
Using an Infographic tool to promote healthier and more sustainable food consumption: the Double Pyramid Model by Barilla Center for Food and Nutrition

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\section*{Abstract}

The Barilla Center for Food and Nutrition (BCFN) has produced an updated version of the traditional Food Pyramid based on the Mediterranean Diet in order to assess the simultaneous impact that food has on human health and the environment. The Double Pyramid model demonstrates how the foods recommended to be consumed most frequently are also those exerting less environmental impact, whereas the foods that should be consumed less frequently are those characterized by a higher environmental impact. This paper will present the scientific underpinnings of the Double Pyramid as well as its usefulness as a framework for appraising and comparing the impacts of different consumption patterns.

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\textit{Keywords: } sustainability; Mediterranean diet; carbon footprint; ecological footprint

\section*{1. Introduction}

Health is becoming an increasingly important personal value. As many studies (Ares et al. 2015; Goetzke et al. 2014) confirm, adequate nutrition is, along with physical activities, a crucial aspect in influencing a person’s health
status and, ultimately, the physical and psychological wellbeing of the individual (Ares et al. 2015). Nevertheless, nowadays we are facing the escalation of illnesses connected with unbalanced nutrition, including hiking obesity rates and increasing risks of chronic non-communicable diseases (NCD). In the last two years, more than 2.1 billion people were considered overweight or obese (Ng et al. 2013). This trend is even more worrying if we consider that obesity rate is increasing rapidly among the youngest generations: according to the World Health Organization, more than 40 millions of children above 5 years were overweight or obese in 2011 (WHO, 2014). Non-communicable diseases, whose risk is directly connected with unbalanced nutrition, are currently causing more deaths than all other causes of death combined (WHO 2014). NCD deaths are expected to account for two-thirds of the global burden of disease by 2030, if these dietary trends continue (Chopra et al. 2002; Nishida et al. 2004).

Our daily food choices affect human wellbeing directly, through the impact on our health, and indirectly, through the impact on the environment in which we live. Food production is very intensive in terms of land and water resources, and greenhouse gases emissions. Current food production and consumption patterns have been cited among the main causes of environmental deterioration (UNDSD 2006). Particular attention is paid to the role of households as consumers and the consequences of their choices. Tukker et al. (2006) estimated that food and drink consumption accounts for approximately one third of total environmental impacts from European households, outreaching the impacts of all other investigated consumption domains, included transport (17% of the measured impact) and housing (7%).

In recent years, a growing body of research have documented the interrelation between food choices, nutritional adequacy and environmental impact (Stehfest et al. 2006; Garnett T. 2014; MacDiarmid et al. 2011; Tillman and Clark 2014). Although consumers have started to understand that their food choices may affect their health and the environment (Goetzke et al. 2014; Bachl 2007; MacDiarmid et al. 2014; Grunert et al. 2014), greater public awareness is still required.

This is the reason why the Barilla Center for Food and Nutrition has devised the Double Pyramid model, a graphic framework aimed at relating the nutritional and environmental impacts of food consumption, in order to raise people’s awareness on these issues and to promote a shift towards healthier and more sustainable food consumption.

This paper will present the scientific underpinnings of the Double Pyramid, as well as the main results from an empirical project in which the effectiveness of the model in influencing food consumption has been tested.

2. The theoretical framework: the Double Pyramid of the Barilla Center for Food and Nutrition

The Double Pyramid is a graphic tool consisting in two frameworks. The first one (Food Pyramid) outlines the relationship between food products and nutritional value according to the principles of the Mediterranean diet, while the second one (Environmental Pyramid) stress the connection between food products and environmental impacts.

The Food Pyramid on the left is based on the Mediterranean Diet pattern, which has been explicitly cited by the FAO as an exemplary Sustainable Diet (FAO 2010) for its features of healthiness, affordability and low environmental impact. The nutritional value of the Mediterranean diet has been recognized since the middle of the 20th century (Keys et al. 1967; Keys et al. 1980). This dietary pattern is rich in vegetables, fruits, nuts, unrefined grain cereals, fish and limited amounts of red meat and saturated fats (Trichopoulou et al. 2003). Many studies have confirmed that high adherence to the Mediterranean Diet is connected with several health benefits, including a reduction in the overall mortality rate (Trichopoulou et al. 2003), reduced incidence of cardiovascular diseases (Fung et al. 2009; Lopez Garcia et al. 2014; Estruch et al. 2013), and some oncological pathologies (Couto et al. 2011).

The Food Pyramid has been developed taking into account various guidelines, produced at international level, regarding the Mediterranean diet (WHO 2003; Oldways Preservation & Exchange Trust 2009; CIISCAM 2009). It orders food depending on the relative amount in which they should be consumed: thus plant foods such as fruit, vegetables and grains are found at the bottom of the pyramid, while meat, sugars and fats are at the top. The message conveyed is that our diet should be based mainly on foods of plant origin, as they provide vitamins, minerals, complex carbohydrates and fibres, while foods residing toward the top of the pyramid should be consumed minimally as they are high in saturated fats, salt and simple sugars.

The Environmental Pyramid on the right reclassifies food in terms of the relative magnitude of its environmental
impact, thus producing an upside-down pyramid with the most environmentally damaging foods represented at the top, and largely mirroring the order of foods in the adjacent Food Pyramid.

The environmental impact of each food type considered was assessed using Life Cycle Assessment (LCA) methodology. LCA is an objective technique for assessing the energy consumption and environmental load of a process, taking into account the whole production chain (BCFN 2014). The results were communicated through three different environmental indicators:

- Carbon footprint, which assesses the greenhouse gas emissions of human activities in terms of amount of CO₂ equivalents;
- Water Footprint, which expresses the total volume of freshwater consumed to produce the specific food product;
- Ecological Footprint, an indicator that measures the anthropogenic impact by considering the different ways in which environmental resources are used. It is measured in terms of square meters and is calculated as the sum of all the cropland, grazing land, forest, and fishing grounds required to produce the food and energy required for human activities; to provide space for infrastructure, and to absorb all wastes produced.

Data were obtained from public databanks (Ecoinvent Database; Environdec Database; Water Footprint Network Database; Global Footprint Network Database; LCA Food Database) and scientific studies (Ewing et al. 2010) and collated into a specific database. For the fifth edition of the BCFN Double Pyramid, 1,180 data were assembled. The results for each of the environmental indicators considered are presented in the form separate environmental pyramids (BCFN 2014). However, in order to increase the communication efficacy of the tool, only the Ecological Footprint was used as reference when creating the Environmental Pyramid (Fig. 1). This indicator was chosen because of its completeness (Ewing et al. 2010), indeed it considers several environmental impact factors simultaneously. Furthermore, its unit of measure is easier to visualize and understand compared to those of the other indicators.

![Figure 1. The Double Pyramid Model, 5th Edition](image)

As it is shown in Fig. 1, the Double Pyramid shows a strong correlation between healthy and environmentally-friendly products. The food products whose consumption is recommended to be more frequent, such as fruit,
vegetables, and cereals are also those associated with low environmental impact, whereas foods whose consumption should be moderate or limited are those with higher environmental impact.

This occurs because plant foods have an environmental impact that is sensibly lower than products of animal origin: for example, 1 kg of bovine meat has a water footprint which is 61 times higher to the one associated to the same amount of vegetables (18,870 l vs 310 l), and 11 times higher to pasta’s water footprint (1,770 l). Similarly the carbon footprint of fruit (475 g CO\textsubscript{2}-eq) and vegetables (820 g CO\textsubscript{2}-eq) are up to 55 times lower that the one of red meat (26,170 g CO\textsubscript{2}-eq).

3. BCFN menus

In order to estimate the extent to which the food choices of individuals affect the environment, two different daily menus were analyzed. The menus had a similar macronutrient profile, but the first was lacto-ovo-vegetarian, while the second one (“Meat-based menu”) was omnivore and strongly relying on the consumption of meat.

<table>
<thead>
<tr>
<th>Kcal Total</th>
<th>Protein</th>
<th>Fats</th>
<th>Carbohydrates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetarian Menu</td>
<td>2,030</td>
<td>14%</td>
<td>30%</td>
</tr>
<tr>
<td>Meat-based (Omnivore) Menu</td>
<td>2,140</td>
<td>15%</td>
<td>25%</td>
</tr>
</tbody>
</table>

Source: adapted from BCFN, 2014

Figure 2. Menu macronutrient profile

Overall, the omnivore menu has an environmental impact that is three times higher than the vegetarian one. The vegetable menu has an Ecological Footprint of 19 sq global m\textsuperscript{2}, while the omnivore one 42. Carbon footprint of the vegetable menu amount at 2,177 g CO\textsubscript{2}-eq. versus 7,058 of the other one. Nearly the same proportion affect the Water Footprint indicator: 2,225 liters for the vegetarian menu versus 5,031 of the omnivore menu (Fig.3).

From this data, it is possible to estimate how individual’s eating choices can impact on the environment. In particular, we saw that already a small change in eating habits can make the difference. That is, reducing the intake of meat to only twice a week can halve Carbon Footprint (from about 49,000 g CO\textsubscript{2}-eq to 25,000) and nearly the same for Ecological Footprint (294 global sq m\textsuperscript{2} versus 179).

Based on this data, we can hypothesize how impactful could be simple changes of an individual eating habits’ on the environment. By limiting the consumption of meat (especially red meat) to just twice a week, an amount in line with the recommendations of Italian nutritionists (CRA-NUT 2003), it would be possible to “save” up to 20 square global meters, 2,942 grams of carbon dioxide and 2,218 liters of water and per person per day (BCFN 2014).
4. Testing the Double Pyramid effectiveness in promoting healthy eating: empirical results from the Si.mediterraneo Project

Since 2011, the Double Pyramid model has been chosen by Barilla Company as the theoretical framework for its initiative “Si.mediterraneo”, an educational project aimed at increasing the well-being Group’s employees and raising their awareness on the environmental impacts of their food consumptions. The project, which is still on going, provided tangible results of the effectiveness of the Double Pyramid to promote healthy and sustainable food consumption.

Si.Mediterraneo project has a twofold purpose. Firstly, it was aimed at raising Barilla employees’ awareness about the benefits of the Mediterranean diet and the relationship between a healthy nutritional regimen and environmental sustainability. The second aim is to improve the eating habits of Barilla employees through nutritional education, modifying the company canteens menus to offer them a wider range of healthy foods, in line with the dietary principles of the Mediterranean Diet.

The project was developed in cooperation with the Department of Clinical and Experimental Medicine of the Federico II University of Naples. The initiative began in 2011 in the two company cafeterias at the Barilla Group headquarters in Pedrignano (Parma), and was then expanded to all the Group’s plants in Italy and in the USA. In 2013 the project has become a global commitment of the Group, and it has been extended to Barilla’s plants and offices in Europe (Germany, Sweden, Norway, Greece, Turkey, and France), Asia (Singapore, China, and Japan), Australia, Brazil and Canada.

Canteen menus were created to be well-balanced from a nutritional point of view, containing the correct proportion of calories, fibers, and saturated fatty acids, and to be sustainable from an environmental perspective. Carbon, Water, and Ecological Footprint have been used to assess and communicate the environmental impact of the menus proposed.

The canteen have been adorned with posters and other notices regarding the Double Pyramid model. The information focused on the nutritional value of the Mediterranean Model, the importance of calorie balance for weight maintenance, the promotion of unsaturated healthy fats, and the environmental impacts of different food choices. Informative materials were distributed into the eating spaces, in order to procure the employees with a proper knowledge about the importance of achieving a sustainable low-carbon diet, both from a health’s perspective and from an environmental point of view.

The same guidelines have been used in all the company canteens around the world. The traditional Mediterranean Diet has been adapted depending on the geographic areas it has been promoted, in order to enhance the food diversity and the culinary traditions of the various countries.

4.1. Results: estimated variation in consumption and environmental impacts

Pedrignano canteens consumptions have been monitored during three weeks between 2011 and 2012. Overall 12,160 meals were recorded. Results show that nutritional messages do have a significant influence on employees’ eating choices. In two months the consumption of whole grain pasta doubled, the consumption of whole grain bread increased (+40%). Fruit and vegetables consumption has improved, too. Results showed also a negative trend in the consumption of red meat (-77%), while the white lean meat consumption increased significantly (+60%). The initiative had positive results also from an environmental perspective, leading to a reduction of the greenhouse gases emissions, water use, and land use. In Pedrignano canteen alone, it has been assessed that the project allowed to save more than 65 kg of CO₂-eq every day, as well as 40 m³ of water and 1000 sq m² of Ecological Footprint per day.

Conclusions

The most interesting evidence emerging from the Double Pyramid is the coincidence, in a single food model, of two different objectives that share fundamental importance for mankind: health and environmental protection. In other words, it has been demonstrated that following a diet put forward by the traditional food-nutrition pyramid not only leads to an improvement in quality of life (longer life-span and enhanced health conditions), but also yields a decisively lower impact, better expressed as Ecological Footprint, on the environment. Indeed, food that should be
consumed in greater quantities, for example following the Mediterranean diet, fits into the category that inflicts less environmental impact overall. Vice-versa, foods falling into a recommendation of limited quantity consumption have also the higher impact on the environment. It has been demonstrated that a diet based on the principles of the Double Pyramid generates lower environmental impacts than a diet relying mainly on a daily intake of meat.

In other words, all of us, through eating responsibly, can definitely reconcile our personal wellbeing either the health of the environment.

We believe that thanks to its communicative efficacy, the Double Pyramid is a valuable tool for helping the general population decide what to eat on a daily basis in order to adopt a sustainable diet. This belief is supported by the results of the educational project Si.mediterraneo, which finds its theoretical basis in the Double Pyramid. The project has demonstrated the effectiveness of educational activities performed in the workplace for positively influence employees’ food choices. Combining the use of immediate and understandable graphic tools (Double Pyramid model and informative posters) with engaging educational activities and balanced canteen menu proposals, it is possible simultaneously increase the well-being of people through a proper nutrition, while protecting the environment.

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