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Med-Index from farm to fork: a food product labelling system to promote adherence to the Mediterranean diet encouraging producers to make healthier and more sustainable food products †

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Abstract: Currently, there is an increasing demand of transparency in food labelling in line with the consumers concern about food origin and composition.. In the recent years, several food indexes have been developed to promote healthy diet as an affordable way to prevent chronic diseases. The Mediterranean diet is recognized as one of the healthiest dietary regimen related to a low incidence of mortality from cardiovascular diseases, type 2 diabetes, certain types of cancer, and neurodegenerative diseases; anyway, a complete index quantifying the Mediteraneaness of foods is still evanescent. Identifying a uniform labelling system, valid in all EU countries and able to promote healthy lifestyle, is the current European challenge. This article deals with the development of the Mediterranean Index (MI), which may definitely estimate the Mediterraneaness degree of food. In particular MI, which simultaneously accounts nutritional and sustainability features of foods, may constitute an objective reference for using the "Mediterraneaness" label on food products; moreover, it can ultimately define the link to the Mediterranean diet encouraging producers to make healthier and more sustainable food products. Growing consumer willingness of eating healthy foods promoting well-being represents a conscious choice which could favor the diffusion of the precision nutrition principles .

Keywords: From Field to Consumers; Mediterranean diet; healthy eating choices; disease prevention; sustainable production; nutrition and sustainability label.

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1. Introduction

Since December 2016, Regulation (EU) no. 1169/2011 [1] on the provision of food information to consumers requires that the vast majority of pre-packaged foods carry a nutrition declaration, supplemented by a voluntary repetition of its principal constituents in the main field of vision (named "front of pack", FOP), to allow consumers reading essential nutritional information at a glance when purchasing food.

For this repetition, food business operators may use other forms of expression and / or presentation in addition to those contained in the nutrition declaration, provided they meet the criteria set out in the regulation. FOP nutrition labelling [2] permits consumers to choose food according to nutritional information at a glance and is more and more considered as a strategic tool in the prevention of non-communicable diseases related to the diet. Most consumers report that they find FOP labels useful and look at them when

shopping, although the percentage of consumers who actually do it is lower. Most FOP labels have been proven to positively influence the consumers' ability to identify the healthier option than an unlabelled situation; furthermore, their consumers' understanding improves when the label has a colour(especially if combined with a summary indicator) and a code. Regarding the potential impact of FOP nutrition labels on the diet and health of consumers, a positive effect (particularly of evaluation labels) would be suggested by modelling studies, although no definitive conclusion can be drawn due to insufficient empirical evidence. With regard to the potential impact of FOP schemes on food reformulation [3], some studies, largely based on self-reported data, take into account food reformulation presumably related to FOP nutrition label, even though it is worth noting that many difficulties exist in reformulating some agricultural food products due to their compositional or traditional properties. Opinions on FOP nutrition labelling schemes [4] vary between Member States and stakeholder groups, consumer organizations, health NGOs, and some industry sectors which prefer either complete schemes assessing the nutritional quality of the productor more reductive schemes. The European Green Deal adopted by the Commission on 11 December 2019 announced that a Farm to Fork strategy will propose actions in favour of consumers choice toward healthy and sustainable diets [5]. In particular, the Commission is examining new ways to give consumers clearer information on the nutritional value of foods. However, it is clear that the principles that motivated the development of the FOP schemes now supported by the various Member States were conceived before two major events revolutionized the relationship between citizens, the health of populations and the health of the planet:

- the intervention of Greta Thunberg [6]
- the spread of the pandemic from Covid-19 [7]

Greta Thunberg is a Swedish girl who in August 2018, armed with a sign with the slogan "School strike for the climate" (Skolstrejk för klimatet), took to sit every day in front of the Stockholm parliament building, to ask her government concrete and immediate action against global warming. Greta Thunberg has inspired millions of young people who have given life to the largest peaceful demonstrations for the climate, with the aim of demanding urgent and immediate action from the powerful of the Earth to reduce CO_2 emissions and put a stop to global warming, to reclaim the "Simple" right to have a future, with signs and slogans, such as "No planet B", "Time is running out" and "Our house is on fire". This issue calls into question global food production because intensive agricultural production is one of the main causes of climate change [8] and 25% of greenhouse gas emissions from the food industry. Thus, the sectors of the agri-food chain contribute about a quarter of greenhouse gas emissions globally and are among the most vulnerable to climate change. In fact, climate change, by altering biological and physical factors, affects the functioning of natural ecosystems and the socio-economic system, threatening the stability of the entire food system. It is therefore evident that the principles animating the proposals for FOP systems in 2016, aimed at the health of citizens, must today be integrated with the principles aimed at simultaneously guaranteeing the health of the planet, adopting a holistic approach that recognizes interconnection among those aspects of food production and consumption that are usually considered separately: the social aspects (i.e., relationship between producers and consumers), environmental aspects (i.e., defence of biodiversityand natural resources, food distribution, packaging, and food waste), and cultural aspects(i.e., conservation of traditional knowledge).

COVID-19 is an infectious disease called Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2), caused by a recently discovered coronavirus. This is a new strain of coronavirus, never identified before in humans; the COVID-19 pandemic is rapidly evolving and investigations into the various epidemic outbreaks are underway. The COVID-19 pandemic has also affected agri-food systems and all dimensions of food security globally. An important aspect that emerged during the crisis is the need to minimize the impact of the Coronavirus on the availability of food resources, considering the economic crisis that is developing in parallel with the health one. Proper nutrition is always

very important, and in particular before, during and after an infection. A healthy and balanced diet, rich in nutrients (e.g., fibersand vitamins) and nutraceuticals (e.g., polyphenols and flavonoids), can support the immune system and be of help especially for the most vulnerable subjects. Furthermore, the promotion of healthier eating habits, also attentive to sustainability, represents an essential tool for preventing the spread of infections and can reduce the incidence of non-communicable diseases (e.g., hypertension, diabetes, and cardiovascular diseases), which time they can lead to a worse prognosis and a higher mortality rate. It is essential to follow good practices during the production, distribution, sale, handling, storage and preparation of food, in order to preserve the nutritional and quality properties of food and ensure food safety. The COVID-19 pandemic is affecting food systems and all dimensions of food security globally [9]. Considering a supply chain approach, and with reference to consumer health, it is important to strengthen the objectives related to environmental safety with regard to sustainable use of the soil, conservation of microbial fauna and biodiversity, sustainable management of the territory, contamination environment, the control of contaminants in environmental matrices and the risk of transfer from the agroecosystem of primary production along the food chain. The ongoing health emergency suggests the need to apply an increasingly holistic and interdisciplinary approach, placing a growing focus on the sustainability of agri-food systems and the application of an integrated supply chain approach, in line with the themes of the Green Deal, and on application of the "one health" concept, taking into account the indissoluble link between human health, animal health and ecosystem health.

In this emergency linked to COVID-19, the role of correct scientific communication, also through a new "one health" FOP food labelling system for sustainable food production and healthy consumption, such as the Med Index, is fundamental to reduce disinformation and misinformation on the theme of nutrition, health and sustainability, reducing potentially harmful consequences for public health and for effective communication and management of the crisis, and of uncertainties and fears in citizens..

2. Med- Index

The increased awareness of the importance of protecting collective health also passes through the relationship with food and not only in nutritional terms, but along the entire supply chain because the environmental and social sustainability of production is a path that begins in the field and goes up to flat, and this is how, for example, the European Commission tries to tackle it with the Farm to Fork strategy. A FOP labeling system should give more information on the complexity of the nutritional aspects (which is not limited to calories and macronutrients), on the producers, on the origin of the raw material, on the plant varieties and territories where they are grown, on the animal breeds raised, on cultivation, breeding and processing techniques, animal welfare and social equity.

To overcome the information asymmetry often affecting food purchasing and to offer a better understanding information about which products are suitable for a healthy and sustainable diet based on the principles of the Mediterranean diet, a new model of nutritional labeling, called Med Index [2] has been developed.

In particular Med Index, which simultaneously integrates nutritional and sustainability features of foods, may constitute an objective reference for using the "Mediterraneaness" label on food products; moreover, it can ultimately define the link to the Mediterranean diet encouraging producers to make healthier and more sustainable food products.

Med Index can also be considered a tool to achieve the objectives of 2030 Agenda for Sustainable Development [10]. Indeed, Mediterranean Diet and Med-Index can simply and intuitively focus the interest of the community toward a correct diet regimen; brings citizens closer to the productive world; stimulates the interest and curiosity of both adults and young people in acquiring a greater awareness of the importance of sustainability as

a primary tool for sustainable development by laying the foundations for the creation of a network of sustainable and resilient communities.

The Mediterranean diet and the correct adoption of the Med-Index can support a resilient and sustainable community model. Nutritional labeling should not only have the scope of satisfying the consumer needs about nutritional information, but also a tool to compare different products with the aim of assessing which is the most sustainable, because human health is inextricably linked to health of the planet [11].

Figure 1 shows the iconographic interpretation of Med Index.

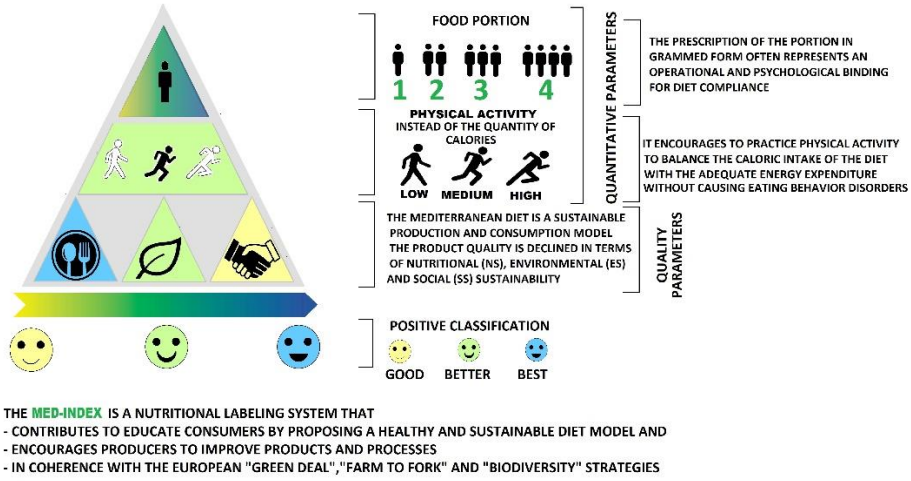

Figure 1. The Med Index - The logo shape: the triangle is the symbol of the food pyramid that evokes the concepts of balanced food choices. The triangle, similarly to the food pyramid, has been divided into three parallel rows returning two fields for quantitative information and one field for qualitative information to the user. The apex and central row of the triangle informs about the number of food portionsand the caloric intake of a portion, respectively. It is worth pointing out that listing calories as number of kcal could have a detrimental effect on people with eating disorders; therefore, the caloric intake is expressed in the form of intensity of recommended physical activity(low, medium, and high associated to walking, light running, and intense running, respectively) so that to depict an actual balance between ingested and consumed calories. This approach would allow to inform and educate people to make healthier choices, but without negatively impacting people with eating disorders or those in recovery. . Specifically, the caloric intake is deduced from the icon highlighted in black together with the background color: the lowest caloric intake value, associated with walking, is indicated by blue color (symbolizing the best choice), while the high caloric intake value, associated with intense running, is indicated by yellow color (symbolizing the good choice). The color message is always interpretable positively because it starts from the assumption that the Med-Index can only be applied to products that fall within the Mediterranean basket of products. Yellow is the color of optimism and clarity, arousing positive and reassuring emotions; green is the color of freshness, well-being, and relaxation, which expresses authenticity and naturalness and inspires confidence; blue, the color most loved by people, means security, tranquility, and trust. .

Finally, the base of the triangle provides information on the degree of nutritional, environmental, and social sustainability of the product through the use of three different colors inside three small triangles.

Nutritional sustainability

1. The product is in part of the traditional basket of products of the Mediterranean diet
2. The Mediterranean product respects the biodiversity of food
3. The Mediterranean product respects the seasonal availability

4. The Mediterranean product has a balanced ratio of macronutrients
5. The Mediterranean product has a nutritional claim
6. The Mediterranean product is recognized by a certification of origin [12]
7. The Mediterranean product contains prebiotics
8. The Mediterranean product contains probiotics
9. The Mediterranean product has a health claim [13, 14]

Environmental Sustainability

1. Local food product certified by the traceability system.
2. Environmental and animal welfare regulations are fully respected in the production process of agri-food products.
3. Zero-residue product from conventional farming systems.
4. Food product obtained from organic farming systems.
5. Eco-friendly management of all waste throughout the entire production cycle.
6. Production system based on a circular economic model [15, 16].
7. The production process takes advantage of renewable energies [17].
8. The product has an environmental sustainability certification relating to carbon and water footprint.

Social Sustainability

1. The production process fully respects the labor regulations.
2. The players in the supply chain equally enjoys the revenue from the product.
3. The production systems preserve the Mediterranean landscape and its identity role.
4. The producer implements food education actions.
5. The producer invests in R&D for supporting well-being and quality of life.
6. The producer measures the social impact of the production process (social report, SLCA, etc.)
7. The producer promotes positive actions to favour gender equity.
8. The producer promotes positive actions to minimize disparity between generations.
9. The producer implements positive actions to create new jobs and reduce forced migration of human capital that deplete the territory.

3. Conclusions

Consumers are becoming much more aware of the food they eat, its production and origin, as well as its environmental impact. Environmental and social factors have become an important factor influencing purchasing choices as much as nutritional and health factors. The Farm to Fork strategy includes the development of a standardized labeling system, and the Safe Food Advocacy Europe (SAFE) has launched a campaign to demand greater clarity and transparency in labels for consumers. To date, there is no single labeling system that combines the three pillars of sustainability, nutritional, environmental and social: the Med Index is the first system ever. This labeling system could certainly facilitate the choice of consumers, who would feel supported by an easy-to-use system that immediately identifies if a product is good from a nutritional point of view, also being able to evaluate how sustainable it is from an environmental and social point of view.

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