CLIMATE CHANGES AND NUTRITION SUSTAINIBILITY

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(max 1500 words and 10 references)

A dramatic climate change is occurring, due to the increased global temperature consequent to the heat-trapping effect of carbon dioxide produced in great and increasing quantity by our industrialized way of life. Climate changes damage the humankind because more frequent and more severe harmful conditions such as heatwaves, droughts, floods, glacial melting, tropical storms and destructive fires, all events that negatively influence the environment, expand the habitat for detrimental animal and vegetable disease vectors, alter agricultural conditions and favor air, soil and water pollution. In the recent United Nations Climate Change Conferences (commonly referred to as Conference of the Parties or COP26 and COP27) it has been clearly indicated that climate change is the single biggest health threat facing humanity.

People are well aware that fossil and fuel combustion is the major source of climate-warming greenhouse gases (GHGs) and consequent climate changes. But there is no diffuse awareness that up to 35% of GHGs comes from food production. The food system is a major driver of climate changes and its role is expected to increase in the next future due to the population increase that will require more food production and more invasive agro-industrial technologies.

A large series of studies document that animal-based food (meat and dairy) disproportionally contribute to environment harm (*Barret 2022, Gibbs 2022*). Animals are inefficient at converting feed to food. Meat and cheese production requires much more land, water, energy and agrochemicals than plant-based food. Animals not only produce GHGs and pollute the soil but also absorb vital space and resources for their living and growing requirements. For instance, to feed the 230 million animals (the majority poultry) in the UK it is necessary to grow crops (hay,

cereal grains, soybean) in 40% of the entire cultivable land, in competition with direct human consumption *(WWF, 2022).*

The current climate crisis, therefore, requires to urgently intervene also on the food system to promote nutrition sustainability in order to feed the increasing world population without destroying our planet ecosystem *(Vaidyanathan 2021)*.

Theoretically this shouldn't be difficult to understand and to adopt since there is a clear linkage between healthy eating and the environments advantage by reducing animal-based diet and related GHG production. To tackle the global epidemics of obesity, diabetes and dyslipidemia (with consequent increased cardiovascular and cancer morbidity and mortality) a diet based on vegetables, fruits, nuts, whole grains and unsaturated fats is recommended, with a moderate amount of fish, poultry and low-fat dairy but keeping very low or absent the consumption of red and processed meat, refined carbohydrates and added sugar. Recent studies confirm that relevant animal-food consumption (i.e. eating meat three or more times per week) increases metabolic and cardiovascular morbidity and all-cause mortality (*Papier, 2020 – Zheng 2019)*. Today the unhealthy eating pattern is the single greatest contributor towards human morbidity and mortality, more than tobacco, alcohol, drugs and unsafe sex altogether (*Afshin 2019*). If people would comply with a more appropriate diet, human morbidity and mortality could be reduced by 20-25% (*Afshin 2019, Murray 2020)*. Solid evidence, therefore, connects a healthy diet with a reduced food-related GHGs generation: both human health and the environment would co-benefit by a change in nutrition behavior.

A general switch to a more "healthy" and more "sustainable" diet, however, requires multiple interventions, including innovation and radical behavioral changes that may be opposed by cultural and social habits and by economic interests. Science progresses and technology advancements, together with a diffuse awareness of the problem, are necessary to promote eating changes. A good

example comes from meat production. Nearly a century ago Winston Churchill wrote that “we have to escape the absurdity of growing a whole chicken in order to eat the breast or wing, by growing these parts separately under a suitable medium”. Today this intuition has become a feasible reality. While farm animals emit planet-warming carbon dioxide and methane, put out waste and parts of them are not used, alternative meat (which include plant-based, fermentation enabled and cell-based meat) has become a possible alternative. Animal cells grown into a fermenter or bioreactor produce less emission and waste and would not contain unhealthy fat. Cultivated (lab-grown) meat is a form of tissue engineering that uses technologies already available in medical science. So far, meat manufacturing is only a limited activity and no large industrialized production is expected anytime soon. Very recently, however, Singapore has become the first country to approve the commercial sale of lab-grown cultivated meat in the form of chicken nuggets and chicken breast *(The Guardian, November 5, 2022)*, demonstrating that the use of alternative meat is already feasible for the general population. Many questions still have to be answered and many problems to be solved but science and technology rapidly advances and in the next decades a shift from traditional farming to alternative meat appears inevitable under the pressure of the world growing population and the planet limited resources.

Food production, of course, is only one component of environment pollution related to the food-chain system. Other components such as transportation, packaging, purchasing, cooking and waste significantly influence the economic cost and the food-related environment pollution. To mitigate the detrimental side-effects of such a complex system, radical changes of how food is produced and consumed are necessary, aiming at reaching what can be called ”dietary eco-wellness” *(Barrett, 2022).*

In recent years the perception of the climate changes as a planet emergency has become more clear and diffuse and has led the international agencies to deal with the problem promoting large-scale intervention with organization, regulations, incentives/disincentives aimed at mitigating the constant GHGs increase.

During the recent COP26 and COP27 important actions have been negotiated to reduce the global warming. Negotiations, however, were mainly focused on the urgency to move away from fossil fuels. No specific attention and resolution was given to the food-related GHGs generation although the role of the food system in causing climate changes is well documented *(Springmann, Nature, 2018)*. A global approach to this issue is very difficult and controversial because the local nutrition conditions are very different among the nearly 200 Countries participating to the COP conferences, with the prevalence in different areas of either overweight adults or under-nourished children. Wealthy Countries that have a large industrialized animal farming are the main producer of food-related GHGs emission and some of them are starting to deal with this issue providing national policy guidelines. The UK government has published in 2022 a report on food strategy, setting out medium- and long-term measures to support the national food system and aiming at the promotion of a climate-resilient and more healthy food availability (https://www.gov.uk/government/publications/government-food-strategy).

Moreover, in September 2022 the USA administration produced comprehensive recommendations for a national strategy regarding nutrition, health and health care costs, including financial incentives for producing and purchasing healthier food *(Mozaffarian, NEJM 2022).*

In addition to this large-scale national intervention programs, however, community-scale and individual interventions are also needed, mainly regarding individual food consumption. To promote a healthy and sustainable diet, cultural and social awareness as well as consideration for local circumstances are necessary. Physicians and health professionals may play an important role at this level, convincing people

to adopt healthy and sustainable diets. The efficacy of their intervention, however, depends from significant changes in their practice. Routine nutrition screening during patient encounters, for instance, should become a vital sign collected and tracked in the patient medical record, just like blood pressure, heart rate and other vital signs. Of course there are two major barriers to this change. The first one is competence, that may require to incorporate specific nutrition education and training in health-science schools. The second one is time constraints: to include an additional and demanding task to the busy clinic workflow poses serious problems of feasibility. Technology progress may help also in this issue: digital platforms such as DietID are becoming available and allow rapid dietary assessment and management.

In conclusion climate change is a worldwide emergency and the food system is a major contributor to GHGs production, global temperature rise and planet pollution. The consequent climate crisis comes at a great cost for humanity causing social, economic and healthcare detrimental effects. Inaction is no longer justified and intervention on the food system is urgent and feasible, with a synergistic combination of multiple measures regarding food consumption and then the consequent changes in food production and distribution. The vital target of climate change mitigation will not be achieved without a global understanding and diffuse participation to the principles of what humanity should eat to stay healthy and save the planet.

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