

The Ecological Footprint of Nutrition

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Abstract:

Climate change is among the greatest threats of our society to public health, ecosystems and the economy. Some of the most projected impacts of climate change include: increased heat, food and water shortages, extreme weather events, damages from flooding and wildfires, forced migration from rising sea levels and natural disasters. Food production is responsible for one quarter of the world’s greenhouse emissions. There is a growing awareness that the food choices have a great impact on the carbon footprint. The aim of this paper is to highlight: the contribution of the food production to the increase of carbon footprint and actions that may contribute to reducing the ecological footprint of food. The research methodology will be based on the systematic literature review of current studies that focus on the effects of nutrition on the ecological footprint globally and secondary data that present foods (livestock and agriculture) with the highest carbon footprint worldwide.

Keywords —Climate change, Ecological footprint, Food production, Greenhouse emissions, Nutrition.

I. INTRODUCTION

The ecological footprint of food or foodprints is referred to the greenhouse gas emissions produced by growing, rearing, farming, processing, transporting, storing, cooking and disposing of the food that people consume. The aim of this study is to highlight the most important effects of human nutrition on the environment and to demonstrate the importance and usefulness of the term ecological footprint, as a useful environmental sustainability indicator of a system, in the diet of the world's population, and as a tool on which environmental policy-making can be based.

Daily food intake is vital for every human body. In addition, the food and gastronomic identity of each person has great cultural and emotional value for him. The way we choose to consume, produce and manage food waste has a significant impact on the environment. Indicative of this is the fact that farming, animal husbandry and fishing are the sum

of those human activities that are largely responsible for the consumption of the planet's natural resources.

II. THEORETICAL FRAMEWORK

Nutrition is responsible for 25% of the environmental impact caused by each individual. The interdependence between nutrition and the environment is bidirectional.

The ecological footprint of products, especially food, is at the heart of the international scientific community with the ultimate goal of reducing and sustaining sustainable applications.

A. Define the ecological footprint of food

The ecological footprint is a tool to measure the demand of humanity on earth's ecosystems and compares such demand with earth's ecological capacity to regenerate resources. Also, it represents the amount of biologically productive land and sea area needed to regenerate the resources which are consumed by human population and thus renders

the corresponding waste harmless. The term of ecological footprint was conceptualized and coined by Wackernagel and Rees and further developed by them and others to assess the societal demands on the regenerative capacity of the biosphere (Chambers, Simmons and Wackernagel, 2000).

On the other hand, the ecological footprint of food is a portion of the overall ecological footprint of each individual. It concerns the natural resources needed to meet the nutritional needs of an individual or population based on dietary choices. Specifically, carbon footprint of a food product is the total amount of Greenhouse Gas Emissions emitted throughout its lifecycle, expressed in kilograms of CO₂-equivalents (Carlsson-Kanyama, Ekström, and Shanahan, 2003).

The calculation of the ecological footprint of the food presupposes a holistic approach to the study of food systems and the life cycle of food. The ecological footprint is a very useful tool, but its results can raise questions and concerns in the world community about lifestyle (Miglietta and Pastore, 2015).

B. The impact of food industry in the ecological footprint of food

The environmental impact of a product should be considered throughout its life cycle, from the initial phase include cultivation, processing, transport and use, to the last phase, which is its disposal and recycling. The environmental performance of the products is of particular scientific interest, enabling the promotion of innovative green production processes, but maintaining their character (Notarnicola, et al., 2015).

Specifically, the environment is a shared resource and indispensable condition for the development of people, health, and wellbeing. Living in an increasingly threatened environment is becoming increasingly precarious. The waste caused by the food industry threatens biodiversity, topsoil, the marine environment and the climate itself. The carrying capacity of the planet is running out. Food production uses 34% of arable land and 69% of purified water. The devastating environmental consequences, however, are not limited to this. The standardized products industry accounts for 24-30%

of greenhouse gas emissions, leading to global warming and extreme weather events. It is also worth noting that the vegetables produced in greenhouses burden the environment up to 15 times more. The production and consumption of non-seasonal food requires the use of refrigerated storage, packaging and transportation from other countries. Therefore, this entails high energy consumption, with the additional use of natural resources for packaging materials and finally the emission of greenhouse gases from the means of food transport. It is a fact that both packaged industrial and standardized products require more energy to produce and distribute them, inevitably leading to more waste and environmental pollution (Kumar and Chakabarti, 2019).

In summary, all of the above lead to the "ecological footprint", namely the required use of resources to meet daily energy and water needs. The ecological footprint of the processed food industry is large and its requirements are anything but rational.

C. The foods with the highest emissions

Carbon dioxide (CO₂) is the most important of Greenhouse Gas emissions (GHG), but not the only one – agriculture is a large source of the greenhouse gases methane and nitrous oxide. To capture all GHG emissions from food production researchers therefore express them in kilograms of ‘carbon dioxide equivalents’. This metric takes account not just CO₂ but all greenhouse gases (Sonesson, Davis and Ziegler, 2010).

There are massive differences in the GHG emissions of different foods (TABLE 1).

TABLE I
GHG EMISSIONS PER FOOD TYPE (KGCO₂E)

Food Type	GHG Emissions per 1 kg Produced
Beef (beefherd)	60 kgCO ₂ e
Lamb & Mutton	24 kgCO ₂ e
Cheese	21 kgCO ₂ e
Beef (dairyherd)	21 kgCO ₂ e
Chocolate	19 kgCO ₂ e
Coffee	17 kgCO ₂ e
Prawns (farmed)	12 kgCO ₂ e
Palm Oil	8 kgCO ₂ e
Pork Meat	7 kgCO ₂ e

PoultryMeat	6 kgCO ₂ e
Tomatoes	1.4 kgCO ₂ e
Bananas	0.7 kgCO ₂ e

Producing a kilogram of beef emits 60 kilograms of greenhouse gases (CO₂-equivalents), while palm oil emits just 8 kilogram per kg. Overall, animal-based foods tend to have a higher footprint than plant-based. Lamb and cheese both emit more than 20 kilograms CO₂-equivalents per kilogram. Pork and poultry have lower footprints but are still higher than most plant-based foods, at 6 and 7 kg CO₂-equivalents, respectively.

For most foods – and particularly the largest emitters – most GHG emissions result from land use change and from processes at the farm stage. Farm-stage emissions include processes such as the application of fertilizers – both organic (“manure management”) and synthetic; and enteric fermentation (the production of methane in the stomachs of cattle). Combined, land use and farm-stage emissions account for more than 80% of the footprint for most foods (Subramanian Senthilkannan, 2014).

III. RESEARCH METHODOLOGY

The research methodology of the current study is based on: (i) the systematic literature review of studies about the effects of foods on the increase of ecological footprint globally and (ii) secondary data from official sources that present the Greenhouse Gas emissions of different type of foods.

The extensive analysis of the literature review and the presentation of the secondary data will lead to the configuration of the results of the study.

IV. RESULTS

Livestock and the standardized food industry are considered to have the greatest impact on the foodprint. Between the two, the livestock sector is among the most polluting. In particular, it is the second largest polluter after the energy sector, emitting up to 7 billion tons of gas, mainly methane and nitrogen monoxide, exacerbating the greenhouse effect. Furthermore, this sector uses too much water for its activity, while at the same time irreparably polluting the marine environment by

discarding chemicals. The burden on the environment is also caused by the deforestation tactic, in order to create arable land for animal husbandry.

CONCLUSIONS

The global food system needs a lot of attention and restructuring. Nutritional choices determine the environmental consequences of the present and the future. It is necessary to implement policies and practices that will lead to the adoption of a "sustainable" diet.

Cooking smartly, bring back home-cooking, save water, shop wisely and local are some of the most important actions of reducing carbon footprint from food. Also, think more creatively about how you can reuse and recycle is one of the best ways to limit foodprint. Reusable bags for shopping fruits and vegetables can be an extremely eco-friendly way (Bockel, Touchemoulin, and Jönsson, 2011).

By strengthening the above, reducing reckless waste and consumption of food, proper information and education, coordination of state and international bodies and the adjustment of economic policies to modern environmental data, is the “vehicle” for sustainable development and ensure the future generations.

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