

Common goods and food sovereignty

Double Pyramid and Economic Considerations on Sustainable Diets

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Executive summary

This document aims to offer a general introduction to the trade off between nutrition, health, diets and environment, following mainly the Double Pyramid approach started by BCFN in 2010. Taking Mediterranean diet as a sustainable diet reference model– as it is low in fats and meat consumption, whereas high in vegetables and whole cereals -, it analyzes the environmental impact and economic costs of the above mentioned model, making comparisons with other dietary habits.

Keywords

Sustainable diets, environment preservation, health and nutrition, menu cost

Introduction

“The Double Pyramid” to its third edition

In 2010 the Barilla Center for Food and Nutrition published its first study on “*the Double Pyramid*” investigating at the same time nutritional and environmental aspects of sustainable diets. The result claimed food healthy for people is also good for the planet. Graphically speaking, it is represented by two triangle shapes, one pointing up and the other one pointing down.

The first one represents the traditional Mediterranean diet pyramid, while the second one - turned down – is designed matching each food category with its ecological footprint.

In its second publication, the Double Pyramid position paper has been enriched with the study of a nutritive Mediterranean pyramid specific for ‘people who are growing’.

Finally, the third edition – to be published by the end of 2012 – opens the doors to economic research considering food prices in different countries to verify the effective costs of a sustainable diet.

All the research documents by BCFN are available online at www.barillacfn.com and freely downloadable, as to share culture and knowledge as a common good. The BCFN is a permanent think-tank created by Barilla in the effort of tackling the challenges of the future of food. How would we be able to feed about 9 billions of people in less than 40 years? What can be done to minimize the impact of food on the environment? What does it mean “degrowth” for the agri-food sector? – these are some of the research objectives of the BCFN, handled with an international and multidisciplinary approach.

Sustainable Diets

Defining the meaning

The notion of 'sustainable diet' would have been curious a few hundred years ago, when people obtained the majority of their foods out of their ecosystems. Biodiversity was valued and utilized; ecosystems and agro-ecological zones produced the foods that they had produced for millennia. Traditional knowledge and practices ensured the conservation and sustainable use of food biodiversity within healthy ecosystems. Agriculture, diets, and nutrition have changed so dramatically in recent decades, that now, the concept of a sustainable diet seems novel.¹

In 1986 Gussow and Clancy wrote a paper entitled *Dietary guidelines for sustainability*, on the *Journal of Nutrition Education*², adopting for the first time the term "Sustainable Diet". Although Gussow and Clancy did not provide specific food-selection recommendations, they hoped to initiate a discussion of the need of incorporating issues of agricultural sustainability into nutrition message.

From that moment on the topic has stirred the attention of governments and international organizations, as FAO. In 2010 FAO organized a scientific symposium on biodiversity and sustainable diets entitled "United against hunger", where they gave the following definition of 'sustainable diets':

"Sustainable Diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life 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."³

The notion of sustainable diet include also cultural, ethical and moral references, beyond the preservation of the environment. It is important to ensure satisfaction of people's expectations and economic and geographic accessibility to food resources. Despite of improvement in agricultural technics in the last three decades, it is clear nowadays the entire food system is not working at the best, as 1 billion people live in hunger albeit 1 billion people suffer from obesity and cardiovascular diseases.

The American professor Michael Pollan⁴, author of *Food Rules*, gives us a few simple suggestions to follow a sustainable diet. **"Eat food. Not too much. Mostly plants"**, or "Eating what stands on one leg (vegetables and pulses) is better than eating what stands on two legs (poultry), which is better than eating what stands on four legs (red meat)".

¹ Barbara Burlingame, Sandro Dermini, 3rd CIISCAM International Conference, 2009, <http://www.ciiscam.org/files/download/eventi/folder%20inglese%20ciiscam%202009%20%20.pdf>

² Gussow JD, Clancy KL. *Dietary guidelines for sustainability*. *J Nutr Educ*. 1986;18:1-5

³FAO, International scientific symposium on biodiversity and sustainable diets, Final document, 2010 <http://www.fao.org/ag/humannutrition/28507-0e8d8dc364ee46865d5841c48976e9980.pdf>

⁴ Michael Pollan, journalist, activist and professor at UC Berkeley Graduate School. Author of *Food Rules*, USA, 2011

The Mediterranean model

Healthy, nutritious, sustainable

The importance of the Mediterranean diet lies not in its specific foods but in the methods used to characterize/analyze it and philosophy of sustainability at its core. These same methods can be used to characterize sustainable diets in other eco- food systems, to identify the necessary new paradigms of reference for the solution of the many challenges that face humankind, with more than one billion hungry people worldwide.⁵

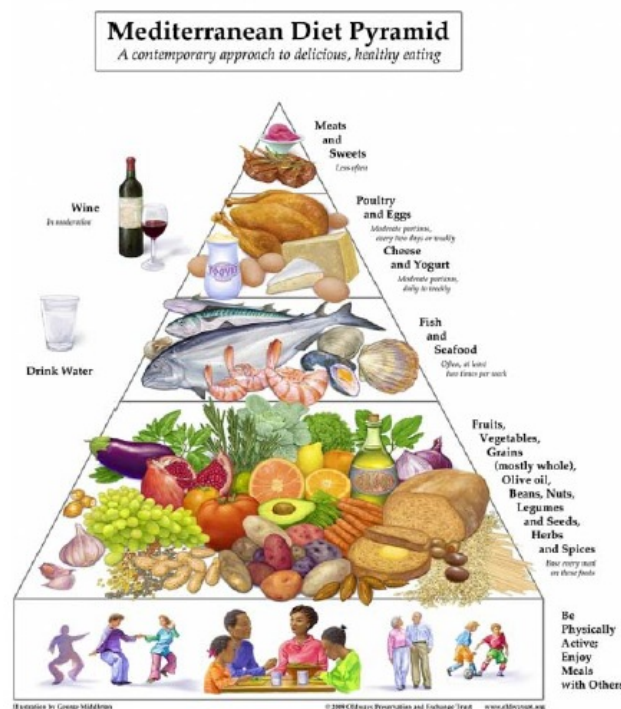


Fig 1 - Mediterranean diet representation by Oldways

The uniqueness of Mediterranean diet lies at the bottom line of the pyramid. Doing some sports or physical activities, besides the habit of sharing the meal together with family or friends, are fundamental to the success of a healthy diet. In this sense the word 'diet' is intended in its original Greek meaning of *diaita* – "lifestyle". The *World Health Organization* highly recommends the Mediterranean diet (typical of Italy, Spain, Portugal, Greece and Provence) as it is associated with health and longevity, along with the Japanese diet, also low in meat and saturated fats and high in pulses and vegetables intake.

Former Italian Ministry of Agricultural, Food and Forestry Policy Prof. Petrillo from University of Rome La Sapienza, in its contribution to the book *Sustainable diets and biodiversity* published by FAO, focuses on the biocultural diversity: "...The Mediterranean diet encompasses more than just food. It promotes social interaction, since communal meals are the cornerstone of social customs and festive events. It has given rise to a considerable body of knowledge, songs,

⁵ Sandro Dernini, CIISCAM, Forum on Mediterranean Food Cultures, 2009
<http://www.ciiscam.org/files/download/eventi/folder%20inglese%20ciiscam%202009%20%20.pdf>

maxims, tales and legends. (...) The Mediterranean diet emphasizes the development of a relatively new concept: the bio-cultural diversity. This concept encompasses biological diversity at all its levels and cultural diversity in all its manifestations. **Biocultural diversity** is derived from the countless ways in which humans have interacted with their natural surroundings. Their co-evolution has generated local ecological knowledge and practices: a vital reservoir of experience, methods and skills that help different societies to manage their resources.”⁶

Mediterranean model has been claimed to be one of the most complete from a nutritional point of view. The first scientific study about it - made in the 40s by Ancel Keys et al. – was called ‘*Seven Country Study*’ and it highlighted the relationship between a balanced and controlled diet and the right level of cholesterol in blood. The majority of the successive studies focused on seeking causes of chronic diseases like cardiovascular ones, diabetes, cancer. Specifically, the only natural way to prevent cardiovascular diseases is a diet inspired to Mediterranean model, which is poor in fats, sweets and meat albeit high in vegetables, fruits and dried fruits, olive oil, cereals (whole wheat to be preferred to white one), fish and non-salted dairy products.

Furthermore, the above mentioned diet is preferable not only for its health benefits, but also because of its environmental sustainability. Some researchers from the Mediterranean Agronomic Institute of Montpellier and Bari stated the parameters by which Mediterranean diets can be defined sustainable.

(I) The large variety of food preserves biodiversity of the area, (II) variety of preparing methods is a cultural asset, (III) small amount of animal products, (IV) there is a solid cultural heritage of sharing meal and respect natural seasonality and surrounding landscape.⁷

In 2010 UNESCO has inscribed the Mediterranean model into the list of Intangible cultural heritage of Humanity, as follows:

“The Mediterranean diet constitutes a set of skills, knowledge, practices and traditions ranging from the landscape to the table, including the crops, harvesting, fishing, conservation, processing, preparation and, particularly, consumption of food. [...] the Mediterranean diet (from the Greek *diaita*, or way of life) encompasses more than just food. It promotes social interaction, since communal meals are the cornerstone of social customs and festive events. It has given rise to a considerable body of knowledge, songs, maxims, tales and legends. The system is rooted in respect for the territory and biodiversity, and ensures the conservation and development of traditional activities and crafts linked to fishing and farming in the Mediterranean communities. Women play a particularly vital role in the transmission of expertise, as well as knowledge of rituals, traditional gestures and celebrations, and the safeguarding of techniques.”⁸

⁶ Petrillo P.L., *Biocultural diversity and the Mediterranean Diet*. In FAO. (2010). *Sustainable Diets and Biodiversity*. 224-229.

⁷ Padilla M., Capone R., Palma G., Sustainability of the food chain from field to plate: the case of the Mediterranean Diet. In FAO. (2010). *Sustainable Diets and Biodiversity*. Pgg. 230-241.

⁸ <http://www.unesco.org/>

Meat consumption

An overall look at latest data

USA - As the American Journal of Clinical Nutrition reports⁹, it has been calculated that about 2 billion people worldwide follows a meat-based diet, whereas 4 billion people have a plant-based diet.

“In the United States, more than 9 billion livestock are maintained to supply the animal protein consumed each year. This livestock population on average outweighs the US human population by about 5 times. Some livestock, such as poultry and hogs, consume only grains, whereas dairy cattle, beef cattle, and lambs consume both grains and forage. At present, the US livestock population consumes more than 7 times as much grain as is consumed directly by the entire American population.¹⁰ The amount of grains fed to US livestock is sufficient to feed about 840 million people who follow a plant-based diet¹¹”. Figure 3 reports some data elaborated by the USDA (U.S. Department of Agriculture) referring to the period 1994/96.

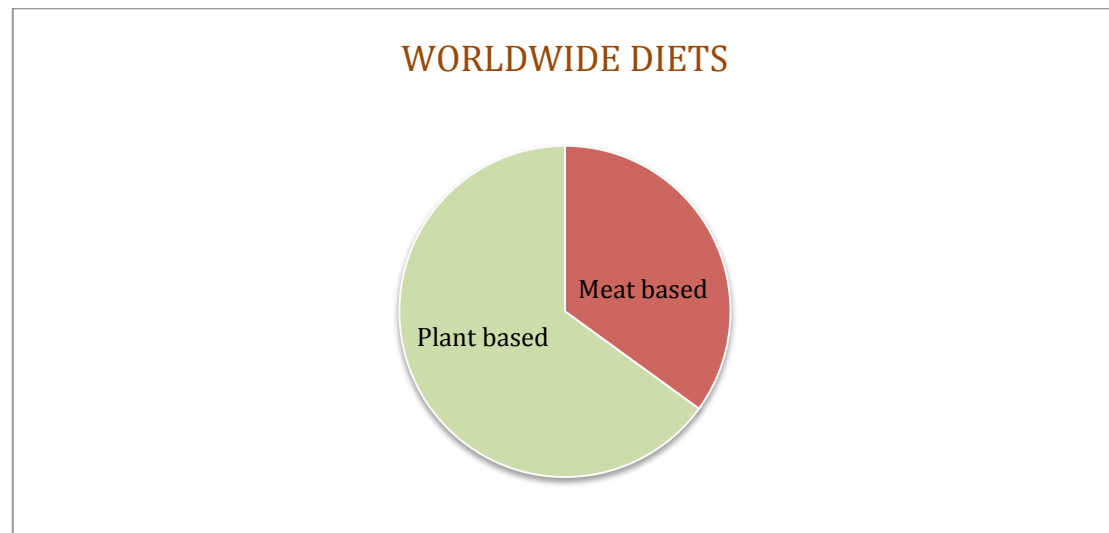


Fig 2 – 1/3 people in the world follow a meat based diet, 2/3 a plant based one

Italy - Regarding Italian situation, the most recent study about food consumption habits was published by INRAN (National Research Institute for Food and Nutrition) in 2008.¹² Taking into consideration protein content foods, referring to the years 2005 - 2006 it turned out 75% of Italians eat regularly red meat, while just 35% eat pulses and 31% pork meat. In other words, about 65% of consumers never eat pulses and 25% of them never eat red meat.

⁹ <http://ajcn.nutrition.org/content/78/3/660S.full>

¹⁰ US Department of Agriculture. Agricultural statistics. Washington, DC: US Department of Agriculture, 2001.

¹¹ Pimentel D. Livestock production and energy use. In: Cleveland CJ, ed. Encyclopedia of energy (in press).

¹² Leclercq et al (2008); Turrini (2001).

Europe - “The EFSA European Food Consumption Database”¹³ reports eating habits data ordered per food macro groups of 22 European countries. Particularly, in the graph has been highlighted data from France and Sweden.

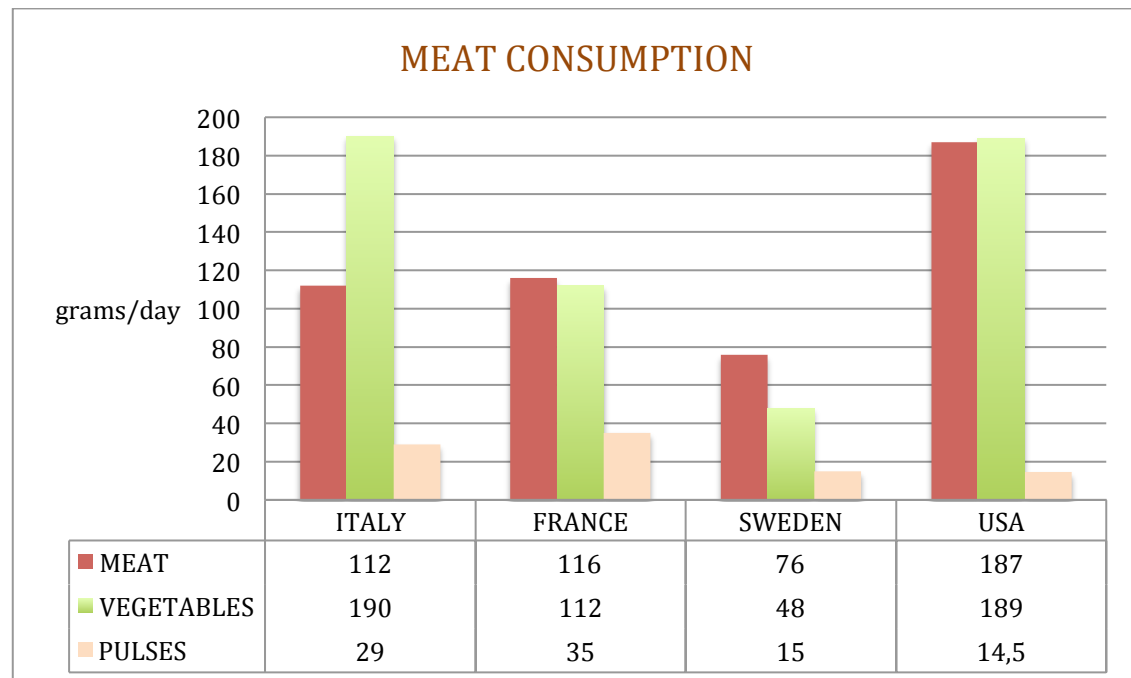


Fig 3 – Some food categories grams per day consumption, as reported by INRAN (Italy), The EFSA European Food Consumption Database (France and Sweden), USDA (USA)¹⁴

UK - In UK it is estimated that every person consumes about 79 kilos of meat per year. In order to reduce meat consumption, WWF has started a project named Livewell, aiming to drastically cut meat consumption reaching the threshold of 10 kilos/year by 2020.

The 5 Livewell¹⁵ principles to educate to a healthy and sustainable diet are:

- 1) **Eat more plants** - enjoy fruit and veg
- 2) **Waste less food** - 40% of food planted worldwide is wasted
- 3) **Eat less meat** - Meat, be it red or white, can be a tasty complement rather than just a centre piece of a good meal
- 4) **Eat less processed food** - as they tend to be more resource intensive to produce and often contain high levels of sugar, fat and salt
- 5) **Eat certified food - buy food that meets a credible certified standard**- like MSC for fish or RSPO for palm oil or RSPCA Freedom Foods for meat and eggs.

¹³ <http://www.efsa.europa.eu/en/datexfoodcdb/datexfooddb.htm>

¹⁴ Please note that graphics are a rough guide. Data are not directly comparable, as they come from different sources.

¹⁵ The WWF Livewell project http://www.wwf.org.uk/what_we_do/changing_the_way_we_live/food/

Measuring methods

The food chain environmental impact

There are three indexes commonly used to analyze the impact of food production and consumption on the environment. They have been outlined taking in account the LCA (Life Cycle Assessment) criteria, which means considering every phase of the product lifecycle from production to final consumption, as shown in Figure 4.



Fig. 4 - The LCA analysis regulated by international standards ISO 14040 and 14044.

The process analysis highlights the main environmental loads: greenhouse gas generation, the use of water resources and the ability to regenerate local resources. According to this input, the following environmental indicators were chosen:

1. **Carbon Footprint**, representing and identifying greenhouse gas emissions responsible for climate change: measured through the CO₂ equivalent;
2. **Water Footprint** or virtual water content, quantifying consumption and how to use water resources: measured through water volume (liters);
3. **Ecological Footprint**, measuring the quantity of biologically productive land (or sea) needed to provide resources and absorb the emissions produced by a manufacturing system: measured in m² or global hectares.

Lately, one more parameter has been added to measure air and soil pollution derived from fertilization. It is the **N-print (Nitrogen Footprint)**, although at the moment there are no sufficient data to include it in this analysis.

Nitrogen is a core part of industrial food production, so its impact cannot be ignored. “Of the N used to produce food, about 80% is lost before consumption, and the remainder is lost after consumption as human waste. Once lost to the environment, this nitrogen moves through the Earth’s atmosphere, forests, grasslands and waters causing a cascade of environmental changes that negatively impact both people and ecosystems. These changes include smog, acid rain, forest dieback, coastal ‘dead zones’, biodiversity loss, stratospheric ozone depletion and an enhanced greenhouse effect”¹⁶

A sustainable diet model The Double Pyramid

All things considered, below there is the graphical representation of the Double Pyramid. It is clearly shown foods that nutritionists recommend to assume in small quantities are the same having the biggest impact on the environment. The food pyramid reports the Mediterranean diet model, while the environmental pyramid on the right has been designed referring to the Ecological Footprint food relative data.¹⁷

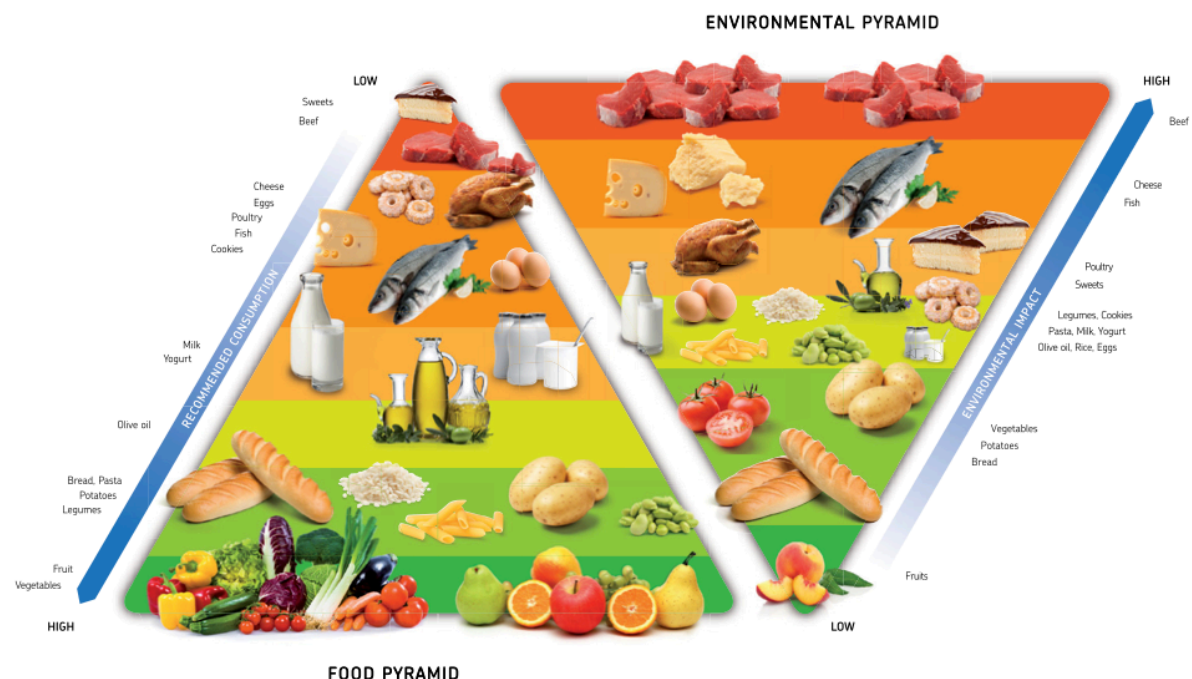


Fig. 5 - Double food and environmental pyramid by BCFN - 2011

¹⁶ <http://www.n-print.org/node/31>

¹⁷ <http://www.barillacfn.com/en/position-paper/pp-doppia-piramide-2011/>

Education and Communication

New players are taking action

After scientific studies affirming the validity of the Mediterranean diet, it is necessary to shift the focus on how to communicate this and how to increase consciousness about environment and health related individual food choices. Once this depended on the family, unfortunately nowadays a few social changes have occurred. In fact, due to working hours flexibility and women entering the job market, time for the family meal – especially for preparing it – has been cut down abruptly. This causes adolescents not to have a good food education, besides not having a balanced nutritive diet.

Consequently, it is important food education comes from other sources, like public campaigns, schools, canteens, supermarkets and other players involved in the food sector.

Supermarkets. A SCS Consulting research co-committed by BCFN analyzes data referring to two different periods (2009 and 2011) about consumers' inclination towards being aware of green products and eventually purchasing them. The research was realized on site by directly 'opening' consumers' shopping bags, after asking them to answer a few questions. Data report shows first of all an increase in the percentage of people being aware about green issues and the active role played by their purchasing choices (75% of a 1.200 clients cross section). In second place, it has been demonstrated the more retailers invest into energy savings policies, new organic or certified product lines and communicate clearly their 'green trail' towards sustainability – the more people are induced to reflect on this kind of issues and eventually to buy low impact products.

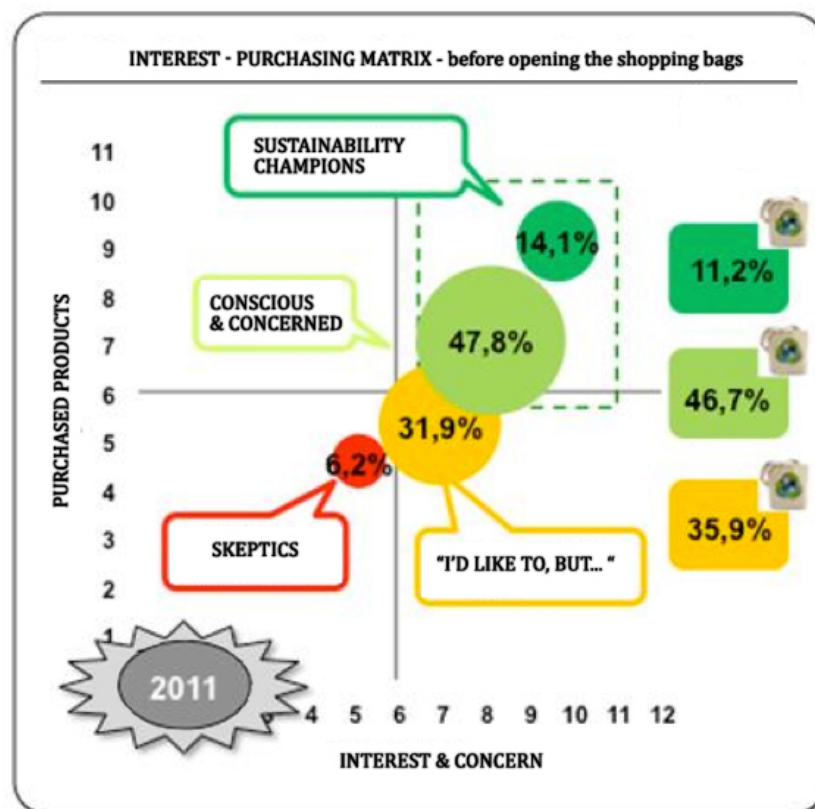


Fig. 6 – Effects of sustainability communication policies in supermarkets, 2011.

Canteens. In October 2011 Barilla started applying practically the results coming from its researches on nourishing and sustainable diets in the the two company canteens for office and plant staff at Pedrignano (Parma), the Group's headquarters, where 1,500 people work.

Sì.Mediterraneo¹⁸ is a pilot project developed in collaboration with the Department of Clinical and Experimental Medicine of the Federico II University of Naples and the contribution of the Barilla Nutrition Advisory Board. The final aim is to increase the nutritional knowledge of Barilla People, starting from an analysis of their eating habits and lifestyle. Over the course of four weeks, information was provided on the Mediterranean Diet, the Double Pyramid, the nutritional value of food such as products based on whole grains or pulses, consumption of fish and white meat, and reduction in sweet products.

To this end, information panels were set up in the canteens, and illustrative place mats handed out along with leaflets summarizing the initiative's main messages. As a consequence, also the canteen menus were modified with an increase in wholegrain products including pasta and bread, pulses, vegetarian options, salads of cereals, vegetables, plus fish and less fatty meat, and more in general meals that respect the wellbeing of People and the environment, and provide high nutritional value, clearly indicated on the day's menu.

Also the so-called "cestini" were modified. These are quick meals that can be booked and delivered to the workplace in the case of meetings or other commitments. To verify the impact of the project on the eating habits of Barilla People, consumption before and after the conclusion of the initiative was monitored.

The results were astonishingly positive, so Barilla is now thinking to expand the project to other company canteens in Italy and also abroad.

SÌ.MEDITERRANEO INDICATORS	TOTALS	OFFICE CANTEEN	PLANT CANTEEN
Number of "cestini" with vegetarian option	+35%	from 338 to 538	from 337 to 370
Quantity of cheese and eggs	-20%	-39%	+4%*
Quantity of pulses	+55%	+12%	+152%
Quantity of fish	+40%	+67%	+16%
Quantity of deli meats	-24%	-26%	-21%
Quantity of whole grain bread	+41%	+45%	+39%

Fig. 7 Results of Sì.Mediterraneo by Barilla – a pilot project of communication and practical actions over sustainable diets in company canteen, 2012.

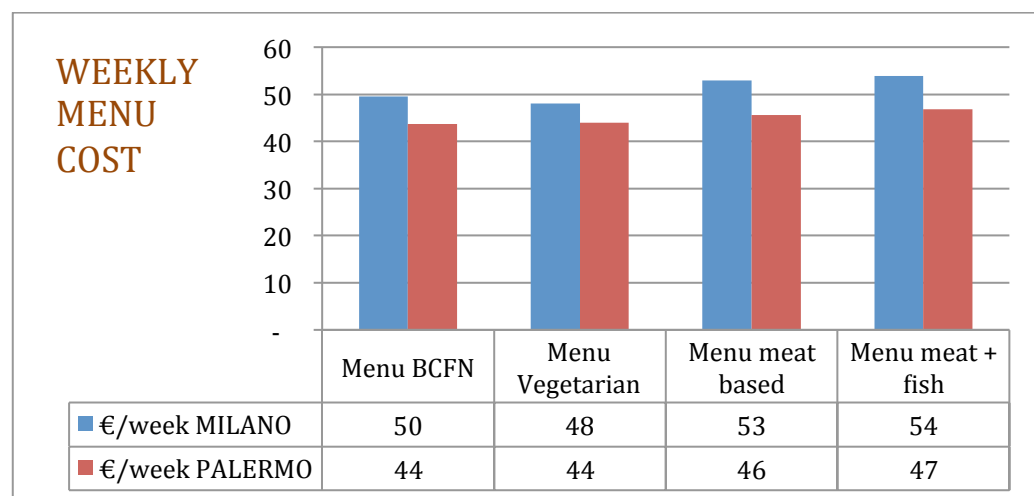
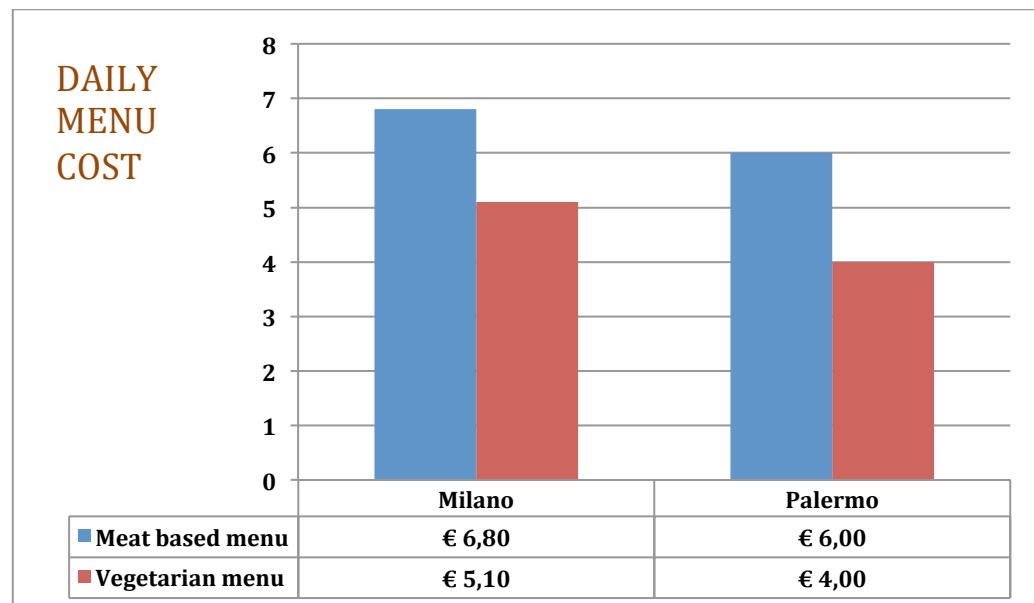
¹⁸ <http://www.barillagroup.com/vm/en/sustainabilityreport2012/costruire-conoscenza.html>

Tackling degrowth issues

The cost of sustainable diets

One of the recurring questions about sustainable eating is how much does it cost in economic terms. Would it be really sustainable – even from an economical standpoint - following a green diet? There are contrasting opinion about this matter, some people stating reducing meat consumption would visibly help in saving money, others blaming vegetables prices to be too expensive.

The BCFN has analyzed food retailers' common prices in two different Italian cities, then it has formulated two different kind of menus, one vegetarian and one meat-based. On weekly basis, giving the same nutritive properties and calories quantity, it has turned out vegetarian menu would cost 10% less than having meat every day.



To be more specific, in an ideal scenario of a world with enhanced equity, talking of costs should ideally **include all the externalities and the occulted costs of a product, not just its price**. The economic costs chart should include also hidden costs, like healthcare expenses due to a bad diet with a non-balanced nutritive and calorie intake. According to this principle, also environmental externalities have been calculated for each menu, referring respectively to the Carbon Footprint, Water Footprint and Ecological Footprint criteria. The four menu considered in the chart are to be intended as sample options of four different kinds of dietary patterns: vegetarian (no meat), BCFN menu (meat or fish 8 times/week), meat-based menu, and a menu rich in meat and fish.

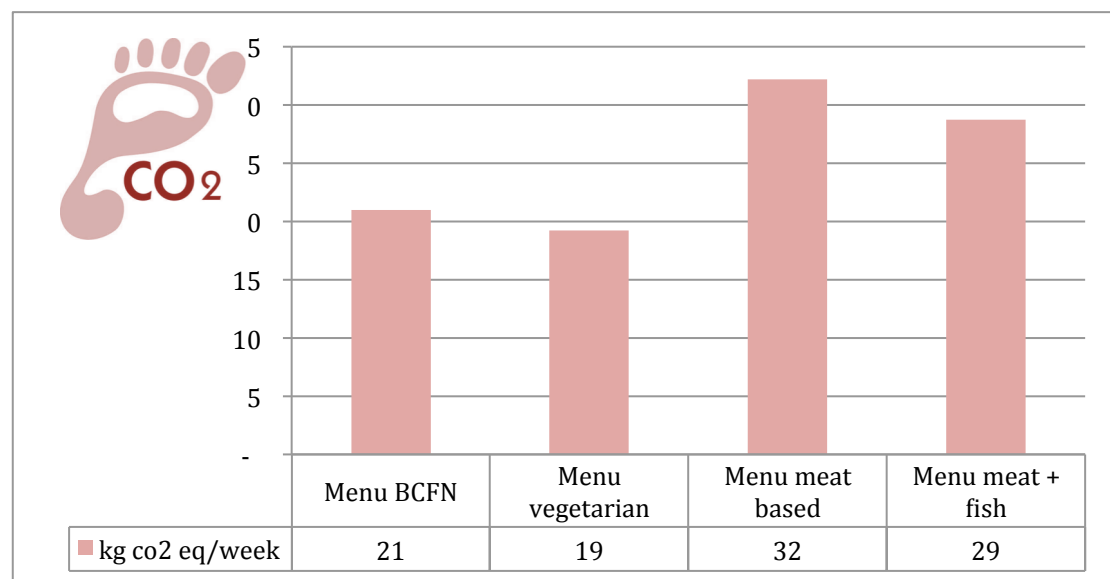


Fig. 8 Carbon Footprint analysis of four different menus – all nutritionally balanced.

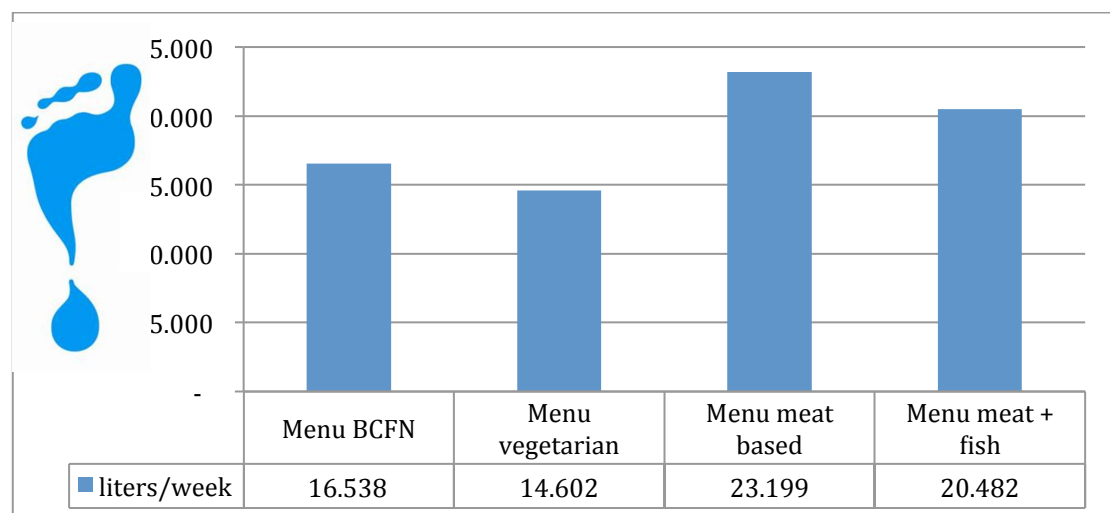


Fig. 9 Water Footprint analysis of four different menus – all nutritionally balanced.

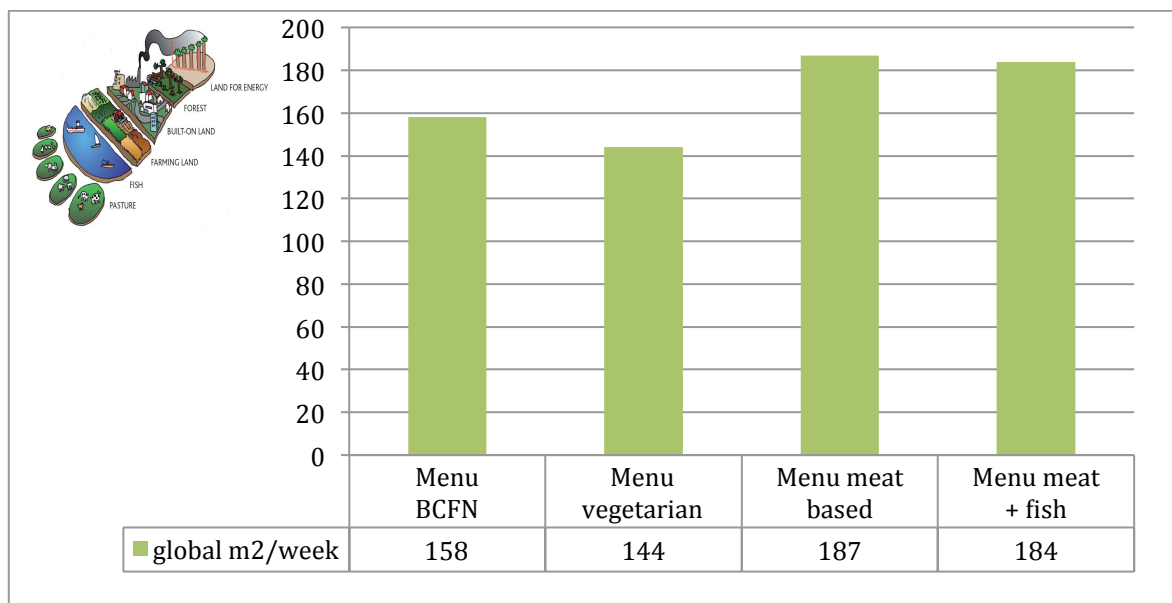


Fig. 10 Ecological Footprint analysis of four different menus – all nutritionally balanced.

Looking at the graphics above, it can be said a vegetarian menu costs about 10% less than a meat-based one. Moreover, it has a markedly lower impact on the environment: its Ecological Footprint is 15 m² versus 41 m² of a meat menu.

The chart below reports a series of studies analyzing food prices to tell if sustainable diets are more or less expensive than diets including high impact (and less nutritive) foods. On a group of 8 studies, 5 of them state sustainable diets cost more, on the opposite there are 3 studies claiming they cost less. The variance mainly depends on the methods used in doing analyzes.

A research conducted by USDA (U. S. Department of Agriculture) in 2012¹⁹ shades the light on how big the difference in results could be, giving two different measuring methods. For instance, if it is considered the price per calorie of a food, it is likely vegetables and fruits would cost more (up to 3,70\$ per 100 kcal), while 'moderation foods' (less healthy foods - especially those high in saturated fat and added sugar) would cost less than 2,30\$ per 100kcal. Obviously, fruits and vegetables have less calorie density – and more micronutrient – than moderation foods.

On the contrary, if the analysis method is shifted from price per calorie to considering price per edible grams, fruits and vegetables would have an average cost of maximum 1,70\$ per portion, while moderation foods would cost about twice the price - giving the same amount of edible product.

Also, it is important to consider that price-related studies are strictly relative to a specific regional area, so they can't be applied worldwide.

¹⁹ United States Department of Agriculture, Economic Research Service, *Are Healthy Foods Really More Expensive? It Depends on How You Measure the Price*, 2012 <http://www.ers.usda.gov/publications/eib-economic-information-bulletin/eib96.aspx>

COUNTRY	STUDY	APPLIED METHODS	RESULTS	SUSTAINABLE DIETS COST...
Italy	BCFN 2012	Using market prices to calculate the cost of daily and weekly nutritionally balanced menu (source: The Price Watch of the Ministry of Economic Development)	Sustainable diets cost 10% less. A 'sustainable menu' costs from 2€ to 4€ less per day, than a meat based menu	LESS
USA	Drewnowski et al. 2012	Prices for 100g of edible portions	Foods high in energetic content are likely to cost less. On the contrary, cost per calorie of fish, light meat, whole grains, vegetables and fruits is more expensive.	MORE
USA	USDA 2012	Price per calorie	Vegetables and fruits are more expensive than moderation foods.	MORE
		Price per edible gram	Giving the price per edible gram and per average portion, vegetables and fruits are less expensive than moderation foods.	LESS
France	Drewnowski et al. 2004	Additional grams per price	Additional 100 grams portion of fruits and vegetables per day causes the total food daily price to increase by 0,23 – 0,38 \$	MORE
France	Drewnowski et al. 2007	\$/Kcal	Shifting from a high energy density menu to a lower energy density menu would cost about 25% more. E.G. A man shifting from a 2700 kcal daily menu to a 2390 kcal daily menu should pay 764 \$ more per year.	MORE
UK	Cade J. et al. 1999	Price per Healthy diet indicator	Cost difference between a lower HDI level and one higher is 540£ / year (= abt 685€)	MORE
UK	WWF 2011	Livewell 2020 project's shopping list price – compared with DEFRA data	Livewell 2020 weekly shopping price: 28,40 £/person (= abt 36€). Average cost of food shopping and alcoholic beverages of an English family in 2009: 32,12 £/person (= abt 41€).	LESS

**moderation foods: less healthy - especially those high in saturated fat and added sugar*

Conclusions

A crucial moment

Regarding menu costs analysis - in conclusion - beneath a few contrasting evidences due to different measurement methods, it can be assumed 'sustainable eating' is not necessarily more expensive. It depends on many factors, like country, economic situation, food accessibility, type of main economic activities of a specific area. Mediterranean diet is cheaper – especially in Italy - provided a frequent consumption of low cost and high nutritious foods, such as pasta, pulses, and some kind of vegetables, oil and dried fruits. Saying that, there is actually one point in which Mediterranean is more lavish than western popular diet. It is the amount of time required to prepare daily fresh and healthy meals, so it is time the necessary resource. Besides, this food model is a grant for the future wellbeing, as it prevents many chronic cardiovascular diseases. Considering food a common good in a future perspective, the Mediterranean sustainable diet seems to offer an option to naturally balance nutrition, health and environment preservation.