
- Legislate for honest and transparent marketing, especially prohibiting advertising of high fat, high, sugar, high salt ultra-processed foods to children.
- Provide certification programmes for journalists trained in quality science communication for the general public.
- Improve the provision of education on healthy lifestyles (including physical activity), nutrition and sustainable MedDiet food preparation for public health, education and culinary professionals and trainees, as well as in lifelong learning and active aging programmes, and for students throughout compulsory schooling and in post-secondary and higher institutions.

Once these policies are set in place, then implementation will follow by improving the living/social environment (relationships) and ensuring a healthy, safe external environment (institutional context) to affect the individual and, thereby, enhance adherence to a healthy, sustainable MedDiet. Finally, we note that diets should not be a list of do's and don'ts, but rather a pleasurable and tasty experience which will support our health potential (Individual) and through which we respect traditional and cultural preferences (Social Environment). In true Mediterranean 'Diaita' spirit, we should strive to collectively put both mind and heart into our food systems and lifestyle choices for resiliency and sustainability.

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FLAVOURS OF SUSTAINABILITY: THE IDENTITARY CUISINE INITIATIVE

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ABSTRACT Identitary Cuisine is a cultural holistic approach and a strategic communication model linking sustainable chains of food production, traditional balanced consumption, and natural primary prevention through a salubrious lifestyle, whilst strengthening the communities' identity, particularly in the Mediterranean region. This ongoing research process is based on a transdisciplinary and data-analysis laboratory around three fundamental pillars - salubrity, sustainability, and identitary nature - through a balanced combination of traditional recipes, and suitable methods of treating raw materials. Food is a basic element of collective identity, providing a sense of social belonging and a meeting point between peoples through the rediscovery of different historical culinary memories, also thanks to the women's crucial role in facilitating dialogue, social harmonization, and peace-making processes. Social prosperity depends on the ability to think together and co-create the best solutions through an educational system teaching students at all levels how a healthy lifestyle affects well-being. Similarly, identitary tourism can enhance cooperation between governmental and non-governmental bodies, putting the Mediterranean Diet consistently at the centre of each Mediterranean country's national sustainable development plan for the UN 2030 SDGs. In light of the aforementioned shared goals, different collective identities can express and discover each other at the proposed Euro-Med Centre for Innovation, Higher Education, and Science Diplomacy on Sustainability, hosting the first planned pilot Identitary Cuisine Academy (ICA). For an effective Change of Route, balanced changes in eating habits can greatly contribute to saving natural resources, facilitating social inclusion and equality, reducing the risk of climate warming, protecting cultural heritage, and strengthening our immunological system to prevent possible diseases.

Keywords identitary cuisine, collective identities, sustainability, salubrity, cultural heritage.

LES SAVEURS DE LA SOUTENABILITÉ : L'INITIATIVE DE LA CUISINE IDENTITAIRE

Résumé La cuisine identitaire est une approche culturelle holistique et un modèle de communication stratégique qui relie les chaînes durables de production alimentaire, la consommation équilibrée traditionnelle, et la prévention primaire naturelle par un style de vie salubre, tout en renforçant l'identité des communautés, en particulier dans la région méditerranéenne. Ce processus de recherche continue est basé sur un laboratoire transdisciplinaire et d'analyse de données autour de trois piliers fondamentaux - salubrité, soutenabilité et nature identitaire - à travers une combinaison équilibrée de recettes traditionnelles et de méthodes appropriées de traitement des matières premières. L'alimentation est un élément fondamental de l'identité collective, qui procure un sentiment d'appartenance sociale et un point de rencontre entre les peuples grâce à la redécouverte des différentes mémoires culinaires historiques, et grâce aussi au rôle crucial des femmes dans la facilitation du dialogue, de l'harmonisation sociale et des processus de pacification. La prospérité sociale repose sur la capacité à penser ensemble et à cocréer les meilleures solutions grâce à un système éducatif qui enseigne aux étudiants de tous les niveaux comment un mode de vie sain affecte le bien-être. De même, le tourisme identitaire peut renforcer la coopération entre les organismes gouvernementaux et non gouvernementaux, en plaçant la diète méditerranéenne de manière cohérente au centre du plan national de développement durable de chaque pays méditerranéen pour les ODD de l'ONU 2030. Vu les objectifs communs susmentionnés, différentes identités collectives peuvent s'exprimer et se découvrir mutuellement au Centre Euro-Med pour l'innovation, l'enseignement supérieur et la diplomatie scientifique en matière de Soutenabilité, qui accueillera la première Académie pilote de Cuisine identitaire (ICA). Pour un changement de route efficace, des changements balancés dans les habitudes alimentaires peuvent grandement contribuer à économiser les ressources naturelles, à faciliter l'inclusion sociale et l'égalité, à réduire le risque de réchauffement climatique, à protéger le patrimoine culturel et à renforcer notre système immunitaire pour prévenir d'éventuelles maladies.

Mots-clés Cuisine identitaire, identités collectives, soutenabilité, salubrité, patrimoine culturel.

1. IDENTITARY CUISINE AND MEDITERRANEAN DIET

This article includes the main features of an innovative – though it relates to ancient collective memories – concept: Identitary Cuisine. After an introduction explaining its relations with the idea of Mediterranean Diet, the focus is devoted to some of its aspects, such as its potential impact on a sustainable

lifestyle, strengthening and balancing our immune system, with an attempt to suggest possible future prospects and solutions.

Identitary Cuisine is a holistic cultural research approach and a strategic communication model, considering sustainable chains of food production and traditional balanced consumption aiming at strengthening the communities' identity, particularly in the Mediterranean region, as well as natural primary prevention through a salubrious nutrition.

Like Mediterranean Diet, Identitary Cuisine "involves a set of skills, knowledge, rituals, symbols and traditions concerning crops, harvesting, fishing, animal husbandry, conservation, processing, cooking, and particularly the sharing and consumption of food" (UNESCO, 2013) .

Its three fundamental pillars are: salubrity, sustainability and identitary nature. This cultural approach recently developed into a proposal, in the context of the annual Euro-Med inter-institutional initiative Medi-Jer (2022) , reconciling scientific literature with traditional customs, as well as the 2030 Sustainable Development Goals (SDGs) (UN, 2016) :

1. SDG 2 encourages efforts from the international community to improve the nutrition's quality, related to the Identitary Cuisine's Salubrity pillar. Additionally, SDG 3 highlights that the more governments invest in nutrition, the better outcomes citizens will attain in terms of healthy lives and well-being . Our great-grandmothers have inherited from their ancestors methods of selecting, preparing, and cooking food, balancing taste and nutrition. Such phylogenetic traditional food culture benefits the immune system to help prevent several diseases, including antibiotic resistance;

2. According to SDG 2, the zero-hunger prime objective will depend on global progress in achieving food security and promoting sustainable agriculture. These goals embody the Sustainability pillar, which is related also to other SDGs, such as SDG 11, in relation to disaster risk reduction. SDG 13 adds that investments in nutrition reinforce global efforts to "combat climate change and its impacts, leading to stronger and healthier societies that will be more resilient to the effects of climate change" ;

3. The UN Agenda never mentions the Collective Identities' crucial role, which represents the Identitary Nature's pillar of Identitary Cuisine. There is an urgent need to fill this vacuum, since sustainability is an empty and ineffective concept without an authentic integration within human groups.

2. LOCAL COMMUNITIES, WARM CIRCLES, AND COLLECTIVE IDENTITIES

Collective identity is the basis of life. Gregory Bateson (Kato and Lomiento, 2018) developed an anthropological identitary concept, explaining why the way human beings (as mammals) communicate is more important than the contents of communication. Bateson relates the issue of identity to essential concepts of symmetric and complementary integration within a group, with mutual respect.

Local communities are the main educational agencies, together with the family, building those fundamental values that each individual learns and applies in everyday life. According to the Swedish sociologist Göra Rosenberg, individuals feel making part of a group when they perceive it as a surrounding warm circle (Bauman, 2001) .

Space proximity, typical of small villages and towns can build intimate and reassuring communities

with defined identities. People moving from small towns and rural areas towards a huge metropolis: - for example Italians emigrated abroad during the 18th and 19th centuries, - create their own local communities, in order to keep living in warm circles (Bauman, 2001) . Such an intimate community is the life's ultimate goal for every individual. Within this circle, our behavior follows values going beyond the Smithian "homo oeconomicus," who would calculate only material benefits (Smith, 1977) .

Warm circles define membership in local communities through minimum groups' categorizations (Tajfel, 1971), emphasizing a real and symbolic image defining each collective identity in relations with others (Leone et al., 2022).

Food is a basic element of each group's identity orthopraxis, based on repetitions of a daily behavior through generations (Durkheim, 1963) . It represents a sense of social belonging and a meeting point between peoples through the rediscovery of different historical culinary memories.

In this context, women played a crucial role in facilitating dialogue, social harmonization, and peace-making processes, since they have been preserving over the generations the Identity Cuisine's knowledge, safeguarding its techniques, respecting seasonal rhythms and festive events, and transmitting its values to the new generations (UNESCO, 2013) . This author's "Women for Collective Identities, Peace, and Security " 2020 project showed the close connection between nutrition and wellness, as well as its historical roots and cultural traditions, through the good quality of organic, seasonable, and natural locally grown food.

3. IDENTITIES ON THE FORK

Collective identity is the basis of human life. Developing his identity concept, the British anthropologist, ethologist, and psychologist Gregory Bateson (1972) explained why human beings - and mammals in general - feel more intensively formal way and modalities to communicate than its specific contents.

From business lunches to weddings, or holidays family reunions, the act of sitting around a table and sharing food is a characteristic of every culture. It represents a well-established practice of building and consolidating stable relationships, and an immense contribution to verbal and non-verbal communication, facilitating social inclusion in crowded religious or political rituals. Eating together is the collective identities' foundation and continuity, especially throughout the Mediterranean Basin (UNESCO, 2013) .

Social context is intimately responsible for each individual's food choice. The variations in the pool of commonly used ingredients, the structure of meals, and the symbolic or ceremonial role of food are all elements of each group's collective identity, expressing both the group's oneness and the otherness of whoever eats differently. Food has a crucial role as a local, cultural, ethnic, regional, religious, and national identity marker.

In contemporary societies the peculiar characteristics of food production and consumption are still a key component of the local communities' identity, contributing in shaping the multiple meanings of food. Food culture can act as a powerful tool for dialogue between different cultural identities in furtherance of sustainable development and social inclusion. Traditional habits in the consumption of food represent a strong driver of collective identity also within migrant communities, as well as a potential feature of social integration.

4. SUSTAINABILITY, A MATTER OF CHOICES

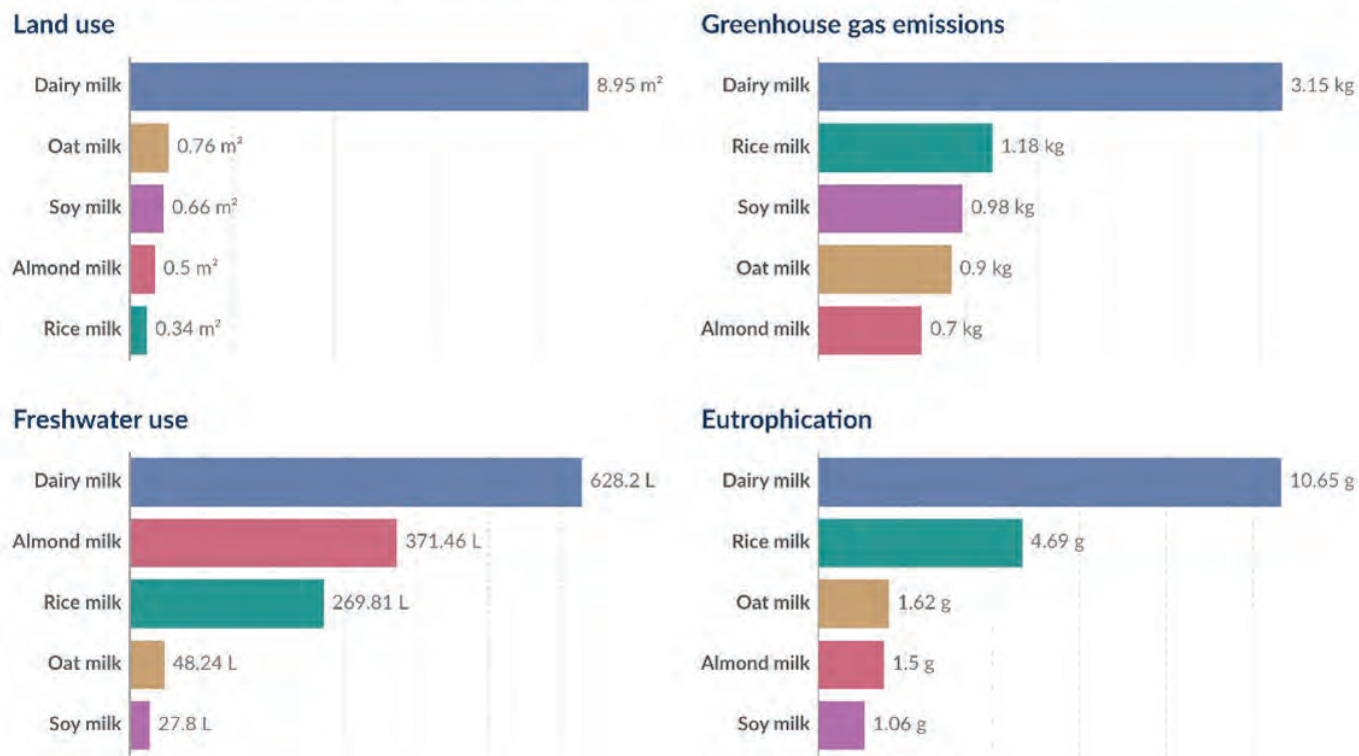
Every community's food habits symbolically express their respective cultural heritage. Since culture is a developing process, nutrition trends also change, influencing food production. In this context, every sustainable practice may contribute to preserving natural resources, helping to face the social consequences of scarcity, and the risks of health problems.

Considering the perspective of a Change of Route, sustainability can also be a matter of food consumption, and culture. For example a study links limitations of animal foods to greenhouse gases, water and land use (Polyak et al., 2023) . Another study (Poore and Nemecek, 2018) focuses on the different impacts of dairy milk versus oat milk, showing their different impact in terms of used resources.

ENVIRONMENTAL FOOTPRINTS OF DAIRY AND PLANT-BASED MILKS



Impacts are measured per liter of milk. These are based on a meta-analysis of food system impact studies across the supply chain which includes land use change, on-farm production, processing, transport, and packaging.



Data source: Joseph Poore and Thomas Nemecek (2018).

OurWorldInData.org/environmental-impacts-of-food | CC BY

The production of one litre of dairy milk needs the space of a bedroom (9sqm), while the space of a shower tray (0.8sqm) is enough to produce one litre of oat milk. An amount of water that a person drinks in one year (628 litres) is necessary for one litre of dairy milk, while an amount of water smaller than a person' use in one month (48 litres) can produce one litre of oat milk.

According to FAO reports (2023) from 1961 to 2020 the consumption of dairy products decreased globally by 6%, despite its 111% increase in regions like Asia, particularly in China, with a rise of 906% concentrated in the last 20 years. In the same period, countries around the Mediterranean Sea also show an increase: Southern Europe +49%; and Northern Africa +16%.

5. FOOD HABITS AND IMMUNE SYSTEM

5.1. NON-COMMUNICABLE DISEASES (NCDs)

Recent studies tend to correlate chronic diseases with wrong food consumption (and lifestyle) habits. NCDs are a group of pathologies not developing an acute infection but with potential long-term health consequences, often creating a long-term need for care and treatment (The Lancet, 2017) . They are responsible for 74% of deaths worldwide and more than three-quarters of all NCD-related deaths occur in low-middle-income countries. The main causes are related to a wrong lifestyle such as tobacco and alcohol use, physical inactivity, and unhealthy diet (WHO, Undated) .

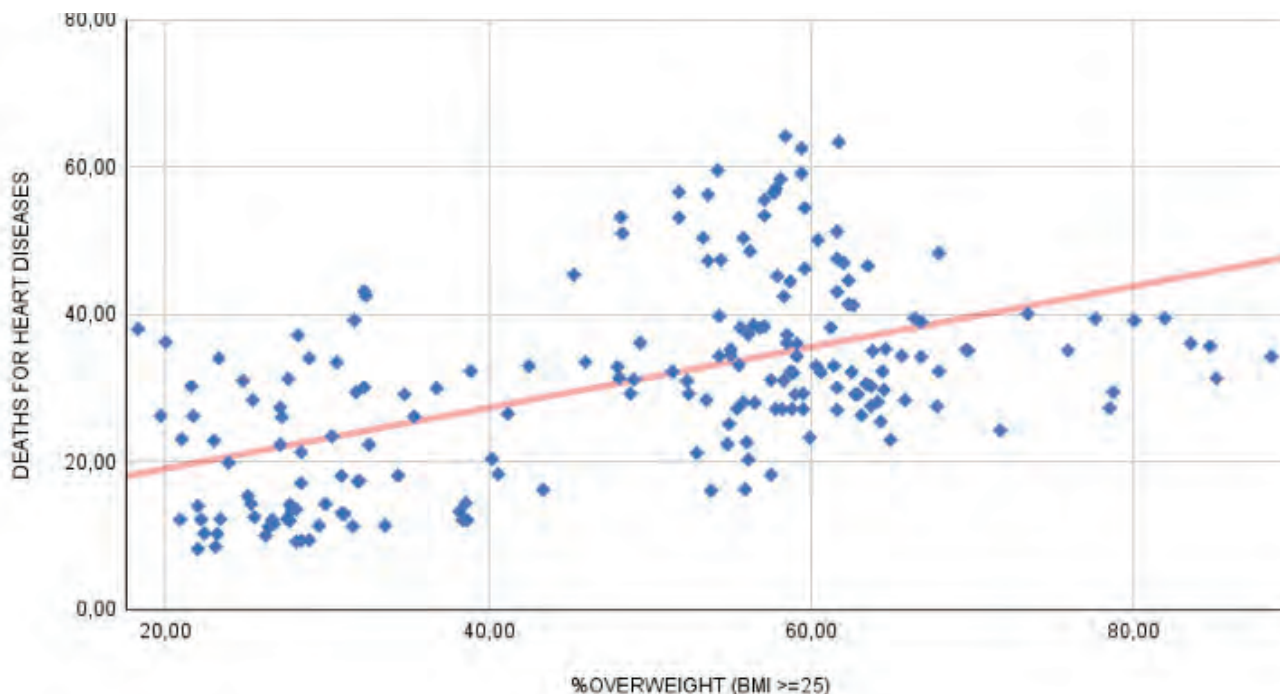
Scientific research relates food habits with the development of chronic diseases, and with the rate of deaths: in 2017, 11 million deaths and 255 chronic diseases are strictly related to dietary risks (WHO, 2023) , in particular cardiovascular diseases, followed by cancers and type-2 diabetes. These troubling data show that 45% of related deaths and 70% of related diseases occurred among adults aged younger than 70 years.

5.2. A SILENT KILLER

The ambitious challenge for an effective Change of Route would be to prevent chronic diseases by helping people to understand the correlation between food consumption and health (Ros et al., 2014) , leading them towards a change of habits in terms of lifestyle.

According to the European Society of Cardiology (2021) , heart diseases are more frequent among people who have a diet rich in saturated fat (mostly present in meat) and, among them, high BMI is a constant. WHO considers an overweight person everyone whose BMI equals or is greater than 25), and overweight people rate is increasing in every country, with the average of deaths from heart disease globally rising (ESC, 2021) .

OVERWEIGHT AND DEATHS FOR HEART DISEASES



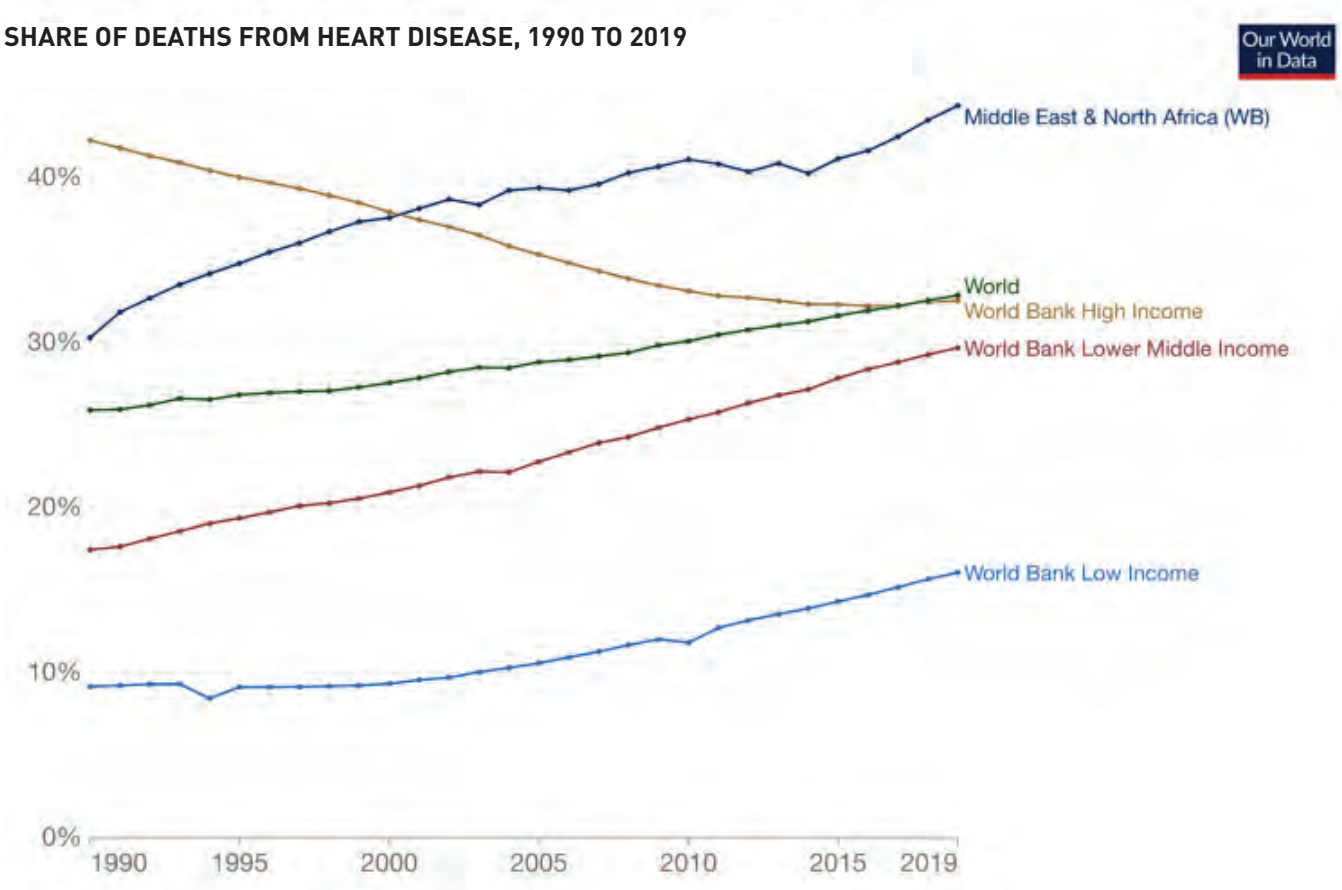
The following chart is the result of data analysis process cross-referencing data from WHO (2022) , showing a correlation between overweight rate and deaths from heart diseases in 192 countries.

Observing more closely at additional statistics (IHME, 2021) from a historical perspective, the average overweight population is globally rising, but while in some countries the deaths for heart diseases are increasing, in others they are decreasing. Why?

A significant factor seems to be the GDP: countries with the highest income are more equipped to deal with the problem, unlike lower and middle-income countries. In the MENA region, where heart disease rates are extremely high, cooperation and knowledge exchange between countries around the Mediterranean Region is crucial, as highlighted also in the SDG's targets 17.6 and 17.9 to "enhance North-South, South-South and triangular cooperation" (UN, 2023) .

In the European framework, Italy ranks among the top places for incidence of what is now widely recognized as a disease. According to the latest Report, Italy has the highest percentage (42%) of overweight or obese children in the 5-9 age group, while it ranks fourth in the 10-19 age group, with 34.2 percent of youngsters affected (WHO, 2022) .

According to the Italian Medical Endocrinologists Association's specialist Piernicola Garofalo the measures identified by WHO/Europe to counter the current projections - e.g. promoting physical activity and



Source: IHME, Global Burden of Disease (2019)

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energy-reduced Mediterranean diet (in particular plant-based diet), as well as strengthening prevention and regulation of the food and beverage industry - prevent the worsening of this silent epidemic: "it is also necessary to present obesity not as a problem, but as a concrete, threatening premise for a multiplicity of health problems, potentially serious, but absolutely modifiable" (Sole24Ore, 2023).

In this healthier and balanced lifestyle context, the Epidemiologist (former Director of the Department of Preventive and Predictive Medicine at the National Institute on Tumors in Milan) and Italian nutrition expert Franco Berrino suggests a receipt for a healthy life based on three pillars: a macro-Mediterranean diet (based on cereals, fruit and vegetables) fitness, and meditation (Berrino et al., 2018).

5.3. EDUCATION AS ONE SOLUTION

As anticipated above in section 1.2., besides the scientific, medical, and intellectual perspective, the studies on the relations between food habits and salubrity have practical significance within the UN 2030 Agenda. Food culture is a core element of the challenge of achieving sustainable production and consumption patterns (SDG 12). It may also encompass a broader range of Sustainable Development Goals relating to the eradication of extreme poverty (SDG 1) and hunger (SDG 2), and the reduction of inequalities (SDG 10) with particular emphasis on gender equalities (SDG 5), healthy lives and well-being (SDG 3), responding to climate change (SDG 13) and protecting the oceans (SDG 14).

Food is a significant element ingrained in every cultural and ethnic group, helping people's connection to a common history, heritage and values, even if they come from different backgrounds. This is particularly relevant for countries in the Mediterranean region, a crossroad of historically diverse cultures and cuisines: since the middle of the last century the term "Mediterranean Diet" exalts the health benefits and life-lengthening properties associated with the regional food culture.

The advent of globalization has turned the interest of people living in the Mediterranean region towards less healthy diets, marking a decline in traditional cuisine cultures. However, the intrinsic importance bestowed to the dietary patterns typical of traditional Mediterranean nutrition has evolved from the 1950's model to include further facets. The Mediterranean diet is, nowadays, not just a synonym of a well-balanced consumption and a salubrious lifestyle; the term is entwined also with the international and localized challenges of sustainable development.

As highlighted on the occasion of the 3rd World Conference on Revitalization of Mediterranean Diet, food systems governance in the region should prioritize a multidisciplinary approach in order to deliver a tangible solution to present and future generations (Raeli, 2022). Promoting nationally and internationally identity cuisine by means of transdisciplinary methods would, therefore, embody a threefold function:

1. first, the rediscovery of traditional Mediterranean dietary patterns could raise awareness of a more balanced and salubrious nutrition, particularly among adolescents (Flores-Vasquez et al., 2023);
2. second, identity cuisine may foster commitment from governmental and non-governmental stakeholders in the Mediterranean region to embrace sustainable solutions to tackle environmental challenges;
3. third, reinforcing collective identities shaped on the convergence of cultures from similar backgrounds could reinforce a sense of self-identity, belonging and social harmonization amid individuals in the region.

Revitalization of the Mediterranean diet is crucial from a nutritional point of view, in order to limit a growing erosion of the myth that has depicted the Mediterranean Diet as “the bedrock of virtuous eating” (Blum, 2023) , since the rate of consumers in the Mediterranean countries that opt for traditional diets is shrinking.

By contrast, more and more individuals, especially the younger generations, exhibit a higher preference for dietary patterns high in dairy and protein that can be commonly found in the British or North American diets (IFMeD, 2016) . This is a paradox that risks hindering the social and cultural preservation of the Mediterranean Diet. Therefore, the more countries in the region rediscover the values of traditional balanced consumption, the more leeway competent authorities have to promote healthier lifestyles and mobilize citizens on the prevention of nutrient-related diseases.

Starting from the 2000s, the Mediterranean Diet has transformed its significance from a nutritional to a sustainable perspective. The 3rd World Conference placed paramount attention on the environmental aspect of traditional diets in the Mediterranean framework. Owing to its variety and diversity of food cultures, processing and culinary systems, the Mediterranean countries have what it takes to bridge sustainable food consumption and production (SCP) (Raeli, 2022) .

Another lever that emerged from the 3rd Conference is the importance of sustainable tourism. More specifically, government and non-governmental entities could promote identity tourism in less traveled or emerging destinations in the Mediterranean Diet countries. Such a far-reaching solution could enhance sustainable travel plans, reduce environmental pressures and direct tourist flows towards more nature-based locations (Raeli, 2022) .

Besides the salubrious and sustainable component, the rediscovery of the health benefits associated with the Mediterranean Diet is the rediscovery of the traditional culinary memories that shaped the various Mediterranean identities. In this view, their identity nature becomes the leitmotif that links to the roots of traditional cuisines in the region, thereby rediscovering its different collective identities and the development of their dialogue and cultural harmonization (Raeli, 2022) .

6. CONCLUSIONS AND FUTURE PROSPECTS

Owing to its relation to the Mediterranean Diet and all its facets (i.e., valorisation of a healthy, balanced and sustainable food consumption), the identity cuisine may represent a tangible solution that would permit strengthening of the Euro-Mediterranean identities and rediscovery of traditional customs. Indeed, it does not only reinforce connection between nutrition and general wellness, encompassing commitment to fostering current food production and consumption towards more sustainable alternatives. It also contributes to enhancing harmonization of different cultures whilst preserving a sense of self-identity amid local communities, which is particularly challenging to maintain in an ever-growing globalised society.

In more recent years, the Italian Network for Euro-Mediterranean Dialogue (RIDE, Head of the Anna Lindh Foundation in Italy) has been endeavoring to give form and substance to project activities under the umbrella of identity cuisine in the Mediterranean region.

In conjunction with additional partners (e.g. the Union for the Mediterranean-UfM, PRIMA Foundations, the Parliamentary Assembly of the Mediterranean-PAM, aiming at involving also other interested UN organizations, such as UNAOC, IFAD, FAO, UNESCO), the RIDE network has conceived the establishment

of an iconic Centre for Innovation, Higher Education, and Science Diplomacy on Sustainability. This planned Centre may facilitate social aggregation for young researchers and experts – including from countries in conflict - on issues related to sustainable development in the region, food security, and a place-based Academy of identity cuisine.

Located in Italy, this Centre would promote cross-border cooperation in sectors such as sustainable growth and circular economy. This includes sectors with high potentiality to elaborate solutions for more resilient agricultural practices, preserve agro-biodiversity and favor exploitation of non-fossil energy resources. In addition, the planned Centre would function as a catalyst of ideas and activities aimed at enhancing the Mediterranean Diet, gathering experts and institutions, thus avoiding duplication and overlapping of similar activities, providing them with an inter-institutional coordination hub at their benefit.

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MEDITERRANEAN SCIENCE AND TECHNOLOGY DIPLOMACY: A SOLUTION FOR SUSTAINABILITY AND TRANSFORMING FOOD SYSTEMS

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ABSTRACT Education, research and innovation are policy tools that have a multiple positive impact. They are key for answering the needs of shifting job markets, that require updated know-how and skills, and provide the necessary groundwork for uptaking and developing technologies able to support the green transitions. Effectively, they are building blocks for adapting the societies to new and established challenges, creating opportunities for the Mediterranean Youth. Science is also a privileged fields for cooperation, advancing common interests and creating new bridges across regions and countries. This applies particularly to food systems in the Mediterranean, in dire need of a green transition able to support jobs, increase food security, and adapt against climate change and degrading environmental conditions. The link between food systems, research and innovation, and the 2030 Agenda for Sustainable Development has been explored at regional level through the SFS- MED Platform. This article aims to present how academia and science are essential tools for new “diplomacies” based on research, technology and skills that play the current global multilateral arena, particularly in the context of a systemic transformation of sustainable food systems in the Mediterranean. In order to do this, the article briefly presents food systems as a lever for implementing the SDGs, subsequently it puts forward science and technology diplomacy as part of the transformative toolbox. Finally, it details the main initiatives at the EU and Mediterranean level more relevant to the topic at hand.

Keywords Mediterranean - Science diplomacy - Research and innovation - Employability - Higher education - Food security - Food systems.

LA DIPLOMATIE SCIENTIFIQUE ET TECHNOLOGIQUE EN MÉDITERRANÉE : UNE SOLUTION POUR LA DURABILITÉ ET LA TRANSFORMATION DES SYSTÈMES ALIMENTAIRES

Résumé L'éducation, la recherche et l'innovation sont des instruments politiques avec de multiples impacts positifs. Ils sont essentiels pour répondre aux besoins des marchés du travail en évolution, qui nécessitent des savoir-faire et des compétences actualisés, et fournissent les bases nécessaires à l'adoption et au développement de technologies capables de soutenir la transition verte. En effet, ils constituent des éléments de base pour adapter les sociétés aux défis nouveaux et établis, créant ainsi des opportunités pour la jeunesse méditerranéenne. La science est également un domaine privilégié de coopération, faisant progresser des intérêts communs et créant de nouveaux ponts entre les régions et les pays. Cela s'applique particulièrement aux systèmes alimentaires de la Méditerranée, qui ont profondément besoin d'une transition verte capable de soutenir l'emploi, d'accroître la sécurité alimentaire et de s'adapter au changement climatique et aux conditions environnementales dégradantes. Le lien entre les systèmes alimentaires, la recherche et l'innovation et l'Agenda 2030 pour le développement durable a été exploré au niveau régional à travers la plateforme SFS-MED. Cet article vise à présenter comment le monde universitaire et la science sont des outils essentiels pour les nouvelles « diplomaties » basées sur la recherche, la technologie et les compétences qui soutiennent l'arène multilatérale mondiale actuelle, en particulier dans le contexte d'une transformation systémique des systèmes alimentaires durables en Méditerranée. Pour ce faire, l'article présente brièvement les systèmes alimentaires comme un levier pour la mise en œuvre des ODD, puis il met en avant la diplomatie scientifique et technologique comme élément de la panoplie d'instruments de transformation. Enfin, il détaille les principales initiatives au niveau européen et méditerranéen les plus pertinentes pour le sujet traité.

Mots-clés Méditerranée - Diplomatie scientifique - Recherche et innovation - Employabilité - Enseignement supérieure - Sécurité alimentaire - Systèmes alimentaires.

1. IMPLEMENTING THE UN AGENDA THROUGH ACADEMIA: ROAD TO SUSTAINABILITY

When considering the ramifications of implementing the United Nations agenda for 2030, we cannot overlook the importance of universities and research centres as levers for accelerating the implementation of the 17 Sustainable Development Goals that should serve as polar stars for a fairer, greener and more inclusive world.

Higher education and research institutions share a set of features rendering them entry points for transforming societies and economies. For example, they are local actors, embedded in a specific territory

and intertwined with its history and economy. At the same time, they tend to be among on the frontlines in their connection with international agendas, and are more and more globalized in their activities, staff and students. In fact, they could be characterized as links between global agendas and local needs, through the knowledge and competences they develop or spread.

As natural meeting points and contamination areas between students, researchers, and professors, they play an invaluable role in empowering youth and women, particularly those hailing from disadvantaged areas (such as rural areas and peripheries) and have historically acted as social equalizers.

Universities and research centres may therefore be presented as structural allies and implementers of many Sustainable Development goals through their mere functioning. Finally, they also contribute to the innovation and capacity-building aspects which are implicitly and explicitly linked to many SDGs.

This article aims to present how academia and science are essential tools for new “diplomacies” based on research, technology and skills that belay the current global multilateral arena, particularly in the context of a systemic transformation of sustainable food systems in the Mediterranean. In order to do this, the article briefly presents food systems as a lever for implementing the SDGs, subsequently it puts forward science and technology diplomacy as part of the transformative toolbox. Finally it details the main initiatives at the EU and Mediterranean level more relevant to the topic at hand.

2. FOOD SYSTEMS AS AN INTERFACE TO ACHIEVE SUSTAINABILITY

Food systems are not just related to the SDG 2 about creating a world free of hunger by 2030 but can help achieve the entire set of 17 Sustainable Development Goals, if transformed holistically toward social, economic, and environmental sustainability. This is particularly evident in the Mediterranean context, where agrifood holds a particular importance as a socio-economic sector, for instance in North Africa, where in most Countries stays above 10% as a share of GDP (World Bank, n.d.).

Food systems in the Mediterranean area, from both land and the sea, are also uniquely impacted by climate change, extreme events, land degradation, overfishing, ocean acidification and salinization of coastal soils. While climate extremes are posing a threat to the entire agriculture sector, and unsustainable fishing have caused a 28% decline in fish landings from 1994 to 2017 (Mrabet, 2020), geopolitical threats are putting into question the use of imports as an alternative to regional production to achieve a minimum level of food security.

Adapting agriculture, fisheries, and value chains to the needs of a more sustainable future, able to resist climate change and to generate economic growth, also offers the opportunity to exploit the potential of a young region, especially in its Southern Shore. Equipping youth and women with useful skills (e.g. technical and green skills) and knowledge for supporting the transformation of food systems offers a way of tackling different policy goals and supporting employability, with positive externalities since 32% of enterprises in the Southern Mediterranean consider skill gaps as a major constraint to hiring (Dernini and Capone, 2022). It also enables a reflection on skills, curricula, research, technology and crucially a dialogue with the private sector to support the role of academia in contributing towards local development.

The interlinkage between food systems, research and innovation, and the 2030 Agenda for Sustainable Development has been explored at the regional level through the multistakeholder dialogue led by the

Sustainable Food Systems MED Platform, an interinstitutional endeavour led by the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM), the Food and Agriculture Organization of the United Nations (FAO), the Secretariat of the Union for the Mediterranean (UfM), the One Planet Network's Sustainable Food Systems Programme, and the Partnership for Research and Innovation in the Mediterranean Area (PRIMA) Foundation.

Following the outcomes of the 2021 UN Food Systems Summit, which brought together Countries, institutions, and stakeholders to focus on more sustainable and equitable food systems, different Mediterranean dialogues have been spearheaded by these institutions. A key emerging message from the dialogues has been that food systems are indeed an entry point to achieve the 2030 Agenda for Sustainable Development and its goals. Particularly, it was remarked how research, data, and innovation contribute to understand food systems and accelerate their transformation (FAO, 2021).

Operationalising this lever requires a series of innovative actions and dedicated funds. For instance, to bridge the gap between science, policy and business, dedicated competences and professional figures would be needed to facilitate innovative ecosystems, to connect with local needs, and to enhance the transfer of knowledge from research centres to applied fields. And crucially, a more conscious effort to exploit the potential of science and innovation diplomacy.

3. SCIENCE DIPLOMACY: WHAT'S IN A NAME?

What it is meant by science and technology diplomacy, or sometimes simply science diplomacy, may vary significantly according to different schematization and conceptual frameworks. For the purposes of multilateral cooperation, it could be presented "as the set of activities performed to promote bilateral and multilateral cooperation via know-how, science, technology and innovation" (Roig A., 2020). The classic definition of Science Diplomacy presented for instance by the Royal Society and the American Association for the Advancement of Science is mainly based on three pillars: informing foreign policy objectives with scientific advice (science in diplomacy); facilitating international science cooperation (diplomacy for science); using science cooperation to improve international relations between countries (science for diplomacy) (Royal Society/AAAS, 2010).

A more aspirational perspective understands science diplomacy as a series of structured practices at the intersection of science, technology, and foreign policy, promoting both sustainable development and just and socially fair approaches, informing foreign policies through evidence to help address global challenges, while strengthening links between countries that are addressing them (Melchor et al., 2020).

Strategies and ongoing debates point out to a variety of views and approaches that reflect a magmatic field, or the evolutions and liminal spaces between different fields albeit interconnected, such as research cooperation, technology transfer and good old-fashioned foreign policy. As such, it would seem more appropriate to consider Science Diplomacy not in constrained dogmatic or overly typified terms, easy to be seen in critical terms or problematized (Penca, 2018), but as a tool to achieve bilateral or multilateral goals through or with a scientific component.

4. WHY THE MEDITERRANEAN NEEDS SCIENCE DIPLOMACY

When it comes to the Mediterranean region, the case for scientific and technology diplomacy may be presented under the three complementary arguments, based on the above definitions.

First, multilateral exchanges and regional research agendas facilitate cooperation in a variety of sec-

tors, including science, foreign policy, economic growth, while empowering the most innovative sectors of Mediterranean societies. According to the classic definition of science diplomacy, this could be classified under the headline of “diplomacy for science”.

On the other hand, science diplomacy may help to overcome the challenges that arise from operating cross-border cooperation in such a fragmented region where no overarching regulatory frameworks can be found to smooth operations. By creating a shared working basis built on data and facts, it also creates the conditions for approximating Countries’ foreign policies and scientific agendas, by fostering trust between stakeholders. By virtue of strengthening international cooperation in specific sectors, it raises standards and promotes awareness on the latest techniques, discoveries and know-how available, contributing to reinforce skills and the quality of research in the region as an aggregate. This also contributes to diplomacy in general, intended as an endeavour to improve relations among States.

Finally, it should be noted that from the perspective of the Mediterranean region, many transformational challenges supersede national borders. Climate change, environmental degradation, water scarcity, food security, brain drain are all elements intimately interconnected with the sustainability of food systems in the region. There is also a need to avoid a “tragedy of the commons”, where “freeloaders” do not partake in remedial actions, or in proactive initiatives for ensuring the sustainability and prosperity of the region over the long term.

A common understanding, based on the neutral and shared language of science, is a preliminary fundamental condition for jointly agreeing as a community of peers on the way forward and on which tasks need to be tackled by the diverse international community inhabiting the Euro-Mediterranean region. Science diplomacy in the region can also have an added value by virtue of creating a common framework of data, reports, knowledge available; a function even more compelling given the lack of supranational frameworks tasked with creating legal obligations for all existing States.

While it is true that science and technology alone cannot act as a “silver bullet” to the many political, security and economic wicked problems that the Mediterranean is facing today, boundary-stranding tools such as research, innovation and technology, have an important role to play in addressing core challenges related to food systems, such their environmental, energy, and water dimensions. Given that many of these sectors are deeply intertwined, any positive action on this front at the local and regional level contributes to regional stability. This holds true particularly in the South Mediterranean among Arab countries part of the region, with the example of the improving technologies for desalination plants (Dohjoka et al., 2017), now more cheaply available and sustainable in a region where the ‘water-poor’ population is expected to increase to over 250 million, within 20 years¹.

As a tool for cooperation, Science and technology diplomacy should not be discounted as a mere North-South cooperation outlet, but it could be an asset in generating more south-south cooperation. For instance, among the Arab countries which by virtue of sharing important linguistic, cultural and historical heritages would be prime candidates for low-hanging fruits of scientific cooperation, if policy tools were to be deployed to promote south-south brain circulation and mobility, for instance

1. <https://ufmsecretariat.org/world-water-day-water-scarcity/>

by getting inspired by EU models such as the European Union's "Scientific Visa Package" (Dohjoka et al., 2017). Possible vehicles for this could be either the Arab League (for instance through its scientific and cultural arms, such as ALECSO²), the 5+5 specialised Dialogues (a more informal outfit of ten Countries in the West Mediterranean) or even by proposing "variable geometries" in ad-hoc or EuroMediterranean contexts.

While different outfits may offer the needed flexibility to overcome political challenges, it remains clear that regional problems can in many cases find effective solutions only through cross-border cooperation. On this, the potential of cultural and scientific commonalities should not be discarded, and in the Mediterranean many cases exist of strong societal interlinkages, and where Countries are often part of a web of historical, political and economic relations. If coupled with the existence of many *linguae francae*, they can offer obvious baselines for structuring cooperation strategies and way forwards.

5. IS THERE AN EU AND A MED AGENDA WHERE SOME PRINCIPLES OF SD COULD BE BETTER APPLIED?

Since Science Diplomacy goes beyond a simple cooperation on research and innovation, it requires a finer integration with foreign policy tools in order to be effective and target to achievable goals.

At a bilateral level, there seems to be a growing recognition and utilization of the concept among many European Mediterranean countries, many of which have long established science attaches embedded in Embassies. While their bilateral nature naturally leads to exploiting it as yet another tool for improving Countries' relations, the widely shared recognition of its added value in solving transnational issues remains, at least in the backdrop.

For example, Spain's Ministry of Foreign Affairs and Cooperation directly quotes Science, technology and innovation among the tools it wishes to leverage in contributing to the search for solutions to global challenges³. In France's case, it is remarked its role in supporting "the scientific community in developing countries in order to build its capacity to meet the economic, environmental, social and cultural challenges of development"⁴. Italy's MFA's sectorial policy stems instead "from the conviction that there can be no economic development without innovation and support for scientific research"⁵.

The European Union is among the trailblazers when it comes to scientific, technological and skill diplomacy. First of all, its cross-border programs, both inside and outside the Union, are the most sizable in the world in terms of budget, but crucially also in terms of consistency and reliability.

The supranational structure of programs such as Horizon Europe or ErasmusPlus lend themselves almost with a natural inclination towards openness and acceptance of "external" partners, by being "open to the world" in terms of aspiration, and through mechanisms such as association agreements. When it comes to Research and Innovation, to facilitate a reasoned and strategic use of the funds, Horizon Europe has structured itself along societal missions, aiming at increasing impact on long-term policy choices such as climate, energy, healthy oceans. Global ambitions with regional dimensions, which require direct engagements with partners through cooperation, lest to remain unrealized and

2. Arab League Educational, Cultural and Scientific Organization.

3. <https://www.exteriores.gob.es/en/PoliticaExterior/Paginas/DiplomaciaCulturalCientifica.aspx>

4. <https://www.diplomatie.gouv.fr/en/french-foreign-policy/scientific-diplomacy/france-and-development-research/>

5. <https://www.esteri.it/en/diplomazia-culturale-e-diplomazia-scientifica/cooperscientificatecnologica/>

aspirational. Particularly evident on this front could be the European climate actions ambitions, with the EU's greenhouse gases amounting to only 7% of global emissions (Statista, 2023), or the restoration of sea water basins such as the Mediterranean, shared with third parties not bound by Union law with whom "robust cooperation" is needed (Provenzano, 2016).

Aware of these needs, policies on science have been progressively more conscious in their use of external engagement not merely as a cooperation tool, but as a way to achieve external policy goals. The Global Approach to Research and Innovation of the European Commission clearly states that global challenges require global solutions for which research and innovation should act as a catalyst. This strategy highlights key actions to deliver the global approach to R&I, among these "pool global efforts to tackle global challenges" where we can find an aim to "support multilateral cooperation on R&I policy for fair, healthy and environmentally friendly food systems" (European Commission, 2021). The Communication puts forward also a series of values that are considered at the core of multilateral cooperation, such as academic freedom, research ethics and integrity, gender equality, diversity and inclusiveness, open data and open science, and evidence-informed policymaking (European Commission, 2021).

It also states that "the EU partnership with the Southern Neighbourhood, based on the Renewed Partnership with the Southern Neighbourhood and its Economic and Investment Plan, is instrumental to promoting growth and prosperity through research and innovation. International cooperation supports technology transfer, innovation and collaborative research, and lead to more resilient and inclusive growth, the creation of sustainable employment opportunities, a knowledge society and economy and environmental improvements through initiatives such as the BlueMed" (European Commission, 2021). Taking stock of this reality, the Council of the European Union has therefore requested the Commission and the European External Action Service to develop a European Science Diplomacy Agenda, an effort currently ongoing (Council of the European Union, 2021).

Multi-dimensional frameworks, among which we can count wildly different tools, are also incorporating a research and technology dimension. More specifically on food systems, the push for strategic technological leadership is highlighted as key towards a just green transition, given the ambition of the EU to become the first climate-neutral bloc, a significant external dimension of the European Green Deal (European Commission, 2019).

The mentioned EU Green Deal includes at its heart a "Farm to Fork" Strategy, which aims to address comprehensively the challenges of sustainable food systems and recognises the inextricable links between healthy people, healthy societies and a healthy planet (European Commission, 2020). As an important dimension for this transient, the strategy foresees as enablers Research, innovation, technology and investments, with 10 billion euros dedicated to it through the Horizon Europe programme. Finally, among the latest developments of EU's outreach and influence efforts abroad, we should note the Global Gateway, a 30-billion-euros investment strategy which claims to be fully aligned with the UN's Agenda 2030 and its Sustainable Development Goals, as well as the Paris Agreement. The strategy is including in fact investment on education and research. In addition to the participation to Horizon Europe, it is enhancing cooperation on space technologies, for instance through EU Copernicus and Galileo/EGNOS, or the creation of Regional Centres of Excellence in Sub-Saharan Africa⁶.

6. https://international-partnerships.ec.europa.eu/policies/global-gateway/education-and-research_en

In the context of Euro-Mediterranean cooperation and the framework supported by the Union for the Mediterranean, the Mediterranean Initiative should be noted, a series of calls for proposals included in the work programme of Horizon Europe, which contribute to the implementation of the UfM Research and Innovation roadmaps, many of which intimately connected to food systems.

6. THE UNION FOR THE MEDITERRANEAN AND MULTILATERAL COOPERATION IN THE EURO-MEDITERRANEAN REGION

The Union for the Mediterranean (UfM) is the only intergovernmental organization which joins 43 Member States from the North, South and East of the Mediterranean. With a mission based on regional cooperation and integration through open dialogue, it answers to a systemic need for cultural, scientific and economic exchanges in the Euro-Mediterranean region, one of the least integrated in the world (OECD, 2021).

The UfM region, especially in the South, is missing an incredible potential for co-development, for instance on trade and services, given a lack of treaties and agreements. Lowering barriers and costs for allowing more transactions and to allow more sustainable economic growth also requires, in addition to traditional engagements between States, converging towards a common understanding based on data and scientific information.

By offering a neutral platform, where Member states, international organizations, and a wide variety of stakeholders such as networks, research centres, and representatives from civil society, the Union for the Mediterranean implements and mixes elements of traditional diplomacy and innovative “track-two” diplomacies, such as economic and science diplomacy.

This could be exemplified through its multistakeholder working methodology, its sectorial work in many areas where neutral scientific advice is needed (e.g., climate science), its specific activities in the Research and Innovation sector, and its aspiration to act as an interface between the global UN agenda and the regional level.

The sustainability of the agri-food systems has often been either a focus or an important component of much of its sectorial work, given the outsized importance that agriculture, fisheries and the food sector play in its economy, society and history.

In the setting of the Union for the Mediterranean, Science diplomacy has been explicitly mentioned for the first time in the UfM Ministerial Declaration of Research and Innovation (Paris, June 2022), that gave political impetus on a research and innovation agenda based on three priority themes: climate change, renewable energy and health (Union for the Mediterranean, 2022).

After an inclusive drafting process spearheaded by a working group and endorsement from the UfM Member states at technical and political levels, it led to the establishment of eight roadmaps on key goals for the sustainability of the region, with many cornering different aspects of food systems, such as the modernization of electric power systems, green hydrogen, sustainable agricultural production, and water scarcity. For instance, the research theme of climate change foresees a research and innovation on Sustainable agricultural production, and on the Impact of water scarcity and drought in Rural Areas (Union for the Mediterranean, 2021).

To date, different examples exist of strategic cooperation based on achieving broader regional goals through research and innovation. The most explicit of these initiatives targeting directly sustainable food systems is certainly the Partnership for Research and Innovation in the Mediterranean Area (PRIMA). As a Research and Innovation partnership between the European Commission and Member states from the North and the South of the Mediterranean, it targets the sustainability of farming systems, agri-food value chains, water management and the so-called water-energy-food-ecosystem nexus. While its contribution to science diplomacy has been systematically remarked at political level (Union for the Mediterranean, 2022), its impact is already on the ground, with more than 200 project funded as of 2021, with a total budget of 285.9 million euros⁷.

7. CONCLUSION

Applying Science to multilateralism and foreign policy is a way of creating a “common language”, a baseline upon which mutual understanding of aims and trajectories can be made easier. This is an incredibly important tool for a region where dialogue is not always easy, and where crises and mistrust are sometimes difficult to overcome. On the upside, it seems to be more and more structurally integrated at the bilateral and multilateral levels as part of the policies toolbox at disposal of decisionmakers.

On food systems in the Mediterranean, one of the frameworks of reference where science is already built-in is the process of the World Conferences on the Mediterranean Diet, a gathering which held their third edition at CIHEAM Bari in October 2022. “A change of route”, the title given to the Second World Conference on the Mediterranean Diet (Palermo, 2019) and again quoted in the Third conference, remains a paradigm indicating a destination, for which a vehicle is needed. If this were to be considered akin to a sailing ship, then we could visualize science as the wind accelerating towards its destination.

Science can shed a light even in the darkest time, helping overcome difficult negotiations if sufficient political will is present. A notorious example has been the negotiations for the so-called Nuclear Accord between Iran and the E3+3 format, where nuclear physicists helped during impasses in finding common spaces for agreement. Nevertheless, the outcome of that process should also be a warning in contextualising the real power of these tools.

While awareness about this instrument grows in the region, we hope that it may contribute to a more inclusive, fairer, and greener Mediterranean, and a better world. As the participants of the first Euro-Mediterranean Conference on Science Diplomacy have remarked, joint science diplomacy actions have “the potential to trigger innovative ideas and approaches that can help solving challenges not only affecting the Mediterranean region, but also other World regions and humankind as a whole, thereby supporting the World to get back on track to reach the Sustainable Development Goals of the United Nations’ 2030 Agenda.”⁸

7. PRIMA. PRIMA in Numbers. <https://prima-med.org/who-we-are/prima-in-numbers/>

8. Fostering Science Diplomacy in the Mediterranean Region. Outcome of the Euro-Mediterranean Conference on Science Diplomacy. Barcelona, 3 October 2023. Available at: <https://ufmsecretariat.org/science-diplomacy-conference-2023/>

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MEDITERRANEAN CITIES AND LOCAL GOVERNMENTS FOR FOOD SYSTEMS TRANSFORMATION

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ABSTRACT The last decade has seen the emergence of cities and local governments and confirmed the importance of urban-rural linkages for territorial development and of food systems transformation as an entry point for sustainable development. The role of small and intermediate cities will be a priority in the coming years, as they are key in connecting rural and urban areas and are projected to grow much faster than megacities. Mediterranean cities therefore have a key role to play to ensure health and resilience of both urban and rural populations in a context of natural resources crisis, conflicts and migration. Each is connected to its territory by specific urban rural linkages and a combination of long and short food networks. They bring local knowledge, practices and experience which provide a basis for strategic planning at local and bioregional level. This will require joint participation of all actors, and in particular of the private sector, as well as effective networking and partnerships at national, thematic and Mediterranean levels for technical support, knowledge management and data collection, funding, action research and advocacy. The 2021 UN Food Systems Summit and 2023 Stocktaking Moment in Rome reiterated the commitment of the UN System to support food systems transformation and the urgency of concrete engagement and coordination of all actors at territorial, national, regional and global levels. Present institutional structures and procedures however remain an obstacle for joint action in the Mediterranean region and multi-level governance is therefore a priority.

Keywords Urban-rural linkages - Territorial development - Resilience - Multi-level governance - Networks.

VILLES ET GOUVERNEMENTS LOCAUX: DES ACTEURS-CLÉ POUR LA TRANSFORMATION DES SYSTÈMES ALIMENTAIRES MÉDITERRANÉENS

Résumé La dernière décennie a vu l'émergence des villes et des gouvernements locaux et a confirmé l'importance des liens entre les zones urbaines et rurales pour le développement territorial et de la transformation des systèmes alimentaires en tant que point d'entrée pour le développement durable. Le rôle des villes petites et intermédiaires sera une priorité dans les années à venir, car elles constituent une interface plus directe entre zones rurales et urbaines et devraient croître beaucoup plus rapidement que les mégapoles dans les années à venir. Les villes méditerranéennes ont donc un rôle clé à jouer pour assurer la santé et la résilience des populations urbaines et rurales dans un contexte de crise des ressources naturelles, de conflits et de migrations. Chacune d'entre elles est reliée à son territoire par des liens urbains et ruraux spécifiques et une combinaison de réseaux alimentaires longs et courts. Elles apportent des connaissances, des pratiques et des expériences locales qui devraient fournir la base de la planification stratégique au niveau local et biorégional. Celle-ci nécessitera la participation conjointe de tous les acteurs, et en particulier du secteur privé, ainsi qu'une mise en réseau et des partenariats efficaces aux niveaux national, thématique et méditerranéen pour le soutien technique, la gestion des connaissances et la collecte de données, le financement, la recherche-action et le plaidoyer. Le Sommet des Nations Unies sur les systèmes alimentaires de 2021 et le Moment de bilan de 2023 à Rome ont réitéré l'engagement du système des Nations Unies à soutenir la transformation des systèmes alimentaires et l'urgence d'un engagement concret et d'une coordination de tous les acteurs aux niveaux territorial, national, régional et mondial. Les structures et procédures institutionnelles actuelles restent cependant un obstacle à l'action conjointe dans la région méditerranéenne et la gouvernance multi-niveaux est donc une priorité.

Mots-clés Liens urbains-ruraux - Développement territorial - Résilience - Gouvernance multi-niveaux - Réseaux.

1. INTRODUCTION

The last decade has seen the emergence of cities and local governments and confirmed the importance of urban-rural linkages for territorial development and of food systems transformation as an entry point for sustainable development. There is also increased recognition of the links between food systems transformation and other major development agendas, such as climate, biodiversity, water, energy or resilience. Urban inhabitants consume about 70 percent of global food production, which means that sustainable transformation of urban food systems can leverage the overall sustainability of agri-food systems. Many urban and peri-urban communities, especially in middle and low-income

countries, are exposed to food insecurity and malnutrition including increasing overweight and obesity, and the diffusion of diet-related non-communicable diseases.

Since antiquity, the history of the Mediterranean basin has been shaped by cities. High levels of urbanization has been further increased by rural to urban migration and international displacements. Migration for economic or political reasons (including refugees and IDPs) make the headlines daily. Most of the urban growth has taken place on the peripheries of primary cities, several of which have become extended metropolitan regions and some of which are actual or emerging mega-urban regions with complex issues of region-wide urban governance, authority conflicts and governance voids.

Cities have become increasingly dependent on food imports and as a result surrounding rural areas are increasingly depopulated as they do not offer any longer either economic opportunities or the necessary basic services (health, education, mobility...), which in turn feeds rural-urban migration and urban sprawl. But today, secondary cities are experiencing the fastest rates of growth. The importance of urban food systems governance in small and intermediate cities and their rural catchment areas was brought up at the June 2022 World Urban Forum as a means to bridge the national-local divide and promote sustainable food systems transformation at all levels¹.

In recent years the role of cities around the world has undergone a unique transformation. Challenges and opportunities, such as the demographic challenge, climate change and the emergence of new forms of participation and interaction with civil society, the private sector or academia, have led municipal governments to revisit their agendas and rethink governance and management practices. Food was by and large absent from formal urban agendas until 2015. It became an explicit topic with the development of the Milan Urban Food Policy Pact² and the increasing involvement of local governments in food-related issues which led mayors' offices to engage in the food systems debate. The creativity, sense of opportunity and pragmatic nature of local governments offer a space in which different areas of knowledge and forms of social grouping meet, and where processes which were until then disconnected are converging in a surprising harmony.

This is very much in line with the concept of "Circular Culture" launched at the 4th UCLG Culture Summit in 2021 in Izmir. Culture functions like a mortar that binds a building together, and circular culture seeks a holistic transformation of cities through fostering harmony between people and nature as well as the past and the future, and therefore aims to provide a vision that integrates all dimensions of sustainable development

2. THE COMBINATION OF CLIMATE CHANGE, COVID19 AND WAR HAVE GENERATED A PERFECT STORM.

The basin of the Mediterranean has been identified by the Intergovernmental Panel on Climate Change (IPCC) as one of the world's 25 climate change hotspots. The rise in temperatures and the associated disruptions in terms of precipitation, hydrological cycles or intensity of cycles, and frequency of extreme weather events will affect in particular coastal areas and watersheds, which are home to 33% and 50% of the world's total population, respectively, and 50% of the total population of the area. Its

1. <https://wuf.unhabitat.org/event/urban-food-systems-governance-small-and-intermediate-cities-and-their-catchment-areas>

2. <https://www.milanurbanfoodpolicypact.org/>

impacts are exacerbating pre-existing environmental, socio-economic, political, institutional, and conflict-related stressors and tensions. The impact of droughts and increased water scarcity is not only undermining food security, but also heightening resource competition within and between communities (in particular urban and rural and for agricultural and domestic use), undermining social cohesion and increasing the risk of violence. Cities and urban rural linkages are therefore at the heart of the Water Energy Food Ecosystems nexus³.

The response to COVID19 affected all supply chains and disrupted world trade. The global crisis generated by the COVID-19 outbreak pushed cities and local governments to give immediate answers to an emergency that seriously threatened not only citizens' health, but social cohesion, the economy, and the functioning of territories⁴. COVID-19 has been an eye-opener to all forms of inequalities across people and places, and in particular in large cities, and of the need for better urban-rural linkages and more resilient territorial food systems. Municipalities and local institutions (and in particular civil society and the private sector) have demonstrated enormous potential in collaborating, coordinating, exploring and supporting community-based solutions. New working relations emerged between health, planning, social protection, economic development and other municipal departments. Responses to the pandemic also focused attention on the need for better alignment and collaboration between local, territorial and national governance levels.

The Russia-Ukraine war has aggravated the situation since both countries produce a quarter of the wheat exports, therefore affecting Mediterranean countries that have become highly dependent on wheat import. The rise in the price of fossil fuels further contributes to an unprecedented rise in food prices as transportation and fertilizers become more expensive.

Mediterranean cities are therefore at the crossroads of these converging trends, are paying a high price and have a key role to play to ensure health and resilience of both urban and rural populations in a context of natural resources crisis, conflicts and migration. Each city is connected to its territory by specific urban rural linkages and a combination of long and short food networks

3. THE BARI CONFERENCE: A MILESTONE IN AN ACCELERATING PROCESS?

It is this context that CIHEAM - Bari hosted on 28-30 September 2022 the 3rd World Conference on Revitalization of Mediterranean Diet - A Change of Route: Towards more Sustainable and Resilient Food Systems in Mediterranean Countries - The Mediterranean Diet as a Strategic Resource for Accelerating the Agenda 2030 in the Region, and included a side event on Mediterranean Cities and Local Governments for Food Systems Transformation. The objective of this side event was to discuss the role of Mediterranean cities and local governments in food systems transformation, the implications in terms of multilevel food systems governance, and the importance of cities networks.

The experience of the Mediterranean cities of Bari, Gaza and Tunis confirmed that cities bring local knowledge, practices and experience which provide a basis for strategic planning at local and bioregional levels. The experience of Gaza was particularly interesting as it illustrated the impact of conflicts on food systems,

3. <https://www.gwp.org/en/sdg6support/iwrm-support/themes/water--energy--food--ecosystems-nexus/what-is-the-wefe-nexus/>

4. <https://www.oecd.org/coronavirus/policy-responses/the-territorial-impact-of-covid-19-managing-the-crisis-and-recovery-a-cross-levels-of-government-a2c6abaf/>

which have been acknowledged as a major cause of food insecurity⁵(see SOFI 2017 and foll.), but are de facto receiving insufficient attention to date in the nationally-driven food system transformation process. At a time when the war in the Gaza strip rages, it is important to remember that a year ago the city of Gaza had been facing for years protracted conflict, economic stagnation, restricted trade and access to resources. Poverty and food insecurity, coupled with high unemployment affected 53% and 64.4% of the population respectively. Responding to the increased needs generated by the recent escalations and impact of COVID-19, the Municipality of Gaza (MoG) insisted on the crucial role of its collaboration with international and local partners, including UN agencies (FAO, UN-Habitat) and INGOs (ICRC), providing food security assistance to Gaza inhabitants and building the capacity of social safety nets. The Municipality, together with the Gaza Urban Agriculture Platform (GUPAP), was also running a social behaviour change project, raising awareness of Gaza citizens and supporting community activities to reorient food systems, adopt new greening practices, improve nutrition and combat food insecurity. To further strengthen its food systems, the city of Gaza was also working with sister cities, such as Barcelona (Spain) and C line ti (Romania) to share knowledge, expertise and good practices, and scale up resilience-building activities, including greenhouses, vegetable farms and technical and vocational trainings, especially for youth, women and vulnerable groups.

Tunis is another good example of the challenges faced by Mediterranean cities. It has been severely affected by the COVID 19 pandemic, which according to World Bank estimates of June 2021, was responsible for an increase of the poverty rate from 15.55% to 21%. Tunisian diets are highly dependent on imported cereals, and in particular wheat, with an average annual consumption at about 174.3 kg per person, and are therefore further affected by the Russia-Ukraine conflict. The municipalities of Tunis and neighboring La Marsa are focusing on ensuring that homeless and migrants are not left behind, thus providing living labs for other municipalities to learn from. Other interventions such as waste management, support to public places and sustainable inclusive spaces and markets also contribute to food systems transformation.

The experiences presented have shown that a variety of entry points have proven effective in enhancing territorial food security and sovereignty, such as prioritising the production and consumption of local foods, supporting family farming, promoting short supply chains, reviving and improving traditional food preferences and practices, supporting local gastronomy and creating denominations of origin, managing food waste, enhancing the food retail environment, reorienting public procurements, etc. Chefs and cooks are key actors to revive the Mediterranean diet and contribute to education and communication. City planners, economists, agronomists, health staff, lawyers, cooks, among many others must engage in joint discussions on such complex issues in order to generate a consensus on topics of common interest.

Peer-to-peer exchange is a fundamental strategy to advocate for urban food systems transformation and scaling up initiatives. Cities or local governments networks are therefore also essential to strengthen local and territorial processes. The example of the “Rete Italiana Politiche Locali del Cibo”⁶ shows how researchers, experts, civil society and public administrators can jointly engage in the transformation of food systems at territorial level. In its Manifesto signed in 2019, the Network emphasises the need to privilege the term ‘local’ over that of ‘urban’, in order to bring out the complexity of urban-rural linkages, counterbalance the hegemony of the city and fight rural depopulation. The transformation of

5. See SOFI Reports, from 2017 and following. <https://www.wfp.org/publications/2017-state-food-security-and-nutrition-world-sofi-report>

6. <https://www.politichelocalicibo.it/>

food systems at territorial level is increasingly considered crucial but not yet given adequate attention in the public political debate. The Italian network is therefore engaged in a strong advocacy strategy, combining research-action in relevant territories, thematic roundtables and working groups (e.g. on school canteens, food poverty, relationship between food and landscape, foodification), mapping activities and monitoring and evaluation of local activities.

The Executive Secretary of ORU-FOGAR⁷ emphasized the fact that poor governance is a root cause of food insecurity and hunger. Governance cannot be limited to global and national levels but should be multi-level and multi-actor. As we are heading towards a multidimensional crisis (demographic, economic and climate crisis), more sustainable food systems can contribute to resilience. Cities, local and regional governments are in the frontline to face related problems, although in most cases they are not aware either of their potential role in reorienting territorial development or of the opportunities such an approach could bring. Cities, regional and local governments must play a fundamental role in strengthening food systems resilience and should draw up an emergency plan to address crises and guarantee the provision of food to the most vulnerable. This will require joint participation of all actors, and in particular of the private sector, as well as effective networking and partnerships at national, thematic and Mediterranean level for technical support, knowledge management and data collection, funding, action research and advocacy.

Since 2007, the plea for the increased involvement of regional, local and city governments in resilience, food security and sustainable development has gathered an increasing momentum. Food systems are at the heart of territorial development and cities have a key role in the transformation of local food systems. Participants agreed that cities and local governments need to adopt a systems approach, developing holistic food strategies, with explicit attention to social inclusion, and integrating food systems in urban and metropolitan planning but also integrating food systems actions into a broader territorial approach through strengthening links between (multiple) urban and rural areas, actors and population groups. The role of small and intermediate cities will be a priority in the coming years, as they are key in connecting rural and urban areas and are projected to grow much faster than megacities.

4. A LOT HAS HAPPENED SINCE SEPTEMBER 2022

It would be impossible in a few pages to make an inventory of all relevant bilateral, technical and institutional initiatives in the past year or so. The following list therefore just tries to illustrate the variety of relevant ongoing processes, at both global and Mediterranean levels.

- The Committee on World Food Security <https://www.fao.org/cfs/en/> in its 50th session on 10-13th October 2022 requested the High Level Panel of Experts to undertake a study on “Strengthening urban and peri-urban food systems to achieve food security and nutrition in the context of urbanization and rural transformation” to be prepared and presented in 2024.
- The UN Convention to Combat Desertification (UNCCD) CoP 15 held in May 2022 in Abidjan invited Parties to promote sustainable territorial development, including multi-level governance and planning mechanisms, as appropriate, to strengthen urban–rural linkages (URL) and create social and economic opportunities that reduce forced migration and displacement and increase rural resilience and livelihood sustainability.

7. <https://www.regionsunies-fogar.org/en/>

- At the CoP27 Climate Change Conference (6-18 November 2022, Sharm al Sheikh). the Local Governments and Municipal Authorities (LGMA) Constituency, bringing together more than 45 accredited networks of local and regional governments, insisted on their role in climate action, in particular in the North East and North Africa Region A session on “Circular agriculture for climate emergency” was hosted by the Izmir Municipality with a view to strengthen the ties between urban and rural areas and bring a regional approach to development⁸. **Circularity in urban life can rebuild cities ties with nature and enhance** interconnectedness of all ecosystems.

- At the CoP15 UN Biodiversity Conference from 8 to 18 December 2022 in Montreal, a Summit parallel event and a Pavilion for Subnational Governments & Cities⁹ focussed on local and subnational government actions and opportunities. Decision 15-12 specifically addresses the engagement of subnational governments, cities, and other local authorities to enhance implementation of the Kunming-Montreal Global Biodiversity Framework. The Plan of Action calls for biodiversity-inclusive urban planning, enhancing native biodiversity, ecological connectivity and integrity, improving human health and well-being and connection to nature and contributing to inclusive and sustainable urbanization and the provision of ecosystem functions and services.

- On 14 December 2022, UN-Habitat and its partners launched the research initiative “Multilevel Governance for SDG Localization: Accelerating progress towards the localization of the SDGs and post-pandemic recovery through enhanced multilevel governance”. <https://www.multilevelgovernance.org/about>

- On 22-23 June, in preparation of CoP 28, the third Meeting of Mediterranean territories for climate action (MedCop3) organised by UCLG Africa in Tangiers <https://www.medcop.ma/> included a session on sustainable food systems which highlighted the crucial issue of financing food systems transformation.

- On 12 July, the 2023 edition of the ‘State of Food Security and Nutrition in the World’ (SOFI) ‘Urbanization, Agrifood Systems Transformation, and Healthy Diets Across the Rural-urban Continuum,’ was launched in New York City in a high-level event on the margins of the 2023 UN High-level Political Forum on Sustainable Development <https://www.fao.org/new-york/events/detail/launch-of-the-state-of-food-security-and-nutrition-in-the-world-2023/en>

- The 2023 UN Food System Summit Stocktaking Moment, held in Rome 26 to 28 July reiterated the commitment of the UN System to support food systems transformation and the urgency of concrete engagement and coordination of all actors at territorial, national, regional and global levels. A multi-actor side event on City, subnational and national governments join actions with multiple actors towards healthy, inclusive, sustainable, and resilient food systems was organised. Coalitions around entry points in which cities and local governments play a lead role (e.g. Urban Food Systems Coalition <https://ufs-coalition.org/>, School Meals <https://schoolmealscoalition.org/> or World Farmers Markets <https://www.worldfarmersmarketscoalition.org/>) Coalitions also provide concrete opportunities for advocacy, information exchange and partnerships

- The delegations present in October 2023 at the CFS 51th session commented on SOFI 2023 and confirmed the interest of national governments in exploring the implications of urbanization. A

8. <https://www.iklimhaber.org/izmirs-vision-for-circular-agriculture/>

9. <https://www.cities-and-regions.org/multilevel-action-pavilion-at-cop27/>

multi-actor side event entitled Our seat at the table – Maximizing transformative opportunities across the rural-urban continuum to deliver healthy diets from sustainable food systems was also organised.

5. WHAT NEXT?

While the multiplication of relevant processes and events reflects the growing awareness and understanding of the role of cities in the transformation of food systems and is certainly a good sign, much remains to be done to ensure synergy and avoid duplication and misunderstandings. This is even more of a challenge in the Mediterranean basin since on the one hand Mediterranean institutions, initiatives and processes have been so far blind to food systems issues; and on the other hand that major food-systems related global processes have not adopted a bioregional approach and therefore are not looking at the Mediterranean as a whole.

Dealing with complexity requires joint action-learning by a variety of stakeholders. Which means that all actors seeking sustainable development or engaged in major global agendas (e.g. digitalization, climate, energy, sustainable urbanization, food systems transformation) that are promoting intersectoral and inter institutional processes and multi level governance would be logical key players in this process.

Cities and local governments have been encouraged to set up a variety of coordination mechanisms and join different networks. Major cities that have significant human resources have thus multiplied task forces, committees and working groups, which actually mirror the situation at national and global levels as they rarely communicate and have their own specific funding.

Such processes do not include bilateral partnerships between cities (such as sister cities), initiatives of NGOs or researchers - which often have limited contacts with municipalities. Most academic institutions in Mediterranean areas of EU countries have research projects in Near East or Northern African areas. Networks like the Habitat International Coalition <https://www.hic-net.org/> which have focussed on human rights for decades have members in many Mediterranean cities and could be key actors in the transformation of food systems

In the case of the Mediterranean basin, the problem is further compounded by the organizational charts of international institutions and their geographical areas of intervention. UN agencies which should be joining forces to transform food systems have parcelled out the Mediterranean into European Union “Northern” countries, Eastern Europe, Near East and North Africa. But their regional offices are in different locations and do not cover the same set of countries. Besides they support national policies which do not necessarily address urban and territorial approaches, and their counterpart ministries and procedures are different. Global initiatives (e.g. WHO’s Healthy Cities initiative) are adapted by regional offices but undermined by different regional priorities and limited horizontal communication. There is therefore no Mediterranean Healthy Cities network. As a result, there is no Mediterranean perspective in relevant global processes including the Milan Urban Food Policy pact.

However since cities are increasingly acknowledged as key actors in present agendas (health, energy, climate, digitalization...), relevant initiatives have been developed in recent years and could provide a concrete basis for Mediterranean food systems transformation:

- MedCities <https://medcities.org/> was created in 1991 to help empower Mediterranean local governments to achieve their strategic priorities, believing them to play a vital role in improving the lives of citizens. It is a Mediterranean voice for local authorities and builds their capacity to meet the challenges of local governance in a sustainable way.

- The 2005 Conference of Euro-Mediterranean Cities in Barcelona identified the issue of governance at different levels of intervention and of their coordination within a particular territory as a priority.¹⁰

6. A CHANGE OF ROUTE TOWARDS MORE SUSTAINABLE AND RESILIENT FOOD SYSTEMS... AND DEVELOPMENT IN THE MEDITERRANEAN: CITIES ARE WELL PLACED TO STEER IT

The Mediterranean basin has always been a fulcrum of civilization where cities played a major role and where cultures and knowledge meet. There is therefore a lot to learn from Mediterranean food culture and practices. Food is also an entry point at citizen and institutional level for engagement, dignity, and communication. Urban food systems are proving to be one of the few opportunities to consolidate participatory citizenship, to exercise the right to territory, to culture, to democracy and to justice. Cities should therefore be provided the support they need to play or continue playing their active role of integrating food systems in their policy, planning and actions.

Present institutional structures and procedures remain an obstacle for joint action in the Mediterranean region and multi-level governance is a priority. The current policy framework is, in most cases, fragmented; national policies and local actions must be congruent. And a focus on local food policies could strengthen relations and collaboration in the region.

A change of route is therefore urgently needed to overcome institutional and technical silos and bring together actors which until now have been taking the lead from a variety of entry points, acknowledging their contribution and experience within a broader territorial framework. Food systems transformation will require effective networking and partnerships at national, thematic and Mediterranean level for technical support, knowledge management and data collection, funding, action research and advocacy. But an essential dimension is to systematically promote functional urban-rural linkages¹¹, urban-rural balance and partnerships for social and environmental sustainability, culture and human rights.

The creation of a Network of Mediterranean Cities and Local Governments for Sustainable Food Systems, offering a space for dialogue and research to share strategies, good practices and analysis would be a logical step to transform food systems in the Mediterranean Region, enhance synergy and accelerate transformation. But at a time when the integration and localization of SDGs are acknowledged to be a priority for more sustainable development, it may be more efficient to work towards a Network of Mediterranean Cities and Local Governments for Sustainable Development which could seek to bring together all major humanitarian and development agendas, in line with SDG target 11.a. *“Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning.”*

While a variety of institutions might be interested in supporting such a network which could help overcome existing gaps and alleviate tensions, it could only be launched by Mediterranean cities and local governments themselves. And rather than creating yet one more structure, this could be an opportunity to build upon and enhance synergy of existing networks and partnerships. The SFS MED platform could be instrumental in exploring cities willingness to launch such a network <https://www.oneplanet-network.org/programmes/sustainable-food-systems/sfs-med-platform>.

10. <https://www.iemed.org/publication/the-great-challenges-of-mediterranean-cities/?lang=frThge>

11. <https://unhabitat.org/urban-rural-linkages-guiding-principles>

AGRICULTURAL AND FOOD HERITAGE INITIATIVE FOR PROMOTING COMMUNITY-BASED SUSTAINABLE FOOD SYSTEM AND DIETS

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ABSTRACT Abstract. The agricultural sector is responsible for the sustainable production, equitable marketing and distribution of nutritionally adequate, safe and environmentally sound food. There is therefore an urgent need to develop and promote strategies for sustainable food systems and diets, emphasising the positive role of biodiversity in human nutrition and poverty alleviation, and promoting nutrition-sensitive development and diversified food-based approaches. The dietary changes that have taken place in urban areas are now spreading to rural communities, where people are abandoning traditional food systems and diets based on locally grown crop varieties and animal products in favour of 'westernised' diets. Many of the traditional food systems are maintained by local communities and indigenous people, who retain knowledge of the land, water, biodiversity and food resources rooted in historical continuity within their region of residence, and include traditional foods accessed through traditional knowledge from their natural environment through farming or wild harvesting. Traditional Mediterranean food systems are adaptive and nutritionally rich and diverse, local and biodiverse, subsistence and risk-averse, and socially and culturally rooted. Many rural communities in Mediterranean developing countries, which continue to face serious development challenges, still cherish their food culture and traditional food systems, which are indeed their natural and cultural heritage. Protecting, revitalising and exploiting this food heritage and its documented health-giving attributes would contribute significantly to sustainable development goals. This article highlights the need to launch a "Mediterranean Food Heritage Initiative" based on the experience of the GIAHS Partnership Initiative, capitalising on its achievements, networks and potential, together with a feasibility study to be extended to traditional food, nutritional, culinary and medicinal systems, with the aim of recognising these systems as Food Heritage and supporting income-generating activities through the labelling of GIAHS and NIAHS products and services, promotion of agri-tourism, marketing and labelling of food heritage, festivals and celebrations.

Keywords Globally Important Agricultural Heritage Systems (GIAHS) - Mediterranean Food Systems Heritage Initiative - Mediterranean Traditional Food Systems - Small Holders and Family Farmers as Custodians of Ecosystem Services - Food Sovereignty - Agroecology - Food and Nutrition Security.

INITIATIVE EN FAVEUR DU PATRIMOINES AGRICOLE ET ALIMENTAIRE POUR LA PROMOTION DE SYSTÈMES ET DE RÉGIMES ALIMENTAIRES DURABLES COMMUNAUTAIRES

Résumé Le secteur agricole contribue à assurer une production durable, une commercialisation et une distribution équitables d'aliments qui présentent un bon profil nutritionnel, sont sûrs sur le plan sanitaire et sont obtenus en respectant l'environnement. Il est donc urgent de développer et de promouvoir des stratégies pour des systèmes et des régimes alimentaires durables, en insistant sur le rôle positif de la biodiversité dans la nutrition humaine et la réduction de la pauvreté, en prônant un développement sensible aux aspects nutritionnels et des approches alimentaires diversifiées. Les évolutions alimentaires qui se sont produites dans les zones urbaines s'étendent actuellement aux communautés rurales, où les habitants ont abandonné les systèmes alimentaires traditionnels et les régimes basés sur des variétés végétales et des produits animaux locaux, au profit des régimes « occidentalisés ». Les communautés locales et les populations autochtones, qui détiennent les savoir-faire inscrits dans la continuité historique de leur territoire, concernant la terre, l'eau, la biodiversité et les ressources alimentaires, maintiennent la plupart de ces systèmes alimentaires traditionnels qui incluent des aliments traditionnels obtenus de leur environnement naturel, par l'agriculture ou la cueillette sauvage, dans le respect des connaissances ancestrales. Les systèmes alimentaires traditionnels méditerranéens sont adaptatifs, riches et diversifiés sur le plan nutritionnel, locaux et biodiversifiés, basés sur la subsistance et l'aversion au risque, et enracinés socialement et culturellement. De nombreuses communautés rurales des pays méditerranéens en développement, toujours confrontés à de grands défis, privilégient encore leur culture alimentaire et leurs systèmes alimentaires traditionnels, qui constituent en fait leur patrimoine naturel et culturel. La protection, la revitalisation et l'utilisation de ce patrimoine alimentaire et de ses bienfaits pour la santé contribueraient de manière significative aux objectifs de développement durable. Dans cet article, nous soulignons la nécessité de lancer une « Initiative pour le patrimoine alimentaire méditerranéen » en nous appuyant sur l'expérience de l'Initiative de partenariat des « Systèmes Ingénieurs du Patrimoine Agricole Mondial » (SIPAM), en valorisant ses réalisations, ses réseaux et son potentiel, ainsi qu'une étude de faisabilité sur l'extension aux systèmes alimentaires, nutritionnels, culinaires et médicaux traditionnels, afin de reconnaître ces systèmes comme patrimoine alimentaire

et de soutenir les activités génératrices de revenus en étiquetant les produits et les services des SIPAM et des SIPAN, en promouvant l'agritourisme, le marketing et l'étiquetage du patrimoine alimentaire, les festivals et les célébrations.

Mots-clés *Systèmes Ingénieux du Patrimoine Agricole Mondial (SIPAM)), Initiative pour le patrimoine alimentaire méditerranéen, Systèmes alimentaires traditionnels méditerranéens, Petits exploitants et agriculteurs familiaux gardiens des services écosystémiques, Souveraineté alimentaire, Agroécologie, Sécurité alimentaire et nutritionnelle*

1. SUSTAINABLE FOOD SYSTEMS IN MEDITERRANEAN REGION AND SUSTAINABLE DEVELOPMENT

Food is essential to a healthy life and has important implication on social, economic and environmental dimensions of sustainable development. It forms also an important part of cultural identity of both producers and consumers. While the current food system offers consumers inexpensive food, the quality of the calorie-rich but nutritionally deficient processed food with increased environmental footprint brings questions on the long-term sustainability of the current trends in the production and consumption of food. The Food losses and food waste in production, processing, transport and consumption stages impacts both food security and nutrition and the sustainability of food systems.

According to FAO, nearly one-third of the food produced for human consumption – approximately 1.3 billion tonnes per year – is either lost or wasted globally. A more holistic approach to food systems sustainability is needed, focusing on the structures, systems and relationships underpinning all stages of food production, processing transportation and consumption along the food chain. The management processes, in which social, environmental and equity dimensions are considered and integrated in a wholistic approach. Integrated strategies to promote better environmental and societal health and greater human well-being can then be more easily put into plans for action. The system of food provision is a key consideration for supporting sustainability - social, economic and environmental - at local and regional levels (FAO-HLPE, 2014).

Regrettably, the decline in investment in sustainable agricultural and rural development, specifically on traditional agriculture, smallholders and family farming, has further constrained rural populations' available opportunities and is an important factor in rural stagnation and increased migration from developing countries particularly highlands, drylands, and in the fragile ecosystems where many of the rural poor live. Reducing world poverty is not only a moral imperative and a social good, but it is also a priority of global strategy for peace and stability and the survival of our planet.

For centuries the agricultures of developing countries were built upon the local resources of land, water, and other resources, as well as local plant and animal species and varieties and indigenous knowledge. This has nurtured biologically and genetically diverse smallholder farms with robustness and a built-in resilience that has helped them to adjust to rapidly changing climates, pests, and diseases.

The new models of food systems that humanity will need to include are the forms of farming that are more ecological, biodiverse, local, sustainable, and socially just. This means that they should be rooted in the ecological rationale of traditional small-scale agriculture, representing long established examples of successful community-based local agriculture. There should be closer connections between producers and consumers, therefore local production and consumption and increased link between rural and urban areas. In the face of such global trends, the concepts of food sovereignty and ecologically based production systems (e.g. Agroecology) have gained much attention in the last two decades.

Since the early 1980s, hundreds of agroecologically based projects that have been promoted by NGOs

and farmer's organizations throughout the developing world, have shown that by blending elements of both traditional knowledge and modern agricultural science, the productivity and sustainability of small farming systems can be optimized and thus enhancing the conservation of natural resources and local and national food security. The emerging concept of food sovereignty and Agroecology emphasizes farmers' access to land, seeds, and water while focusing on local autonomy, local markets, local production-consumption cycles, energy and technological sovereignty, and farmer-to-farmer networks (Altieri 2012).

2. THE ROLE OF SMALL HOLDERS AND FAMILY FARMERS IN A SUSTAINABLE FOOD SYSTEM

The Small-scale, family farming and more traditional forms of agriculture and food systems could significantly address many problems of sustainable agriculture today and in the future. Smallholder and family farmers have adapted their systems and adopted new practices to economic and environmental changes at scale. They continue to supply most basic food commodities at local, national and global levels (FAO, 2014). Their small-scale farms offer an array of environmental, economic, social and cultural services, and remain a source of employment, nutritious food, cultural value and quality of life (Koohafkan and Altieri, 2010; Altieri and Koohafkan, 2013, Koohafkan 2017). These systems have been managed with time-tested resilience, ingenious combinations of techniques and practices that have typically led to food sovereignty, sustained resources and incomes, and the conservation of natural resources and biodiversity. Indeed, agricultural systems with high levels of social and human assets are able to innovate and adapt to uncertainties. Family farmers make the majority of contribution to agricultural production worldwide and are thus acknowledged as the key leverage for ensuring future food security. At regional levels, the smallholders in fact provide up to 80 % of the food supply in Asia and sub-Saharan Africa; among them women have a key role since they account for 43 % of the agricultural labour force of developing countries, rising up to almost 50 % in Eastern and South eastern Asia and sub-Saharan Africa (FAO, 2011). Their model of farming is based on means of organizing agricultural production mainly relying on family labour, including both women's and men's. In family farming and traditional agriculture, the central approach is the integration of the production activities with the local landscape in which the resources are complementary, integrated and sustainably valued. The indigenous knowledge and traditional techniques that smallholder farmers apply indeed derive from the deep knowledge of the context they interact with and are adapted to. Such knowledge, apart from being the backbone of diverse and environmentally sustainable production systems, makes farmers able to adapt to modifications in their environment and thus more resilient to the changes expected in light of climate change and other pressures. In spite of these strengths, though, smallholder farmers are threatened by unfair trade and market forces and competitive pressure from globalization and integration into common economic areas, insomuch that their fate is either to become self-subsistence marginal producers, or to grow into larger units to compete with large industrialized farms which is in contrast with the current global needs (van der Ploeg 2009).

In 2014, the declaration of the International Year of Family Farming gave rise to a number of events that focused attention on these farmers as the foundation of agriculture, which represents 88% of the world's farms according to FAO (FAO, 2012a; FAO, 2012b; FAO, 2012c; FAO, 2014; FAO, 2015), well ahead of firms and agro-businesses. Within this category, family farmers and smallholders with less than 2 hectares of land represent almost 85% of such farms and account for around 40% of the world's workforce. Consequently, and because of their understanding of the often marginal lands they use, they have considerable potential to provide food security and nutrition, job creation, the reduction of poverty and inequality, sustainable livelihood and territorial development, if they are supported by judicious public policies, sustainable investment and fair access to market (Bosc et al., 2014).

3. GLOBALLY IMPORTANT AGRICULTURAL HERITAGE SYSTEMS (GIAHS)

The Globally Important Agricultural Heritage Systems (GIAHS) in Mediterranean region comprises of a small proportion of traditional agricultural systems dispersed over many countries and regions. These agricultural systems all reflect common traits of rich biodiversity, knowledge systems, cultural diversity and environmental resiliency. The persistence of these systems tells a fascinating story of the ability and ingenuity of humans to adjust and adapt to the vagaries of a changing physical and material environment from generation to generation (Marten 1986). The custodians of these systems represent an abiding commitment to conservation and respect for nature, agricultural patrimony and comprise a legacy of considerable importance, even though modern agriculture constantly threatens the sustainability of these people and their inheritance. Because many of these traditional agricultural systems represent a wealth and breadth of accumulated knowledge and experience in the management and use of resources, it is imperative that they be considered as nationally and globally significant resources that require protection and conservation while being allowed to evolve dynamically (Koochafkan, 2012). It is suggested that such ecological and cultural resources are of fundamental value to the future of humankind. However, GIAHS face great challenges in adapting to rapid environmental and socio-economic changes in the contexts of weak agricultural and environmental policies, climate variability and economic and cultural pressures. Globalization is exacerbating pressures on small-scale household farming systems by promoting monoculture specialization emphasizing exports.

The penetration of global commodity-driven markets into remote areas often creates situations in which local producers in GIAHS, have to compete with agricultural production from intensive (and



Picture 1. Agricultural Heritage of South Mediterranean Region

often subsidized) agriculture in other areas of the world. Among these pressures, inadequate policies inducing subsidized external inputs and lowering farm prices for staples and cash crops often directly transform the overall economic viability and biodiversity basis of traditional systems (FAO, 2008; Kohafkan and dela Cruz, 2011). This limits the capabilities of local inhabitants to meet their food security needs and livelihood requirements.

Often the impacts of these forces include: adoption of unsustainable practices and erosion of traditional knowledge, overexploitation of resources and declining productivity and land degradation, and importation of exotic domesticated species, leading to severe genetic erosion, as well as social disintegration and cultural erosion of rural communities and populations. In sum this leads to a dwindling capacity of these land use-livelihoods systems to deliver and sustain global goods and local benefits.

The current rate of extinction of cultures, habitats, and human-created ecosystems threatens to destroy all hope of meeting this century's food security challenges. There is a pressing need to preserve and safeguard the unique characteristics of agricultural heritage systems. Unless these systems are protected, the GIAHS will meet the fate of most other rural systems, which have been dying all over the world in the wake of industrialization and modernization. Strategies to protect these systems have to be conceived within a global context.

There are many policies that directly and indirectly impact the evolution of farming systems. Their interactions are complex, and thus their individual impacts vary according to the socio-economic and biophysical realities at each GIAHS site. Macro policies are important drivers of change, and they often determine the threats and opportunities that the farmers of a given system face. Exchange rates, trade liberalization, interest rates, fiscal policies, prices stability, and structural adjustment policies can in fact determine the likeliness of a given farming system continuing to be perceived as viable.

Agricultural sector policies naturally play a crucial role in the viability of farming systems: the allocation of funds such as how much is spent on irrigation, the subsidies for small-scale farmers or given commodities, and the regional distribution of funds, agricultural domestic market liberalization, land tenure policies, credit policies, international agricultural trade, agricultural income taxation, research and training, subsector policies and programs, and the reduction of subsidies and public services to the sector. These policies induce changes in pressure on natural resources and changes in local incomes that constrain the viability of given systems or practices while possibly benefiting others.

Certainly, policies concerning the manufacturing and services sectors must also be mentioned because they affect the terms of trade between these sectors and agriculture. They are of primary importance, also, in determining the 'push-pull' factors that may induce, for example, an increasingly significant income gap between rural and urban areas, and a strong rural-urban outmigration, or excessive pressure on the natural resources base of an agricultural system. One way or another, all these policies impact a farming system's environmental conditions, composition and level of production. They affect the economic viability of individual farms within given farming systems, on the incidence of poverty and the level of food insecurity in the area, and finally on the level of outmigration, or inward migration, characterizing the system.

Policy reforms observed in the developing world during the last 30 years were often dramatic. Most changes were to liberalize trade policies, deregulate domestic markets, privatize and decentralize, within the context of continuing structural adjustment programs. In many countries, macro-economic



Picture2. Agricultural Heritage of northern Mediterranean region Italy

policy changes were more effective and proved to be stronger engines of change for agricultural systems than policies in the sector.

External trade and exchange rates have a greater influence on agricultural transformation than central rural and agricultural development policies. However, rural and agricultural sector policies remain highly important in determining the magnitude and direction of the changes induced by macro policies and, in many instances, for specific farming systems and depending on the macro reforms within the country, they may remain a major, if not the principle, driver of change.

To summarize, the major drivers of loss of biodiversity are land-use changes, crop improvement programs, over exploitation of the wild resources, overfishing, high food consumption and waste in some societies, trade liberalization and agricultural subsidies. The consequences of these losses disrupt the lifestyles of the poor who depend upon local ecosystems for their livelihoods, especially in terms of food security.

4. AGRICULTURAL HERITAGE SYSTEMS AND FOOD SECURITY

Increasingly, the global community has recognized that while the last half-century has witnessed striking increases in global food production through intensive use of inputs, such practices are depleting natural resources and impair the ability of agroecosystems to sustain production into the future. In addition, current intensive systems of production and food distribution have not significantly reduced the number of chronically hungry people around the world. We have highlighted that it is both possible and highly advantageous to address future needs by transitioning to systems of food production that are based on an effective use of ecosystem services and in ways that are regenerative, minimizing negative impacts. Such ecological approaches to food production tend to be knowledge-intensive processes, requiring optimal management of nature's ecological functions and biodiversity to improve agricultural system performance, efficiency and farmers' livelihoods (FAO, 2011; Royal Society 2009; Clay 2011; Foley et al. 2011). The stress is thus on knowledge and management skills – of farmers, advisers and researchers- as a major input. In addition to the core desired output of productivity from all agricultural systems, there is a growing recognition that farms and farming have central roles for

human livelihoods in many other respects beyond singular commodity outputs. Farms and farmers are and should be capable of providing multiple goods and services, often beyond farm boundaries. For example, many agricultural zones serve as watersheds for urban areas providing clean water for users downstream. Many agricultural zones occur in biodiversity hotspots, and in centers of crop genetic diversity and there is a need for farmers to be able to continue maintaining these genetic diversities for the present and future generations. Farming systems contribute substantially to the diet diversity of local populations if they are diversified. They may be the repositories for centuries of traditional knowledge and culture, handed down through families. Increasingly, it is recognized that farming practices contribute - positively or negatively - to adaptation to climate change and the mitigation of greenhouse gases and sequestering of carbon in soils.

LINKING AGRICULTURAL HERITAGE AND FOOD HERITAGE (FOOD CULTURE)

Food Heritage is important in revitalization of Sustainable Tourism, conservation of local crops and varieties and their contribution to local food system



By adopting multiple-use strategies, many local and indigenous resource users and farmers manage, in situ, a continuum of agricultural and natural systems, obtaining a variety of products as well as ecological benefits. Diversified systems, such as those based on inter-cropping and agro forestry, and crop/livestock or crop/fish combinations, and those that manage the “associated biodiversity” of soil biota, pest and disease modulating organisms and others, are proven to be more sustainable and have been the target of considerable research. The favourable attributes are related to the higher levels of “functional” biodiversity and effects on the stabilization of agro-ecosystem processes. The challenge is to manage the agro-ecosystem so as to maintain or enhance key ecological services such as nutrient cycling, biological pest regulation, and water and soil conservation. Many traditional and local systems and management practices have developed over years and generations to exploit such relationships between species and inter-linkages between biological processes of land resources.

The use of livestock, for example, is essential to recycle nutrients and maintain ecosystem resilience in the traditional extensive agro-pastoral systems developed over generations in the drylands of

Africa, as well as in the modified intensive systems using stall fed animals in Java, Indonesia and other parts of Asia, where population pressures are high. Moreover, modern agro-ecological technologies that build on increased scientific knowledge of such synergies are recently proving to be more productive, especially in marginal lands, and when the biological structuring of the farm is improved and labor and local resources are efficiently used. They are being adopted in diverse environments and by certain groups of farmers where the socio-economic and political environment proves propitious, as exemplified by organic agriculture, for the production of environmentally friendly but often high value produce, especially for urban communities. The best example of spontaneous adoption on a much wider scale is that of the uptake of conservation tillage in many countries. In overall output, the diversified farm produces more food, but this is achieved with lower negative impacts on the environment, as research shows that small-scale farmers generally take better care of natural resources. For example, they demonstrate superior skill at reducing soil erosion and conserving biodiversity.

5. AGRICULTURAL HERITAGE AND NUTRITION SECURITY

The recognition of the value of nutritional and dietary diversity is becoming an important entry point for exploring the roles and place of traditional agriculture in sustainable food systems. The causes and consequences of the impoverishment in food diversity and simplification of diets span culture, health, agriculture, markets and environment and are complex to address. However agricultural biodiversity can play an important role in reducing nutritional problems (Johns and Eyzaguirre, 2006). The combination of various crops and animals in traditional agro-ecosystems permits not only the more-efficient utilization of ecological niches, it also increases locally available nutrients for human diets or improves household income, allowing the purchase of alternative food items on the market.

Indigenous species are important to health besides having an important role in ecologically based production systems. In many crops, the difference between one variety and another can make the difference between micronutrient deficiency and micronutrient adequacy. Initiatives that are implementing an integrated approach to sustainable food system and improved nutrition have successfully built upon locally available biodiversity to revitalize local or regional food products and systems and have had a positive impact on communities' livelihoods and health. In many countries, consumers are already willing to pay more for products that come from sustainable agricultural systems organically produced food and traditional landscapes because of health and environmental concerns. Product certification is one of the most commonly used instruments to identify and add value to such products and can provide a price premium for producers. The market for certified organic products has been growing by 20% a year since the early 1990s, a lot faster than the rest of the food industry both in developed and developing nations. Estimates of future growth range from 10% to 50% annually depending on the country. Certification is used not only for organic products, estimated at over 35 million hectares in 2008 (Willer and Kilcher, 2010), but also for those obtained through the use of a wide range of practices that conserve soil resources, wild habitats, endangered species or forest land. The Rainforest Alliance runs a certification programme for coffee from shaded plantations that maintain forest cover and prevent soil erosion. The Salmon-Safe Agricultural Products programme in the USA awards a label to farmers who protect salmon habitat. Fairtrade labelling embraces a concept of sustainability that goes beyond natural and environmental values to include social equity in securing livelihoods and adequate income for producers, especially from small holders and family farmers in developing countries.

There is great potential to develop markets for underutilized or wild species, given the wide availability of crops, livestock and fish that have not been (fully) domesticated or commercially exploited. Such developments would support the conservation through use of a wider range of genetic resources while providing farmers with opportunities to diversify livelihood options and increase their incomes, which is particularly relevant in dealing with global changes. The development of new markets, however, needs to take into account possible modifications along the entire supply chain, including measures to ensure stable supply of planting or breeding stocks, to adapt processing technologies and to set quality standards.

6. AGRICULTURAL HERITAGE AND AGROECOLOGY

Despite the evidence of the resiliency and productivity advantages of small-scale and traditional farming systems, many scientists and development specialists and organizations argue that the performance of subsistence agriculture is unsatisfactory, and that agrochemical and transgenic intensification of production is essential for the transition from subsistence to commercial production. Although such intensification approaches have met with much failure, research indicates that traditional crop and animal combinations can often be adapted to increase productivity. This is the case when ecological principles are used in the redesign of small farms, enhancing the habitat so that it promotes healthy plant growth, stresses pests, and encourages beneficial organisms while using labour and local resources more efficiently.

Several reviews have amply documented that small farmers can produce much of the needed food for rural and neighbouring urban communities in the midst of climate change and burgeoning energy costs. The evidence is conclusive: new agro-ecological approaches and technologies spearheaded by farmers, NGOs, and some local governments around the world are already making a sufficient contribution to food security at the household, national, and regional levels.

Whether the potential and spread of agro ecological innovations is realized depends on several factors and major changes in policies, institutions, and research and development approaches. Proposed agro-ecological strategies need to target the poor deliberately, and not only aim at increasing production and conserving natural resources. But they must also create employment and provide access to local inputs and local markets. Any serious attempt at developing sustainable agricultural technologies must bring to bear local knowledge and skills on the research process. Particular emphasis must be given to involving farmers directly in the formulation of the research agenda and on their active participation in the process of technological innovation and dissemination through farmers-to-farmers models that focus on sharing experiences, strengthening local research, and problem-solving capacities. The agro-ecological process requires participation and enhancement of the farmer's ecological literacy about their farms and resources, laying the foundation for empowerment and continuous innovation by rural communities.

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MAINSTREAMING SUSTAINABILITY OF FOOD SYSTEMS THROUGH SUSTAINABLE FINANCE

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ABSTRACT To achieve SFS at scale the finance for food systems must change. The correlation of food systems with the use of natural resources and in particular land, water, energy, the correlation with CO2 emissions, the impact of food on health of individuals and communities confirm that what happens in food systems is paramount. What happens in food systems for sustainability is a function of the finance related to them, both for investments and for the working capital. SDGs related questions should be asked by financiers before providing loans or equity, therefore the science related to SDG measurement must be made simple for companies and for loan officers of banks to use assess and apply them. The article explores few examples to demonstrate the win-win approach for financiers in applying sustainability criteria. For consumers in mature markets, the appeal of sustainability is already increasing. Yet the financial sector is doing too little to mainstream sustainability via incentives, discounts, conditionalities in their business which will outreach the millions of small companies in our planet with no resources to address sustainability. All this will be also of great advantage for the promotion of sustainable and healthy diets, such as the Mediterranean diet. The article argues that the approach of value chain can be useful but to improve at scale sustainability and transparency, mainstreaming SDG via sustainable finance is the key.

Keywords Sustainable finance - Mainstreaming sustainability in finance - Impact investing - ESG for SDGs.

LA FINANCE ET LES INVESTISSEMENTS AXÉS SUR LES ODD COMME FACTEURS D'INCITATION FONDAMENTAUX POUR LES SYSTÈMES ALIMENTAIRES DURABLES

Résumé Pour parvenir à un SFS à grande échelle, le financement des systèmes alimentaires doit changer. La corrélation des systèmes alimentaires avec l'utilisation des ressources naturelles et notamment de la terre, de l'eau, de l'énergie, la corrélation avec les émissions de CO2, l'impact de l'alimentation sur la santé des individus et des communautés confirment que ce qui se passe dans les systèmes alimentaires est primordial. Ce qui se passe dans les systèmes alimentaires en matière de durabilité dépend du financement qui leur est associé, tant pour les investissements que pour le fonds de roulement de tous les acteurs économiques impliqués. Les questions liées aux ODD devraient être posées par les financiers avant d'accorder des prêts ou des capitaux propres. Par conséquent, la science liée à la mesure des ODD doit être simplifiée pour que les entreprises et les agents de crédit des banques puissent les utiliser, les évaluer et les appliquer. L'article explore quelques exemples pour démontrer l'approche gagnant-gagnant pour les financiers dans l'application des critères de durabilité. Pour les consommateurs, l'attrait de la durabilité augmente déjà. Le secteur financier ne fait pas grand-chose pour intégrer la durabilité via des incitations, des remises et des conditionnalités dans ses activités qui toucheront les millions de petites entreprises sans ressources pour aborder la durabilité. Tout cela sera d'un grand avantage pour la promotion d'une alimentation durable et saine, comme le régime méditerranéen. L'article soutient que l'approche de la chaîne de valeur peut être utile, mais que pour améliorer à grande échelle la durabilité et la transparence, l'intégration des ODD via la finance durable est la clé.

Mots-clés Finance durable - Intégrer la durabilité dans la finance - Investissement d'impact - ESG pour les ODD.

1. INTRODUCTION AND FRAMEWORK

The idea to work on SDG compliance starts with policy action of the author in FAO (2018-2020) and it is a direct outcome of the 2nd World Conference on the Revitalization of the Mediterranean Diet (Capone and Dernini, 2022) reinforced by the 3rd Conference in 2022 (Capone and Dernini, 2022)¹. As an affiliated project of the United Nations One Planet Network Sustainable Food Systems Programme²,

1. The Conference was organized by CIHEAM-Bari and the Forum on Mediterranean Food Cultures, with the technical support of FAO, under the auspices of CIHEAM, UfM, the Italian Ministry of Foreign Affairs and International Cooperation, the Italian Ministry of Agriculture, Food, Forestry and Tourism, the Italian Ministry of Health, the Sicilian Region, the City of Palermo, IFMeD (International Foundation of the Mediterranean Diet), FENS (Federation of European Nutrition Societies). It was made in collaboration with CNR, CREA, ENEA, ICAF (International Commission on Food Anthropology), ICARDA, SINU, SFN, SENC, Society for Nutrition Education and Behaviour, CMI (Center for Mediterranean Integration), and many other international and national institutions.

2. <https://www.oneplanetnetwork.org/sustainable-food-system>

CIHEAM, FAO and UfM expressed their interest to develop a joint proposal, as a collaborative effort, for the establishment of a Multi-stakeholder Sustainable Food Systems (SFS) Platform in the Mediterranean, to be defined in its operational inclusive format, for a broader participation and engagement of all interested stakeholders.

Immediately it was clear that the key was finance which was the topic of one of the conclusive panels at the 3rd Conference “A change of Route”: towards more sustainable and resilient food systems in the Med countries held in Bari on 28-30 September 2022 (Dernini and Capone, 2022).

A better understanding of the multidimensionality of the sustainability of food systems, as well as interconnections between individual SDGs implies the application of SDG due diligence to Finance for and through Food systems. As part of the efforts towards the 2030 Agenda, global commitment in the international community for a shift towards more sustainable food systems has increased significantly over recent years, yet on the financial aspects there is still reliance on voluntary ESG (not SDGs) or CSR (not SDGs) and individual approaches by companies or associations that far too often do not display the necessary scientific level of objectivity and rigour. As a matter of fact, in some cases the expression “greenwashing” is used to define the superficial and episodic approach to sustainability. A previous work in FAO “SDGs for People Planet and Prosperity (Ridolfi, 2019)” tried to simplify the approach of SDG due diligence even though maintaining it within scientific objectivity. This effort of simplification is also at the foundation of the finance for SDGs. In fact, Investors and with them the commercial framework of finance are not keen to invest outside their core business and therefore SDG must be brought to them.

2. THE CORE OF NEEDS FOR A CHANGE OF ROUTE IN SFS.

Sustainability and sustainable development are directed towards a better world of which there is no sign in sight. Ever growing migration and conflicts remind it to us. It is, in fact, highly unlikely that the number of unemployed people will decrease in the short-term (ILO, 2018). Similarly worrying is a recent estimate by ILO that indicates that vulnerable employment is on the rise and concerns more than 40% of workers globally. Making food systems more efficient and fairer is key to redressing the economy and to creating decent works for many. On the one hand, given the importance of agriculture in many developing countries, improving efficiency along agricultural supply chains could create the foundation for renewed economic growth in emerging economies. On the other hand, given that the agricultural sector is still the main source of employment in low-income countries (69%), it is also the sector where efforts should focus to improve decent work conditions for women and men, and the young people, essential to SDG1 (No Poverty).

The agriculture-climate change nexus, as agriculture is both one of the largest sources of greenhouse gas emissions and the sector most impacted by climate change. The International Panel on Climate Change (IPCC) showed that impacts from recent climate extremes have revealed the strong vulnerability of human and eco-systems to climate variability (IPCC, 2014).

But all the above need investments. The aspects of providing one framework and one metric for sustainability due diligence in financing is essential for the financial ecosystem of sustainability.

In order to develop functioning structures and systems for SDG compliance the financial players can profit of guarantee schemes subsidies and other blending facilities that were or are being developed, External Investment Plan, from farm to fork, next generation EU and the various plans to relaunch

economic prosperity by governments (such the PNRR in Italy) also in relation to recent pandemic crisis (Ridolfi, 2020) and institutions like the European Commission that run an agreed policy of principles and approaches on financing sustainability.

The achievements of SDGs while enjoying broad policy support, verbal and in writing, have been under-financed. The annual financing gap to achieve the SDGs by 2030 has been estimated at USD 2.5 trillion. Until now, development finance institutions (DFIs) have been mainly focusing on a few “easy”, low-risk SDGs and in relatively stable country frameworks. All countries and will need to realistically reconsider how we can finance the SDGs to achieve them by 2030. Blended finance and public-public, public-private, and private-private impact investments have the potential to scale up efforts, perhaps combined with stimulus packages allocated for post-COVID-19 recovery and for post war recoveries.

Increasing uncertainty will increase the risks, more so in developing economies, and the increased risk perception will unavoidably not only increase the cost of capital but the actual decision to invest. There will be a boost to self-sufficiency in many wealthy nations to reduce the long supply chains beyond borders and, therefore, FDI in developing countries will decrease further.

3. PROCLAIMS AND REALITY FAR APART. WHERE TO LOOK FOR GOOD POLICY TIPS?

But who is seriously working on SDGs at scale today? Several think tanks, NGOs and research institutes, some governments and DFIs and a few enlightened entrepreneurs, very few bankers. This isn't enough. The goals of Agenda 2030 and the SFSs in the critical Mediterranean area require the commitment of a much wider turnout of participants, starting with those who can **mobilise** the necessary financial resources.

In the MED arena with the challenging climate change scenario, the food systems are probably one of the most complex geopolitical-sector scenarios on our planet.

The panel at the third conference on the Mediterranean diet has demonstrated how the essential catalyst role of blended finance can play out in the sustainable development finance architecture.

Grants, equity, loans, debt, and risk mitigation products (guarantees and insurance products, including hedging): all of these can and must probably include a “blended” (concessionary) component. The concessionary element can be used to address different goals imposed using public funds, one of these goals is the creation of jobs to curb migration. However, **most remarkably the concessionary element can be used to impose SDG compliance of the investments.**

The SDGs that were launched as a blueprint for a more just, sustainable, and prosperous future, through the UN, are gaining recognitions within the private sector. Impact investors and private companies in Food Systems aiming for a corporate disclosure on the SDGs are looking for tools and ways to analyse and present their performance on the SDGs. It is therefore important to embed sustainability in commercial and institutional investors actions

4. THE ROLE OF BLENDED FINANCE AND THE NEED TO MAINSTREAM SDG FINANCE IN COMMERCIAL BANKS AS CATALYSER

The actors of blended finance have been traditionally big grant providers like the European Union (grants) and DFIs (loans).

A reference can be made to the European External Investment Plan (EIP)³, the result of a 10-year experience of the European Commission, more specifically of the directorates for Sustainable Development, and Planet and Prosperity under the Directorate-General for International Cooperation and Development in the years 2013- 2017⁴.

The development finance sector is essential, as it is the bridge between commercial financing and donorship. The purpose of this paper is to analyse the current state of the art in methodologies and policies applied by DFIs in assessing sustainability.

There are several financial schemes or architectures that can be cited as examples, and they were built using a variety of instruments based on the public grant, public development bank lending (quasi commercial) plus private equity and lending.

Grants, equity, loans, debt, and risk mitigation products (guarantees and insurance products, including hedging): all of these can include a “blended” (concessionary) component. The concessionary element within agricultural blended finance transactions can be used to address different goals imposed using public funds: for example, to ensure adequate training through technical assistance (TA), creating market facilitating infrastructure (e.g.: collateral registries, warehouses), establishing public grant funds to match private investments (such as the challenge funds), and setting up subsidized guarantee programs and insurance schemes.

5. HOW FINANCIAL ACTORS ARE SETTING THE OPERATIONS TO VERIFY AND OR APPRAISE SUSTAINABILITY ALIGNMENT OR COMPLIANCE: AN APPROACH TO METRIC

Disclosure and reporting transparently are key but not enough to accelerate the transformation towards a sustainable world.

It is not by chance that the World Benchmarking Alliance has started with long delays benchmarking for the financial sector.

For the great role that finance sector plays on sustainability we shall look at the internal processes that FIs are giving themselves to assess, measure and quantify compliance or alignment to SDGs.

Some financial actors are analysed on public easily available information about their rules and procedures if any, on checking SDG more often defined Environmental and Social Issues.

The level vary greatly from IFC which has been setting the standards for a certain time to less structured mechanisms in other banks.

The analysis of banks and DFIs as well some global investors entering the field of Development Finance shows beyond doubts the need, even for experienced IFIs, of having concrete tools to measure, compare, (benchmark) improve, and report the sustainability of investments under the SDGs umbrella. They do not have it and they could apply them as part of the appraisal, decision making monitoring and reporting of their investments also contributing to the reporting of countries of operations and companies financed throughout the process.

3. https://ec.europa.eu/commission/eu-external-investment-plan_en

4. https://ec.europa.eu/commission/presscorner/detail/en/MEMO_17_3484

6. SOME RECOMMENDATIONS FOR ACTION

The above analysis on the current available information on SDG compliance systems currently existing in banks coupled with poor standardisation of processes, largely use of qualitative not quantitative criteria, small capacity to measure impact, small capacity to report on progress for targets, are some of the main issues to be addressed.

Better standardisation of processes will be necessary both at the level of SDG indicators and data, as well as at the level of blended-finance frameworks. Data-driven analysis used for comparative and benchmarking will help to position businesses along the sustainability spectrum across their value chains can be useful in understanding how maximizing SDG compliance will correlate to market positioning and good financial returns. Leveraging the SDGs as a framework not only for sustainable development, but also for innovation towards generating new, more future-ready revenue streams, can help identify business opportunities that simultaneously serve the needs of the SDGs⁵.

6.1 THE WORK AT SCIENTIFIC LEVEL MUST BE TRANSLATED INTO BUSINESS PRACTICES PRICING EXTERNALITIES LINKED TO NATURE.

A set of global and science-based metrics is being developed on the solid basis of SDG indicators. The metrics must translate the SDGs in tangible business decisions for investors, large and small public and private. To achieve that an effort of simplification and practical approaches will have to be explored to deal with the complexity of SDGs.

Similar tasks have been undertaken on climate finance or energy and the path can be followed for food. It will be important to gather broad stakeholder input: the metrics must be scientifically robust, simple concrete, and must make business sense since it must be achievable. Companies and investors must be part of the process to own the implementation. A buy-in from venture capital investors driving the market towards companies with sustainable practices is also essential. In Food systems using block chain technologies will be essential to link up quickly disclosure and SDGs at the fingertips of the finance leader to generate in time, financial decision to make production compliant and supply-chain information demonstrating sustainability.

With time this can be translated into science-based indexes for the financial markets as in fact ultimately the mainstreaming of SDG (i.e. SDGs are good for business) will be measured by establishing if financing decisions are tied to companies demonstrating sustainability via measurable indicators indicating their performance across the dimensions of nature, energy, water, chemicals, soil, social dimensions including governance issues on the management of natural capital and land in particular. These performances must be displayed in the financial markets.

6.2 POLICY MAKERS MUST CREATE INCENTIVES FOR FOOD PRODUCERS AND OTHER ACTORS ALONG THE CHAIN TO MEET SDG-ALIGNED TARGETS.

Pending the arrival of the new economic theory, subsidies, tax breaks and other incentives should be created specifically to support small and medium size producers and food processors companies in their transition to sustainable practices. These incentives can only exist if tied straightforwardly to the

5. I will not enter here in the difficult question of offsetting in case targets are moving in opposite directions of sustainability. It is an extremely complex question that is situation specific and it will not be treated here.

targets of the SDGs, (translated in practice by the metrics above and by the tools) and supporting the virtuous behaviour of consumers. In the medium term will be crucial to conceive new financial blended instruments to allow investors to hedge risk and push food and agriculture companies to be rewarded for their performance.

6.3 THE PUSH FACTOR FROM INVESTORS TOWARDS SDG ALIGNMENT AND TRANSPARENT REPORTING WILL SCALE UP SUSTAINABILITY

Pressure from investors and shareholders for increased disclosure and transparency about sustainability in company reporting will drive investors to hold public companies accountable. The financial segment of the food system can share due diligence processes and methodologies, including certification to reduce system costs and encourage standardization on the high upper end of the spectrum of quality. The tools conceived for business will have the same metric of certification, validation schemes to be used in loan appraisal and investment design. The indexes also mentioned above will be based again on the same metrics.

However, the financial sector will not take any more risks than those that they are ready to take. For this reason, (and always awaiting for the new economic theory) we need to connect the blended finance techniques in a way that are instrumental to the policy incentives and the schemes that public authorities will decide to implement.

7 ARTIFICIAL INTELLIGENCE “BOTS” AND BIG DATA PLATFORM SFS: A PROPOSAL FOR MEDITERRANEAN COOPERATION AND BEYOND

As we said data driven analysis metric coupled with benchmarking through artificial intelligence can come useful to make sustainability simpler by promoting innovations towards it. To manage structural change and to support innovations as efficiently as possible, local incubators for innovation need to be developed and strengthened.

Sustainable innovation, building on sustainable development, and on systems thinking, can help us understand and solve complex and generating sustainable well-being as prerequisites for innovation and as sources of competitive advantage for innovation and knowledge ecosystems. Transition towards sustainable food systems globally and in the Mediterranean area requires coordinated actions at local, national, and regional levels. In this regard, the multi-stakeholder platform on sustainable food systems in the Mediterranean can serve as a catalyst of multi-actor initiatives on food systems in the region.

Creative platform models in the global economy produce considerable value for global value networks. They are well known and attract talent, firms, and investments. In them, we can find a dynamic innovation ecosystem where innovations emerge when different actors collaborate. The SFS MED platform aims to strengthen the cooperation for the business success in the agri-food system, which include two approaches on the supply and demand side with the same aim to exchange information, competences and knowledge among different players supporting the growth of all of them.

Dialogues among all stakeholders to redesign the future of tomorrow's food systems are needed to trigger collective, multi-stakeholder actions on the ground, at local, regional, and global level, towards more sustainable food systems, linking sustainable food production to more healthy and sustainable food consumption. (Ridolfi et al, 2020). Indeed, data on projects and programmes collected and stored in the platform to be read and analysed via AI techniques will allow to provide benchmarking vis a vis existing accessible databases national

regional and global and will make available solutions (best practices) to all in a new marketplace of innovation based on big data analysis and benchmarking.

Accordingly we can define the SFS as an integrated set of digital tools based on a central platform to provide an open vision of different activities and best practice related to innovation and sustainable issue in the agrifood system implemented around the Mediterranean region.

The “SFS-MED Platform”, is the conceptual framework in which this AI platform operates: a multi-stakeholder initiative initiated by CIHEAM, FAO and UfM Secretariat and offers a forum to facilitate collaboration among private and public institutions, sharing a common approach to food systems transformation, mobilizing funds, and fostering investments, capacities, and innovation as a systemic response to the challenges hindering the region.

In fact one of the key objectives of the SFS-MED Platform to identify and/or develop a number of flagship proposals, link them to innovation and best practices in order to build communities of practice within the platform to share knowledge which combined with the mobilization of resources can boost the scaling up of concrete actions for sustainable food systems to support positive evidence-based exchange across stakeholders, financial institutions and investors.

To this purpose, the SFS-MED Platform can provide the conceptual framework to create a tool, an AI platform to engage with stakeholders i.e. private companies, CSOs, academic and research centers, policy making entities in the food system from Member countries and regional bodies to identify and map initiatives addressing sustainable food system (SFS) issues, explore stakeholders’ interest to contribute to the platform by proposing best practices, innovations and flagship projects which will be screened and then hosted on the platform become part of the communities of practice and be able to mobilize resources to be mainstreamed into SFS.

The agri-food sector can play a central role in the transition of Mediterranean economics towards more environmentally sustainable and climate-neutral economic models such as bioeconomy, blue economy, green economy, and circular economy.

The platform could constitute a link to proposed criteria to be implemented in the exercise of mapping existing projects, initiatives, policies, and other instruments that can qualify as “flagship projects” in the context of the Multi-stakeholder Sustainable Food Systems Platform in the Mediterranean region. The solution is to bridge the gap between science, policy and business requires investing in specific competences and professional figures, such as innovation brokers, to facilitate an innovative ecosystem, connect with local needs, and enhance the transfer of knowledge from research centers to applied fields.

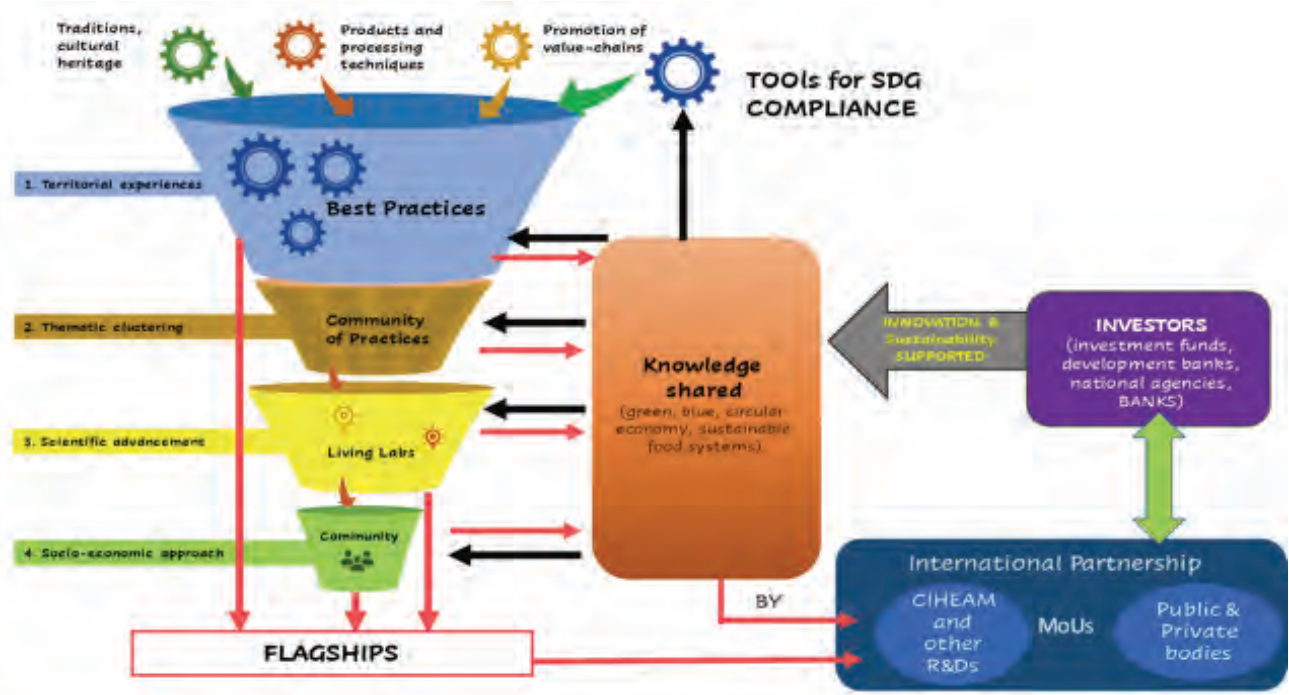
7.1 A CONCEPTUAL APPROACH FOR AI TO COMPARE, ANALYZE, BENCHMARK, AND DRIVE SUSTAINABILITY.

Let’s try now to provide a logical flow chart on how this AI platform can work. Against the complexity of analysing data to assess sustainability to make it part of the credit appraisal process the new techniques of artificial intelligence are useful.

Here on the right the conceptual approach (Figure 1) that could be proposed for the platform becoming an essential element of the Finance for sustainability in the Food systems. The numbering is referred to the picture.

1. The elaboration of tools for SDG compliance based on science but made simple for business and investors to use is combined with the experience of producers and the techniques used including the values of traditions cultural heritage etc. We can call this the acquisition of the territorial experience.
2. The above set of experiences and techniques will configure the definition of best practices which are shared among stakeholders organised (by virtue of their specific competence into communities of practice) and then discussed, challenged, and eventually improved in **very specific and concrete situations**. This is defined as the thematic clustering.
3. The discussions among the community of practice are further tested in living labs and advanced research centres for scientific advancement and coupled with a sociologic approach that plugs
4. into real life community experience featured by high inclusion, high intensity participatory approaches for the essential socio-economic approach.
5. All the process above eventually defines the flagships which are in the SFS platform high relevant, replicable frameworks into concrete situations. They become the subject of partnership (local or international) between research centres able to nurture the knowledge around them and ensuring replicability with public and private actors interested in their application and use.
6. Those elements as filtered above and presented for replicability also via valorisation, become the core of the SDG compliance applied by investors which are financial actors in their approach to finance the players of the Food systems at all levels.
7. This is what we call innovation and sustainability becoming the knowledge shared by the platform and mainstreamed feeding in turn new tested tools for SDG compliance (see point 1) restarting the cycle.

Figure 1. Conceptual approach of AI to SFS. Diagram by the author



Sustainability of food systems can be measured by several indicators and targets. We try to build a meaningful list of clusters linked to concrete real practices of players in the value chain. Ten points around clearly identifiable functions and domains define the communities of practice:

- Water is the blue gold.
- Climate is impacting negatively on food production.
- A bee can save the planet. Biodiversity
- Food is a natural right. Food security
- Eating good is good health. Nutritional quality
- Good economics behind sustainability. Economic viability
- 3R Reduce, Reuse, Recycle
- “Gaia” our mother lives well under a good skin. Healthy soil is essential.
- Fair is fair. Fair trade
- Always looking ahead. Innovation and research

8. CONCLUSION

It is possible and realistic today promote the advancement of sustainability in Food systems through the adoption of data analysis with techniques of AI that can verify the indicators linked to positive improvement of SDG targets in unambiguous way by reading the quantitative features of a project or programm, compare them with available databases and benchmark SDG targets of that experience against the market performances on the same.

Applying AI techniques will allow to “mine” and “dig out” the data both from project results and databases to be compared also proposing PROXIES.

The use of the platform by financial actors will allow them to apply criteria and valuation ex ante to finance investments that privilege and support sustainability therefore promoting and scaling up sustainability in a massive way.

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A RETHINKING OF THE MEDITERRANEAN DIET AS A CROSS-CUTTING SCP ACCELERATOR FOR AN SFS-MED TRANSFORMATION BRIDGING SUSTAINABLE FOOD CONSUMPTION AND PRODUCTION

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ABSTRACT A transformational change of route towards more sustainable food systems (SFS) and diets is needed to address the multiple and interdependent challenges facing the Mediterranean region, as highlighted at the 3rd World MD Conference organized by CIHEAM Bari in 2022. There is no clear common understanding of what sustainability means and how to assess trade-offs between its three pillars: environmental, economic, and social. The implementation of the SFS-MED Platform conceptual framework can provide a common language for a better sustainability understanding and action on the ground. It requires a holistic and ecological SFS-MED approach, context-specific for the Mediterranean, by taking into account different country realities and a wider, inclusive and collaborative multi-stakeholder participation. Since 2011, CIHEAM and FAO have identified the Mediterranean diet as a case study for improving the sustainability of Mediterranean food systems and food consumption patterns. In 2015, the Med Diet 4.0 framework was designed to highlight the multiple sustainable benefits of the Mediterranean diet, shifting its mainstream narrative from health to sustainability by linking sustainable food consumption and production (SCP), to activate a wider range of stakeholders from other sectors. In conclusion, this SFS-MED “Change of Route” requires a new transdisciplinary rethinking, a change of mindset, overcoming silos of disciplines, different levels of specialization, and fragmented sectoral approaches. It requires bringing together sciences and humanities and connecting people with nature.

Keywords Sustainable Food Systems (SFS) - Sustainable Consumption and Production (SCP) -Mediterranean diet - Sustainable diets – Sustainability – Mediterranean countries.

REPENSER LA DIÈTE MÉDITERRANÉENNE COMME ACCÉLÉRATEUR TRANSVERSAL DE LA CONSOMMATION ET DE LA PRODUCTION ALIMENTAIRES DURABLES (CPD) POUR UNE TRANSFORMATION DES SYSTÈMES ALIMENTAIRES DURABLES (SAD) EN MÉDITERRANÉE RELIANT CONSOMMATION ET PRODUCTION ALIMENTAIRE DURABLE

Résumé Un changement de cap transformationnel vers des systèmes alimentaires et des régimes alimentaires plus durables est nécessaire pour relever les défis multiples et interdépendants auxquels est confrontée la région méditerranéenne, comme il a été souligné lors de la 3ème conférence mondiale sur la diète méditerranéenne organisée par le CIHEAM Bari en 2022. La notion de durabilité et la manière d'évaluer les interactions et les compromis entre ses trois piliers, économique, social et environnemental, ne reposent pas encore sur une vision claire et unanime, La mise en œuvre du cadre conceptuel de la plateforme SFS-MED peut permettre de disposer d'un langage commun pour une meilleure compréhension de la durabilité et une action plus ponctuelle sur le terrain. Pour ce faire, il est nécessaire d'adopter une approche holistique et écologique concernant les SAD méditerranéens, viable et partagée, adaptée au contexte de la région, en tenant compte des différentes réalités nationales et en s'appuyant sur une participation collaborative, élargie, inclusive et multi-acteurs. A partir de 2011, le CIHEAM et la FAO ont proposé la diète méditerranéenne comme une étude de cas pour promouvoir la durabilité des systèmes alimentaires et des modes de consommation alimentaire méditerranéens. En 2015, le cadre 'Med Diet 4.0' a été conçu pour faire ressortir les bienfaits multiples et viables de la diète méditerranéenne, en réorientant le discours dominant axé sur les vertus sanitaires pour miser sur la durabilité, en reliant consommation et production alimentaires durables (CPD), afin de mobiliser un plus large éventail de parties prenantes dans d'autres secteurs. En conclusion, ce « changement de cap » nécessite une nouvelle réflexion transdisciplinaire, un nouvel état d'esprit, permettant de dépasser les cloisonnements de disciplines, les différents niveaux de spécialisation et les approches sectorielles fragmentées. Ce qui revient à dire réunir sciences et humanités et relier les gens à la nature.

Mots-clés Systèmes alimentaires durables (SAD) - Consommation et production durables (CPD) - Diète méditerranéenne - Régimes alimentaires durables - Durabilité - Méditerranée.

1. INTRODUCTION

The world is not on track to achieve the 2030 Agenda by 2030. Global Food Systems are broken.

(Antonio Guterres, UN Secretary-General, 2023).¹

Global commitment in the international community for a shift towards more sustainable food systems has been increased in the last decade following the Rio+20 United Nations Conference on Sustainable Development Conference “The future we want” (UN, 2012), and significantly accelerated by the 2021 Food Systems Summit and its Stocktaking Moment+2 follow-up process (UNFSS+2, 2023).

Evidence on the unsustainability of food systems and diets has been accumulating over last years (HLPE, 2017; Springmann et al., 2018; von Braun et al., 2021). A sustainable food system has been defined as “a food system that ensures food security and nutrition for all in such a way that the economic, social and environmental bases for generating food security and nutrition for future generations are not compromised” (HLPE, 2014).

“Sustainability” was defined in 1987 in the report “Our Common Future” of the World Commission on Environment and Development as “meeting the needs of the present without compromising the ability of future generations to meet their own needs” (UN, 1987). This definition is still recognized as increasingly complex and criticisms abound (Bene et al., 2019). There is no clear common understanding on what “sustainability” means and how to assess its economic, social and environmental dimensions and interactions (Pawłowski, 2008; Strezov et al., 2017).

In early 80s, the notion of “sustainable diets” started to be explored (Gussow and Clancy, 1986) to recommend diets healthier for the environment as well as for consumers. After the publication of these first dietary sustainability recommendations, critics continued to raise controversies about sustainable diets (Gussow, 1999; Merrigan et al., 2015).

With the food globalization process and the increased agricultural industrialization, with no attention for the sustainability of the agro-foods ecosystems, the sustainable diet’s concept was neglected for many years.

In the last decade, the interest in sustainable diets again raised, because the evidence of unsustainable dietary trends to feed a growing world population, expected to reach 9 billion people in 2050, with an increased demand for animal products by 60 percent (Alexandratos and Bruinsma, 2012). An international scientific a consensus was reached in 2010 on a definition of sustainable diets as “diets with low environmental impact which contribute to food and nutritional security and healthy lives 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” (Burlingame and Dernini, 2012).

In 2011, a joint case study on the Mediterranean diet as a sustainable diet model was initiated by FAO and CIHEAM for the characterization and assessment of the sustainability of food consumption patterns and diets in the Mediterranean region (FAO/CIHEAM, 2012).

1. <https://news.un.org/en/story/2023/07/1139037>

2. BACKGROUND

Since 2002, CIHEAM with the Forum on Mediterranean Food Cultures has developed a continuous collaboration on the Mediterranean diet as a sustainable resource for the region.

In 2005, at the Third EuroMed Forum “Dialogues between Civilizations and People of the Mediterranean: The Food Cultures”, at the Sapienza University of Rome², “The Call of Rome for a Common Action on Food in the Mediterranean” was issued³.

In 2009, at the 3rd International CIISCAM Conference “The Mediterranean Diet Today: A Model of Sustainable Diet”⁴ a new revised Mediterranean diet pyramid was elaborated, in which elements such as seasonality, biodiversity, traditional, local and eco-friendly products, culinary activities, frugality and conviviality, were also represented (Bach-Faig et al., 2011).

In 2010, at the International Scientific Symposium “Biodiversity and Sustainable Diets: United Against Hunger”, at FAO in Rome⁵, in which an entire session was devoted to the Mediterranean diet as a model of a sustainable diet, a scientific consensus on the definition of “sustainable diets”, with the Mediterranean diet as an example, was reached⁶.

In 2011, at the International CIHEAM-FAO workshop on “Guidelines for the Sustainability of the Mediterranean Diet”, at the CIHEAM-Bari, as a joint case study for the assessment of the sustainability of the Mediterranean diet an initial series of 24 indicators within four thematic areas: Environment and natural resources (including agro-biodiversity); Economy, Society & Culture; Nutrition, health and lifestyle were identified, within a broader group of 74 potential indicators, to assess the sustainability of the Mediterranean diet (FAO/CIHEAM, 2012).

In 2014, at the International Workshop “Assessing Sustainable Diets within the Sustainability of Food Systems. Mediterranean diet, organic food: new challenges” at the CREA-NUT in Rome, a revised set of 13 nutrition and health indicators was identified (FAO, 2015).

In 2015, at the International Conference “Does the Mediterranean diet Still exist? Nutrition-Health-Quality-Sustainability-Innovation-Evolution”⁷, at the EXPO of Milan, “The Med Diet 2015 EXPO Call: Time to Act Now” was issued by CIHEAM towards more sustainable food systems and diets for present and future generations in the Mediterranean⁸.

In 2016, at the 1st World Conference on the Mediterranean diet “Revitalizing the Mediterranean diet: From a healthy dietary pattern to a healthy Mediterranean sustainable lifestyle” held in Milan⁹, the Call

1. <https://news.un.org/en/story/2023/07/1139037>

2. https://www.medfoodcultures.org/241/185/products/3_forum_on_mediterranean_food_cultures_rome.html

3. https://www.medfoodcultures.org/241/298/products/2005_open_call_for_a_common_action.html

4. https://www.medfoodcultures.org/245/activities_2009.html

5. <https://www.fao.org/ag/humannutrition/29186-021e012ff2db1b0eb6f6228e1d98c806a.pdf>

6. <https://www.fao.org/3/i3004e/i3004e00.pdf>

7. https://www.medfoodcultures.org/306/activities_2015.html

8. https://www.medfoodcultures.org/306/299/products/2015_med_diet_expo_open_call_time_to_act_now.html

9. https://www.medfoodcultures.org/304/291/products/first_world_conference_on_the_revitalization_of_the_mediterranean_diet_6_8_july_2016_milan.html

of action for its revitalization was issued acknowledging the Mediterranean diet as a pivotal element for sustainable food systems in the Mediterranean¹⁰.

In 2019, as outcome of the 2nd World Conference on the Revitalization of the Mediterranean Diet on “Strategies towards More Sustainable Food Systems in the Mediterranean Region - The Mediterranean Diet as a Lever Bridging Consumption and Production in a Sustainable and Healthy Way”, held in Palermo¹¹, the SFS-Med Platform was initiated by CIHEAM, FAO and Union for the Mediterranean (UfM), as a multi-stakeholder initiative on sustainable food systems in the Mediterranean, within the United Nations One Planet Network’s Sustainable Food Systems Programme¹². In July 2019, in the renewed Memorandum of Understanding (MoU) between FAO and CIHEAM, the development of the multi-stakeholder sustainable food systems platform was included in the MoU workplan. Then, in the fall 2019, a Coordination Desk, hosted at the CIHEAM Bari and made by focal points of CIHEAM, FAO and UfM was formed, and an SFS-MED Platform common ground paper was elaborated, Med context-specific, for a broader inclusive stakeholder participation¹³.

In January 2021, a tripartite MoU was signed by FAO, CIHEAM and UfM to accelerate the Agenda 2030 in the region with the SFS-MED Platform acting as a joint activity. In the fall, the PRIMA Foundation joined the Platform Coordination Desk.

In 2022, the 3rd World Conference on the Revitalization of the Mediterranean diet » was organized by CIHEAM Bari, with the main objectives, among others, to: 1) **Enhance a change of route** in the Mediterranean for a shift towards more sustainable and resilient food systems for accelerating the Agenda 2030 at the country level; 2) **Enhance the SFS-MED Platform by strengthening multi-stakeholder partnerships across the entire region;** 3) **Catalyse more collaborative multi-stakeholder** “green”, “blue” and “circular” SFS actions on the ground in Mediterranean countries, context-specific, within a One Health development framework, with the Mediterranean diet acting as a SCP lever; 4) **Foster a change in the current perception of the Mediterranean diet** as a resource of sustainable development in the Mediterranean, at country and regional level, taking in consideration their contextual differences; 5) **To consolidate the initiative of World Mediterranean Diet Conference** as permanent forum for multi-stakeholder and transdisciplinary SFS-MED dialogues and actions to accelerate the Agenda 2030 in the region¹⁴.

In October 2023, a new Memorandum of Understanding (MoU) was signed between FAO and CIHEAM, with the purpose to provide a framework for collaboration to effectively shift to more sustainable Mediterranean food systems in the region.

3. THE MEDITERRANEAN CONTEXT: MULTI-DIMENSIONAL INTERTWINING CHALLENGES

The Mediterranean is today a region in which growing ecological, economic, socio-cultural, health and nutritional challenges coexist with unresolved international, regional and national tensions, and conflicts. The Mediterranean is marked by the heterogeneity among, and within, its countries and gaps between

10. https://www.medfoodcultures.org/files/download/2016ca_1.pdf

11. https://www.medfoodcultures.org/308/the_second_world_conference_on_the_revitalization_of_mediterranean_diet_palermo_15_17_may_2018.html

12. <https://www.oneplanetnetwork.org/sustainable-food-system>

13. https://pdfhost.io/v/TUIL2TTSV_SFSMED_Common_Ground_Paper

14. <https://3mdconference.org/>

Northern and Southern/Eastern ones. The region, undergoing rapid and drastic changes, is expected to be most impacted by climate change, with an anticipated acceleration of land degradation, desertification, migrations, and urbanization (MedECC, 2020; IPCC, 2022).

Mounting economic, social, and environmental strains and their resultant implications on livelihood and food security make the situation unsustainable, particularly in the Near East and North Africa countries (FAO, 2021). Urban agglomerations on the Mediterranean coasts, along with tourist infrastructure, have resulted in the development of large and mega-cities, with consequent pollution pressures from the growing population and the increase in economic activities in a particularly fragile environment along the coastal zones. Rural exodus and inter-urban migration have accelerated urban growth (UNEP/MAP and Plan Bleu, 2020). Impacts of poverty and unemployment have contributed to social marginalization, which is further compounded by income disparities and migrations from rural areas (Abis and Demurtas, 2023). Population growth with demographic changes, urbanization and globalization, are all driving increased food demand and influencing food choices, which have resulted in profound changes in the food consumption patterns and lifestyles in the Mediterranean region (CIHEAM/FAO, 2015).

All Mediterranean countries are passing through a “nutrition transition” in which under nutrition problems (wasting, stunting, underweight) and micronutrient deficiencies coexist with over-nutrition problems (overweight, obesity) and diet-related chronic non-communicable diseases (Belahsen, 2014; CIHEAM/FAO, 2015). Eating habits of Mediterranean populations, particularly among young people, have shifted away from the Mediterranean diet to western unsustainable unhealthy lifestyle models, resulting in more Diet-related diseases (Herrera-Ramos et al., 2023). Significant discrepancies in economic/industrial development and social inequalities between countries raise more challenges for a sustainable future in the Mediterranean region (Capone et al., 2021).

4. THE RATIONALE

The underpinning rationale of the development of the SFS-MED Platform conceptual framework¹⁵ was based on the assumptions that challenges facing the Mediterranean were interlinked and needed to be addressed through a holistic SFS systemic approach, Med context-specific, linking sustainable consumption and production (SCP) through the Mediterranean diet as a lever, and supported by inclusive multistakeholder collaborative partnerships.

An innovative holistic and ecological mindset shift on food systems and diets is required to accelerate progress in the Med countries by addressing simultaneously multiple priority challenges from different perspectives, rather narrow sectoral thematic fragmented approaches.

Food systems have interdependent impacts on multidimensional intertwining challenges facing the Mediterranean at regional and country level. Therefore, an SFS-MED vision, context-specific, is needed for coping with them through a better understanding of food systems as a whole, addressing all elements across, rather than as separate pieces.

The design of the SFS-MED Platform joint conceptual framework¹⁶ had the purpose to foster, through

15. https://pdfhost.io/v/TUIL2TTSV_SFSMED_Common_Ground_Paper

16. https://pdfhost.io/v/TUIL2TTSV_SFSMED_Common_Ground_Paper

a SFS lens, context-specific, a common understanding of the complexity of interconnectivities among various challenges, drivers, processes, outcomes and trade-off, in order to shape collaborative priority transformative actions to impact food systems positively, at every stage, from production, processing, distributing, and marketing to consumption of food. In the setting of the SFS-MED Platform operationalization, priorities resources mobilization was addressed to intercept and redirect more responsible oriented SDGs investments, with particular regards to Southern/Eastern countries, to accelerate the Agenda 2030 (Ridolfi et al., 2020).

The Mediterranean is currently seen mostly as a dividing sea between the two shores, but culturally diverse countries are still united within the Mediterranean diet heritage, acknowledged by UNESCO as an intangible cultural heritage of Humankind (UNESCO, 2010). Cultural dimensions of Mediterranean food systems were taken into consideration in the design of the SFS-MED Platform conceptual framework, as recommended by FAO Committee on Agriculture¹⁷ for the development of sustainable food systems, as critical in achieving the majority of the SDGs.

The relevance of history and culture in the Mediterranean was unquestioned by having been the cradle of the Western civilization while different visions on the Mediterranean as a “regional entity” (Portugali, 2004) were taken into account.

5. MULTIPLE SUSTAINABLE BENEFITS OF THE MEDITERRANEAN DIET FOR MEDITERRANEAN COUNTRIES

The concept of the Mediterranean diet has undergone a progressive evolution, from a healthy dietary model to a sustainable dietary model (Dernini and Berry). The Mediterranean diet is in continuous evolution and, therefore, it should be understood as a lifestyle in continuous evolution, related through time closely to the particular historic and geographic mosaic that is the Mediterranean. The studies on the Mediterranean diet are mainly focused on health/nutrition impacts of its characteristic foods, while the importance of its cultural, social and economic dimensions of food is shared by all Mediterranean people, beyond a simple physiological need for energy.

In 2015, to address the growing erosion of the heritage of the Mediterranean Diet, due to the continued loss of its adherence by Mediterranean populations, a new multidimensional conceptual framework “the Med Diet 4.0” (Dernini et al, 2017) was designed to highlight its multiples sustainable benefits with the strategic purpose to attract a broader spectrum of interested stakeholders from other sectors, (environment, agriculture, food industry, civil society, consumers, etc.) for its revitalization. Four sustainable benefits of the Mediterranean diet for health, environment (including biodiversity), local economy, societies/communities and cultures, were characterized in parallel.

1. Well-documented health and nutrition benefits (Keys 170); (Guasch Ferré and Willett, 2021). In the EAT-Lancet Commission report on diet in the Anthropocene, the Mediterranean diet was cited as the most studied example of a healthy diet (Willett et al, 2019).

2. Low environmental impacts and richness in biodiversity, essentially a plant-based diet with low consumption of animal products and a type of production that has less impact on natural resources than other diets (Clark and Tilman 2017); (Castaldi et al.2022); (Vanham et al 2016); (Aleksandrowicz et al 2016).

17. <https://www.fao.org/3/mx349en/mx349en.pdf>

3. **Positive local economic returns**, creation of new jobs, reduction of rural poverty and migration (UNEP 2020); (CIHEAM/FAO 2015).

4. **High socio-cultural food values**, dialogue among different cultural identities and food traditions, mutual respect, social inclusion and conviviality (Medina and Sole-Sedeno 2023); (Medina and Macbeth 2021). Recognized by UNESCO as an «Intangible Cultural Heritage of Humanity» (UNESCO 2010).

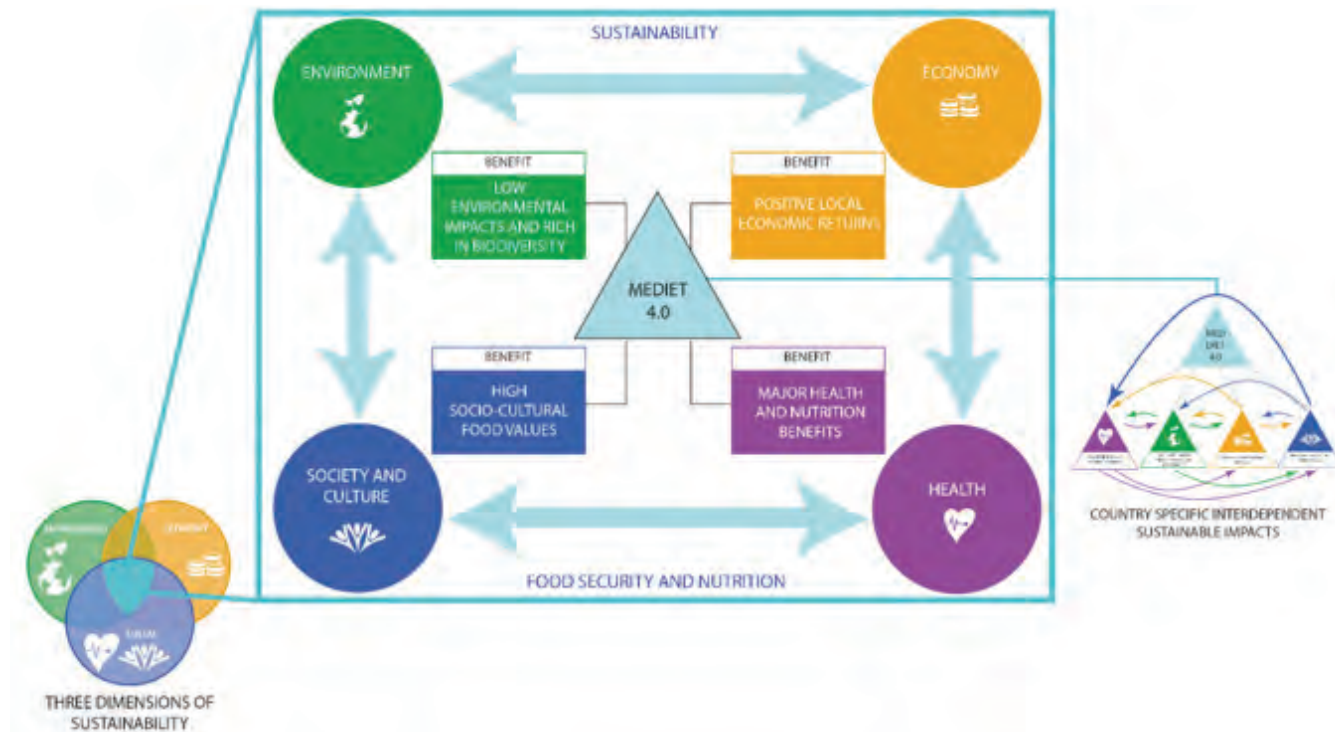


Figure 1. Med Diet 4.0: The Mediterranean diet with four sustainable benefits (Adapted from Dernini et al, 2017)

The Med Diet 4.0 framework, through its four different perspectives, was addressed to a broader panorama of consumers and stakeholders, with different tastes and interests, in order to revitalize the Mediterranean diet that current data show in growing decline in its adherence among Mediterranean people. Through its comprehensive integrated approach, the Med Diet 4.0 framework offers a conceptual multidimensional SCP approach for better understanding and appreciating the multiple sustainable benefits of the Mediterranean Diet, thus paving the way to an enhanced stewardship of this unique diet, to counteract its erosion and ultimately improving the nutritional well-being of individuals and communities in the Mediterranean region.

The assessment of the trade-offs among the MD multiple intertwining dimensions is a challenge of methodological complexity for the multiple dimensions of the interactions among interconnected impacts with Med food systems, with country-specific variations. All of these impacts are interdependent interactions so that changes in one can led to changes in others.

The challenge is to fully take into account this systemic complexity without breaking it down into its different parts, which would cause to lose its interaction characteristics (Dernini 2023).

Reviews of indicators used to evaluate the adherence and sustainability of the Mediterranean diet show that there was no uniformity in their assessments, mainly focused to the health dimension (Bôto et al 2022). Indicators show to be more developed for health and environmental impacts of diets, than for their socio-cultural and economic dimensions (Comerford et al. 2020); (Béné et al, 2019). These indicators are often weak, fragmented and arbitrary, mainly quantitative and less qualitative (Jones et al, 2016). For the assessment of the adherence to the Mediterranean diet pattern there are more than 30 scores creating more confusion (Delarue, 2022). In 2020, a revision of the Mediterranean diet pyramid¹⁸ was published to incorporate more recent findings on the sustainability and environmental impact of the Mediterranean Diet pattern (Serra-Majem et al., 2020).

MED DIET 4.0: A STRATEGIC FRAMEWORK FOR REVITALIZING THE MEDITERRANEAN DIET BY LINKING FOOD SECURITY, NUTRITION AND SUSTAINABILITY



Figure 2. Med Diet 4.0: The Mediterranean diet with four sustainable benefits (Adapted from Dernini et al, 2017)

6. A RETHINKING OF THE MEDITERRANEAN DIET AS A SUSTAINABLE DEVELOPMENT RESOURCE

Most studies on the Mediterranean diet are mainly focused on the health impacts of the nutrients of its foods and on the rate of their consumption and production and impacts on the environment, and less to a cross-disciplinary approach to food choices and lifestyle.

We have to rethink the Mediterranean diet, as a cross-cutting accelerator for sustainable food consumption and production (SCP). It requires also a new storytelling on the Mediterranean diet as a lifestyle in evolution across globalization and food systems transformation. The relation between the

18. <https://www.cambridge.org/core/journals/public-health-nutrition/article/mediterranean-diet-pyramid-today-science-and-cultural-updates/70359644D12A038AC003B935AA04E120>

Mediterranean diet and its geographic area has loosened with globalisation, with a growing physical disconnection between the space of production and the space of consumption, in which the landscapes are also interfaces between people and nature.

Currently Med food systems and diets are no longer determined by what is locally produced. Diets and food systems are closely linked, connecting food production, food consumption and nutritional health, with the consumer at the centre of the system, as an intermediate between food production and nutrition outcomes. (Meybeck and Gitz, 2017).

More support to the development of Mediterranean Global Important Agricultural Heritage Systems (GIAHS), connecting nature and people, enhancing local knowledge and preserving landscapes, biodiversity, cultural values and the work of small producers, farmers and fishermen, are fundamental components and concrete safeguarding measures for the revitalization of the Mediterranean diet, also through the labelling and certification of products and services (Parviz, 2021). It will require the active involvement of the consumer and all sectors, with regional cuisines, chefs and collective caterings playing an important educational role for the adherence to the Mediterranean diet model (Carcangiu, 2020).

“Voluntary guidelines” (FAO/CIHEAM, 2017), or “voluntary code of conduct” (Burlingame, 2019) for the Mediterranean diet as collaborative frameworks for effective concrete safeguarding measures, already requested in 2010 by UNESCO for its inscription as an intangible cultural heritage, are urgently needed. The biodiversity and variety of its traditional foods, at the epicenter of the Mediterranean diet (Trichopoulou, 2019), can drive a variety of local food demands, influencing food production. But more supports to food composition and nutritional values of biodiversity are still needed (Toledo and Burlingame, 2006).

7. MOVING FORWARD

As entry points for an SFS-MED transformation in the Med countries, lessons learned from the CIHEAM MD case study (2011-2023), the three previous World MD Conferences (2016, 2019, 2022), and from the UN Food Systems Summit Stocktaking process, 2021-2023¹⁹, need to be tackled to provide support to food systems transformation pathways in Med countries (FAO/CIHEAM/UfM, 2021).

The collaboration of all actors in the Mediterranean food environment is of crucial importance for an effective “change of route”, as proposed at the 3rd World MD Conference together with more eco-sustainable finance is needed in the Mediterranean to intercept and redirect more responsible oriented SDGs compliant investments and instruments to accelerate the Agenda 2030 (Ridolfi et al., 2020). More mobilization of the social sciences and humanities is necessary to understand the brakes and the levers of action, at different scales.

People and nature are strictly connected in the Mediterranean diet, as well as, with our biosphere and climate change, the complexity of these entangled issues requires a new holistic narrative linking sciences and humanities, overcoming the silos of disciplines, with different levels of specialization. It is necessary to bypass silos between sciences and humanities by connecting nature and culture, within a holistic SFS vision integrated by an innovative transdisciplinary sociobiological (Wilson, 1975) and

19. <https://www.unfoodsystemshub.org/fs-stocktaking-moment/>

ecological (Von Humboldt, 1850; Bateson, 1972; Doherr, 2015) understanding that everything in nature is interconnected.

There is a need of more transdisciplinary collaborations on the ground with other disciplines such as ecology, economy, geography, history, cultures, sociology, anthropology, psychology, art, informatics and artificial intelligence.

Innovative ground-breaking SFS-MED Living Labs, as cross-cutting transdisciplinary accelerators connecting local and scientific knowledge, are needed for enabling conditions for the development of a more sustainable food environment in the region.

By taking into consideration that sustainability is addressed mainly to the future generations, particular priority should be addressed to young people who are also the majority of the population in the Southern/Eastern Med countries.

Education, research and innovation are key elements for a better mutual understanding and coexistence. In a time of increased global competition, Mediterranean countries have to pool their resources of talent in which research and innovation policy are at the heart of any regional employment, stability and prosperity (Lacirignola, 2013).

Sustainability became the catchphrase on everyone's agenda, whether referring to agriculture, the environment or health. There is now the urgency to move, from theory to action, to tackle these pressing Med entangled challenges that have taken us to the edge, and beyond, of the planet's limits to growth (Burlingame and Dernini, 2019).

It is a priority reconnecting the well-being of the individual and the community to the sustainability of natural resources, strongly reaffirming the notion that the health of humans cannot be isolated from the health of ecosystems (OHHLEP, 2022), as a catalyst of sustainable development (Dye, 2022).

In conclusion, there is a need of a SFS-MED change of route, bringing theory to action, in the context of the current global food systems transformation. There is a need of building a new global narrative linking food security and sustainability. The concept of food security has evolved to recognize the centrality of agency and sustainability, along with the four other dimensions of availability, access, utilization and stability (HLPE, 2020).

By recalling that the World Health Organization has defined health as "a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity" (WHO, 1948), "how long could we keep the epistemology of science and the epistemology of human experience apart without jeopardizing our future?" (Salk, 1985).

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SUSTAINABLE FOOD SYSTEMS CHANGE OF ROUTE IN THE MEDITERRANEAN

Editors

Sandro Dernini and Roberto Capone

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