



**Barilla**  
Center  
FOR FOOD  
& NUTRITION

people, environment, science, economy

# DOUBLE PYRAMID 2015

RECOMMENDATIONS FOR A SUSTAINABLE DIET





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# BARILLA CENTER FOR FOOD & NUTRITION

SCIENCE, PEOPLE, ENVIRONMENT, ECONOMY

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[www.barillacfn.com](http://www.barillacfn.com)

The contemporary world is experiencing a major food emergency. The food we choose to eat, its production chain, the ways and places in which we consume it and its inequitable distribution in different parts of the Planet have a profound effect on the mechanisms that govern our society and our times.

In recent years, it has become necessary to compare the different points of view of the actors involved along the food chain, from the field to the table. Ever since its creation in 2009, the Barilla Center for Food & Nutrition has established itself as a privileged platform for this choral dialog and for a wide range of issues about food and nutrition. The BCFN's aim is to become a collector and connector between the different voices, offering

solutions and proposals, and putting science and research in communication with policy decisions and governmental actions.

The BCFN is dedicating an area of study and research to every crucial issue related to food and nutrition, to address current and future challenges: from the problem of access to food and its distribution in the world (*Food for All*) to the rebalancing of the unstable relationship between food and health through healthy lifestyles (*Food for Health*), from reflection on the food chain and assessing the impact of production on the environment (*Food for Sustainable Growth*) to the history of the relationship between man and food, in order to find some good solutions for the present (*Food for Culture*).

## DOUBLE PYRAMID 2015 RECOMMENDATIONS FOR A SUSTAINABLE DIET

The importance of food for health is confirmed by new studies every day. Research in recent years has shown that agri-food is one of the sectors with the greatest responsibility for greenhouse gas emissions and water consumption. What the BCFN Double Pyramid communicates for the first time is that the foods which nutritionists recommend consuming more frequently are also those which have a lower environmental impact. The sixth edition of the Double Food and Environmental Pyramid thus confirms our commitment to promoting correct dietary information, which is always updated and attentive to including the results of the most recent research.

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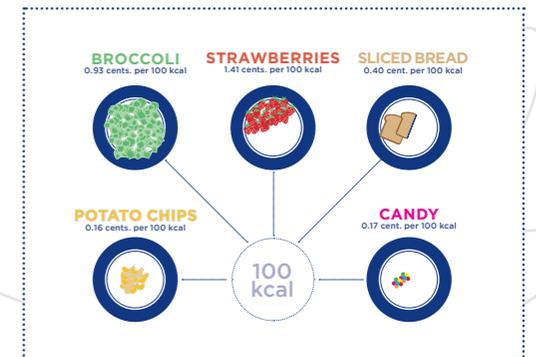
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# EATING BETTER WILL IMPROVE YOUR HEALTH AND THE ONE OF THE PLANET

Every day, the importance of food for people's health is confirmed by new studies. Today, we also know that the food-producing sector has among the highest environmental impact of an economy. According to the BCFN's food and environmental double pyramid, we also know that food products recommend eating more frequently are precisely those that cause fewer CO<sub>2</sub> emissions, less consumption of water and a smaller ecological footprint.

This BCFN model, presented for the first time in 2009, has been transformed over the years into a real line of research: a study path that has been enriched through new stages and scientific subjects which have consolidated the initial diagram. In six years, the amount of data supporting and confirming the initial theory has been multiplied tenfold. Some new versions of the model have been proposed, taking into account different nutritional needs – starting from children. The question of prices has also been considered: prices can influence choices, especially of those who, being less informed, are unable to evaluate correctly all the purchasing alternatives of their food choices. In this new edition of the food and environmental double pyramid, a special emphasis has been placed on the main food policies promoted by public and private organizations, identifying the different countries, the most interesting experiences and the models that can be most easily replicated. In this regard, growing attention to sustainability

is recorded by the participating countries at Expo 2015. There is a new institutional sensitivity as in the case of the United States, where the group of government consultants, made up of doctors and experts in nutrition, has, for the first time since 1980, related human diets with the Planet's sustainability, saying that a diet based on plants is good both for the health of people and the Planet. In the hope that the Milan Charter (which summarizes the contents of the Expo) does not remain just a list of good intentions, the BCFN Foundation is pursuing its objective of helping people improve their behavior – because sometimes even the most informed consumers are not always able to change their habits. In many cases a wrong behavior, instead of improving, is reinforced, not only due to exposure to advertising or other forms of promotion, but also because of the physical and social contexts in which people live.

In this context, families – often the main actors in the education of young people – increasingly need the collaboration and support of all private and public institutional subjects.

The message of the double pyramid aims to encourage widespread awareness that food is one of the significant factors of global sustainability: improving its impact on the environment and on health must be a priority for all the players. Eating better will improve your and your Planet's health.

*Luigi De Biasi*

# THE DOUBLE PYRAMID: A REFERENCE MODEL

*The intuition that led to building up the environmental pyramid as the inverted version of the classic food pyramid, communicating, for the first time, the inverted relationship between nutritionally recommended foods and the environmental impact, was therefore not the point of arrival but of departure for a project that was becoming increasingly structured.*

*The BCFN Foundation's efforts to pool the best of international research have recently increased at the same pace as people's growing interest in nutrition topics, the increasingly aware concern for the harmful effects of CO<sub>2</sub> emissions caused by human activity (agriculture in the first place) and, more in general, the attention towards everything that can foster agri-food sustainability. For 2015, this path has again led to this document*

*which represents its best summary.*

*As you will be able to appreciate on the following pages, the same scientific approach as in the previous publications, has been followed. The style also reconciles the scientific rigor of the sources with an educational approach that is also suitable for the general public.*

*A further step forward can further foster the collaboration between the BCFN Foundation and all the other institutional subjects (starting from schools) and private parties, such as food companies and distributors, the media, both old and traditional; in the awareness that only a constant and collective commitment and can lead us today towards the solution of the paradoxes which today make the way we produce, distribute and consume food unsustainable.*



# THE LINK BETWEEN FOOD AND THE ENVIRONMENT

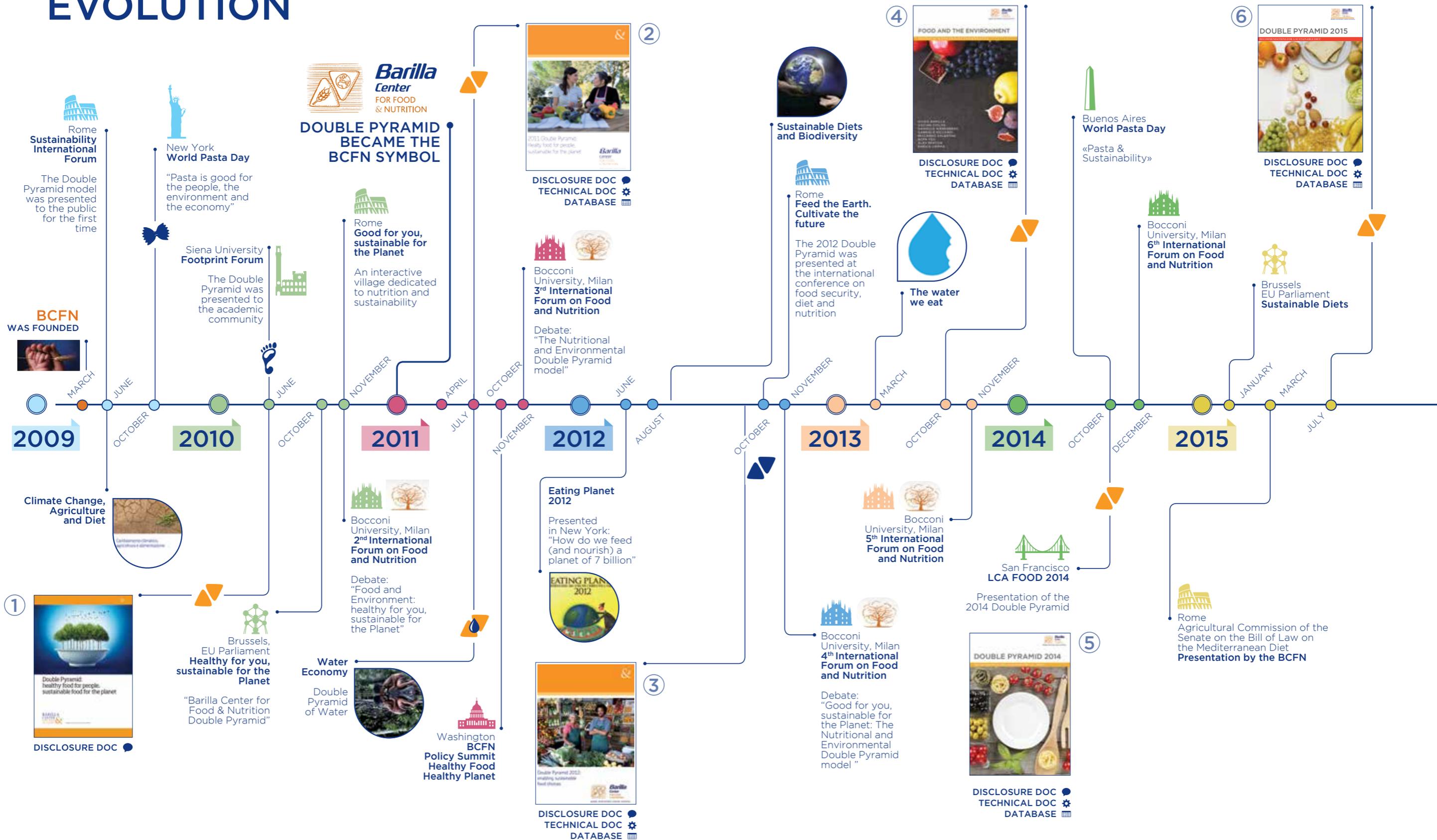
*This food model lets you eating healthily  
without necessarily spending more,  
and keeps your environmental impact low*

The main novelty introduced by the Double Pyramid in 2009 is the close relationship between the environmental impacts caused by the production and consumption of food and their nutritional aspects. In particular, by adopting a dietary pattern which is in line with nutritionists' recommendations such as the Mediterranean diet, it is possible to reconcile the health of people with the sustainability of the environment, without negatively affecting the economy.

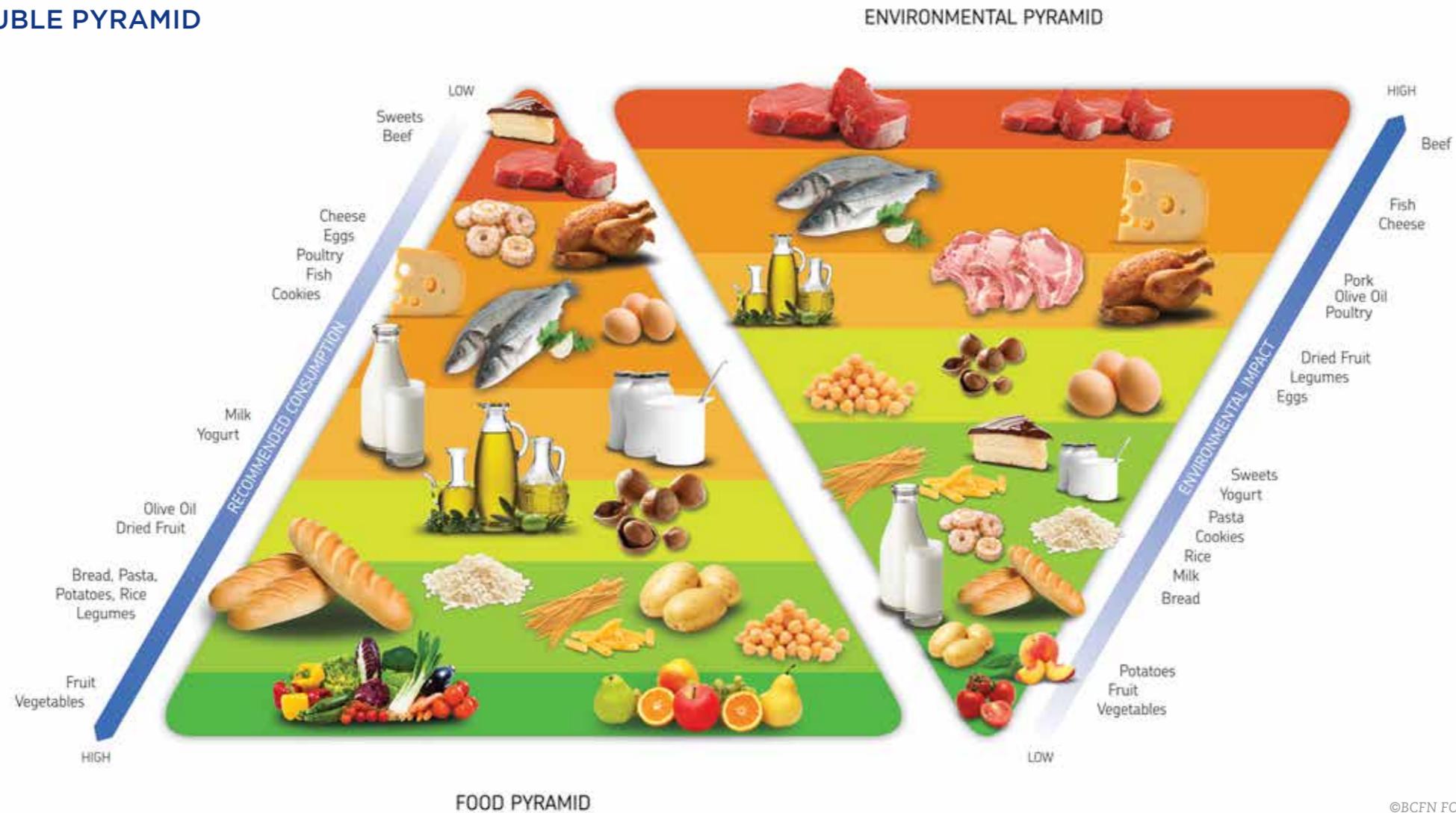
Moreover, as Professor Timothy Lang, an expert in food policy, maintains, the objectives of public health and ecosystems converge. Eating every kind of food without excess, reducing the consumption of meat and dairy products, and increasing that of fruit and vegetables is not only of benefit to people, but also to the environment in which we live<sup>1</sup>. The conceptual model of the

Double Pyramid was created in response to the need to explain the environmental impact of our food preferences. From the first analysis carried out by the Barilla Center for Food & Nutrition published in 2010, it became clear that the foods creating a lower environmental impact are those which, according to nutritionists, should be consumed in larger quantities while those that have a more pronounced environmental footprint on the Planet should be consumed in moderation. Based on this important discovery, the BCFN set the objective of informing institutions and consumers that a well-balanced diet has a positive effect both on people's health and the environment: for this purpose, it developed a diagram where the classical food pyramid (i.e. the Mediterranean diet) is put side by side with a new upside down 'environmental' pyramid in which foods are classified according to their ecological footprint.

# THE DOUBLE PYRAMID EVOLUTION



## THE DOUBLE PYRAMID



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### THE DOUBLE PYRAMID OF THE BARILLA CENTER FOR FOOD & NUTRITION

Over time, the concept of the Double Pyramid has been improved as demonstrated by the publication of six papers dedicated entirely to the topic. The first study entitled *Double Pyramid: healthy food for people, sustainable food for the Planet* was presented at Milan Science Museum in 2010 and proposed the innovative environmentally-friendly food pyramid as a tool for educating people on the right food choices.

The following year *Double Pyramid 2011: healthy food for people, sustainable for the Planet* analyzed

the nutritional requirements of children and adolescents and their relative impact on the environment. The same year, in order to emphasize the central importance of the concepts expressed by the Double Pyramid, it was chosen as the icon of the BCFN. The third paper, *Double Pyramid 2012: enabling sustainable food choices* started a debate on the economic sustainability of a healthy and low-impact diet, while in 2013 the BCFN Magazine *Food and the Environment: diets that are healthy for people and for the Planet* provided further ideas on how to improve and reduce the Carbon Footprint of our food system. The fifth edition, which was presented at LCA FOOD 2014 in San Francisco, aimed at determining the envi-

ronmental impact of various diets (other than the Mediterranean diet) focusing especially on American eating habits. In this sixth edition, the theme is the food policies implemented by the institutions, and their fundamental role in promoting a sustainable diet. The model of the Double Pyramid, thanks to its ability in summarizing complex scientific concepts, has spread rapidly and widely, being considered and expanded on in various publications: *Water Economy* (BCFN, 2011) examined the concept of the water Double Pyramid on the impact of food and beverages; the book *Eating Planet 2012 – Nutrition today: A challenge for mankind and the Planet* (BCFN, 2012) analyzed the effects of individual eating habits on health and the

environment and other topics; the book *Sustainable Diets and Biodiversity* (FAO, 2012) contained a whole chapter regarding the Double Pyramid; while the issues analyzed in *The Water We Eat* (Edizioni Ambiente – WWF, 2013)<sup>2</sup> included the water footprint of foods and its economic, social and political implications using a multidisciplinary approach, as well as a report by BCFN on the concept of the food and water Double Pyramid together with the calculation of the virtual water contained in pasta.

<sup>1</sup> Timothy Lang, 2012.

<sup>2</sup> Recently also translated into English: *The Water We Eat: Combining Virtual Water and Water Footprints* (Springer Water Edition, 2015).

Over the years, many events have been organized to present and discuss these concepts for both the scientific community and the institutions, and the general public. In particular, at the International Forum on Food and Nutrition which has been organized by the BCFN annually at the Bocconi University in Milan since 2009 to promote the debate on global food-related topics and generate concrete proposals to improve sustainability in the agro-industrial sector, large areas are set aside to discuss global issues related to food, sustainable diets and the Double Pyramid.

### DIET FOR PEOPLE'S HEALTH

The food section of the Double Pyramid is the graphic representation of the most important international nutritional guidelines<sup>3</sup> and the main indications for the prevention of non-infectious diseases (cardiovascular, diabetes, cancer). It is inspired by the Mediterranean diet, one of the most coherent and representative of a healthy diet and correct lifestyle and considered so important that UNESCO acknowledged it as being an Intangible Heritage of Humanity in 2010. Since 1992, the Double Pyramid published for the first time by the U.S. Department of Agriculture, has been presented with the same graphic scheme in many documents. In fact the triangular shape emphasizes the fact that nutrition should be based on foods of vegetable origin which is a typical aspect of the Mediterranean diet as they are rich in vitamins, mineral salts, complex carbohydrates, and water, as well as protective components such as fibers and active substances of plant origin, while the foods at the top should be consumed in moderation as they are high in fat and simple sugars.

The food pyramid has a twofold value: on one hand, it is an excellent summary of the knowledge acquired during the main dietary studies carried out by the scientific community which is essential for anyone who cares about their health. On the other hand, it is a powerful tool for educating

people on consumption thanks to its simple and intuitive diagram.

### DIET IN RESPECT OF THE PLANET

The environmental section of the Double Pyramid was designed by BCFN by reclassifying food according to its impact on the environment rather than its nutritional characteristics: using impact data as the unit of measurement (per kilogram or liter) for the products in the Food Pyramid, an upside down pyramid is obtained, where foods with a greater environmental impact are at the top and those with a smaller environmental impact are at the bottom.

The environmental impact of food products are evaluated according to the Life Cycle Assessment (LCA) methodology, by analyzing three environmental indicators: the Carbon Footprint, the Water Footprint and the Ecological Footprint. BCFN only used data and information in the public domain – databases and scientific publications<sup>4</sup> – to offer all those who are interested the possibility of reconstructing the original data and carrying out in-depth analysis. In March 2015, a specific public call for data was also launched to add further information to the database.

In order to make all the sources used to collect the data available in a structured and organic way, a database accessible from the BCFN website ([www.barillacfn.com](http://www.barillacfn.com)) has been created: the Double Pyramid Database which is now five years old.



### THE DOUBLE PYRAMID

Combining the two pyramids produces the nutritional-environmental Double Pyramid. By observing the way the foods are arranged in the two pyramids it is clear that it is possible to match the two entirely different yet equally important and

inter-related objectives in a single dietary pattern: health and well-being for people and safeguarding the environment and the Planet's resources. In fact, it is evident that food that should be eaten in larger quantities and more frequently is usually food that has a lower environmental impact on the environment, and vice versa. Therefore, anyone who decides to eat in a responsible way actually reconciles his or her well-being (ecology of the person) with the environment (ecology of the environment).

### A SUSTAINABLE DIET FOR EVERYONE

In periods of economic recession, and especially for low income people, it is important to pay particular attention to the social sustainability of the diet, avoiding the excessive cost of some suggested foods restraining people from adopting correct dietary patterns. Similarly to what was carried out for the analysis of environmental values, the BCFN used available data on the economic impact of some 'typical diets' in Italy, in the USA and in a number of European countries.

From this analysis we can see that in Mediterranean countries the menus richest in animal protein (meat and especially fish) cost slightly more. However the same studies carried out in other countries such as the United States, France and Great Britain do not produce univocal results. In fact, according to some studies, the sustainable diet is more expensive for families in these countries, even though the data may be partly influenced by the different calculation criteria adopted and the food choices considered.

Therefore generally speaking, eating sustainably does not necessarily mean spending more, but requires an extra effort by individuals and families in terms of the time spent in selecting products, opting for relatively low-cost foods with a high nutritional value, such as pasta, cereal-based products, pulses, certain types of vegetables, dried and fresh fruit. In particular, white meat, low-fat

dairy products and eggs are the cheapest sources of protein.

### FOOD POLICIES FOR HEALTH AND THE ENVIRONMENT

Governments and national and international institutions play a fundamental role in proposing and implementing regulations, incentives, taxes and information campaigns on what, when and how people eat, as well as on the relative economic, social and environmental consequences of the agri-food sector.

In this edition a specific chapter will be devoted to analyzing the main food policies that impact the people's health, taking into consideration at the same time the impacts on the Planet. In particular, we will illustrate some emblematic cases of institutional activities aimed at ensuring suitable nutrition for the most vulnerable sectors of the population; the policies for reducing obesity and overweight conditions; the regulation of food marketing aimed at children; the policies that connect access to food to climate change; the new guidelines for a sustainable diet; and, lastly, how environmental labels in the food sector are evolving. Some controversial topics involving player with potentially divergent interests, or complex issues which are often difficult to regulate, will be highlighted.

<sup>3</sup> Including: Istituto Nazionale di ricerca per gli Alimenti e la Nutrizione (INRAN), *Linee guida per una sana alimentazione italiana*, Roma, 2003; World Health Organization Europe, *Food Based Dietary Guidelines in the WHO European Region*, Copenhagen, 2003; HHS and USDA, *Dietary Guidelines for Americans*, 2010; Institute of Medicine of the National Academies, *Dietary Reference Intakes*, Washington DC, 2006; Ancel and Margaret Keys, *Eat Well and Stay Well, The Mediterranean Way*, Doubleday, 1975.

<sup>4</sup> In particular from: Environdec Database; LCA Food Database; Water Footprint Network Database; Global Footprint Network Database; Andersson K., *LCA of Food Products and Production Systems*. *International Journal of LCA* (4), pp. 239-248 (2000); Baroni L, et al., *Evaluating the environmental impact of various dietary patterns combined with different food production systems*, "European Journal of Clinical Nutrition", 1-8 (2006).

# DIET AND PEOPLE'S HEALTH

*No good or bad foods exist by nature: a balanced diet has to include a variety of foods to be eaten in the proper quantities, avoiding too much or too little*

In the many editions of Double Pyramid, the BCFN has presented reviews of the worldwide eating patterns paying particular attention to the Mediterranean diet which has been widely recognized as being in line with a well-balanced, healthy lifestyle.

## THE MEDITERRANEAN DIET

The traditional Mediterranean diet is a nutritional model that is characterized by its great variety of foods, as well as its strong nutritional balance. It involves a high intake of vegetables, legumes, fruit and dried fruit, olive oil, and cereals (50% of which are whole grain), a moderate intake of fish and dairy products (especially cheese and yogurt), and

a low intake of red meat, white meat, and sweets<sup>5</sup>. The nutritional value of the Mediterranean diet was scientifically demonstrated in the *Seven Country Study* carried out by Ancel Keys<sup>6</sup> in the 1970s. The study compared the diets of different populations to verify their benefits and main issues and for the first time strong correlations were observed between the type of diet and the risk of the onset of chronic illnesses, especially cardiovascular diseases.

Since then many other studies have been carried out on the connections between diet and health, confirming that the adoption of a Mediterranean diet is related to a low mortality rate<sup>7</sup>, a lower incidence of cardiovascular diseases<sup>8</sup>, metabolic dysfunctions<sup>9</sup> and certain types of tumors<sup>10</sup>.



According to some recent studies, the Mediterranean diet is also believed to guarantee longevity: it is related to a greater length of the telomers – the small portions of DNA which are at the ends of the chromosomes – linked to ageing processes<sup>11</sup>. Its uniqueness was also acknowledged by UNESCO as being an intangible heritage of humanity in 2010<sup>12</sup>.

To implement a nutritional education project inspired by the Mediterranean diet, in 1992 the U.S. Department of Agriculture published the first edition of the Food Pyramid<sup>13</sup> which was re-proposed in a FAO report in 1997<sup>14</sup> and briefly and effectively explained how to eat in a well-balanced way. Over the years, various organizations and research institutes such as WHO (World Health Organization) and CIISCAM (Interuniversity Centre for International Studies on Mediterranean Food Cultures) and the Harvard School of Public Health have developed systems of communication based on the image of the food pyramid<sup>15</sup>. The basic concept is to present the different types of food on various levels and the frequency of intake of the foods decreases as you climb up the pyramid, without excluding any type of food as va-

riety is one of the key principles of good nutrition. Over the years, several versions of the food pyramid have been published<sup>16</sup>. Even if they all have a shared scientific base, each pyramid adapts the original model to the specific requirements of its target audience, differentiating between various age brackets, lifestyles, and specific times of life or dietary habits. Moreover, other advice has been added to almost all the most recent versions of the pyramid with the aim of promoting a healthy lifestyle (for example, how much water one should drink and how much time should be dedicated to physical activities, etc.).

<sup>5</sup> Trichopoulou *et al.*, 2003.

<sup>6</sup> Keys *et al.*, 1970; Keys *et al.*, 1980.

<sup>7</sup> Trichopoulou *et al.*, 2003.

<sup>8</sup> Fung *et al.*, 2009; Lopez-Garcia *et al.*, 2014, Estruch *et al.*, 2013.

<sup>9</sup> Babio *et al.*, 2014.

<sup>10</sup> Couto *et al.*, 2014.

<sup>11</sup> Cros-Bou *et al.*, 2014; B. Sears, Ricordi C., 2011.

<sup>12</sup> Saulle and La Torre, 2010.

<sup>13</sup> USDA, 1992.

<sup>14</sup> FAO/WHO, 1997.

<sup>15</sup> OMS, 2000; CIISCAM, 2009; Harvard School of Public Health, 2011.

<sup>16</sup> EUFIC, 2009; FAO 2014.



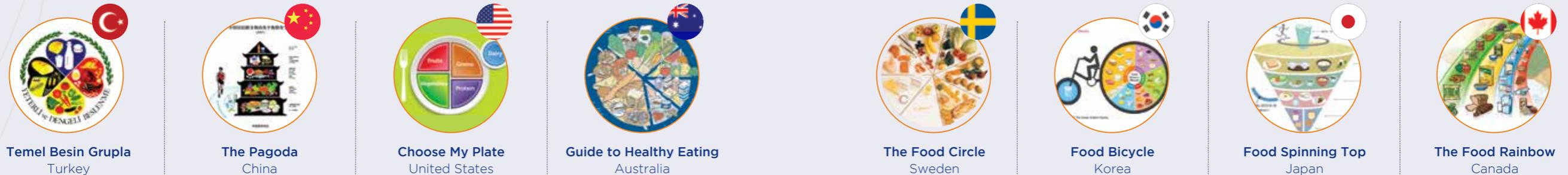
# THE FOOD PYRAMID EVOLUTION

The Mediterranean diet and other worldwide dietary plans



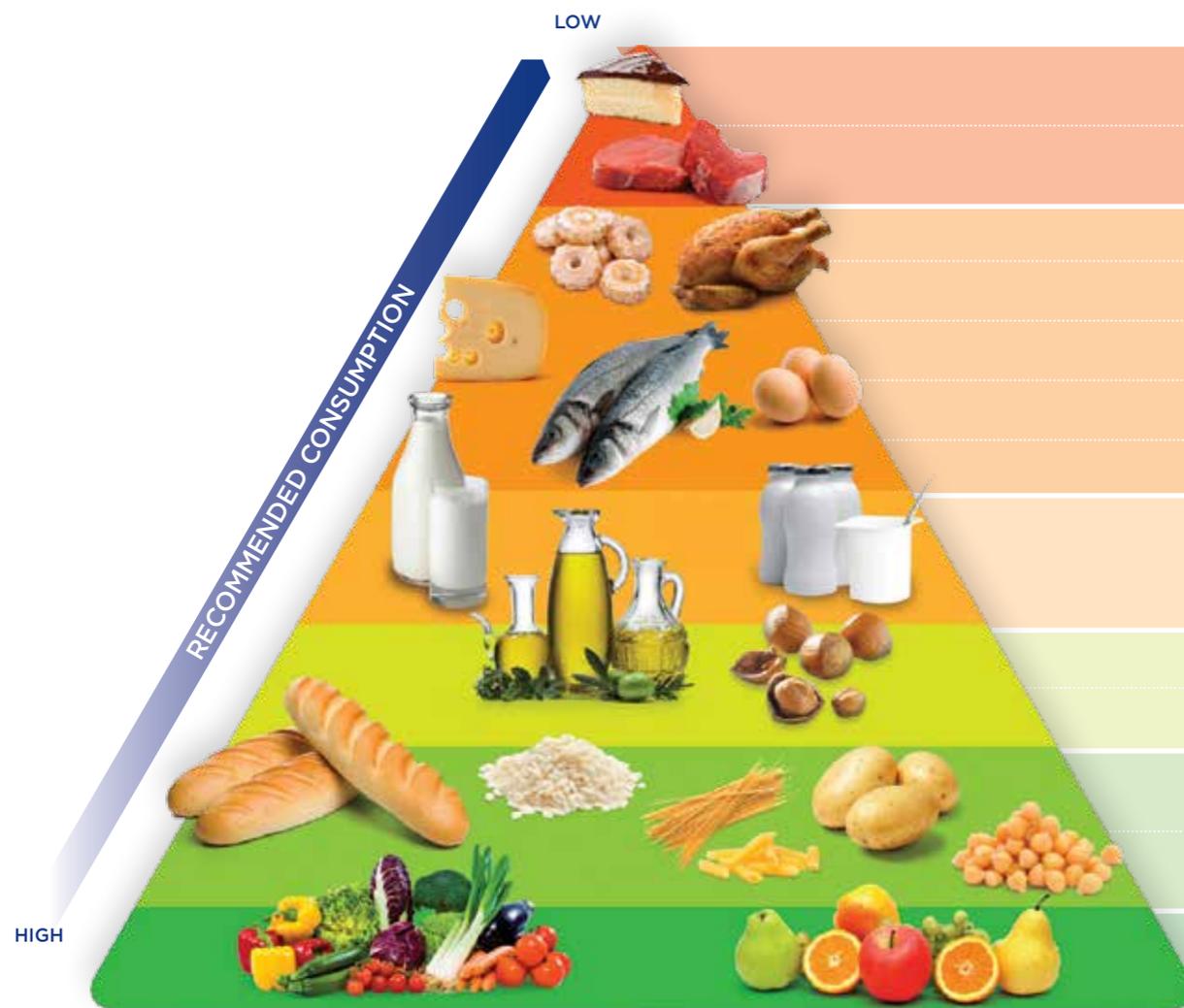
“The Mediterranean diet is a set of skills, practices, traditions and knowledge of food products from the field to the table, including crops, harvesting, fishing, conservation, processing, preparation, and above all food consumption”

## OTHER DIETARY PLANS



# THE FOOD PYRAMID

Recommended intakes for a healthy diet



The Double Pyramid was created by combining various nutritional guidelines at the international level and is similar to the Mediterranean diet in many ways.

The message conveyed by the Double Pyramid is that our diet should be based mainly on foods of vegetable origin, as they are rich in vitamins, mineral salts, fiber, complex carbohydrates, water and plant proteins and typical of the Mediterranean diet, while the foods at the top of the pyramid should be eaten in moderation, as they are high in fat and simple sugars.

-  Saturated and unsaturated fats, simple carbohydrates (sugars)
-  Vitamin B12, iron, zinc, protein, saturated and monounsaturated fats
-  Saturated and unsaturated fats, proteins, essential amino acids, vitamin B, selenium, copper, zinc
-  Proteins
-  Saturated and unsaturated fats, simple carbohydrates (sugars)
-  Protein, saturated fats, calcium, vitamin A
-  Protein, saturated fats, omega 3
-  Water, calcium, proteins, saturated fats, simple carbohydrates (sugars), vitamin A and B, pantothenic acid
-  Vitamin E, polyphenols, triglycerides, essential fatty acids
-  Vitamins, minerals, antioxidants, unsaturated fats, omega 3, omega 6
-    Complex carbohydrates (starch)
-  Proteins, fiber, essential amino acids, vitamin B, iron, zinc
-   Water, vitamins, minerals, fiber, simple carbohydrates (sugars)



## NUTRITION FOR GROWING CHILDREN

In the 2011 edition, the BCFN extended the analysis of the food pyramid to take into account the nutritional requirements of children and adolescents with the ultimate aim of validating the model of the Double Pyramid for individuals in the development phase.

During early childhood – which is characterized by very rapid growth and the synthesis of new tissues – a child requires an adequate quantity of energy. In the first year of life, the energy requirement for growth is considerable but it decreases rapidly; in fact it goes from 35% in the first month of life to 5% at one year old. After the first year of life and up to age 9-10, daily energy expenditure by the child is represented by 50-60% for the basal metabolism, 20-40% for physical activity, 5-8% for thermogenesis and only 2% for growing<sup>17</sup>.

Carbohydrates (starches and sugars) form, in quantitative terms, the organism's first and most

important source of energy; they provide energy to all the tissues in the human body, especially the brain and the red blood cells which only use glucose as a 'fuel' for cellular activities.

Food fiber<sup>18</sup> is made up of non-digestible carbohydrates of plants and has beneficial physiological effects, such as slowed down gastric emptying time, a greater feeling of being full, increased intestinal transit, reduced post-prandial glycaemia and absorption of cholesterol and fatty acids.

Fats in the diet are a source of energy and essential fatty acids for the child. The daily intake of fats is obtained by eating foods such as fish and dried fruit. Vegetable oils are preferred as dressings, especially olive oil, which also enable the child to absorb fat-soluble vitamins (A, D, E and K) from food.

Proteins are the main structural component of all the body's cells<sup>19</sup>. They act as enzymes, membranes, transporters and hormones: amino acids make up the proteins and are precursors of nucleic acids, hormones, vitamins and other impor-



Source: BCFN, Double Pyramid 2011: healthy food for people, sustainable food for the Planet, 2011

tant molecules. Excellent sources of high quality protein are meat, fish, cheese, milk, eggs, and some products of vegetable origin, such as soy, legumes and wheat by-products. Together with the main macronutrients, vitamins and minerals are essential elements of a proper diet for pre-school and school children. Adolescence is the period in which a child passes from the prepubescent stage to adulthood, and is characterized by considerable physical, psychological, and social changes, accompanied by greater qualitative and quantitative nutritional requirements of vitamins, mineral salts, fiber and water. In this phase, the most common nutritional deficiencies are iron and calcium. The levels of iron are the result of the balance between intake (diet, fortified foods and supplements) and expenditure, which in the case of children and adolescents increases with growth, infections and the start of menstruation in teenage girls<sup>20</sup>. For a correct balance, it is therefore important to increase the consumption of iron-rich foods such as lean meats and fish, leg-

umes, dark green vegetables, dried fruit, and iron enriched cereals during adolescence.

Calcium is also essential for the body of a rapidly growing adolescent because it is required for healthy bones and teeth. Therefore, it is important for children to eat foods rich in calcium and Vitamin D, especially for girls, who will be more exposed to the risk of osteoporosis in years to come with the onset of the menopause.

Adolescence is the period in which dietary requirements gradually become similar to those of adults.

In conclusion, despite various necessary precautions due to the different nutritional requirements described above, the Double Pyramid proves to be a useful tool for providing nutritional education for people of all ages.

<sup>17</sup> FAO, 2004.

<sup>18</sup> Institute of Medicine of the National Academic Press, 2005.

<sup>19</sup> Institute of Medicine of the National Academic Press, 2005.

<sup>20</sup> U. Ramakrishnan, R. Yip, 2002.



**190 g/day**  
per capita is the consumption of meat in the United States, followed by Italy, France, Germany and Sweden

## EATING HABITS IN EUROPE AND IN THE UNITED STATES

In order to analyze the extent to which these models are used, the BCFN has collected and analyzed the main food consumption data published by research institutes in Europe and the United States. Research related to Italian food consumption is mainly based on surveys by the National Institute of Research on Food and Nutrition (INRAN), which over the last twenty years has carried out various comprehensive surveys on the eating habits of the Italian population aimed at monitoring food and nutrition in order to design specific awareness-raising actions. The most recent study, published in 2008, presents the data collected in 2005/2006 and provides a useful tool for evaluating the average Italian diet<sup>21</sup>.

The data concerning other countries were taken from the European Food Safety Authority which developed “The EFSA European Food Consumption Database” that published a document which summarizes the food consumption data of 22 European countries most of which were obtained

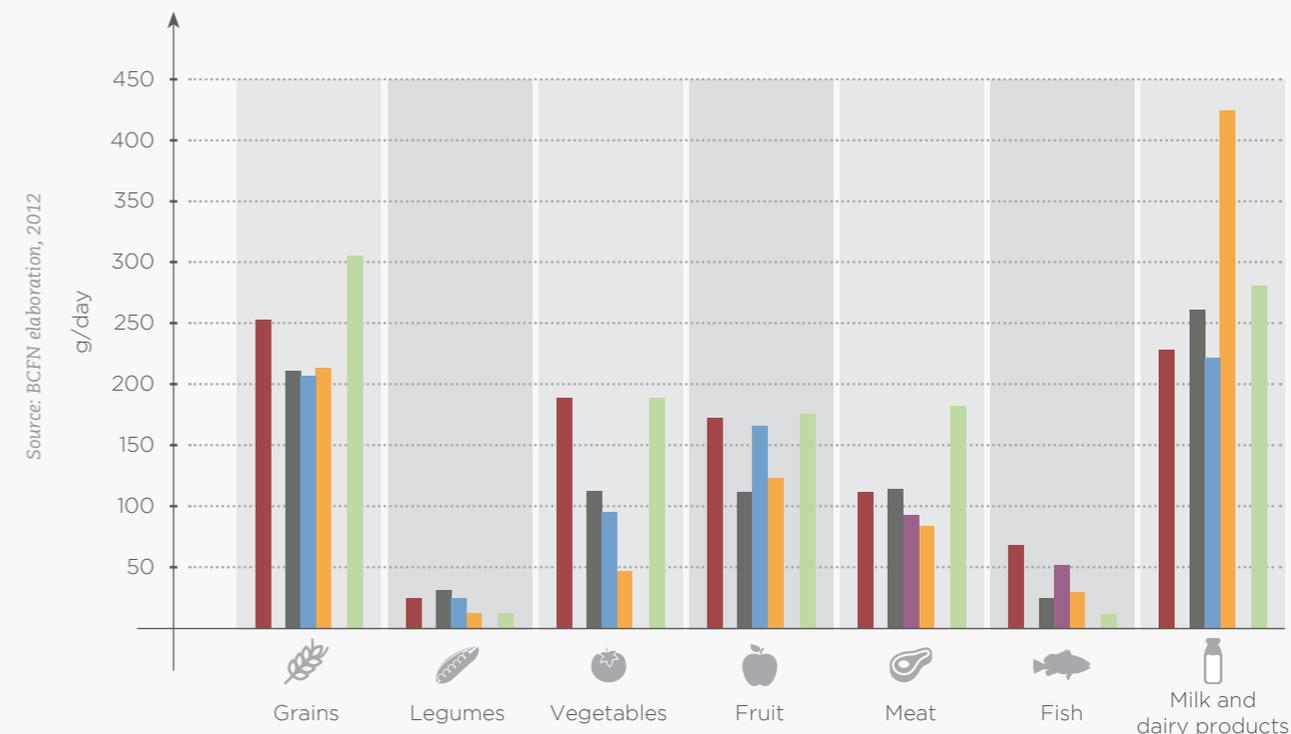
from scientific studies or monitoring programs set up by governmental bodies. For this purpose a comparison was carried out between the eating habits of Italian consumers with those of French, German and Swedish consumers.

Similarly, the USDA<sup>22</sup> carried out a survey on the eating habits of American citizens. The study refers to the years 1994-1996 and the sample included people of all ages. The data is not fully comparable as the approach used and sources were different even though some macroscopic considerations can be made.

The chart shows the average amounts of food of the eight main food categories consumed in Italy, France, Germany, Sweden and U.S.<sup>23</sup>; the data take into account only the effective consumption of that food<sup>24</sup>.

In general, it is important to note that in all countries legumes and fish are only eaten by a small percentage of the population as opposed to the other foods which are eaten by over 90% of the sample under examination.

The case of France is particular as it has a high per-



Average consumptions of the main food categories in four European countries (source: EFSA) and in the United States (source: USDA).

centage of consumers per macro category which means that on average French consumers eat a varied diet which includes all food categories.

The Americans are the greatest consumers of meat (almost a half a pound daily per capita), followed by the Italians, French, Germans and Swedish who eat the least meat (75 g/day). Unfortunately, as disaggregated data concerning meat consumption are unavailable (beef, poultry, pork), it is impossible to make any further considerations. A low consumption of legumes and fish is ob-

served for all countries. Another finding is the very high consumption of milk and dairy products in Sweden (more than 400 g/day).

<sup>21</sup> Leclercq *et al.*, 2009.

<sup>22</sup> EPA, 2007.

<sup>23</sup> Grains include bread, pasta and rice.

<sup>24</sup> The data shown represent a real average, i.e. calculated not on the whole sample of consumers, but only on who effectively consumed the food. This is to avoid the per capita consumption being lower than the real consumption.



# THE MEDITERRANEAN DIET: INTANGIBLE CULTURAL HERITAGE OF HUMANITY

The United Nations Educational, Scientific and Cultural Organization (UNESCO) was founded in 1945 to encourage cooperation among nations in the fields of education, science, culture, and communication. One of UNESCO's tasks is to make a list of 'heritage of humanity' locations, namely, places that are valuable from a natural or cultural point of view and whose conservation is deemed to be important for the global community. Since 2001, UNESCO has also begun to draw up a list of global intangible cultural heritages, namely age-old traditions (performances, knowledge, objects, instruments) which communities recognize as part of their cultural heritage and which often have been handed down orally from one generation to the next. In 2010 the Mediterranean diet was added to this list as<sup>25</sup>: "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 is characterized by a nutritional model that has remained constant over time and space, consisting mainly of olive oil, cereals, fresh or dried fruit and vegetables, a moderate amount of fish, dairy and meat, and many condiments and spices, all accompanied by wine or infusions, always respecting beliefs of each community. However, 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 which Soria in Spain, Koroni in Greece, Cilento in Italy and Chefchaouen in Morocco are examples. 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."<sup>26</sup>



<sup>25</sup> UNESCO, Italian National Commission, News archive. "The Mediterranean Diet is an intangible cultural heritage of Humanity." <http://www.unesco.it/cni/index.php/archivio-news/174-la-doeta-mediterranea-e-patrimonio-immateriale-dellumanita>.  
<sup>26</sup> For more information, see Saule and La Torre 2010; Bach Faig *et al.*, 2011.

# INSTRUCTIONS FOR 'LIVING WELL'

In addition to the various ways of graphically presenting dietary recommendations, it is important to note how the most prestigious scientific research studies regarding the relationship between diet and chronic diseases state that the Mediterranean diet must be considered the benchmark for a proper diet and that 'healthy' lifestyles should be associated with it.

Adequate physical activity is another basic element which should always accompany a healthy diet. In fact physical activity helps to burn calories, relieves tension and stress, and improves our mood and psychological well-being. Regular physical activity and sport aid the cardiovascular and skeletal systems as well as the metabolism. Moreover, regular physical activity helps us to main-

tain a healthy body weight and composition; it makes the adolescent stronger and encourages him/her to have a wholesome lifestyle which will lead to a better state of health during adulthood.

## SUMMARY OF THE GENERAL GUIDELINES FOR GROWING CHILDREN



**1.** Adopt a healthy and balanced diet, alternating daily all the main foods, supplying all the nutrients and micronutrients (vitamins and mineral salts).

rice), of animal and vegetable fats (using less lard and butter and more olive oil).

**7.** Engage in physical activity for at least an hour a day, including both sports and play.

**2.** Avoid excessive calorie intake, balancing the diet with physical activity.

**4.** Minimize the intake of extra salt in order to reduce risk factors for developing hypertension.

**8.** Minimize a sedentary lifestyle as much as possible, particularly the time spent in front of television and computers.

**3.** Start afresh to balance nutrients during the day, ensuring that there is the correct balance between the intake of animal protein and vegetables, of simple and complex sugars (less consumption of sweets, more bread, potatoes, pasta or

**5.** Distribute food intake to five times during the day: breakfast, morning snack, lunch, afternoon snack and dinner.

**6.** Avoid eating food outside the five times previously identified.

## HEALTHY EATING AND LIFESTYLE FOR EVERYONE



1.  Do at least 30 minutes of physical activity per day
2.  Avoid becoming overweight or obese
3.  Avoid excess consumption of alcohol
4.  Do not smoke
5.  Adopt a balanced diet
6.  Increase consumption of fruits and vegetables
7.  Choose complex carbohydrates and increase consumption of whole grains
8.  Increase consumption of legumes
9.  Eat 2 or 3 portions of fish a week
10.  Choose vegetable based condiments
11.  Limit consumption of high-fat foods
12.  Limit consumption of fried foods
13.  Limit consumption of meat and poultry to 3 or 4 times a week
14.  Limit additional consumption of salt
15.  Limit consumption of foods and beverages with a high sugar content

Source: BCFN. Diet and health, 2009

## THE ENVIRONMENT IN THE U.S. NUTRITIONAL GUIDELINES<sup>27</sup>

Every five years, the U.S. Department of Health (HHS) and the Department of Agriculture (USDA) work together to update the Dietary Guidelines for Americans, keeping them up to date with the latest scientific research. The updating process starts with the work of the Advisory Committee, a group of fifteen experts, which submits the guidelines to a strict process of revision and publishes a scientific report with the suggestions for new ones. The USDA has the task, after a phase of public consultation, of translating the scientific content of the report into recommendations for the general public.

On February 15 2015, the Advisory Committee made public the revision report<sup>28</sup> which will form the basis for the new Dietary Guidelines, due to be published at the end of 2015. The new guidelines will mark a decisive turning point with respect to the nutritional indications published to date: for the first time, sustainability will also be mentioned, introduc-

ing considerations of an environmental type into an area, that of public health, traditionally considered from a strictly “medical” point of view.

The report starts from the observation that the average diet of the U.S. population is very imbalanced from the nutritional point of view: it is too rich in calories, saturated fats, refined cereals and simple sugars. About two-thirds of American adults are overweight and many suffer from a lack of important nutrients (potassium, fiber, calcium and Vitamin D) due to a negligible consumption of fruit, vegetables and dairy products.

To make the nutritional recommendations, the Advisory Committee started by outlining the common characteristics of ‘healthy’ diets on the basis of a revision of scientific literature dealing with the relationship between specific diets (for example the Mediterranean diet, the vegetarian diet and the diet against hypertension called “DASH”<sup>29</sup>) and the different diseases connected with

diet. Many different categories are considered: from the impact on obesity to diabetes, from cardiovascular diseases to Alzheimer’s disease and neuro-degenerative diseases. This process allowed identifying the foods (or food groups) that have ‘beneficial’ effects on health and those that should be consumed with greater moderation. In particular, the study shows that:

“The healthiest diets have in common the fact of a high consumption of vegetables, fruit, whole grain cereals, skimmed dairy products, fish, legumes and dried fruit, with a very reduced consumption of red meat, processed meats, refined cereals, sweets and sugary drinks.”<sup>30</sup>

<sup>27</sup> The indications given here come from the Advisory Committee’s report published in February 2015 and are to be considered only as a preliminary indication on the content and orientation of the 2015 Dietary Guidelines, to be published at the end of the year following revisions defined by a public consultation.

<sup>28</sup> Dietary Guidelines Advisory Committee, 2015.

<sup>29</sup> DASH or Dietary Approaches to Stop Hypertension is a diet developed by the U.S. National Institute of Health with the aim of reducing blood pressure without drugs.

<sup>30</sup> Dietary Guidelines Advisory Committee, 2015, Part D, Chapter 2, p. 41.



The latest revision report contains the new observation that “there are many paths that lead to a healthy diet”, and that therefore the guidelines must offer various examples of balanced diets, to meet the different requirements of the population. This is why, rather than suggest only one type of diet, the new Dietary Guidelines will suggest several: the (healthy) American diet, the Mediterranean diet, and the vegetarian diet. The choice of Mediterranean and vegetarian diets as models for nutritional reference is due to the many scientific studies that have shown their benefits.

In addition to dwelling on the nutritional characteristics of the various models proposed, the Advisory Committee also takes into consideration their environmental impact. In general, it recognizes that a diet mainly based on vegetables of the American population (with a reduced content of products of animal origin and with fewer calories than the present-day diet) would bring about a tangible benefit both for the health of its consumers and for that of the Planet. The relationship between the individual’s food choices and the environmental impact in terms of greenhouse gas emis-

sions and consumption of natural resources is thus officially recognized. Once again, the Mediterranean diet is amongst the examples of a sustainable diet and the Advisory Committee devotes a specific paragraph to it in the chapter on sustainability. The scientific evidence confirms that this diet has less of an environmental impact than the current diet of the American population. From the nutritional point of view, the new guidelines introduce further significant variations.

## THE ENVIRONMENT IN THE U.S. NUTRITIONAL GUIDELINES

### 1. FOCUS ON FOODS AND NOT ON NUTRIENTS

As people eat complex foods and not individual nutrient, the recommendations must be expressed in terms of portions or accompanied by practical examples with the scientific opinion in an easily comprehensible message.

### 2. MORE VEGETABLES, FRUIT AND DRIED FRUIT

All the studies examined agree that the consumption of fruit and vegetables has many benefits on health, especially in terms of a reduced risk of cardiovascular diseases, obesity and diabetes.

### 3. FEWER ‘EMPTY’ CALORIES

The report uses this term to refer to added sugars and saturated fats, for which a great reduction is recommended. The added sugars (not those in fruit, but in sweets and sugary drinks) should not contribute more than 10% of the daily calorie intake. The same applied to saturated fats.

### 4. REPLACE, NOT REDUCE

To adopt a healthy and balanced diet, the objective should not just be to reduce food rich in salt, sugar and saturated fats, but to replace them with alternatives. Instead of foods rich in saturated fats, it is better to consume sources of unsaturated fats, whilst added sugars should not be replaced by artificial sweeteners (the impact of which on the health is not completely clear) but by those in fruit.

### 5. NO TO ‘CARBOPHOBIA’

The report takes into consideration the scientific evidence on the efficacy of high-protein and low-carb diets to lose weight. The authors come to the conclusion that in the long term (i.e. for more than 12 months) there is not sufficient evidence that a low-carb and high-protein diet fosters weight loss and reduces the risk of obesity. If the diet is correct and balanced, the proportion of macronutrients consumed each day has no influence on weight loss.

### 6. MORE WHOLE GRAIN CEREALS

At least half the cereals consumed each day should be whole grain.

### 7. CHOLESTEROL IS NOT A PROBLEM (ANY MORE)

Also new is the ‘rehabilitation’ of some foods with a high nutritional profile, such as eggs and seafood, of which until recently moderate consumption was recommended, due to the high content of cholesterol. New research has shown that food cholesterol is not a significant concern.

### 8. MODERATE CONSUMPTION OF RED MEAT AND PROCESSED MEATS

There is some evidence that a very high consumption of red meat and processed meats is connected with a greater risk of cancer of the colon-rectum.

### 9. THE ENVIRONMENT COUNTS

A diet based mainly on plants, such as the Mediterranean diet, has a lower environmental impact compared to the average American one, both in terms of CO<sub>2</sub> emissions and of consumption of natural resources.

To translate the nutritional indications into practice and adapt them to the requirements of different groups of the population, the new version of the Dietary Guidelines will contain three different examples of weekly menus, one for each food model of reference (American, Mediterranean, and vegetarian). Each one will show the recommended weekly portions for each food group, in order to keep a healthy and balanced diet<sup>31</sup>.

<sup>31</sup> It is not yet known whether the updated Guidelines will also be accompanied by a modification of MyPlate, the graphic representation traditionally used to show what should make up a balanced meal from the nutritional point of view.

# UNITED STATES: FROM THE FOOD PYRAMID TO HEALTHY EATING PLATE

The food pyramid is not the only graphic representation used to provide advice to consumers. Over the last few decades, the national governments of various countries have developed other images to inform and educate people to maintain a well-balanced diet for a healthy life. Yet it is interesting to note that, despite some differences due to specific cultural aspects or the diffusion of certain types of food, all of the diets have simi-

lar nutritional characteristics: a greater consumption of fruit, vegetables, cereals (especially whole grain) and legumes and a low consumption of animal protein and fats, and simple sugars. In 1992 the U.S. Department of Agriculture (USDA) released the first American food pyramid. This nutritional education tool was widely recognized by the international scientific community and was the foundation for the evolution of nutritional recommendations on the vari-

ous types and amounts of foods to eat every day. In 2005, the USDA published MyPyramid which was an update of the original pyramid and was designed as an educational tool in addition to the Dietary Guidelines for Americans<sup>32</sup> which are drafted and updated every five years by the USDA and the Department of Health and Human Services (HHS) and addressed to the entire population (aged two years and over) in a normal state of health.

The advice provided by MyPyramid mainly refers to dietary habits (it states which foods one should eat and how often), but it also recommends regular daily physical activity as an essential prerequisite of psychological well-being and healthy body weight. In June 2011, MyPlate was presented instead of MyPyramid, was presented MyPlate, as part of a larger communication initiative based on the 2010 Dietary Guidelines for Americans<sup>33</sup> with the aim of helping consumers to choose better food. At the inauguration, the First Lady, Michelle Obama, said: “Parents do not have time to weigh three ounces of chicken or to calculate a portion of rice with broccoli... but we do have time to look at our children’s plates and if half the plate is full of fruit and vegetables with lean proteins, whole grain cereals and low-fat dairy products their diet is fine. It’s so simple!”

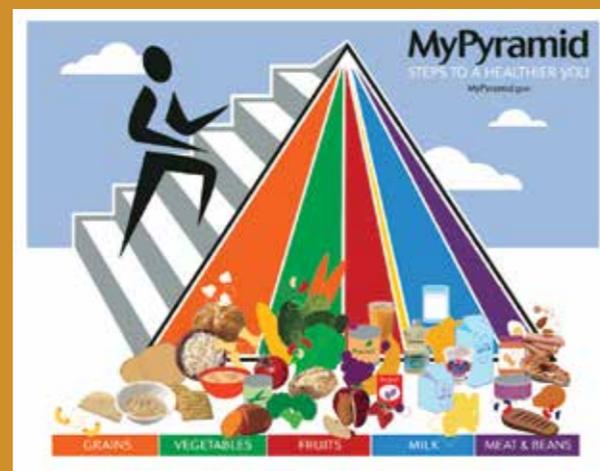
MyPlate has been widely praised as an improvement on the previous MyPyramid icon, which was criticized as being too abstract and confusing. It shows a plate and a glass divided into five groups of food; the plate is divided into four sections containing around 30% of vegetables, 30% of cereals, 20% of fruit and 20% of protein and there is also a small circle containing dairy products like a glass of milk or yogurt. The graphical representation is accompanied by brief messages such as: “Make half your plate fruits and vegetables”, “Switch to 1% or skim milk”, “Make at least half your grains whole” and “Vary your protein food choices”. The inclusion of dairy products at every meal was criticized by the Harvard School of Public Health, which in 2011 published a variant of the nutritional plate called “Healthy Eating Plate”. Unlike MyPlate, this variant includes a glass

of water, and the inclusion of dairy products in the sources of protein. In addition, whole grain cereals are explicitly recommended over refined ones, as is the use of “healthy” vegetable oils such as extra virgin olive oil. In short, American nutritionists recommend a diet mainly composed of fruit, vegetables, whole grains and low-fat dairy products. One should eat meat, fish, legumes, eggs and dried fruit in smaller quantities paying attention to salted or sweetened foods and containing saturated fats as well as sugary drinks. In addition to nutritional advice, regular physical activity is recommended and daily calorie requirements should be calculated with care.

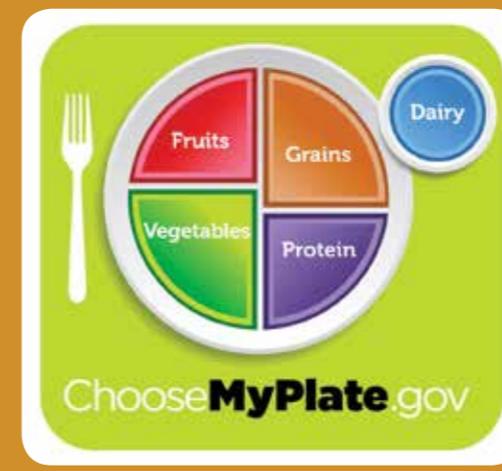
<sup>32</sup> U.S.D.A. and U.S.D.H.H.S. Dietary Guidelines for Americans, 2005.  
<sup>33</sup> U.S.D.A. and U.S.D.H.H.S. Dietary Guidelines for Americans, 2010.



Source: USDA Food Guide Pyramid 1992



Source: www.mypyramid.gov



Source: www.choosemyplate.gov



Source: <http://www.health.harvard.edu/healthy-eating-plate>, 2011

# A PLANET RESPECTFUL DIET

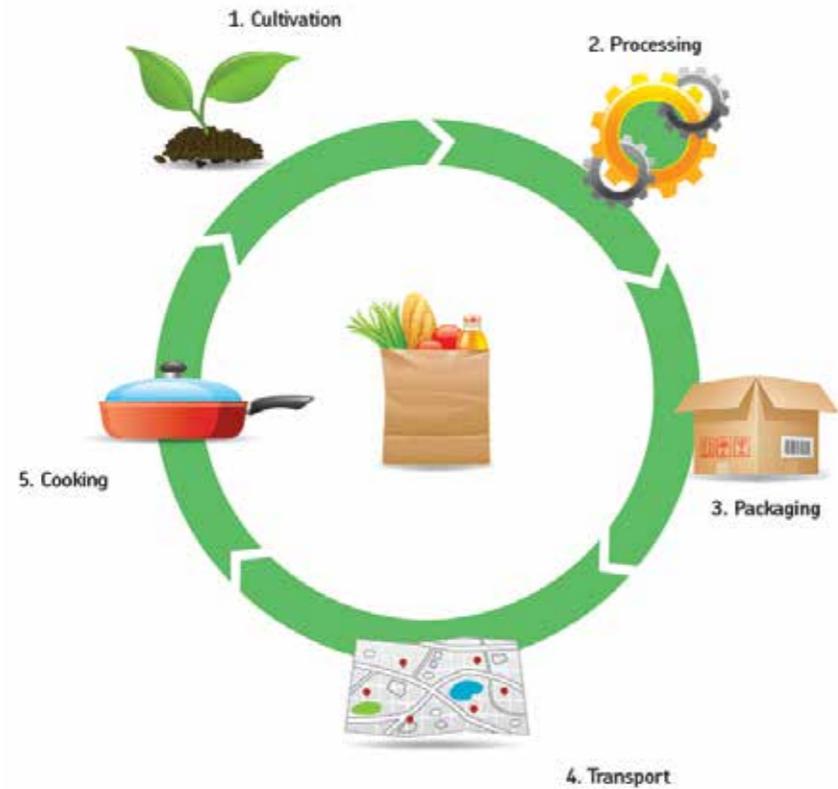
.....  
*In an era dominated by climate change, the food issue goes beyond its nutritional aspect. Its effects on the environment also have to be considered, from production to consumption*  
.....

The impact evaluation of any product can be carried out with various methods which focus on the characteristics of the supply chain or on specific indicators depending on the case.

## LIFE CYCLE ASSESSMENT (LCA) AND ENVIRONMENTAL INDICATORS

Of all the methods of evaluation, Life Cycle Assessment (LCA)<sup>34</sup> which is regulated at the international level by ISO 14040, is probably the

method that has received the most attention in recent years since it takes into account all the environmental aspects of the supply chain. Life Cycle Assessment studies each phase from farming to distribution and consumption, which can also include cooking. Environmental indicators are used in order to make the results of LCA studies easily comprehensible which enable us to present environmental impacts in a simple and aggregated way. In the case of food chains, the main environmental issues are GHG emissions, the use of water and the area used for producing the resources.



Example of representation of an analysis of the Life Cycle Assessment (LCA) of a food.

For this reason the following environmental indicators were chosen:



The **Carbon Footprint**, which quantifies the greenhouse gas emissions responsible for climate change; it is measured in a mass of equivalent CO<sub>2</sub>.



The **Water Footprint** (or *Virtual Water Content*) is the volume of freshwater used to produce a product, measured over the various steps of the production chain. Water use is measured in terms of water volumes consumed or polluted. Water consumption refers to the water evaporated or incorporated into a product. The water footprint is a geographically explicit indicator that shows the volumes of water used and polluted, but also the locations<sup>35</sup>.



The **Ecological Footprint**, which calculates the amount of biologically productive land (or sea) required for supplying the re-

sources and absorbing the emissions associated with a production chain; it is measured in square meters or global hectares.

However, it is important to note how these indicators provide quite a broad view of the impacts even though incomplete, especially if they are considered at the local level. Other impacts that could be assessed are: the use of chemicals in agriculture, the release of nitrogen into the soil, or emissions of other pollutants into the air. Due to the need to summarize, the environmental part of the Double Pyramid was constructed using only the Ecological Footprint, but to provide a broader view, the pyramids relative to the Carbon and Water Footprint indicators will also be presented in the paper.

<sup>34</sup> Regulated internationally by standard UNI EN ISO 14040:2006 and 14044:2006.

<sup>35</sup> Hoekstra, 2013.



# FOOTPRINT INDICATORS IN THE DOUBLE PYRAMID

## CARBON FOOTPRINT

The Carbon Footprint calculates the impact of the production of goods or services throughout the entire life cycle of the system expressed in terms of emissions of carbon dioxide (CO<sub>2</sub> eq)<sup>36</sup>. When calculating the Carbon Footprint, it is important to consider the emissions of all greenhouse gases which are determined according to two factors: the amount emitted and its impact which are measured in terms of Global Warming Potential. In fact the emissions are all converted into a CO<sub>2</sub> value as if the system only emitted CO<sub>2</sub> by means of fixed parameters defined by the IPCC<sup>37</sup>, the Intergovernmental Panel on Climate Change operating under the aegis of the United Nations.

## WATER FOOTPRINT

The Water Footprint is an indicator that measures the amount of freshwater used to manufacture a product in liters or m<sup>3</sup> by totaling the amount used in all stages of the production chain. It is also known as the 'virtual water content' of a product because it takes into account the water used in the production phase (direct consumption), the water required for producing the raw materials (indirect consumption), and the source where the water was taken. The calculation method was developed by the Water Footprint Network<sup>38</sup> and was designed so that the indicator takes into account three fundamental components:

- The *Green Water Footprint* is the volume of water evaporated from the global green water resources (rainwater stored in the soil);
- The *Blue Water Footprint* is the volume of freshwater that is evaporated from the global blue water resources (surface and ground water);
- The *Grey Water Footprint* is the volume of polluted water, which is quantified as the volume of water that is required to dilute pollutants to such an extent that the quality of the ambient water remains above agreed water quality standards.

## ECOLOGICAL FOOTPRINT

The Ecological Footprint is an indicator that measures the surface area of (biologically productive) land and water required for replacing the resources used and absorbing the waste produced in relation to the capacity of the Earth to regenerate the natural resources.

The method was established by the Global Footprint Network<sup>39</sup> and includes the following surface areas in the calculation.

- *Energy Land* represents the land required to absorb the CO<sub>2</sub> emissions generated by the production of goods or services;
- *Crop Land* is the land needed to grow agricultural products and feed for livestock;
- *Grazing Land* is the land required for the grazing of the livestock under examination;
- *Forest Land* is the land used for producing the wood required to create raw materials;
- *Built-up Land* is the land occupied by the facilities used for production;
- *Fishing Ground* is the area required for the natural development or farming of fish. These six components are summed together after being normalized by means of 'equivalence factors' and 'yield factors' that take into account the different levels of productivity of various environments in respect to the average productivity of primary global biomass in a certain year. Global Footprint Network provides the equivalence factors for each type of land annually.

The Ecological Footprint is therefore a composite indicator that measures the various ways of using environmental resources by means of conversion and specific equivalences with a single unit of measurement: the global hectare (gha).

<sup>36</sup> To calculate the Carbon Footprint of a product, the new univocal international standard of reference was published in 2013: ISO 14067.

<sup>37</sup> The most recent version was published in 2013 (IPCC, 2013).

<sup>38</sup> The Database is available for consultation and downloading at [www.waterfootprintnetwork.org](http://www.waterfootprintnetwork.org).

<sup>39</sup> For the details of the hypotheses see [www.footprintnetwork.org](http://www.footprintnetwork.org)

### CARBON FOOTPRINT



### WATER FOOTPRINT



### ECOLOGICAL FOOTPRINT



# THE WATER FOOTPRINT: AN EVOLVING INDICATOR TO MEASURE LOCAL IMPACTS

Introduced for the first time by Tony Allan in 1997<sup>40</sup> and further developed by Arjen Hoekstra in 2003, the concept of Virtual Water and Water Footprint has played a fundamental role in raising the awareness of society on aspects which are often downplayed, such as, the importance of protecting water resources, their fundamental role in agri-food production<sup>41</sup> as well as the impacts of our daily food choices on the natural resource base.

As for other indicators, the advantages of water footprint have to be appreciated but its limits also need to be acknowledged, especially with regards to its use for communication purposes. Its strong point is that, being it measured in liters of water, it is a highly intuitive indicator as everyone knows how much one, ten and even one hundred liters correspond to. Its main limitation, however, is that water footprint does not provide, if used alone, any information on the local effects of water withdrawal.

It is easy to understand that by withdrawing the same amount of water in an area where it is naturally abundant (for example an area with humid climate) will have a smaller impact than taking it in an area where the resource is scarce (i.e., in a desert area). It is equally important to distinguish its 'colour', i.e. the source of the water that is being used, specifying whether it

is rainwater (*green*) or water from aquifers or surface bodies (*blue*). This is because a cereal, grown in an area where irrigation is not needed and rainwater is sufficient, has a very different impact from another that relies on irrigation (thus with a significant use of *blue* water). The scientific debate is moving towards greater understanding of these complex issues and concepts such as *waterfootprint caps* (referred to water basins), *water footprint benchmarks* (for the products) and *fair water footprint of communities*<sup>42</sup> have been introduced.

The standard ISO 14046<sup>43</sup>, approved in 2014, proposes a new method to calculate the Water Footprint, which takes into consideration not only water consumption but also the potential environmental impacts associated with water withdrawal (such as, the maximum limits relative to the source where the water is withdrawn).

<sup>40</sup> J.A. Allan (1997).

<sup>41</sup> The main players in this sense are Hoekstra and Mekonnen, founders of the Water Footprint Network. In a publication of 2002, for example, they estimated that the agri-food supply chain contributes for 92% to the global water footprint (understood as virtual water content). (Mekonnen; Hoekstra, 2012; Hoekstra, 2014)

<sup>42</sup> Hoekstra, 2014.

<sup>43</sup> The standard was published on 08/01/2014.



## THE FOOD CHAIN AND THE ENVIRONMENT

In recent years, agri-food chains have become an object of growing interest, mainly for two reasons: the quality and safety of the food they produce and for the environmental impact they generate. It is above all the structure of the production chain that determines the intensity of the impact associated with a specific food: the more complex the

production chain and the more the raw materials are processed before reaching the final consumer, the greater the impact of that food on the environment. Conversely, a food which requires a minimal amount of processing, such as vegetables or fruit, will normally have little impact.

The food supply chain normally has a complex structure that can be summarized in seven steps, which are associated with specific environmental impacts.



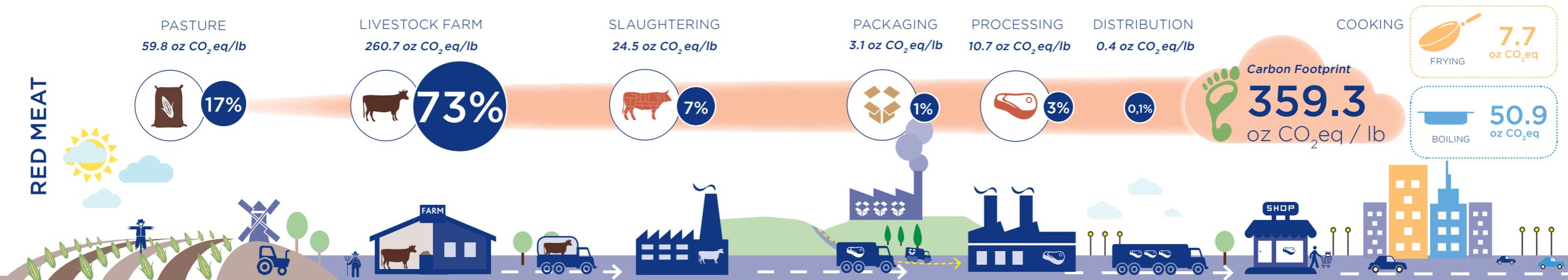
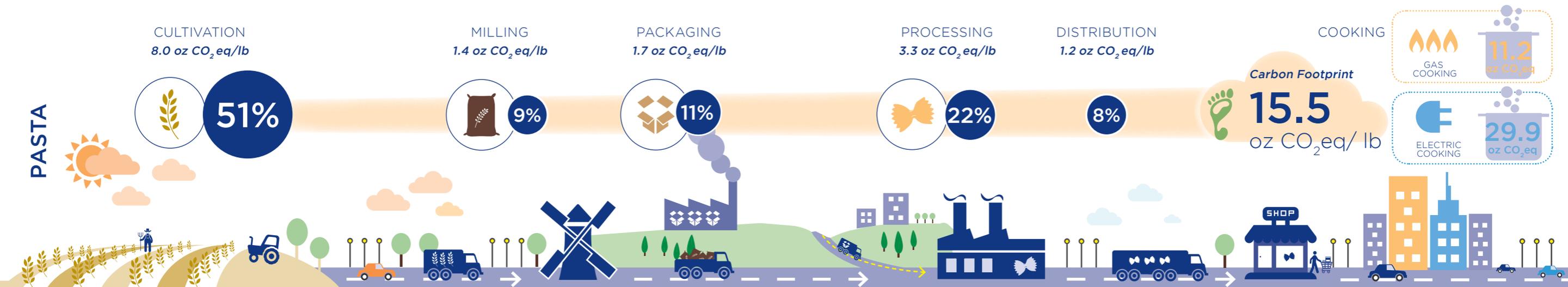
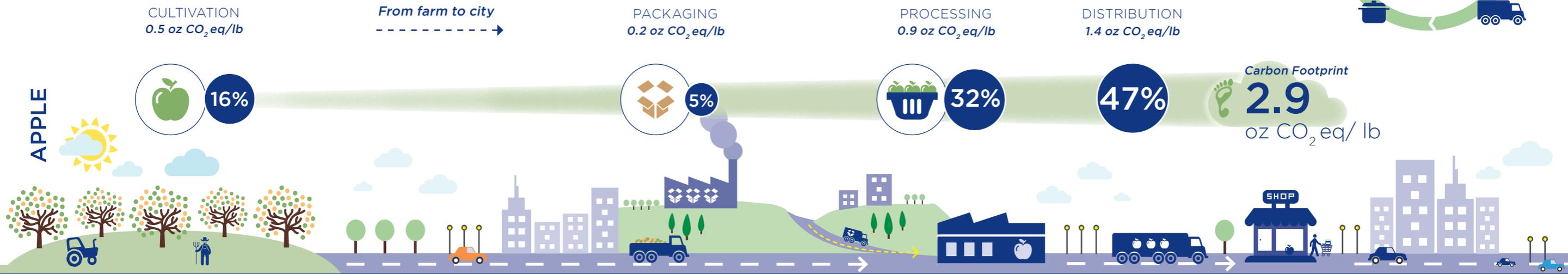
## THE SEVEN PHASES OF THE AGRI-FOOD CHAIN

	<p><b>Cultivation of raw material</b> The agricultural phase is the stage in which we produce the raw materials to be used for human consumption or as fodder for farm animals. Several factors are responsible for the impacts of this phase such as: seed production, the use of fertilizers (both natural and chemical), and pesticides for protecting the crops, the diesel oil used for agricultural practices and the water used for irrigation. In most cases, the agricultural phase is the link in the chain that creates most impacts. Cultivation techniques may substantially influence the impact of the agricultural phase, although in many cases the benefit is not immediately apparent. A typical example is crop rotation or organic farming which, if carried out correctly, reap great benefits over the years for the fertility of the soil and the biodiversity of the ecosystem.</p>
	<p><b>First transformation</b> Many agricultural raw materials must be transformed before they can be used in production process. A classic example is grain cereals which must be ground in a mill before use.</p>
	<p><b>Product processing</b> In the second stage of the production chain, the raw material is transported to a factory where it is transformed to obtain the finished product. In this phase, the impacts are caused by the consumption of energy and water of the factory and vary according to the type and volume of the treated product as well as the efficiency of the production line. Consumption includes both the energy used to operate the production lines and the energy required for refrigeration.</p>
	<p><b>Product &amp; packaging</b> Many types of materials are used for packaging finished products. The most common materials are paper, plastic and glass. The environmental impact of packaging is usually caused by the production phase (quantity and type) and waste disposal, while the impact of the actual packaging is low.</p>
	<p><b>Distribution and sale</b> At this stage of the food chain the product is transported from the processing plant to the distribution point and retail outlets creating impacts, which depend on the means of transport used, and the distance covered. However the impact caused by transportation is generally much less than the impact caused by the production phase and is only notable for low-impact foods such as vegetables and fruit when they are transported over long distances or with high-impact means of transport as in the case of airfreight.</p>
	<p><b>Preparation and cooking</b> Assessing the impacts associated with the preparation of a food product is particularly complex as various cooking techniques can be used which have different levels of environmental impact. The techniques used for the preparation of dishes vary according to the recipe, the consumer's taste and whether the meal is cooked in a home environment or in a commercial kitchen.</p>
	<p><b>Disposal of product &amp; packaging</b> The waste produced by packaging must be considered an integral part of the supply chain of food production therefore its impact must correctly assessed. It is particularly difficult to evaluate the disposal of end-of-life packaging since it must account for the amount and the type of material contained in the product as well as the behavior of the final consumer and the possible ways of disposal. The three ways of disposing of packaging are: recycling, energy recovery or landfilling.</p>

# THE FOOD CHAIN AND THE ENVIRONMENT

## The Life Cycle Assessment of Apples, Pasta and Red Meat

For these three foods the CO<sub>2</sub> emissions of the specified supply chain are shown both with an absolute value per lb of product and the percentage relative to the single stage of the life cycle. Where required, an estimate of the impact due to cooking is also given.



# MEAT AND ITS ENVIRONMENTAL IMPACT

The meat production chain is rather complex and therefore creates the greatest impact of all types of food. One reason is that, unlike other agricultural products, meat requires a 'double production phase': firstly crops are grown for

fodder which is then fed to the animals to produce animal protein. A particularly important aspect in the case of the beef supply chain is the impact of cows that are bred solely for the purpose of giving birth to calves at an average rate of one a year.

The last aspect, which is also particularly relevant for cattle, concerns the management of manure and enteric fermentation, which generates methane that causes a considerable impact, especially in terms of greenhouse gases.



## SIGNIFICANT ELEMENTS IN THE FOOD LIFECYCLE

The calculation of the environmental impacts of foods throughout their life cycle must take into consideration the production phase and agricultural or industrial use, as well as the final stages which may include the cold chain (required for the proper conservation of the product), transportation and the cooking phase. Let's see why.

### Farming practices

The agronomic techniques used may play an important role in determining the environmental impacts of raw materials, which is particularly true in the cultivation of cereals, fruit and vegetables.

As much of the environmental impact is related to agricultural practices, it is important to analyze the various agronomic techniques both in terms of quality and environmental issues.

Some of the practices used by farmers include agronomic techniques that have a great effect on the environment such as fertilizers (which are mainly nitrogenous) or diesel oil used for farming machinery.

Using best practices can reduce the impacts caused by the agricultural phase, although in many cases the advantages are only evident in the long run. More and more studies are focused on optimizing agricultural practices, in order to obtain high quality products to ensure the income of farmers and safeguard the environment.

The adoption of best practices can greatly affect the impact of the agricultural phase, although in many cases the benefit is visible only in the long run. Several studies aim at optimizing agricultural practices, in order to get high quality products, by protecting both farmers' income and the environment.

A typical example is represented by crop rotation, as some experiments on the cultivation of durum wheat have demonstrated that by alternating the

crops grown on the land, it is possible to significantly limit the use of fertilizers thus reducing by one-third the total value of environmental indicators.

With regard to organic farming, previous studies showed the limitations of the LCA method. The indicators commonly used to assess the environmental impacts are not able to determine the actual benefits of organic practices as, even if the impact values are lower, they refer to productions that normally have lower yields than those grown with intensive methods. The benefits may be improved by using appropriate agronomic indicators, for example by measuring soil fertility (especially if it is calculated over a ten-year period) or by determining the level of human and environmental toxicity and the level of biodiversity of the ecosystems.

Studies show that raw materials that are cultivated out-of-season have a greater environmental impact. For instance, a large amount of energy is required for heating greenhouses and may reduce the yield of an out-of-season crop by as much as 50%.

### The cold chain

The calculation of the cold chain environmental impacts (refrigerated and frozen products) may vary, and greatly depends on where the product is stored (in household fridges or industrial cold stores), the storage temperature (4°C or -18°C) and the time of preservation.

The analyses carried out show that the impact caused by the cold chain is only relevant when it concerns freezing simple produce with a low environmental impact such as vegetables and when produce is stored at low temperatures for long periods of time.



On the other hand, the impact of the cold chain is irrelevant for ‘very fresh produce’ which is only stored in refrigerators for short periods of time and for foods which already have a high environmental impact, such as meat. Refrigerated transportation can also be considered negligible, since the increased impact it has on the environment is insignificant when compared to the overall effect of the finished product.

### Transport and distribution

Food distribution is an interesting issue in terms of both social and environmental implications. In fact the ‘farm-to-table’ approach is now popular. This approach is generally associated with a simple equation: “*farm-to-table product = environmentally-friendly product*”.

A comparison was carried out with the life cycle analysis between the impacts caused by the transportation of food products and those related to their production, beginning with the raw

materials. The results indicate that the distribution phase has a significant effect on the overall impact only when the food is characterized by a simple production chain with a low environmental impact (such as fruit and vegetables) and when transportation exceeds a certain distance. In the case of more complex foods, such as meat or cheese, the environmental load associated with transportation and distribution is almost irrelevant if we consider the overall impact of the finished product.

In fact, even if transportation by truck causes a high level of CO<sub>2</sub> emissions per kilometer, large amounts of goods are transported and therefore the impact caused by a kilogram of produce is minimal. This is not the case if the goods are transported by airfreight. Therefore, it is not always true that ‘farm-to-table’ products have a lower environmental impact than ‘distant products’. In fact, the opposite can happen if the latter are produced more efficiently with regard to the production of raw materials and food processing.

For example, from a purely environmental point of view, it may be cheaper to grow a food product far from the place of consumption if this occurs in areas which due to their nature (for example intrinsic humidity of the soil or the average temperature) allow less invasive farming practices which generate lower environmental impacts.

Yet it is also clear that in terms of sustainability, assessments should be carried out bearing in mind social and economic aspects, which are the basis of the production and consumption of foods: for example, local economies certainly benefit from the consumption of local products.

### Cooking

Cooking techniques used for preparing food can vary greatly according to the recipe, the consumer’s tastes and eating habits and whether the dish is homemade or cooked in a professional kitchen. Therefore, it is not easy to quantify the environmental impact of cooking per kilogram of food. However, it is important to note that cooking, especially household cooking, may be the phase with the greatest environmental impact (essentially measured in emissions of CO<sub>2</sub> eq).

The environmental impacts caused by cooking on an electric hob greatly depend on the energy mix that characterizes the electricity supplier (and consequently the country or region of location) and the method of cooking that can significantly affect the amount of CO<sub>2</sub> emissions. Relevant is the cooking time and personal commitment can help to reduce the impact (as we all know, it is a good and simple practice to put the lid on a pan to boil water).



# DOUBLE PYRAMID 2015

*Food is one of the areas of life where personal well-being  
can be reconciled with that of the Planet.  
Without giving anything up*



When the Environmental Pyramid and the Food Pyramid are placed side by side, the BCFN Double Pyramid is formed: it illustrates the connection between two different but highly-relevant goals in a single model: the safeguarding of health and the environment. It shows that generally the foods with higher recommended consumption levels are also those that have less impact on the environment and vice versa.

This means that all of us can reconcile our personal well-being (personal ecology) with the environment (contextual ecology) by eating in a responsible way.

## THE SCIENTIFIC BASIS

Ever since the first edition, the environmental impacts of food have been quantified by using data from three environmental indicators (Carbon Footprint, Water Footprint and Ecological Foot-

print) made available by open source databases and scientific publications. Since then, the method used by the BCFN for constructing the model was based on the maximum transparency, i.e. only using public information in order to allow anyone to retrace the origin of the data.

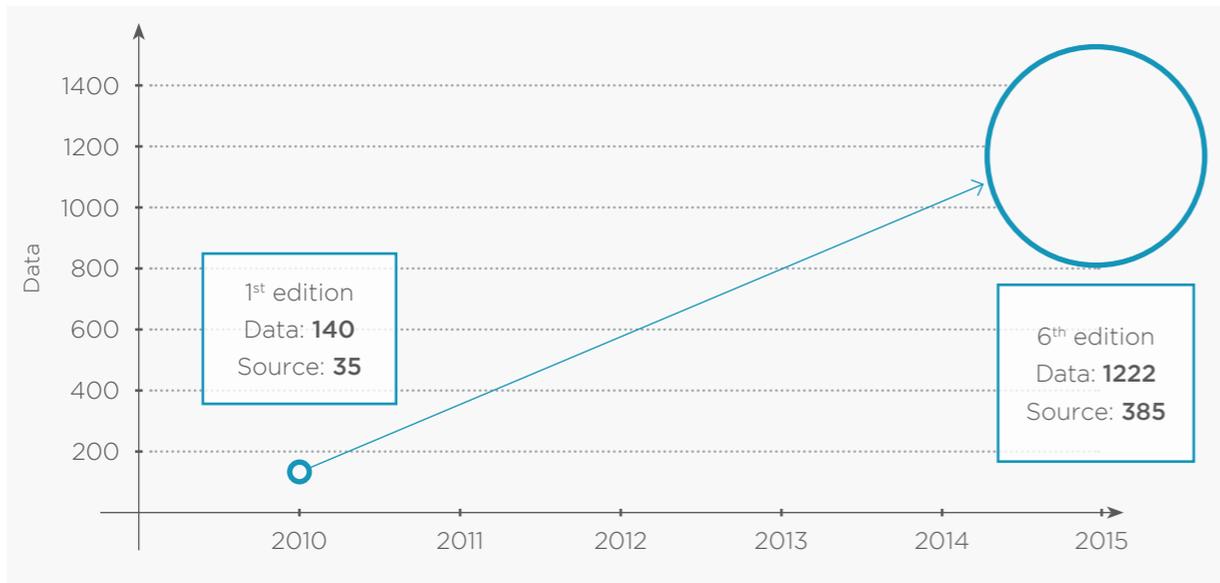
### The BCFN database

The data used in these six editions were gathered together in a database by BCFN. The values of the three environmental indicators, which refer to a kilogram (or liter) of food, were calculated as the



arithmetic mean of all the values provided by research studies. In all cases,

the data refer to studies based on the life cycle analysis method and therefore allow making a first rough quantification of the overall impacts of individual foods<sup>44</sup>.



Data: individual values of impact  
Source: Bibliographic material with the data

Increase in the data used to calculate the averages of the environmental impacts of food from the first to the sixth edition of the Double Pyramid. The dimension of the sphere shows the number of sources, the height the number of data items.



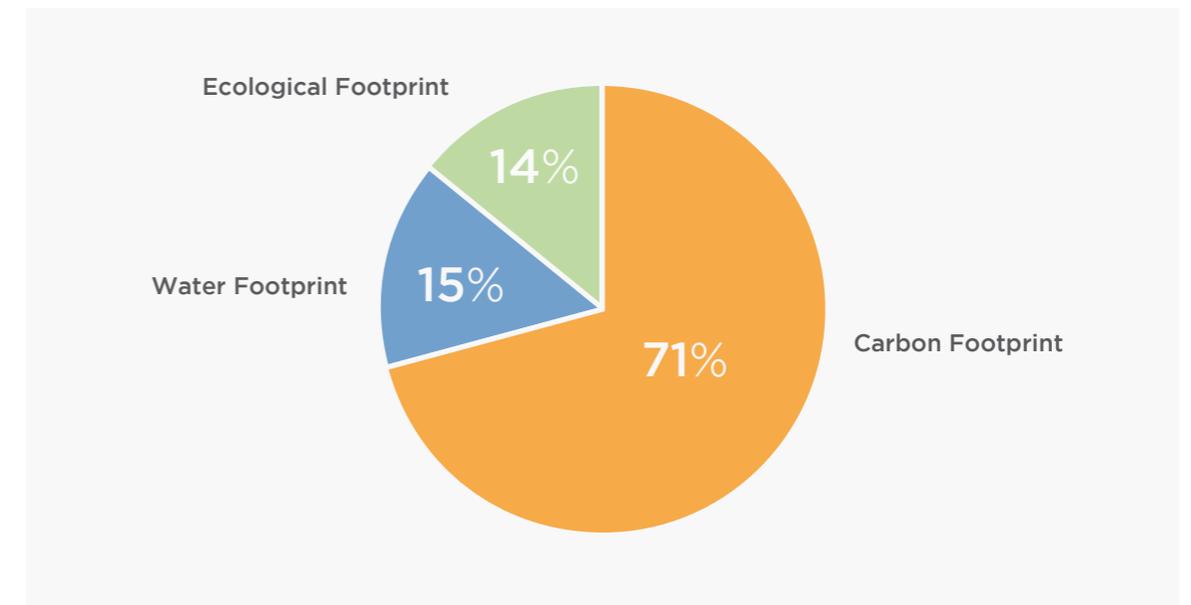
### Statistical coverage

The amount of scientific data used for creating the Double Pyramid model has increased greatly over the years, from a database containing approximately 140 values in the first 2010 edition, it has reached more than 1,200 data items in the sixth publication. The growing number of sources has strengthened the reliability of the assumptions made in the first edition of the Double Pyramid from year to year, thus confirming its scientific validity.

<sup>44</sup> This work does not claim to provide absolute valid value or to replace the most stringent scientific publications; however, the statistical coverage obtained (1222 items of data from almost 385 sources) and the method of aggregation used leads to increasingly reliable values. Greater information on the database is available in a supporting document which illustrates in detail how the BCFN Double Pyramid database is structured. The database and the relative document can be downloaded at the BCFN site.

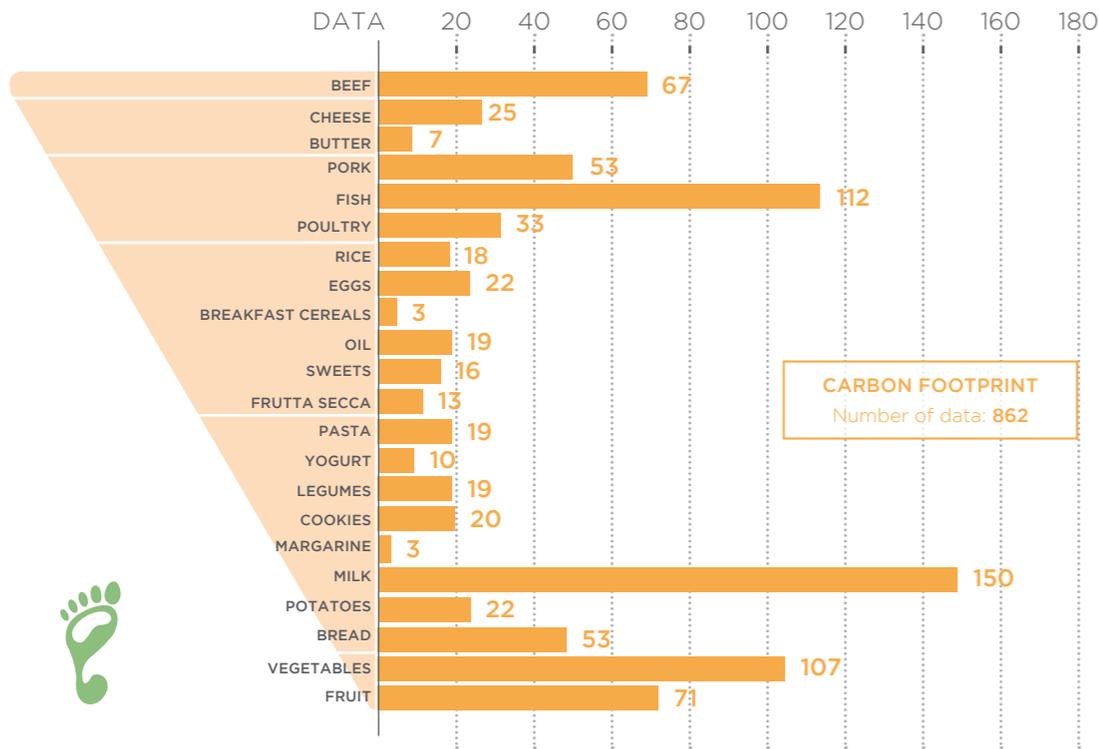
It is important to note that the percentage distribution of the studies varies for each of the three environmental indicators. Most of the sources used refer to the Carbon Footprint, followed by the Water and Ecological Footprints. This is due to the Carbon Footprint, the indicator 'histori-

cally' most used by scholars and that also has the most consolidated and widespread calculation standards at scientific level. Another aspect is related to the increasing number of greenhouse gas emissions communication initiatives.

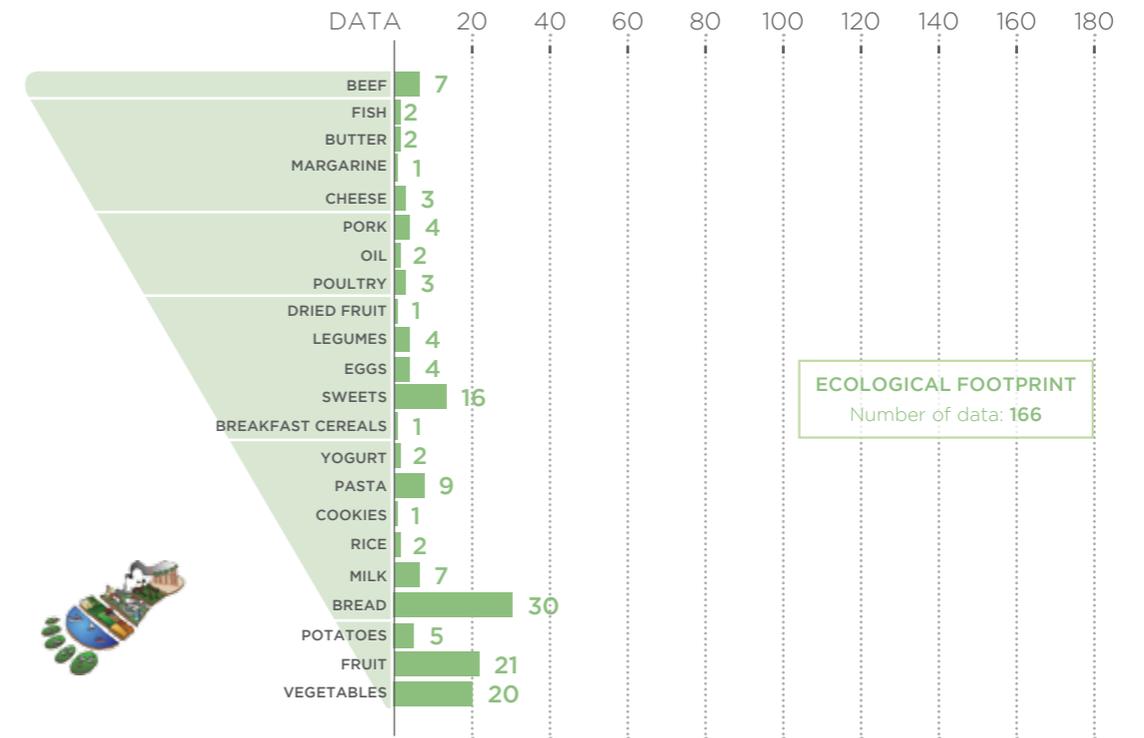


Breakdown of the bibliographic sources on the environmental impacts on the total data of 2015.

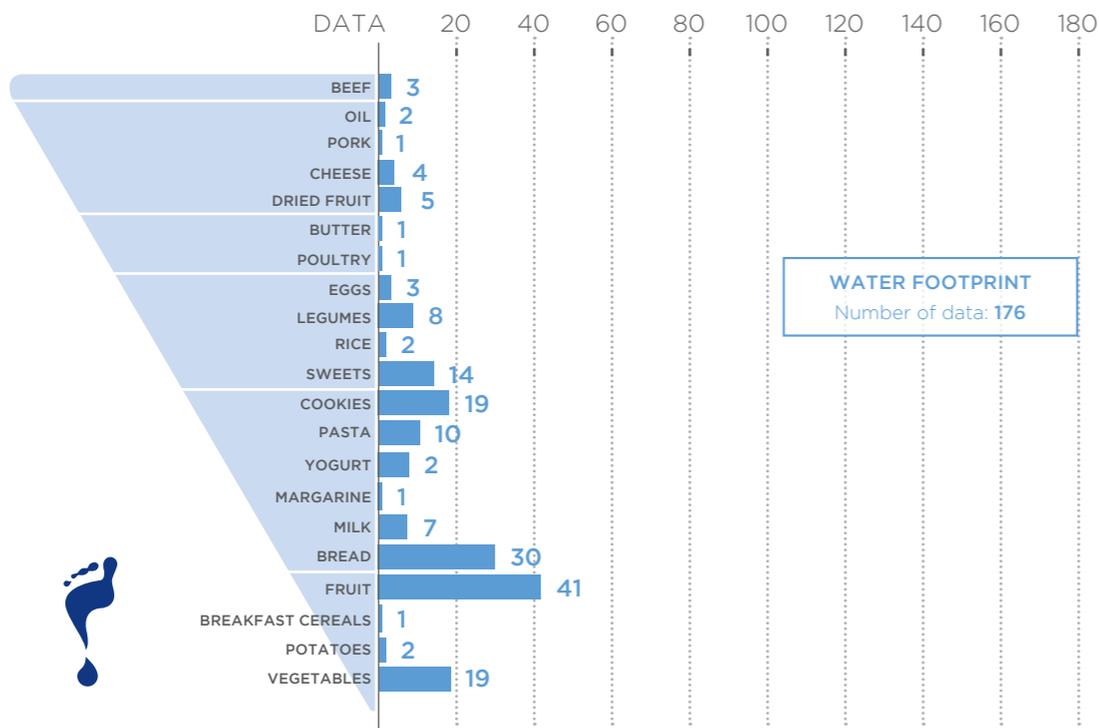
For each of the three environmental indicators, the percentage distribution of the scientific sources relative to the macro-categories of food making up the environmental pyramids is specified.



Number of data items relative to the Carbon Footprint.



Number of data items relative to the Ecological Footprint.



Number of data items relative to the Water Footprint.

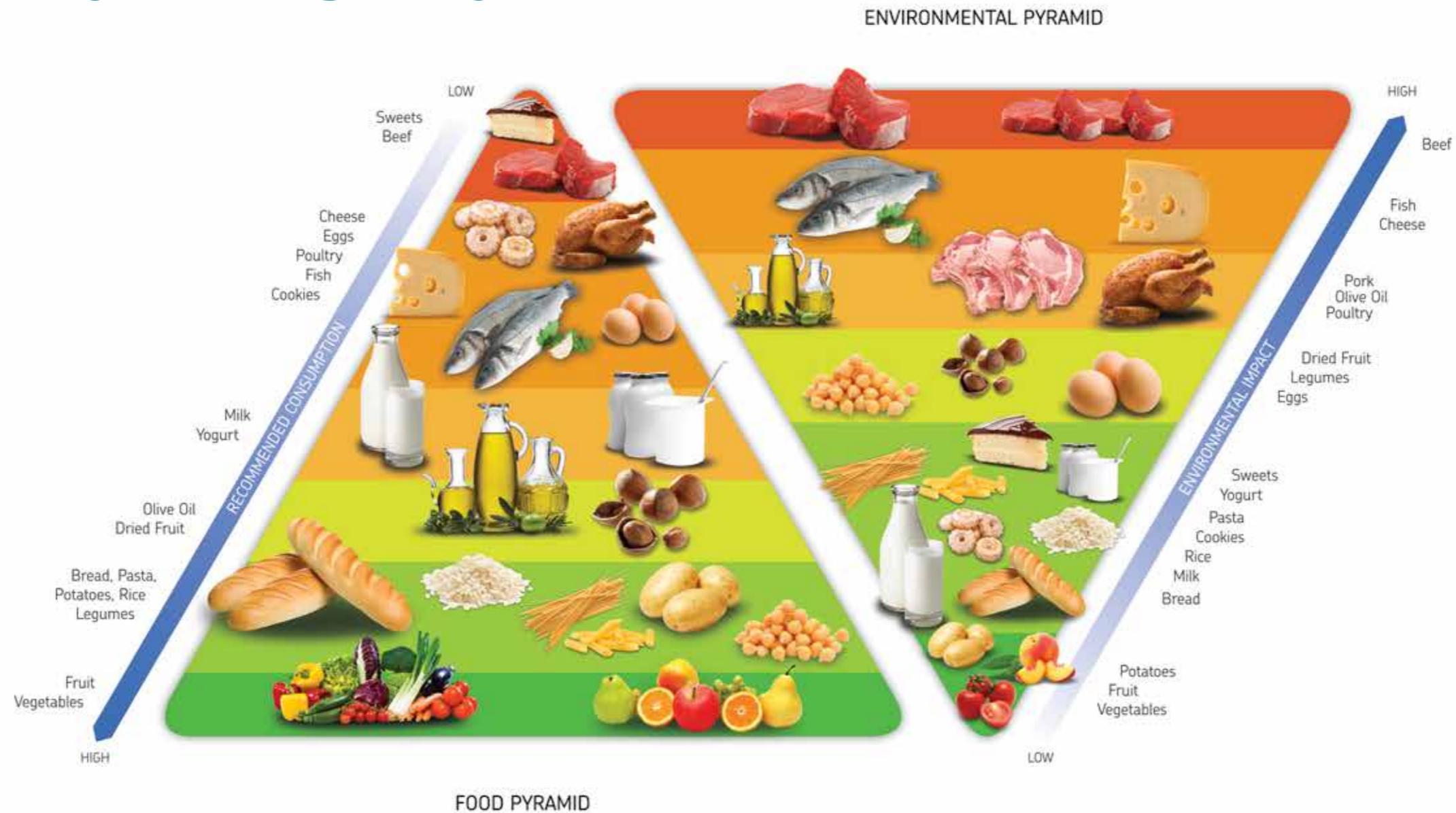


The sources and data are accessible in the Database of Double Pyramid downloaded from the website [www.barillacfn.com](http://www.barillacfn.com)

# THE DOUBLE PYRAMID FOR ADULTS

The sixth revision of the Double Pyramid reported below has gradually become a useful tool for implementing sustainable diets and emphasizes how important it is to have a well-balanced diet for our health and for safeguarding the environment. By placing the traditional food pyramid created

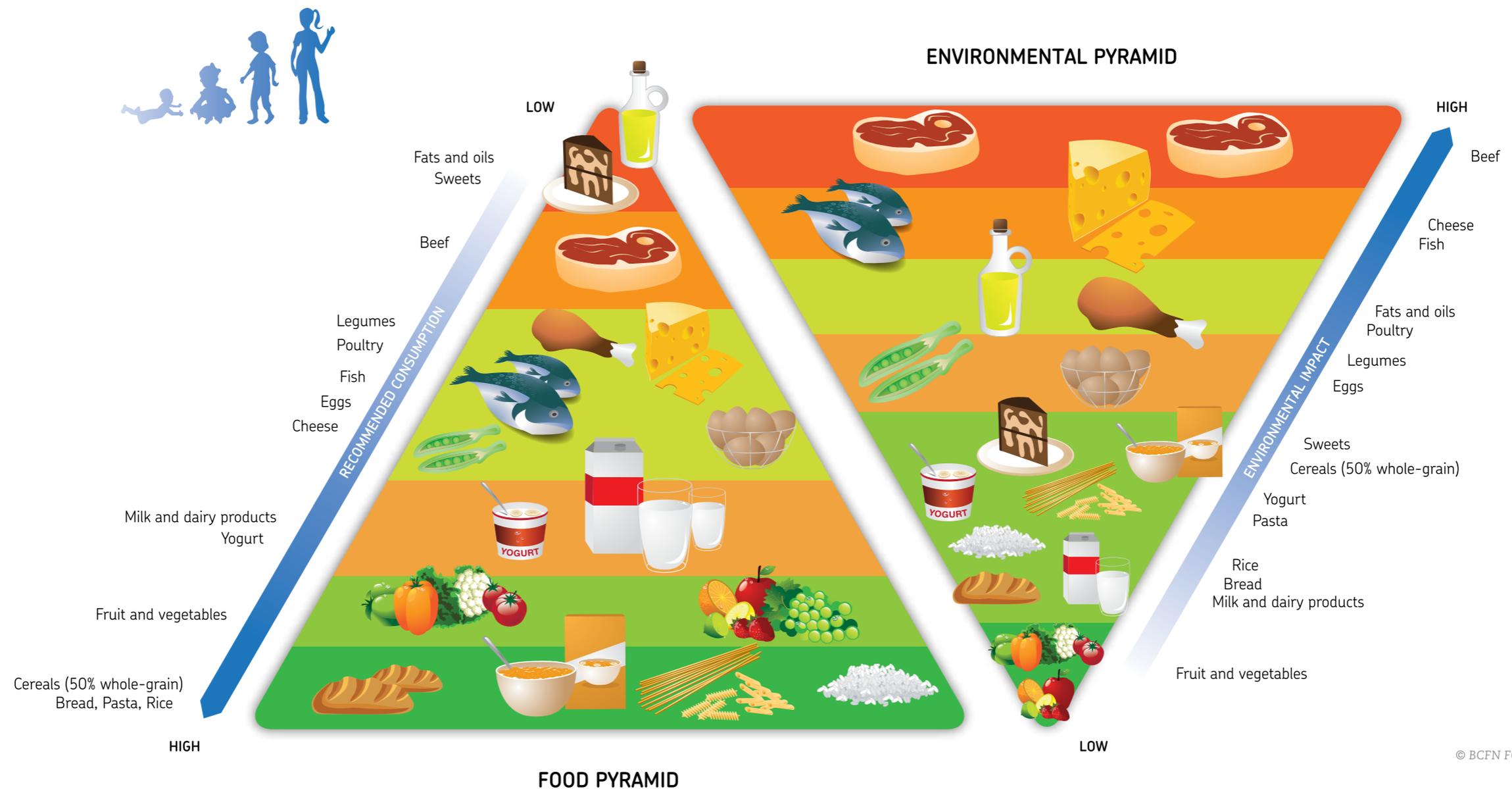
by arranging food on levels according to the principles of a Mediterranean diet side by side with the environmental pyramid which determines the Ecological Footprint of each food, it is observed that the foods that should be consumed in larger quantities according to nutritionists, are also those with a lower environmental impact.



# THE DOUBLE PYRAMID FOR THOSE WHO ARE GROWING

Incorrect eating habits and lifestyles during the period of growth can lead to a significant increase in the risk of contracting diseases such as cardiovascular diseases, diabetes, and several types of cancer during one's life. This is why the BCFN decided to propose a Double Pyramid for children and adolescents, in which the food analysis and classification is

maintained regarding its impact on the ecosystem and nutritional value, while the recommended portions are modified in order to adapt the principles of a well-balanced diet to the requirements of children and adolescents who need a different supply of nutrients than adults for a healthy growth.



# THE THREE ENVIRONMENTAL PYRAMIDS

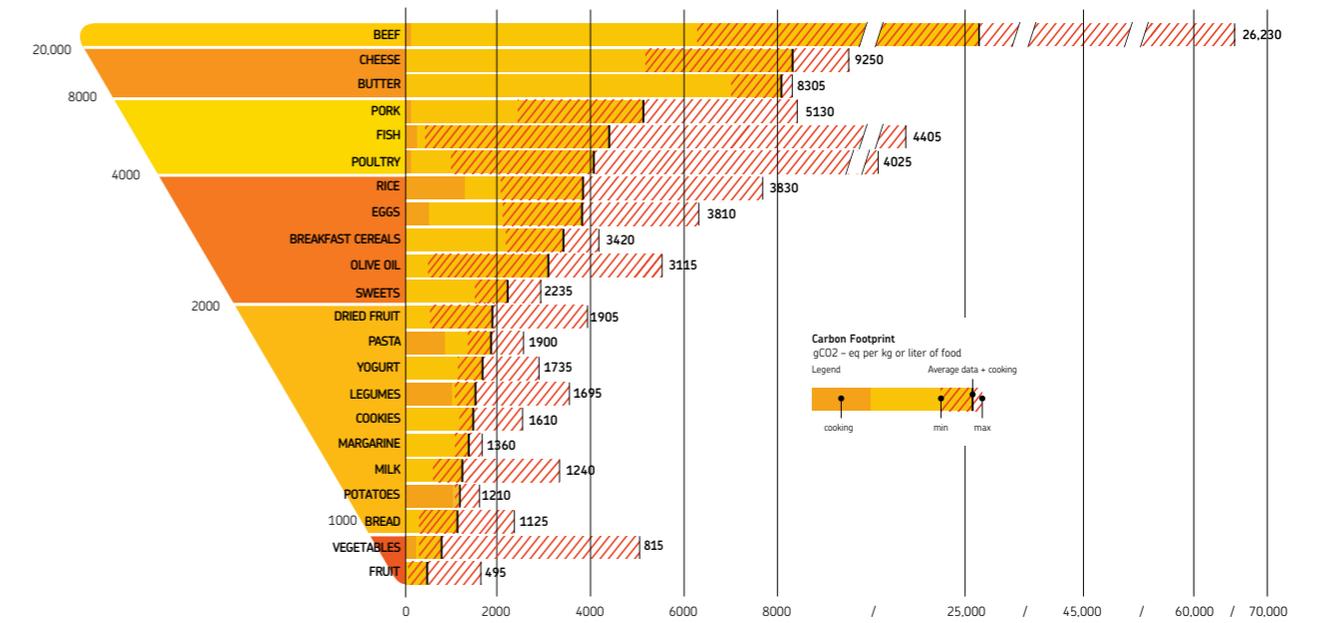
The environmental impacts of food were presented in three different pyramids, one for each of the environmental indicators taken into account. Yet only the one relative to the Ecological Footprint was used to construct the BCFN Dou-

ble Pyramid. It is important to note that the three environmental pyramids shown below were very similar to those published in the first edition: the increased statistical coverage only marginally modified the numeric values.

The considerations made in the first edition of the document are the same as for the sixth edition: meat and cheese have higher impact values per kilogram while fruit and vegetables have lower values of environmental impact.



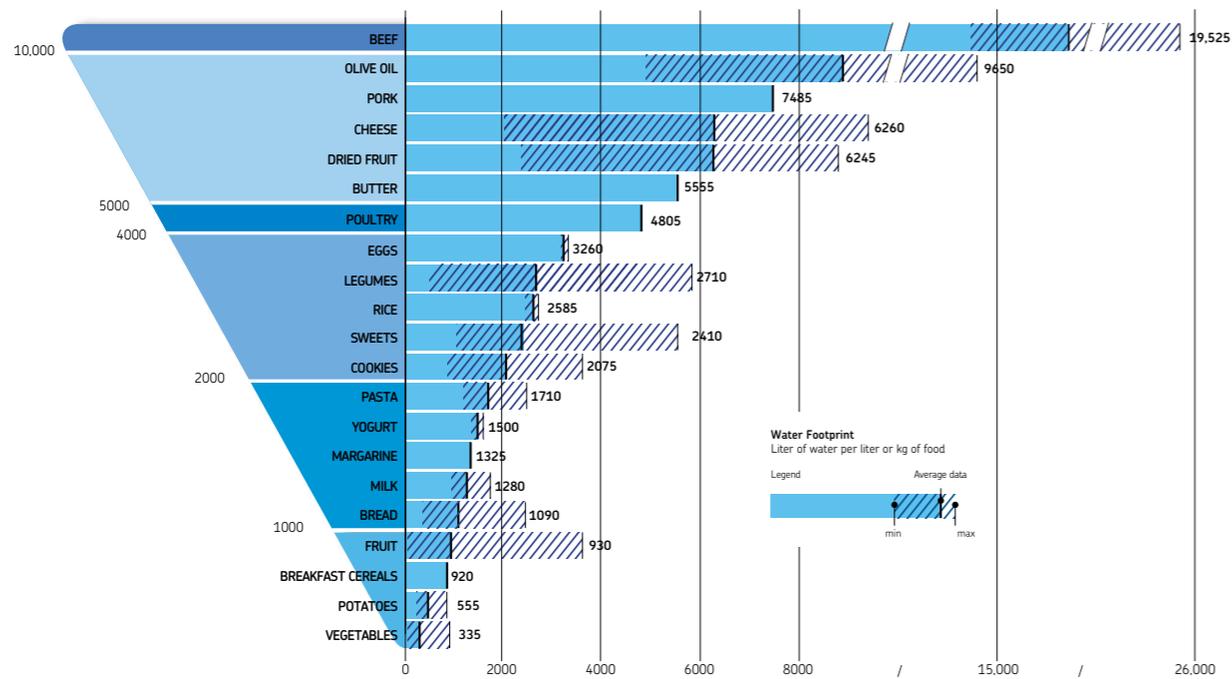
# CARBON FOOTPRINT



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The Carbon Footprint, which calculates the emission of greenhouse gases during the lifecycle of food, is measured in grams of equivalent CO<sub>2</sub> (gCO<sub>2</sub> eq) per kilogram or liter of food. The average value of the collected data was reported for each food group, while the dotted band marks the distance between the minimum and maximum values. The impact caused by cooking was added if the food is normally cooked before eating. The average determines the order of the foods from the top downwards.

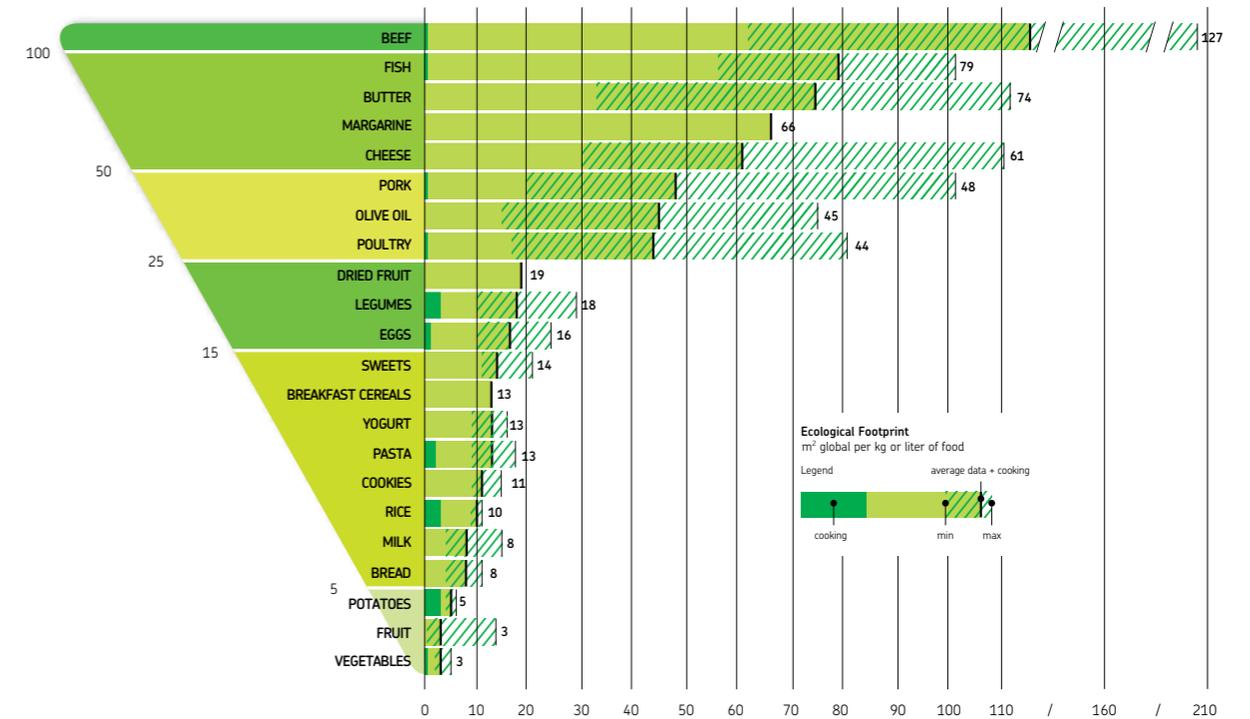
# WATER FOOTPRINT



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The Water Footprint, which quantifies the consumption and use made of water resources, is measured in liters of water per kilogram or liter of food. For each food group, the reported value is the average value of the collected data, while the dotted band marks the distance between the minimum and maximum values. The impact caused by cooking was added if the food is normally cooked before eating. The average determines the order of the food from the top downwards.

# ECOLOGICAL FOOTPRINT



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The Ecological Footprint, which calculates the earth's capacity to regenerate resources and absorb the emissions, is measured in global square meters per kilogram or liter of food. For each food group the reported value is the average value of the collected data, while the dotted band marks the distance between the minimum and maximum values. The impact is added if the food is normally cooked before eating. The average determines the order of the food from the top downwards.

# THE MODEL OF THE ENVIRONMENTAL HOURGLASS

## THE HOURGLASS MODEL

In November 2013, COOP Italia published the report of sustainability of the beef sold under its own brand. On that occasion, the environmental impacts of food, calculated using the suggested weekly quantities, allowed publishing the environmental hourglass for the first time.

This represents the environmental impact (carbon footprint) of one week of the Mediterranean diet. From 2012, in parallel with this initiative, a group of operators in the livestock sector started the Sustainable Meat project which led, in October 2014, to the publication of a report on the

sustainability of Italian meat as well as an updated environmental hourglass.

## WHAT THE HOURGLASS LOOKS LIKE

The hourglass represents the weekly carbon footprint of a person who follows the recommendations of the Mediterranean diet included in the guidelines of the INRAN, now CRA-NUT, recommends limiting the consumption of red meat to 2 portions of 70 grams (for a total of 140 grams) per week and invites a more frequent consumption of fish, with 3 portions of 100 grams per week, together with dried pulses, with 3 por-

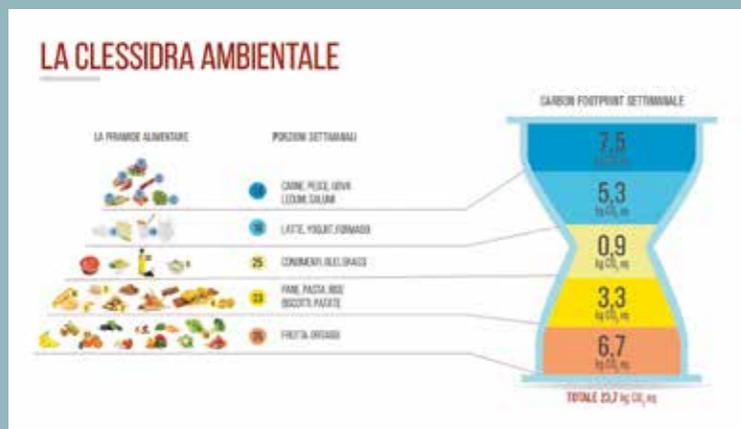
tions of 30 grams (90 grams a week), which currently are not very present on the tables of the Italians, and 52 portions of bread, cookies, pasta, rice and potatoes.

## ARE THE DOUBLE PYRAMID AND THE HOURGLASS ANTITHETIC?

Both models promote the Mediterranean diet as a food habit that is also sustainable for the Planet.

The Double Pyramid provides the environmental impacts of foods per kilo which, if multiplied by the amounts consumed, allow evaluating the environmental impact of what we have consumed. Greater consumption entails a greater impact.

On the other hand, the environmental hourglass starts off from the assumption that the indications of the CRA-NUT are followed: this approach is obviously valid when the amounts suggested are respected, which unfortunately is not always the case, thus risking an underestimate of the impacts.



[www.carnisostenibili.it](http://www.carnisostenibili.it)



# SUSTAINABLE DIETS: A CLIMATE CHANGE SOLUTION

*From field to fork: combining protection of the environment,  
correct nutrition and local economic development,  
along the entire food supply chain*

Sustainability implies the long-term equilibrium of various environmental, social and economic factors, which is why the FAO has developed a broader definition of the 'sustainable diet' and the BCFN has studied the environmental impacts of food in greater depth.

## SUSTAINABLE DIETS DEFINITION

In November 2010, the UN Food and Agriculture Organization and Biodiversity International organized an international scientific conference with the title "Biodiversity and 'sustainable diets': United against Hunger".

The aim of the conference was to gather the major researchers on the subject in order to define 'sustainable diets' in relation to access to food and biodiversity.

In the early 1980s, the term 'sustainable diet' meant the set of dietary recommendations that were able to improve the state of health of citizens and their environment. Subsequently, the primary goal of feeding the starving populations detracted attention from sustainability and the question of 'sustainable diets' was neglected for many years<sup>45</sup>.

Due to increased deterioration of the environment, agricultural practices with an excessive impact on the ecosystem carried out in many areas of the world and the steady reduction in biodiversity, there is renewed attention towards agriculture and food sustainability focusing attention on all its various forms including diets.

Therefore, the international community acknowledged that a definition and a series of sustainable dietary guidelines are required.



The final definition presented and approved at the FAO symposium established that:

*“Sustainable diets are diets which have a low impact on the environment, contributing to food and nutritional security as well as to a healthy life for current and future generations. Sustainable diets that contribute to the protection and respect for biodiversity and ecosystems are culturally acceptable, economically fair and accessible, adequate, secure and healthy from a nutritional viewpoint and, at the same time, optimize natural and human resources”.*

This definition recognizes the interdependence between food production and consumption, dietary requirements and nutritional recommendations and that human health is interrelated with the health of ecosystems. In order to meet the food and nutritional demands of a richer, more urbanized world with a growing population, it is necessary for food systems to undergo radical changes and make a more efficient use of food and resources.

According to the FAO, sustainable diets can reduce water consumption and minimize CO<sub>2</sub> emissions, promote food biodiversity and increase the value of traditional and local foods that are rich in nutrients due to their variety.

In order to promote sustainable diets, the FAO believes that it is necessary to involve private individuals and communities in both supply and demand

in the fields of agriculture, nutrition, health, the environment, education, culture, and trade.

The sustainable diet definition proposed by the FAO underlines its multidimensional nature, considering the correlations existing between the food, nutritional, environmental, social, political and economic variables<sup>46</sup>.

Among the examples of sustainable diets, the FAO specifically cites the Mediterranean diet whose merits go beyond the nutritional aspects, as it promotes social interaction through communal meals (both in the home and during traditional festivities)<sup>47</sup>. There is also a relatively new concept in the Mediterranean diet: bio-cultural diversity which originates from the many ways in which humans have interacted with their natural environment<sup>48</sup>. Their co-evolution has led to local ecological knowledge: an essential reservoir of experiences, methods, and skills that help local communities to manage their resources.

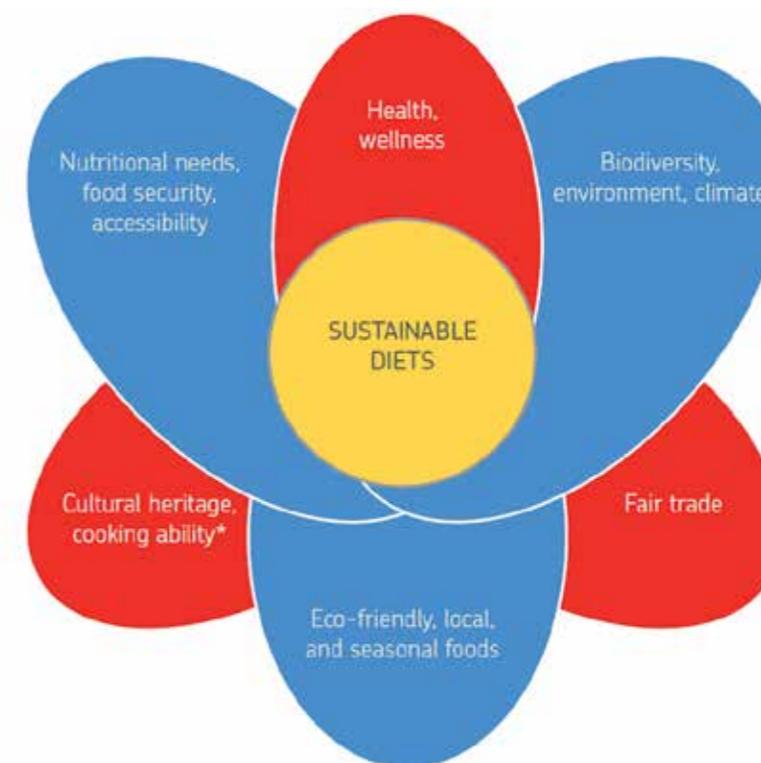
<sup>45</sup> Gussow and Clancy, 1968.

<sup>46</sup> Lang T., 2012.

<sup>47</sup> Petrillo in FAO, 2010.

<sup>48</sup> *Ibid.*

Source: FAO, 2010



Schematic representation of the key components of sustainable diets (Source: FAO, 2010).



	ENVIRONMENTAL ASPECTS	NUTRITIONAL ASPECTS	ECONOMIC ASPECTS	SOCIO-CULTURAL ASPECTS
AGRICULTURE	Follow sustainable agricultural practices. Promote resilience of the systems of production. Develop and maintain diversity.	Promote different varieties of food. Produce food that is full of nutritional elements.	Develop appropriate cultivation techniques. Promote self-sufficiency through local production.	Maintain traditional agricultural practices and promote local varieties.
FOOD PRODUCTION	Reduce the impact of production, processing and sale.	Preserve nutrients along the food chain.	Reinforce the local food systems. Produce food at affordable prices.	Produce culturally acceptable food.
CONSUMPTION	Reduce the environmental impact of food consumption.	Promote a diversified balanced and seasonal diet.	Promote economic accessibility to a varied diet.	Safeguard food traditions and culture. Meet local tastes and preferences.

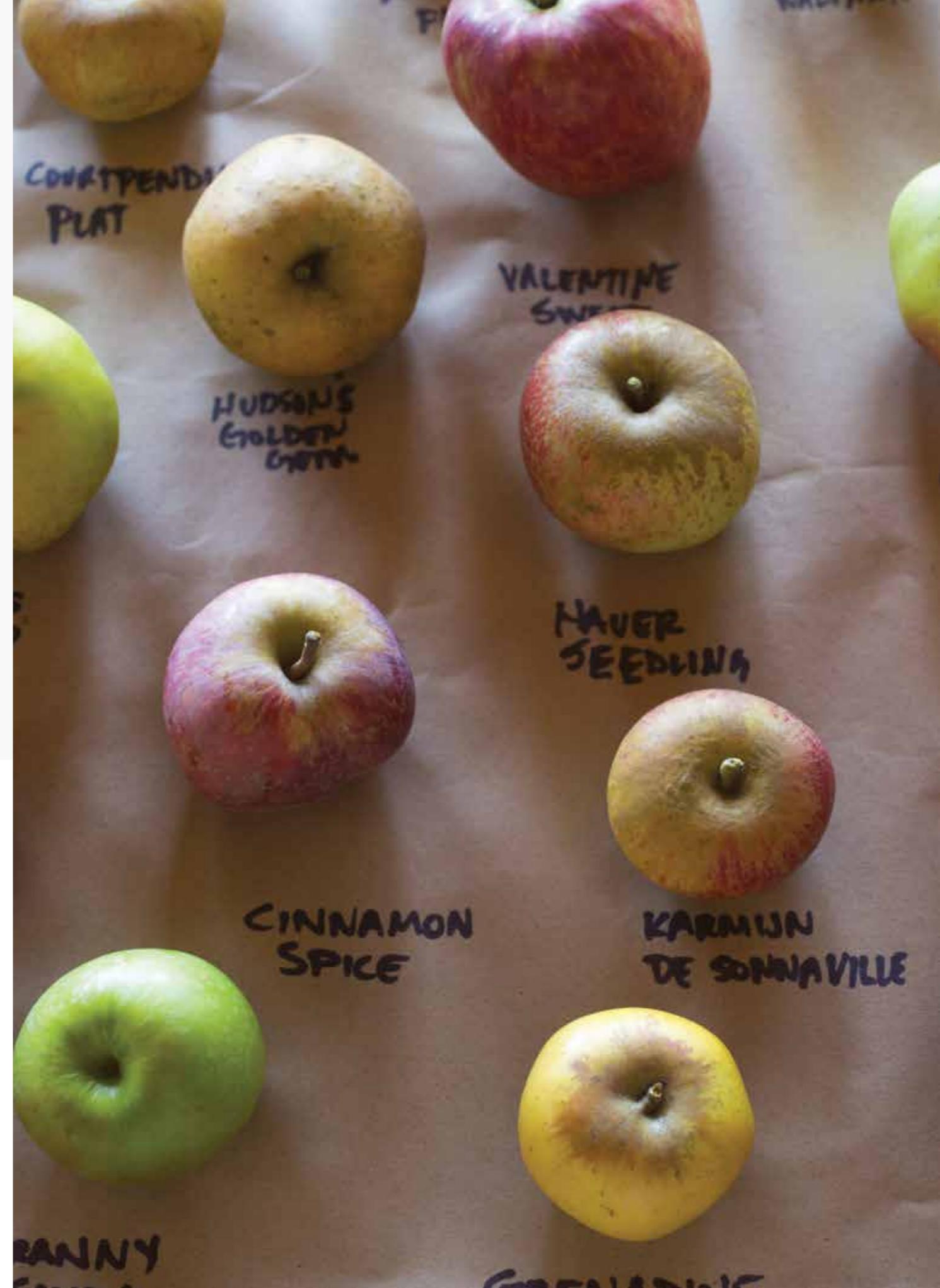
Characteristics of a sustainable food system.

Even some researchers from the Mediterranean Agronomy Institute of Montpellier and Bari<sup>49</sup> state that the traditional Mediterranean diet can be considered sustainable for various reasons. Firstly, for the large variety of foods which effectively promotes biodiversity. Secondly, for the wide range of cooking practices and techniques used for preparing food and the numerous foods that are known to have beneficial effects on health such as olive oil, fish, fruit and vegetables, legumes, fermented milk, and spices. Lastly, due to its strong cultural heritage and tradition; its respect of human nature and seasonality; the diversity of the landscapes which contribute to

well-being; and finally because it is an environmentally-friendly diet thanks to the reduced consumption of animal products.

The definition of 'sustainable diet' shows its multidimensional character: agricultural, food, nutritional, environmental, social, cultural, and economic variables interact with one another. This is the result of the combination of environmental protection, nutrition, and land development with economic and social aspects along the entire food chain.

<sup>49</sup> Padilla *et al.*, in FAO, 2010.



# CLIMATE NEGOTIATIONS AND COMMITMENTS FOR **GREENHOUSE GAS EMISSIONS REDUCTION**



Climate change represents one of the greatest environmental challenges that humanity will have to face in the coming years: increasing temperatures, melting glaciers, and the greater frequency of extreme weather events are some of the signals that our Planet's climate is changing, and at a speed that has never been recorded before. Scientists agree that these changes have been caused by the constant increase in greenhouse gas emissions produced by human activity, which has made the global temperature rise. The first attempts to create an international strategy to reduce the effects of climate

change and curb the increasing temperatures date back to the early 1990s. In 1992, the UN Framework Convention on Climate Change (UNFCCC) was signed, the first international environmental treaty to reduce greenhouse gases and prevent climate change. Since then, the signatory nations have met annually at the Conference of the Parties (COP) to analyze the progress in dealing with climate change. To date, the best-known outcome of this initiative was the Kyoto Protocol, the treaty which established binding commitments for developed countries to reduce their greenhouse emissions. COP 21, which will be held in

Paris from November 30 to December 1, 2015, has the ambitious objective of concluding, for the first time ever, a binding and universal agreement on climate change which will be accepted by all nations. COP 21 comes at a time of great uncertainty as far as the ecological balance of our Planet is concerned. According to FAO estimates, to meet the nutritional needs of a world which in 2050 will have a population of nine and a half billion people, food production will have to increase by 70% compared to present-day levels, improving yields and cultivating new land. If this does not occur, greenhouse gas emissions will

increase 80%<sup>50</sup>, aggravating a situation that is already putting great pressure on natural resources.

To avoid exacerbating this state of affairs and to combat climate change, many countries have made commitments and devised medium-long term strategies to reduce their emissions, including actions aimed at improving the sustainability and efficiency of the agro-food sector, which is effectively responsible for about one-third of the emissions caused by man and represents one of the main causes of deforestation, soil depletion, and loss of biodiversity<sup>51</sup>. For this reason, the agro-food sector has become involved in policies to fight climate change, albeit later than other economic sectors. In its "Roadmap to 2050", the European Union has set itself the objective of reducing CO<sub>2</sub> emissions produced by its member-states by 80%: this is an ambitious but essential objective to guarantee a serene future for the new generations. To achieve this goal, the EU has focused on the need to foster

more efficient and sustainable food systems. However, this is not enough; our eating habits will also have to change, by making an effort to reduce our consumption of animal proteins and by basing our diet on foods with a low environmental impact<sup>52</sup>.

The United Kingdom's Department for Energy and Climate Change (DECC) also recognized the fundamental role of food consumption in the fight against climate change. In its 2015 report, *Prosperous living for the world in 2050: insights from the Global Calculator*, the DECC identified a series of scenarios illustrating how increases in temperature can be reduced while maintaining a high quality of life<sup>53</sup>. In the report, the authors evaluate various actions that can limit climate change and define the daily practices that the world's population should adopt to avoid a dangerous increase in the global temperature. In 2050, if the global population adapted its food consumption to a diet based on 2,100 calories per day (of which only

160 from the consumption of meat) – as suggested by the World Health Organization – it would be possible to save about 15 gigatons of CO<sub>2</sub> equivalent, an amount equal to one-third of global greenhouse gas emissions in 2011<sup>54</sup>.

The Intergovernmental Panel on Climate Change recently studied how modifications in food consumption can help in the fight against climate change, concluding that the behavior of families plays a fundamental role in reducing greenhouse gases<sup>55</sup>.

<sup>50</sup> Bajželj *et al.*, 2014.

<sup>51</sup> Garnett, 2014.

<sup>52</sup> European Commission, 2011.

<sup>53</sup> Department for Energy and Climate Change, 2015.

<sup>54</sup> *ibid.*

<sup>55</sup> IPCC, 2014, chapter 11: *Agriculture, Forestry and Other Land Use (AFOLU)*.



## FOOD CONSUMPTION AND CLIMATE CHANGE

Most people are aware that motorized transportation, heating buildings, and using electricity cause greenhouse gas emissions which are, in turn, responsible for climate change. These factors can easily be reduced by doing small things: switching off the lights in empty rooms, walking or cycling to work, and so on.

On the other hand, it is not as well known that the consumption of food causes about 30% of the emissions of Western families, a higher percentage than that generated by the entire sector of transportation or electricity. Thus, food represents one of the main causes of climate change.

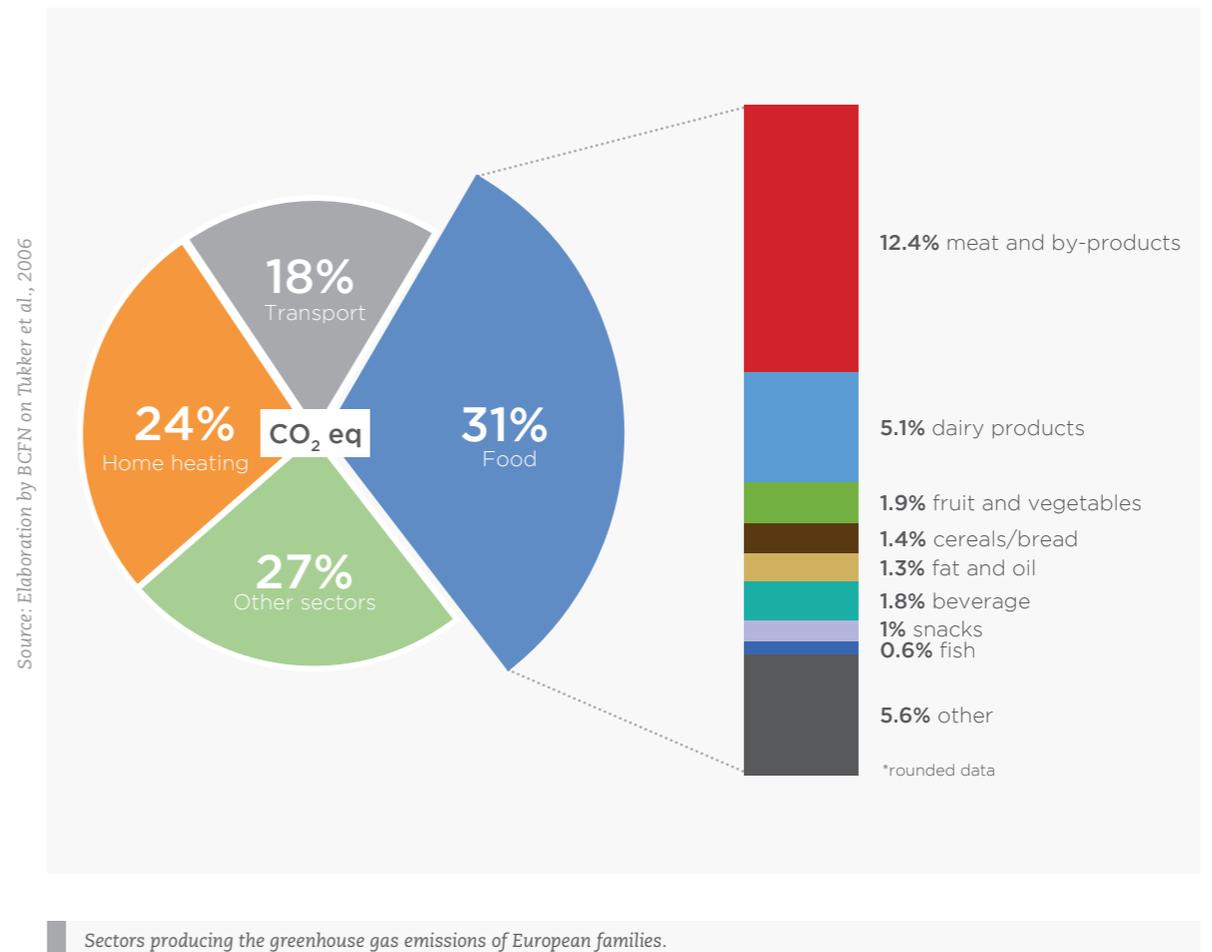
In 2006, researchers (Tukker *et al.*)<sup>56</sup> conducted a study on the environmental impact of products and services commonly used in the European Union. The study, which is still quoted today as one of the most authoritative on the topic, adopted a systemic approach in its measurements, taking into consideration twelve sectors of goods and services and eight indicators of environmental

pressure, including greenhouse gas emissions, eutrophication, acidification of water, and reduction of the atmosphere's ozone layer.

The study showed that the environmental impact of the food and drinks sector represents about 30% of the total of all the indicators considered, a share slightly lower than that represented by heating buildings (35%).

The transportation sector is the third largest contributor, responsible for 15% of the total impact. If, however, we only consider greenhouse gas emissions, the situation is inverted: in this case, food contributes most to climate change (31%), greatly exceeding heating (23.6%) and different means of transportation (18.5%).

<sup>56</sup> Tukker and Jansen, 2006.



A predominant role is played by the consumption of meat, which represents about 12% of overall emissions. Milk and dairy products contribute 5% of the CO<sub>2</sub> emissions, while fruit and vegetables, both fresh and frozen, contribute about 2%. Lastly, the consumption of cereals and derivatives (flour products, bread, pasta, baked goods, etc.) contributes just over 1% to total overall emissions. In summary, at an aggregate level,

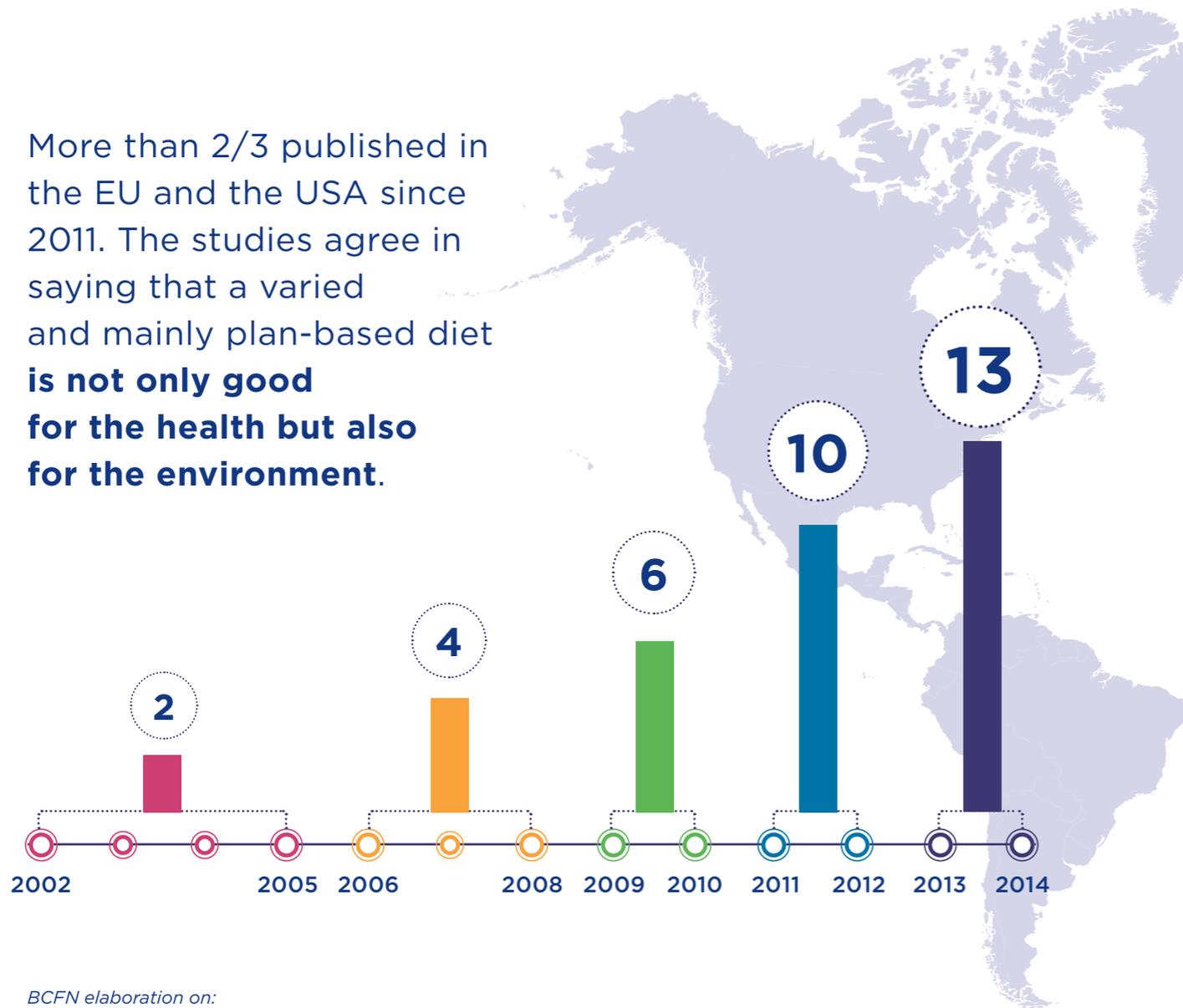
our food consumption has a strong impact on the environment, even greater than some sectors (such as transportation) which are traditionally identified as the most 'polluting'. It remains to be evaluated whether we can reduce this impact by carefully choosing what we eat. This is the question the BCFN menus, illustrated below, attempt to answer.

## BY HOW MUCH CAN WE REDUCE OUR IMPACT BY CHANGING OUR DIET?

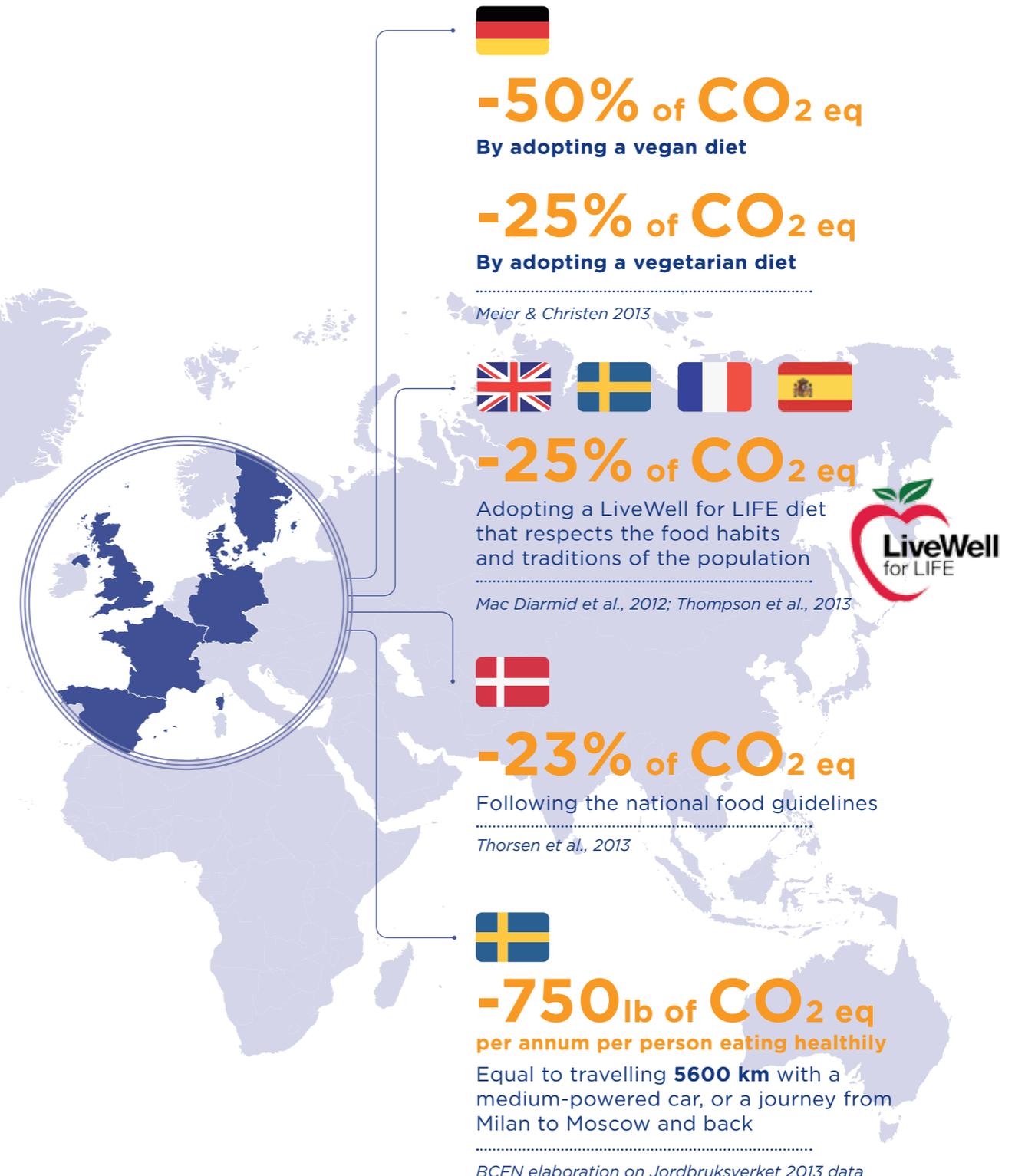
# THE ENVIRONMENTAL IMPACT OF DIETS

35 SCIENTIFIC STUDIES PUBLISHED IN THE PAST 12 YEARS

More than 2/3 published in the EU and the USA since 2011. The studies agree in saying that a varied and mainly plant-based diet **is not only good for the health but also for the environment.**



BCFN elaboration on: Auestad et al., 2015; Tillman & Clark 2015; Van Doreen et al., 2013; Thorsen et al., 2012; Jordbruksverket 2013.



BCFN elaboration on Jordbruksverket 2013 data

## CAN CHANGING DIET MAKE A DIFFERENCE? THE BCFN MENUS

With the aim of making the sustainability concepts of the diet simple and practical to follow, BCFN prepared a series of similar menus from a nutritional point of view (all well balanced in proteins, carbohydrates and fats) but different in the choice of ingredients that provide the nutrients necessary, proteins in particular.

These menus, which can be daily or weekly, are regularly used in BCFN publications for estimating the environmental impacts of the various food choices that people can make, calculated using the Double Pyramid database.

Therefore, some simple elaborations were proposed to help you to understand how consumers' eating habits can affect the environment, in order to determine whether and to what extent well-balanced diets are affordable and environmentally sustainable<sup>57</sup>.

It is important to note that it is better to avoid making a direct comparison between two types of food, while it is preferable to examine a set of dishes (in terms of type and quantity) eaten on a daily or weekly basis.

### The daily menu

Three daily menus were analyzed in order to estimate the extent to which the food choices of individuals have an environmental impact: all of them are balanced in terms of calories and nutrients (proteins, fats and carbohydrates) from a nutritional point of view.

The first menu (vegan menu) contains exclusively proteins of plant origin: therefore excluding any type of meat and animal derivatives (such as dairy produce and eggs). In the second (vegetarian), meat is excluded but dairy produce and eggs are

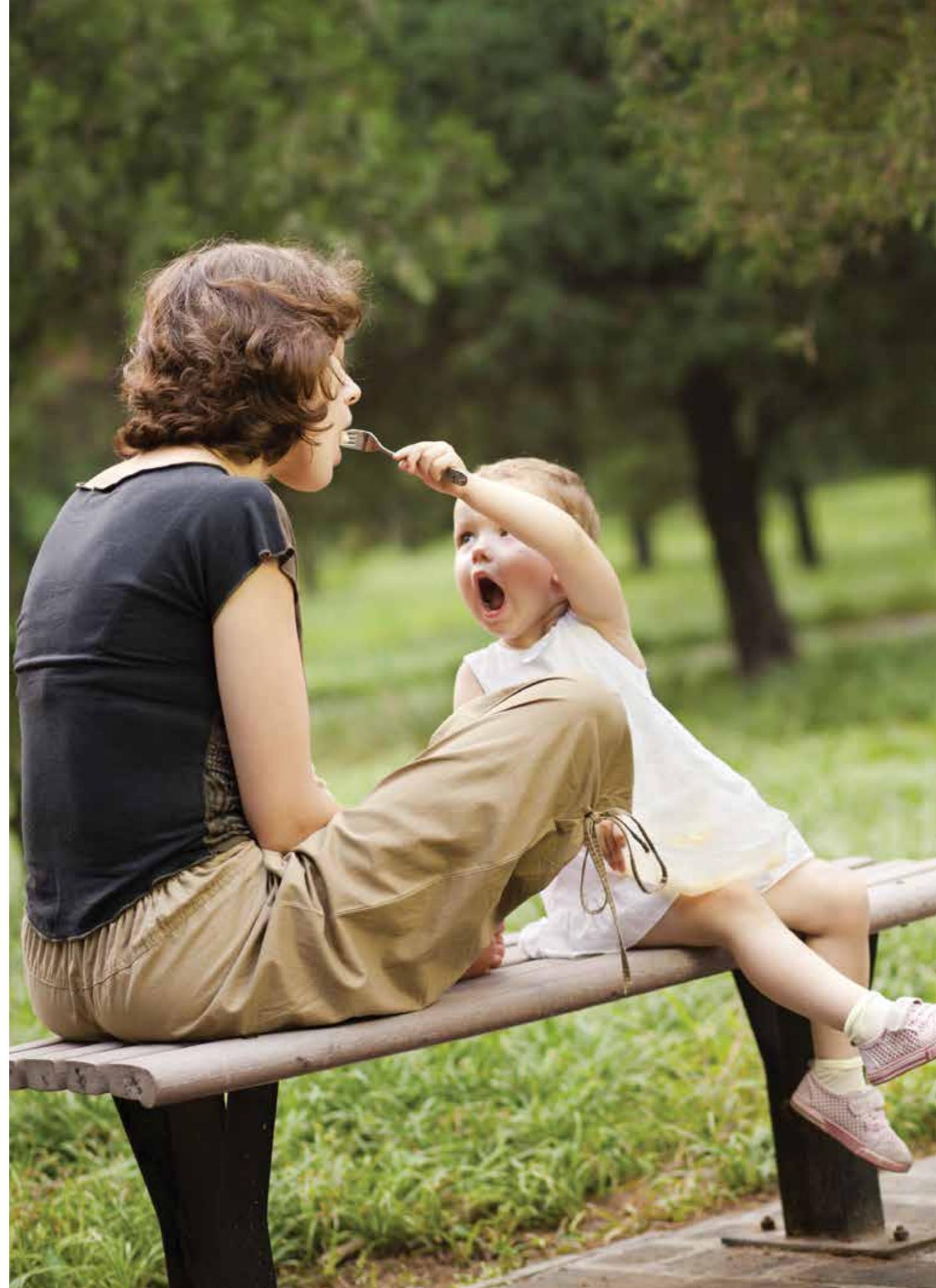
consumed. The third (meat menu) allows for everything, with proteins of mostly animal origin<sup>58</sup>.

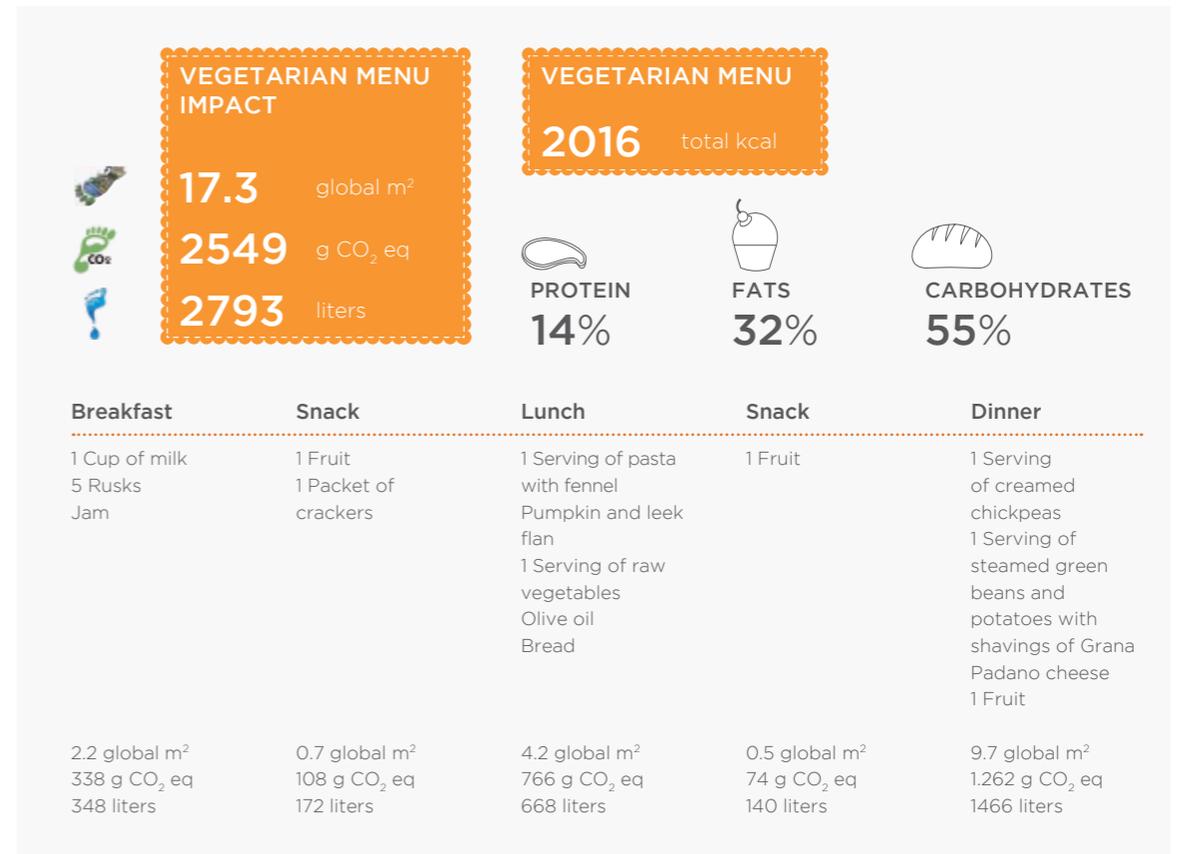
As can be seen, the vegan and the vegetarian menus have an impact that is almost similar, whereas the meat menu has an environmental impact that is on average twice as high as the vegetarian menu: a non-negligible share on the daily impact of an individual.

With this data it is possible to estimate how much an individual can reduce his/her environmental impact simply by changing his/her eating habits. We can hypothesize three different weekly diets according to how many times a vegetarian menu is chosen instead of a meat one: reducing the intake of animal protein to twice a week, which is in line with nutritionists' recommendations, one can 'save' up to 10 square global meters per day.

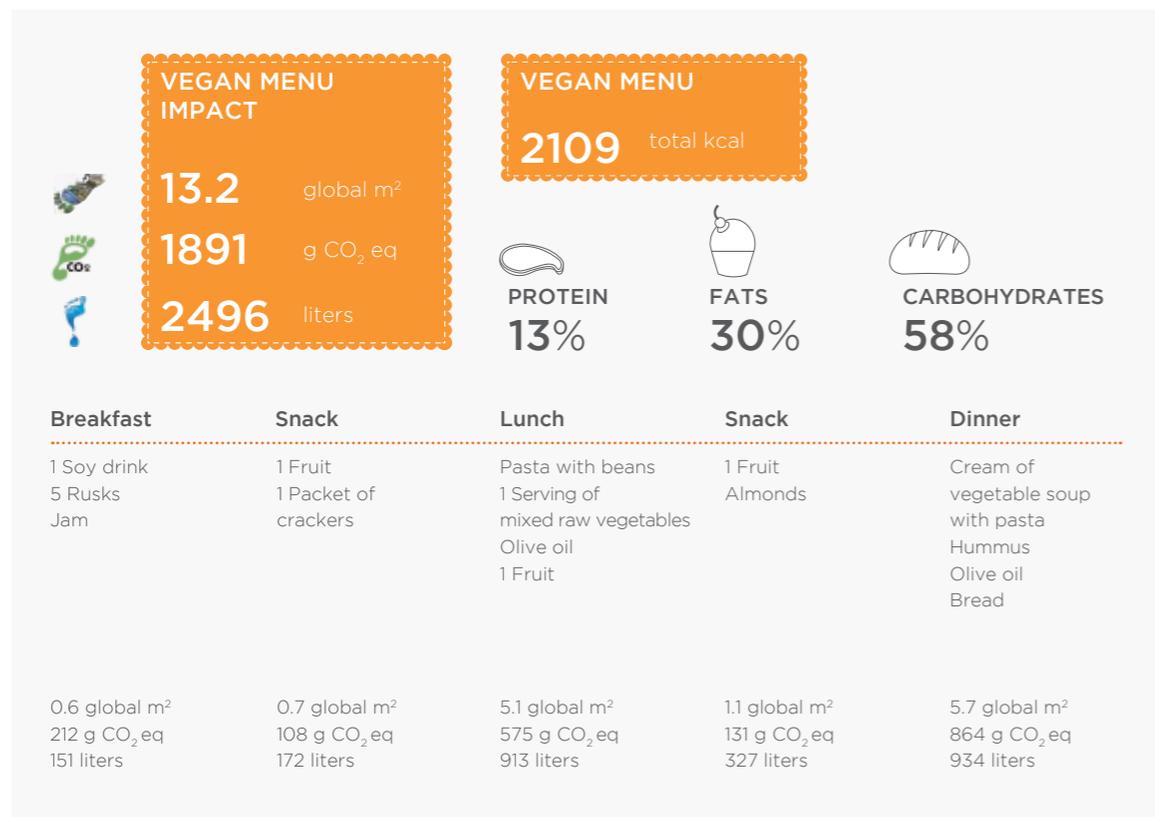
<sup>57</sup> This elaboration is to be deemed purely indicative and is based on some of the food choices taken as an example by the BCFN for the evaluations relative to the environmental impacts.

<sup>58</sup> For the details of the recipes used in the menus, see the supporting technical document.

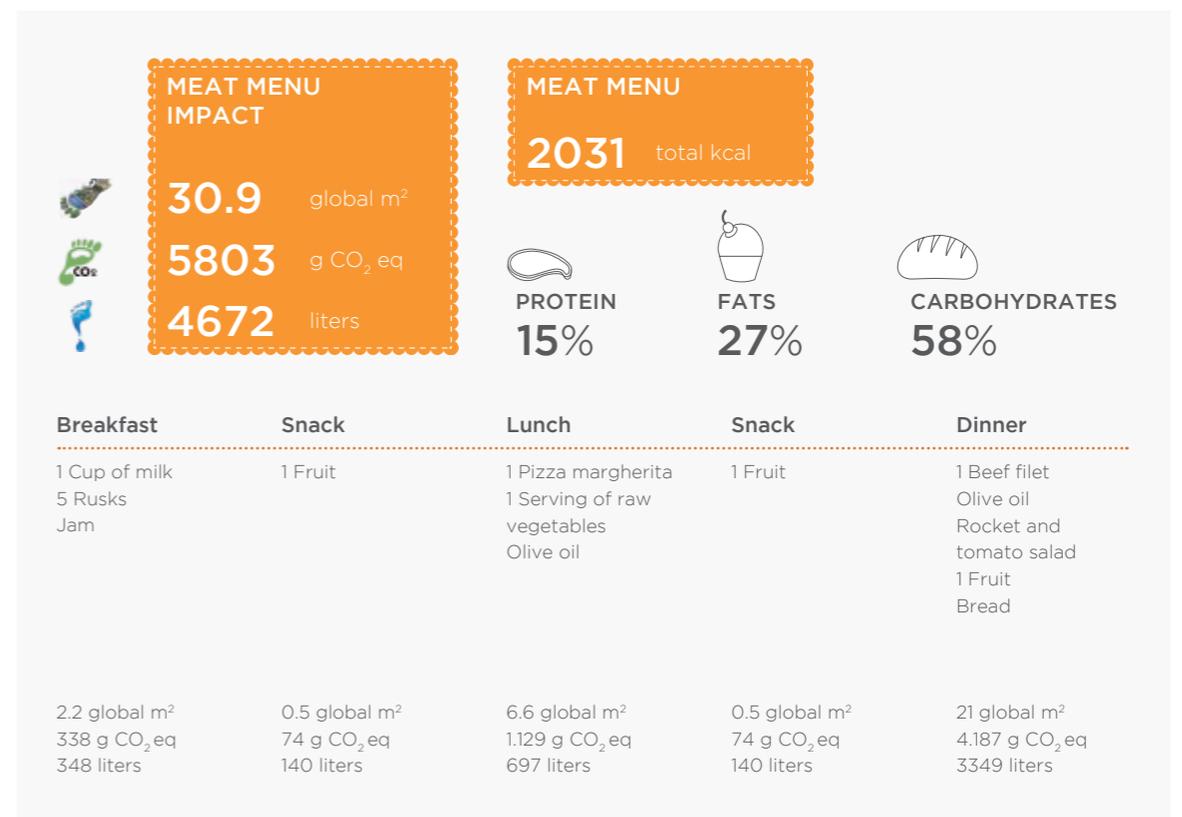




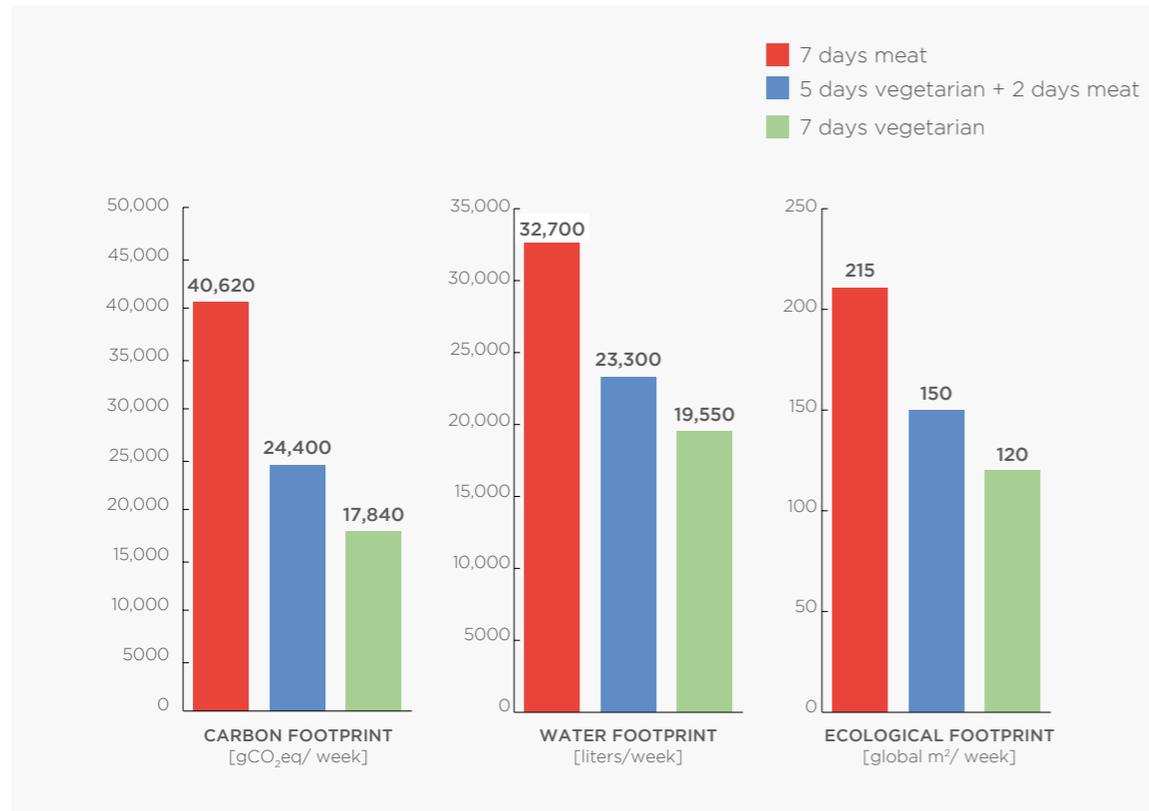
Composition of a vegetarian menu and relative environmental impact.



Composition of a vegan menu and its environmental impact.



Composition of a meat menu and its environmental impact.



	WEEKLY IMPACT			DAILY IMPACT		
	Carbon Footprint [gCO <sub>2</sub> eq]	Water Footprint [liters]	Ecological Footprint [global m <sup>2</sup> ]	Carbon Footprint [gCO <sub>2</sub> eq]	Water Footprint [liters]	Ecological Footprint [global m <sup>2</sup> ]
<b>7 DAYS</b> MEAT MENU 	40,620	32,700	215	5800	4670	30
<b>5 DAYS</b> VEGETARIAN MENU + <b>2 DAYS</b> MEAT MENU +	24,400	23,300	150	3500	3300	20
<b>7 DAYS</b> VEGETARIAN MENU 	17,840	19,550	120	2550	2790	15

\*Note: any discordances between the values are due to rounding up or down for better comprehension.

How the environmental impact varies depending on food choices. The first is calculated supposing for the whole week the consumption of the menu with one meat course; in the intermediate one, the menu with one meat course is followed for two days and for five days the vegetarian menu is followed; the third contemplates only the vegetarian menu.



### The weekly menu

The analysis of the different daily menus, as we have seen, confirms that the environmental impact of our food may vary, even significantly, depending on what we put on our plate. Starting off from this consideration, the BCFN decided to analyze the impacts of four weekly menus, all balanced from the nutritional point of view and with an equivalent calorie count. The BCFN *sustainable menu* includes both meat (with a preference for white meat) and fish, providing a balanced consumption of vegetable or animal protein.

Meat and fish are obviously excluded from the vegetarian menu for which protein comes from both animal (cheese, dairy products in general, and eggs, etc.) and plant (legumes) sources. The vegan menu excludes all the protein sources of animal origin (even eggs and cheese are not allowed). Lastly, the meat menu the consumption of larger quantities of protein from animal sources<sup>59</sup>.

<sup>59</sup> For the details of the recipes used in the menu, see the supporting technical documentation.

# 1. VEGAN MENU

	MONDAY	g	TUESDAY	g	WEDNESDAY	g	THURSDAY	g	FRIDAY	g	SATURDAY	g	SUNDAY	g
BREAKFAST	1 Cup of soy milk	200	1 Cup of soy milk	200	1 Glass of freshly squeezed citrus fruit juice	200	1 Cup of soy milk	200	1 Cup of fruit and soy milk smoothie	200	1 Cup of soy milk	125	6 Dry cookies	30
	4 Rusks	32	2 Slices of whole grain bread	50	2 Slices of whole grain bread	50	6 Dry cookies	30	2 Slices of whole grain bread	50	2 Slices of whole grain bread	50	1 Portion of Fruit	150
	1 Portion of Fruit	150	2 Teaspoons of jam	20	2 Teaspoons of jam	20			2 Teaspoons of jam	20	2 Teaspoons of jam	20		
<b>TOTAL</b>	<b>382</b>		<b>270</b>		<b>270</b>		<b>230</b>		<b>270</b>		<b>195</b>		<b>180</b>	
SNACK	1 Cup of fruit and soy milk smoothie	200	1 Cup of soy yogurt	125	1 Cup of soy yogurt	125	1 Packet of crackers	30	1 Cup of soy yogurt	125	1 Portion of Fruit	150	1 Cup of soy yogurt	125
			1 Portion of Fruit	150	2 Rusks	16	1 Portion of Fruit	150	1 Portion of Fruit	150				
<b>TOTAL</b>	<b>200</b>		<b>275</b>		<b>141</b>		<b>180</b>		<b>275</b>		<b>150</b>		<b>125</b>	
LUNCH	Whole wheat spaghetti with broccoli and pine dried fruit	262	Penne with fresh tomato and basil	220	Risotto with apples and almonds	192	Mixed salad with cucumber and tomatoes	200	Pasta with beans	303	Red bean rissoles with peas	170	Pasta with lentil sauce	280
	Mixed raw vegetables	80	Chickpeas flour omelette with aromatic herbs	78	Zucchini with parsley	80	Chickpeas	150	Spinach	200	Mixed raw vegetables	200	Fennel gratin	270
	Olive oil	10	Raw Fennel	200	Olive oil	10	2 Slices of whole grain bread	50	Olive oil	10	2 Slices of whole grain bread	50		
			Olive oil	10			Olive oil	20			Olive oil	10		
<b>TOTAL</b>	<b>352</b>		<b>508</b>		<b>282</b>		<b>420</b>		<b>513</b>		<b>430</b>		<b>550</b>	
SNACK	1 Portion of Fruit	150	1 Cup of fruit and soy milk smoothie	200	1 Portion of dried fruit	30	1 Portion of Fruit	150	1 Cup of fruit and soy milk smoothie	200	1 Portion of Fruit	150	1 Portion of Fruit	150
	1 Packet of crackers	30			1 Portion of Fruit	150	1 Packet of crackers	30	2 Rusks	16				
<b>TOTAL</b>	<b>180</b>		<b>200</b>		<b>180</b>		<b>180</b>		<b>216</b>		<b>150</b>		<b>150</b>	
DINNER	Red beans cream with grilled bread with herbs	335	Vegetable soup	250	Pasta with creamed vegetables	280	Pasta and pea soup	260	Chickpea flour omelette with artichokes	181	Pizza with tomatoes and mixed vegetables	520	Tomato bruschetta	243
	Grilled peppers	200	Chickpeas with tomato	215	Green salad	80	Cherry tomatoes and arugula	200	Steamed green beans and potatoes	310			Hummus	190
	2 Slices of whole grain bread	50	2 Slices of whole grain bread	50	Pinto beans	150	2 Slices of whole grain bread	50	2 Slices of whole grain bread	50			Mixed raw vegetables with oil dip	200
													2 Slices of whole grain bread	50
	Olive oil	10	1 Portion of Fruit	150	Olive oil	10	Olive oil	10					2 Slices of whole grain bread	50
<b>TOTAL</b>	<b>595</b>		<b>665</b>		<b>520</b>		<b>520</b>		<b>541</b>		<b>520</b>		<b>683</b>	

# 2. VEGETARIAN MENU

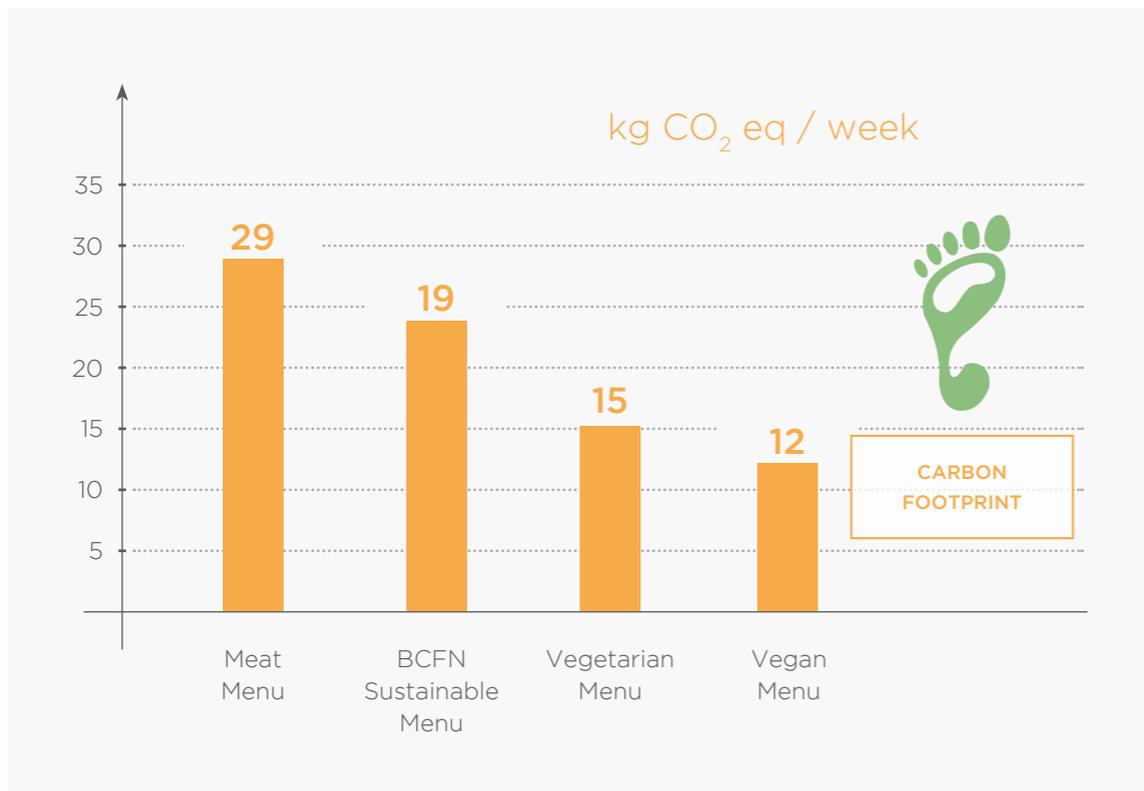
	MONDAY	g	TUESDAY	g	WEDNESDAY	g	THURSDAY	g	FRIDAY	g	SATURDAY	g	SUNDAY	g
BREAKFAST	1 Cup of milk	200	1 Cup of milk	200	1 Glass of freshly squeezed citrus fruit juice	200	1 Cup of milk	200	1 Cup of fruit and milk smoothie	200	1 Cup of skim yogurt	125	1 Croissant	50
	4 Rusks	32	2 Slices of whole grain bread	50	1 Brioche	50	6 Dry cookies	30	1 Croissant	50	2 Slices of whole grain bread	50	1 Portion of Fruit	150
	1 Portion of Fruit	150	2 Teaspoons of jam	20							2 Teaspoons of jam	20		
<b>TOTAL</b>	<b>382</b>		<b>270</b>		<b>250</b>		<b>230</b>		<b>250</b>		<b>195</b>		<b>200</b>	
SNACK	1 Cup of fruit and milk smoothie	200	1 Cup of skim yogurt	125	1 Cup of skim yogurt	125	1 Portion of Fruit	30	1 Cup of skim yogurt	125	1 Portion of Fruit	150	1 Cup of skim yogurt	125
			1 Portion of Fruit	150	2 Rusks	16	1 Portion of Fruit	150	1 Portion of Fruit	150				
<b>TOTAL</b>	<b>200</b>		<b>275</b>		<b>141</b>		<b>180</b>		<b>275</b>		<b>150</b>		<b>125</b>	
LUNCH	Whole wheat spaghetti with cheese and black pepper	112	Penne with fresh tomato and basil	220	Risotto with apples and parmesan cheese	183	Mixed salad with tomatoes and cucumber	200	Pasta with beans	303	Omelette with herbs	76	Pasta with lentil sauce	280
	Mixed raw vegetables	80	Potato and spinach pie	195	Zucchini with parsley	80	Chickpeas	150	Spinach	200	Mixed raw vegetables	200	Fennel gratin	270
	Olive oil	20	Raw fennel	200	Olive oil	10	2 Slices of whole grain bread	50	Olive oil	10	2 Slices of whole grain bread	50	Olive oil	10
			Olive oil	10			273	Olive oil	20		513	Olive oil	10	
<b>TOTAL</b>	<b>212</b>		<b>625</b>		<b>282</b>		<b>420</b>		<b>513</b>		<b>336</b>		<b>560</b>	
SNACK	1 Portion of Fruit	150	1 Cup of fruit and milk smoothie	200	1 Portion of dried fruit	30	1 Portion of Fruit	150	1 Cup of fruit and milk smoothie	200	1 Portion of Fruit	150	1 Portion of Fruit	150
	1 Packet of crackers	30			1 Portion of Fruit	150	1 Packet of crackers	30	2 Rusks	16				
<b>TOTAL</b>	<b>180</b>		<b>200</b>		<b>180</b>		<b>180</b>		<b>216</b>		<b>150</b>		<b>150</b>	
DINNER	Creamed red beans with grilled bread with herbs	335	Vegetable soup	250	Pasta with creamed vegetables	280	Pasta and pea soup	260	Asparagus with eggs	155	Pizza margherita	361	Tomato bruschetta	243
	Grilled peppers	200	Caprese salad with tomato and mozzarella	335	Green salad with mozzarella	170	Arugula and cherry tomatoes	200	Steamed green beans and potatoes	310			Hummus	190
	2 Slices of whole grain bread	50	2 Slices of whole grain bread	50	Olive oil	20	2 Slices of whole grain bread	50	2 Slices of whole grain bread	50			Mixed raw vegetables with oil dip	200
			1 Portion of Fruit	150									2 Slices of whole grain bread	50
													Olive oil	10
<b>TOTAL</b>	<b>585</b>		<b>785</b>		<b>470</b>		<b>520</b>		<b>515</b>		<b>361</b>		<b>693</b>	

### 3. BCFN SUSTAINABLE MENU

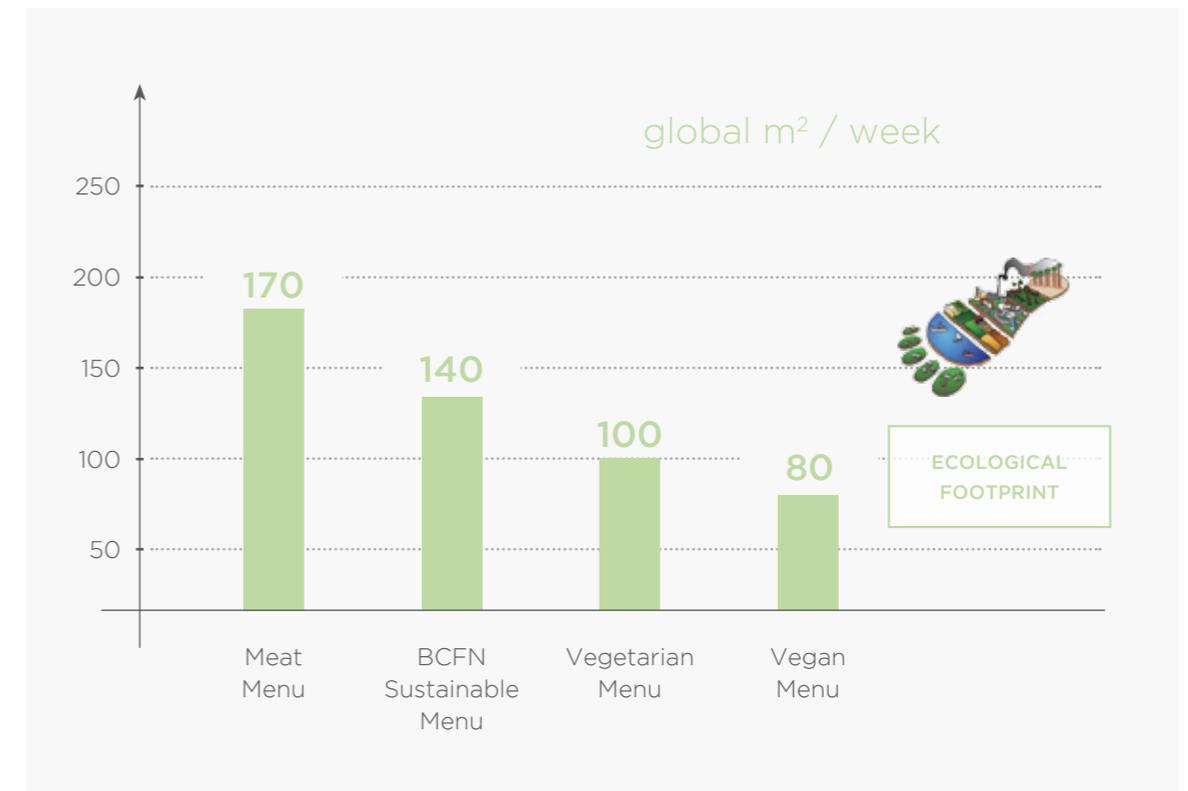
	MONDAY	g	TUESDAY	g	WEDNESDAY	g	THURSDAY	g	FRIDAY	g	SATURDAY	g	SUNDAY	g
BREAKFAST	1 Cup of milk	200	1 Cup of milk	200	1 Glass of freshLY squeezed citrus fruit juice	200	1 Cup of milk	200	1 Cup of fruit and milk smoothie	200	1 Cup of skim yogurt	125	1 Croissant	50
	4 Rusks	32	2 Slices of whole grain bread	50	1 Croissant	50	6 Dry cookies	30	4 Rusks	32	2 Slices of whole grain bread	50	1 Portion of Fruit	150
	1 Portion of Fruit	150	2 Teaspoons of jam	20							2 Teaspoons of jam	20		
<b>TOTAL</b>	<b>382</b>		<b>270</b>		<b>250</b>		<b>230</b>		<b>232</b>		<b>195</b>		<b>200</b>	
SNACK	1 Cup of fruit and milk smoothie	200	1 Cup of skim yogurt	125	1 Cup of skim yogurt	125	1 Packet of crackers	30	1 Cup of skim yogurt	125	1 Portion of Fruit	150	1 Cup of skim yogurt	125
			1 Portion of Fruit	150	2 Rusks	16	1 Portion of Fruit	150	1 Portion of Fruit	150				
<b>TOTAL</b>	<b>200</b>		<b>275</b>		<b>141</b>		<b>180</b>		<b>275</b>		<b>150</b>		<b>125</b>	
LUNCH	Whole wheat spaghetti with cheese and black pepper	112	Penne with fresh tomato and basil	220	Turkey escalope with sage and lemon	115	Caprese salad: tomato and mozzarella	335	Casarecce (pasta) with sardines and fennel	183	Pasta with broccoli	200	Potato gnocchi with tomato sauce	389
	Mixed raw vegetables	80	Salmon with artichoke puree	315	Zucchini with parsley	80	2 Slices of whole grain bread	50	Pumpkin and leek flan	178	Chicken strips with mixed vegetables	370	Baked sea bass	160
	Olive oil	10			2 Slice of whole grain bread	50	Olive oil	20				Mixed raw vegetables	80	
					Olive oil	10						Olive oil	10	
<b>TOTAL</b>	<b>20</b>		<b>535</b>		<b>255</b>		<b>405</b>		<b>360</b>		<b>570</b>		<b>639</b>	
SNACK	1 Portion of Fruit	150	1 Cup of fruit and milk smoothie	200	1 Portion of dried fruit	30	1 Cup of skim yogurt	125	1 Portion of Fruit	150	1 Cup of fruit and milk smoothie	200	1 Portion of Fruit	150
	1 Packet of crackers	30			1 Portion of Fruit	150	1 Portion of Fruit	150	1 Packet of crackers	30	2 Rusks	16		
<b>TOTAL</b>	<b>180</b>		<b>200</b>		<b>180</b>		<b>275</b>		<b>180</b>		<b>216</b>		<b>150</b>	
DINNER	Omelette with aromatic herbs	76	Pasta with beans	303	Pasta with vegetables cream	280	Vegetable soup with rice	270	Creamed chickpea	310	Pizza margherita	361	Tomato bruschetta	243
	Steamed Swiss chard and potatoes	300	Mixed raw vegetables	80	Mixed raw vegetables	50	Beef carpaccio with shaved parmesan cherry tomatoes and arugula	265	Steamed green beans and potatoes with shaved Grana Padano cheese	310			Hummus	190
	2 Slices of whole grain bread	50	2 Slices of whole grain bread	50	Ham	50	Olive oil	10					Mixed raw vegetables with oil dip	50
	Olive oil	10	Olive oil	10	2 Slices of whole grain bread	50							2 Slices of whole grain bread	50
<b>TOTAL</b>	<b>436</b>		<b>443</b>		<b>440</b>		<b>545</b>		<b>620</b>		<b>361</b>		<b>543</b>	

### 4. MEAT BASED MENU

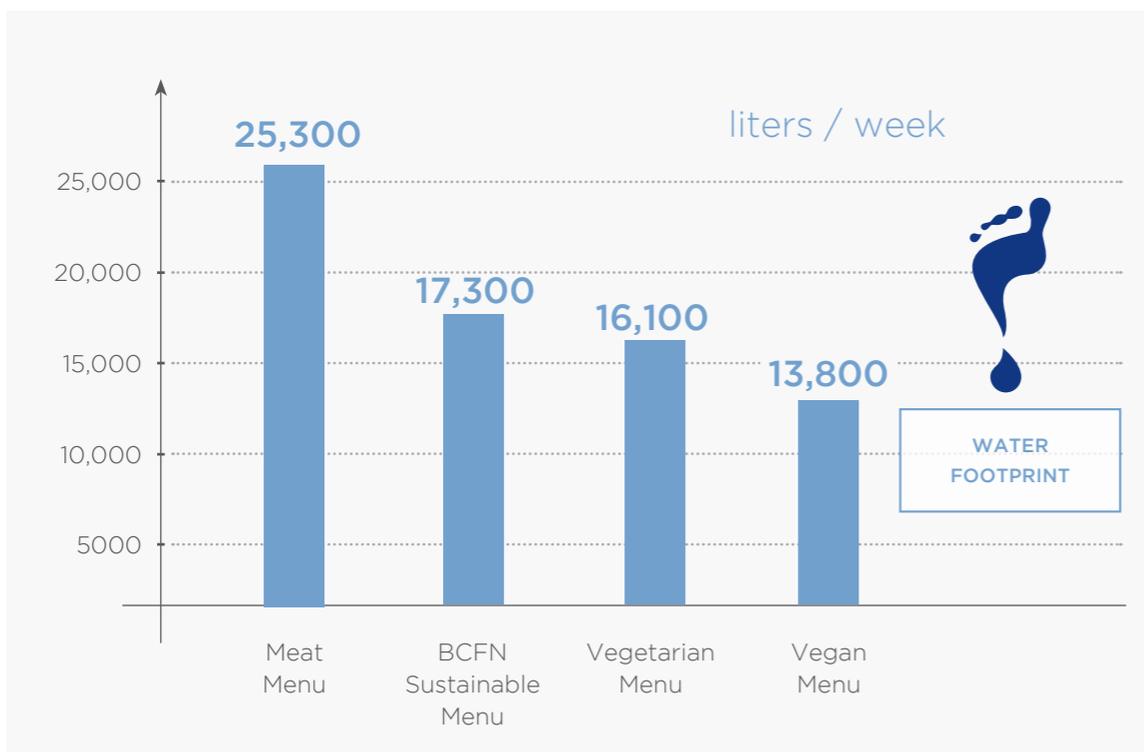
	MONDAY	g	TUESDAY	g	WEDNESDAY	g	THURSDAY	g	FRIDAY	g	SATURDAY	g	SUNDAY	g
BREAKFAST	1 Cup of milk	200	1 Cup of milk	200	1 Glass of freshly squeezed citrus fruit juice	200	1 Cup of milk	200	1 Cup of fruit and milk smoothie	200	1 Cup of yogurt	125	1 Croissant	50
	4 Rusks	32	2 Slices of whole grain bread	50	1 Brioche	50	6 Dry cookies	30	4 Rusks	32	2 Slices of whole grain bread	50	1 Portion of Fruit	150
	1 Portion of Fruit	150	2 Teaspoons of jam	20							2 Teaspoons of jam	20		
<b>TOTAL</b>	<b>382</b>		<b>270</b>		<b>250</b>		<b>230</b>		<b>232</b>		<b>195</b>		<b>200</b>	
SNACK	1 Cup of fruit and milk smoothie	200	1 Cup of skim yogurt	125	1 Cup of skim yogurt	125	1 Packet of crackers	30	1 Cup of skim yogurt	125	1 Portion of Fruit	150	1 Cup of skim yogurt	125
			1 Portion of Fruit	150	2 Rusks	16	1 Portion of Fruit	150	1 Portion of Fruit	150				
<b>TOTAL</b>	<b>200</b>		<b>275</b>		<b>141</b>		<b>180</b>		<b>275</b>		<b>150</b>		<b>125</b>	
LUNCH	Whole wheat spaghetti with cheese and black pepper	112	Penne with fresh tomato and basil	220	Bresaola (cured meat) roulades with stracchino cheese	100	Pasta with meat sauce	290	Salmon with artichoke puree	315	Pasta with broccoli	200	Potato gnocchi with tomato sauce	389
	Mixed raw vegetables	80	Roast veal	225	Carrot and fennel salad	200	Pumpkin and leek flan	178	2 Slices of whole grain bread	50	Meatballs with peas	160	Lamb chop	112
	Olive oil	10	Zucchini with parsley	80	2 Slices of whole grain bread	50					Mixed raw vegetables	50	Grilled peppers	200
			Olive oil	10	Olive oil	10					Olive oil	10	Olive oil	10
<b>TOTAL</b>	<b>202</b>		<b>535</b>		<b>360</b>		<b>468</b>		<b>365</b>		<b>420</b>		<b>711</b>	
SNACK	1 Portion of Fruit	150	1 Cup of fruit and milk smoothie	200	1 Portion of dried fruit	30	1 Cup of yogurt	125	1 Portion of Fruit	150	1 Cup of fruit and milk smoothie	200	1 Portion of Fruit	150
	1 Packet of crackers	30			1 Portion of Fruit	150			1 Packet of crackers	30	2 Rusks	16		
<b>TOTAL</b>	<b>180</b>		<b>200</b>		<b>180</b>		<b>125</b>		<b>180</b>		<b>216</b>		<b>150</b>	
DINNER	Omelette with aromatic herbs	76	Pasta with beans	303	Pasta with creamed vegetables	280	Vegetable soup with rice	270	Chickpea cream	310	Pizza Margherita	361	Tomato bruschetta	243
	Steamed Swiss chard and potatoes	300	Mixed raw vegetables	80	Mixed raw vegetables	50	Beef carpaccio with shaved parmesan cherry tomatoes and arugula	265	Steamed green beans and potatoes with shaved Grana Padano cheese	310			Hummus	190
	2 Slices of whole grain bread	50	2 Slices of whole grain bread	50	Ham	50	Olive oil	10					Mixed raw vegetables with oil dip	200
	Olive oil	10	Olive oil	10	2 Slices of whole grain bread	50							2 Slices of whole grain bread	50
<b>TOTAL</b>	<b>436</b>		<b>443</b>		<b>440</b>		<b>545</b>		<b>615</b>		<b>555</b>		<b>630</b>	



The Carbon Footprint of the four menus analyzed, all balanced from the nutritional point of view.



The Ecological Footprint of the four menus analyzed, all balanced from the nutritional point of view.



The Water Footprint of the four menus analyzed, all balanced from the nutritional point of view.

The differences in impact are minimal between the sustainable BCFN and the vegetarian menus, while the meat menu shows much higher values. On the contrary, the vegan menu is the one associated with the least environmental impact: this result agreed with many scientific studies, which have shown the environmental benefits of an exclusively vegetarian diet<sup>60-64</sup>.

Nevertheless, according to some experts, a vegan diet cannot be considered a 'sustainable' diet according to the definition given by FAO, as sustainability depends not only on the environmental impact but also on a series of other factors, including cultural acceptability and the ability to assimilate all the nutrients necessary to stay in good health through the foods. Although a vegan diet can be balanced from a nutritional point of view, but it requires a good nutritional knowledge.

The adoption of a vegan diet would entail a change which is probably too hard and unlikely to be accepted by the majority of the population. In addition, this diet requires great care in preparing meals, to avoid the onset of nutritional deficiencies in the long term.

A Mediterranean type of diet (as defined in the sustainable BCFN menu) could be the perfect alternative for those who want to look after their own health and the health of the environment, without giving up any food or excessively modifying their habits.

<sup>60-64</sup> Tilman and Clark, 2014; Sáez-Almendros *et al.*, 2014; Westhoek *et al.*, 2014; Van Dooren *et al.*, 2014; Baroni *et al.*, 2006; Van Dooren *et al.*, 2014.

# Practicing sustainability: CHANGING DIET OR USING THE CAR LESS?<sup>66</sup>

What we decide to eat influences, as well as our health, that of the environment. In essence, what does reducing our carbon footprint by 10,30 or 60 kilos a month mean? To give an immediate idea, it may be useful to compare the results of our elaborations with the variations of CO<sub>2</sub> which would be obtained by applying various other measurements of environmental saving, perhaps better known by all: less use of the car, a more frugal consumption of electricity etc.

Consider for example that, in one year:

- If one person were not to eat meat for one day a week, there would be a saving of 310 kg of CO<sub>2</sub> a year, equal to the CO<sub>2</sub> emitted driving a car for 2400 km (equivalent to the distance between Rome and Seville, in Spain);
- If, for one year, a family of four were to adopt a sustainable diet, such as the one recommended by the BCFN, there would be a saving of 3.7 tons, equal to the CO<sub>2</sub> emitted by driving 25,950 kilometers or the same family's consumption of gas for two years;
- If all Italian citizens were not to eat meat for one day a week, there would be a total saving of 197,550 tons of CO<sub>2</sub>, equal to the annual electricity consumption of almost 105,000

families or 1.5 billion kilometers by car. In practice, one meatless meal a week would allow taking 3 and a half million cards off the road for one year<sup>67</sup>.

From this comparison, it is easy to understand how a simple change in our dietary habits is powerful compared to other applicable expedients. If modifying the consumption of some products (such as the typical sources of animal protein) during the week is an option within everyone's reach, giving up heating or the car could not always be possible. If we then consider that the change in diet does not only have positive repercussions on CO<sub>2</sub> emissions but also on the scarcity of water, the use of land and, last but not least, on our health, it is easy to understand that adopting a sustainable diet has many advantages at no cost.

<sup>66</sup> BCFN elaborations on the basis of the data of environmental impacts of the daily menus, described in Chapter 5. For the details, see the supporting technical document.

<sup>67</sup> Our own elaboration considering a car that travels on average 20,000 km a year (data: U.S. Department of Transportation <http://www.fhwa.dot.gov/ohim/onh00/bar8.htm>).





# THE COST OF SUSTAINABLE DIETS

.....

*Eating healthily is not necessarily more expensive.  
If we devote the right attention to our food choices,  
we can even save money*

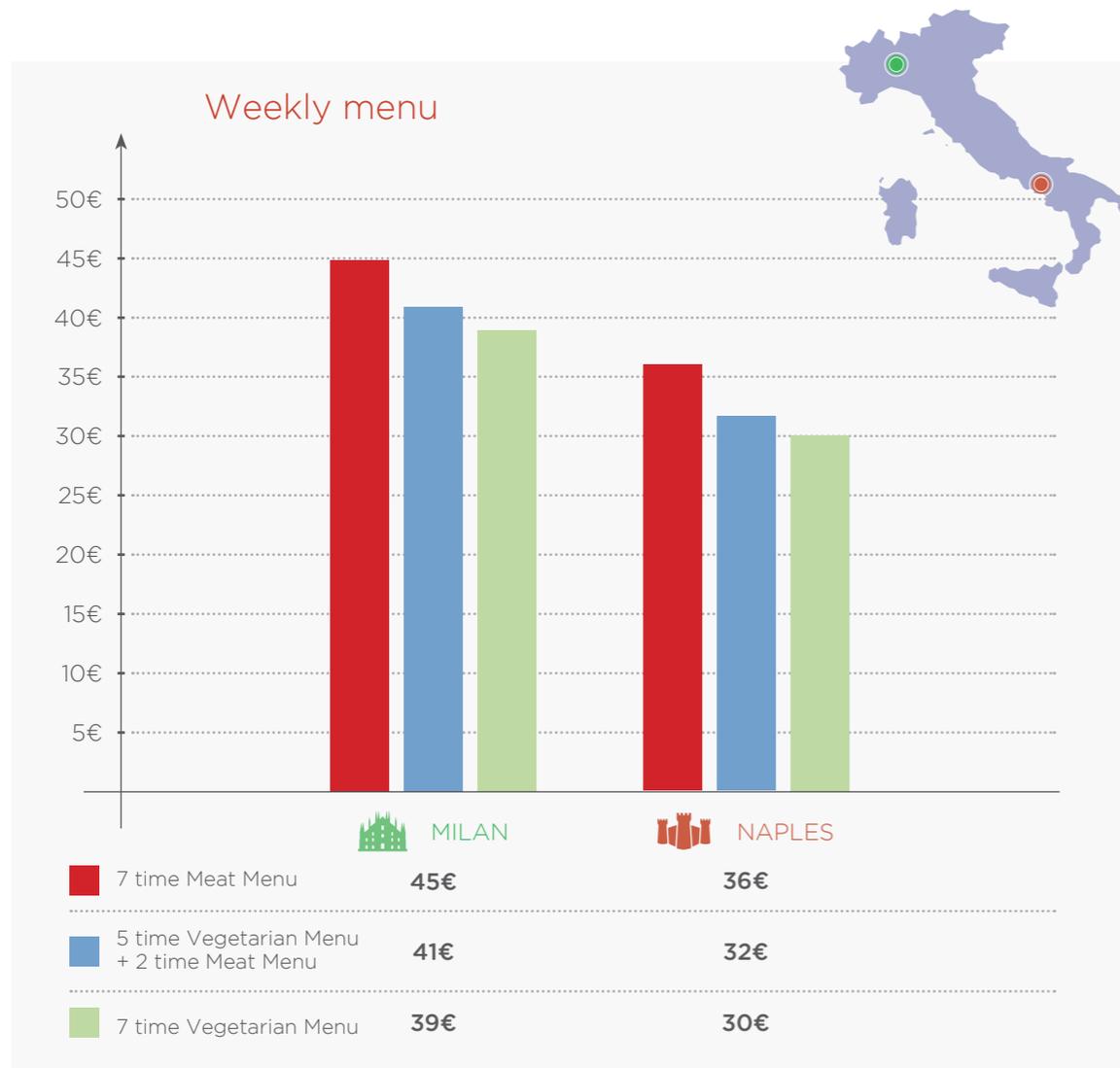
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As we have seen, sustainability implies a lasting balance in time on several fronts; for this reason, in this edition of the Double Pyramid as well, the BCFN has decided to deal with this subject in an structured way, by integrating the nutritional and environmental variables with the economic aspects. In particular, an attempt has been made to understand the impact on consumers' wallets of their different food choices, in order to verify whether diets that are healthy for people and sustainable for the environment are also economically accessible.

According to many specialists, price (real or perceived) is one of the main elements that influence food purchases: if we want to promote a healthy and sustainable diet for the population, it is impossible to disregard its cost as well<sup>68</sup>.

The question of the cost of the sustainable diet in different countries is studied in these pages. In Italy, the analysis was carried out directly by the BCFN using official statistics, whilst in the other European countries and in the USA, the available scientific literature was taken as a starting point.





The price of three possible weekly diets: the first is calculated by supposing only the menu with a meat course for the whole week; in the intermediate one the menu with one meat course is followed for two days and the vegetarian menu is followed for five days; the third contemplates only the vegetarian menu.

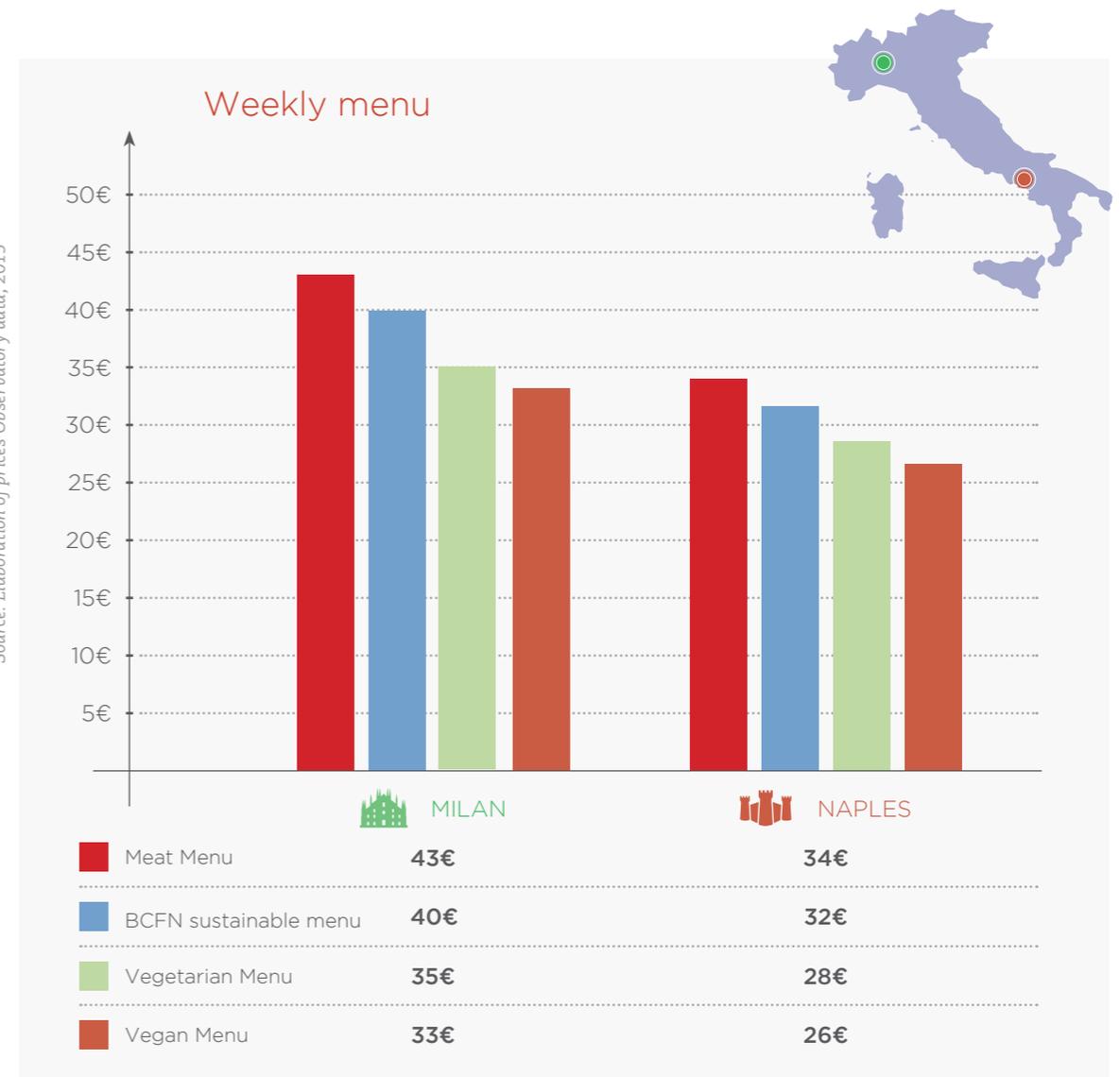
To understand how much these figures can have an impact, we tried to combine the meat menu and the vegetarian menu, hypothesizing three types of weekly diets<sup>73</sup>. Meat menu every day; vegetarian menu every day and a combination of the two menus with five days of vegetarian menu and two days with meat.

The results show that by limiting the consumption of meat to twice every seven days, it is possible to save almost euro 4.5 a week, more than euro 230 a

year. This is a not insignificant figure, especially in a period of recession.

### The weekly menu

In this case too, we started from the four menus already described to evaluate the different of environmental impact; the menus are well balanced from the nutritional point of view but differ concerning the source of protein, which can be animal or plant.



Cost of the four different menus analyzed, all nutritionally balanced.

From the economic point of view the menus analyzed show differences, although not as marked as in the environmental case; the least expensive are the two plant-based menus (i.e. the vegan<sup>74</sup> and the vegetarian menus), followed by the sustainable BCFN menu; the menu richest in protein of animal origin shows higher costs.

On the basis of these data, it is therefore possible to state that in Italy a sustainable diet of the Medi-

terranean type not only has a lower environmental impact, but also a lower cost than diets which are richer in animal proteins (meat and/or fish).

<sup>73</sup> The same exercise was done for the environmental impacts and the results are shown in Chapter 5.

<sup>74</sup> In the elaboration of the menu, however, foods replacing meat, such as seitan and soy products, which in Italy can be rather expensive, were not taken into consideration.

## THE SCIENTIFIC DEBATE ON THE COST OF THE DIETS

In Italy, the home of good food and the Mediterranean diet, eating well could be within everyone's reach; and adopting a sustainable diet would also mean saving. In other countries, however, the question is more complex. Some studies show an inverse ratio between the socio-economic level and the obesity rate, highlighting a greater presence of overweight individuals amongst people with lower salaries and a lower level of education<sup>75</sup>.

In the debate on the factors which cause obesity, and in general diseases connected with food, the prices of food often end up as accused of being too high for healthy food (fruit, vegetables, wholemeal cereals and skimmed products), and especially too low for the 'less healthy' food. It is not easy to find a way through scientific data, because, as we will see, research often leads to contrasting results.

### The metrics that can be used for the comparison of prices of various food products

The choice of the unit of measurement is essential for comparing the prices of different foods. Three metrics are used in scientific research: the price per calorie, the price per edible gram, and the price per average-sized serving.

#### The price per calorie

This is the most frequently used metric, which is calculated as the ratio between the price for 100 grams of food and the number of calories it contains. This measurement may be misleading<sup>76</sup>, since food that is high in calories is less expensive than food that is low in calories<sup>77</sup>. Furthermore, even if a healthier diet costs more per calorie than a less healthy diet, this does not necessarily mean that a daily meal costs more.

As you can see from the graph, the comparison between prices based on calories does not take into account the amount of food generally eaten (great-

er in the case of high-calorie food) and therefore risks being inaccurate.

#### Price per edible gram

This measures the cost of a particular food just as it appears on the plate. It is based on the fact that most unprocessed food undergoes some kind of preparation, which modifies its weight and quantity. It may be useful for consumers to compare the price of foods that differ in size or in the degree of transformation.

#### Price per average serving

This measurement has the advantage of being easily communicable and understood, however its sensitivity to quantity and the inflexibility of the standard serving make it unsuitable for carrying out accurate comparisons.

### The influence of the measurement on the evaluation of the cost of diets

In 2012, the USDA (United States Department of Agriculture) carried out a study to determine if, and to what extent, the unit of measurement influences the estimate of the cost of a 'healthy' diet<sup>78</sup>.

The price per calorie, price per 100 edible grams, and price per average serving were calculated for the same basket of goods. The results show a wide variation in prices according to the metric used.

Low-calorie foods such as fruits and vegetables are more expensive if the price is calculated in dollars per 100 calories. Conversely, if the price is calculated in terms of edible grams and average serving, they are more affordable compared to less healthy foods called 'moderation foods', i.e. foods with quantities of fat, added sugar or sodium which are above the levels recommended by the U.S. Dietary Guidelines, that should be eaten in moderation.



### The impact of income on consumption

There is heated debate concerning the relationship between the nutritional quality of a diet and the cost incurred by families. Scientific literature seems to be divided into two branches: the first train of thought, which is supported by the epidemiologist Adam Drewnowski, is that there is a positive relationship between cost and healthy food, and that this explains consumers' purchasing behavior which establishes a link between obesity and socio-economic level.

On the other hand, the second train of thought states that price is only one of various factors that influence purchasing behavior, and that the widespread phenomenon of poor quality diets is due to a lack of nutritional education of the population, that is, a lack of the necessary information for choosing the right food to purchase and following a healthy diet<sup>79</sup>.

An opposite trend was observed between the energy content of a food, its cost per calorie, and its content of micronutrients<sup>80</sup>. It is evident from this ratio that the association between poverty and obesity is due to the lower cost of junk food: this would explain why the poorest segments of the population are more likely to have a lower quality diet and suffer more from diet-related diseases compared to wealthier people, who have a more healthy diet that is rich in nutrients<sup>81</sup>.

<sup>75</sup> Drewnowski A., 2009.

<sup>76</sup> Carlson and Frazão, 2012.

<sup>77</sup> Lipski, 2009; Rao *et al.*, 2013.

<sup>78</sup> Carlson and Frazão, 2012.

<sup>79</sup> Frazão *et al.*, 2014.

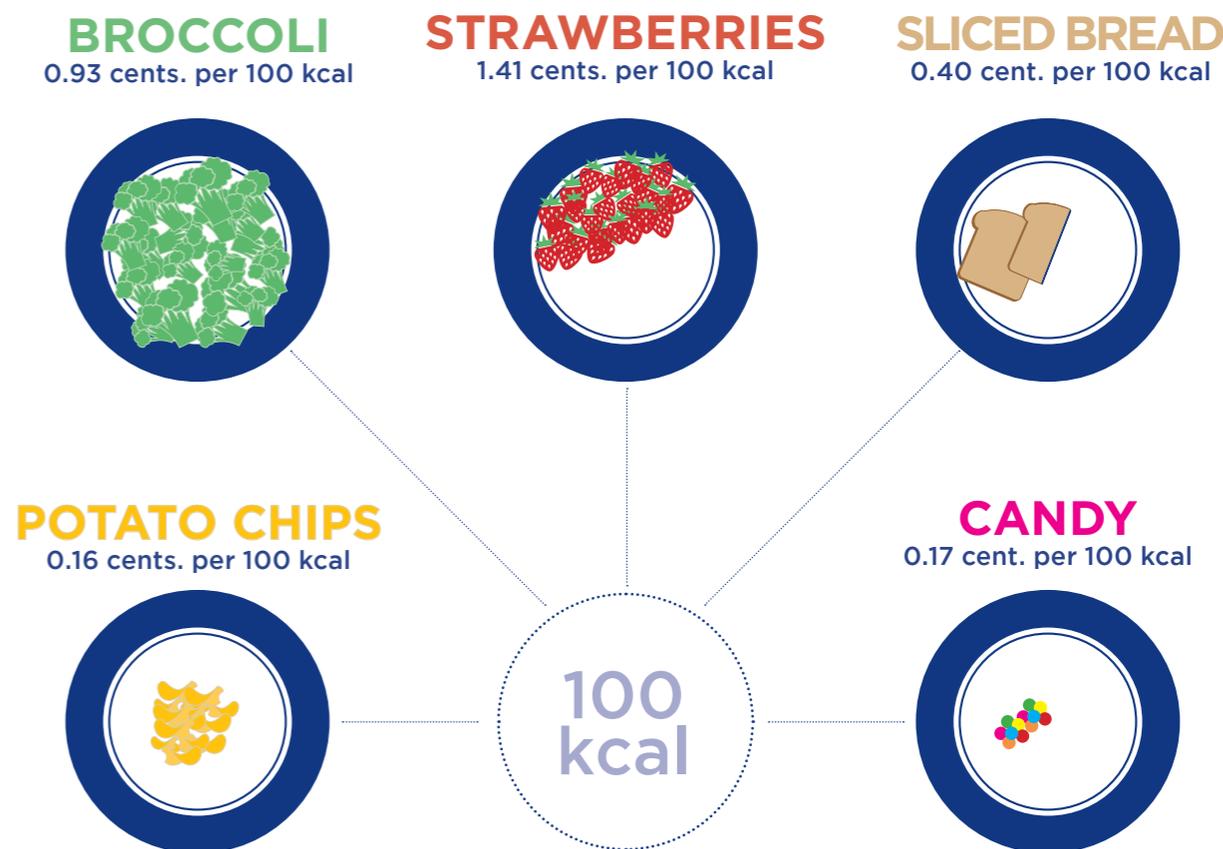
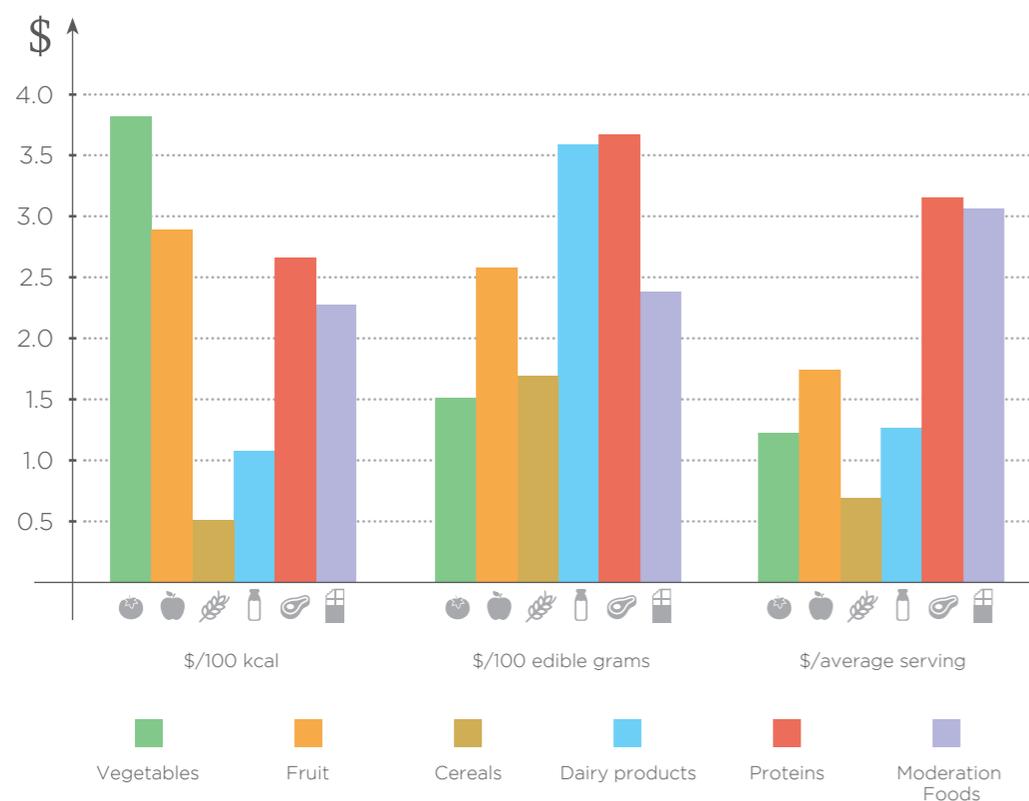
<sup>80</sup> Drewnowski 2004, 2005, 2007.

<sup>81</sup> Drewnowski 2004; Drewnowski *et al.*, 2007.

# THE COMPARISON OF PRICES BASED ON KCAL DOES NOT CONSIDER THE AMOUNT OF FOOD EATEN

These plates contain 100 calorie servings of the following foods (broccoli, strawberries, sliced bread, potato chips and chocolate candies). As you can see, there is a larger amount of vegetable and fruit on the plates compared to the chips, while normally one eats smaller servings of broccoli and strawberries and larger servings of chips. The comparison between prices based on calories does not take into account the quantity of food which is generally eaten and is therefore misleading. (Barilla Center for Food & Nutrition, adapted from Carlson and Frazão, 2012)

Source: Carlson and Frazão, 2012



Food prices vary according to the method used for measuring them.

'Moderation foods' are foods which have higher levels of fat, added sugars or sodium than those recommended by the U.S. Dietary Guidelines or that contain foods belonging to other food groups than those listed above.

Source of prices: USDA National Fruit and Vegetable Retail Report Vol VIII - No. 19 (<http://www.ams.usda.gov/mnreports/fvwretail.pdf>)  
Snacks - average retail price and cost per portion for calorie-dense snack foods; dollar price. ([http://www.ers.usda.gov/datafiles/Fruit\\_and\\_Vegetable\\_Prices/Snack\\_Substitutions/snackprices.xls](http://www.ers.usda.gov/datafiles/Fruit_and_Vegetable_Prices/Snack_Substitutions/snackprices.xls).)



## THE COST OF DIETS IN THE UNITED STATES

The relationship between obesity and socio-economic status has been confirmed by several studies: customers of hard discount stores are mostly people with a lower socio-economic level and a higher obesity rate (27%) than people that shop in high-end supermarkets (9%)<sup>82</sup>, who also have a better diet in terms of nutritional intake. The hypothesis that healthy food costs a little more is also confirmed by a recent study carried out by the Department of Public Health at Harvard University<sup>83</sup>. The authors compared the cost of a 'healthy' diet to a less healthy one, both in terms of individual foods and dietary regimen in general. The results show that healthier diets are also more expensive. The largest differences were found for meat: the healthiest options cost on average 0.29 dollars more per serving and 0.47 dollars per 200 calories. Chicken also appears to be more variable: in reference to the same amount of calories, buying thighs instead of breasts can cost up to 0.72 dollars more. This price trend is also observed concerning the cost of the whole diet: a healthy Mediterranean diet based on vegetables, fruit, cereals, and fish can cost up to 1.54 dollars more per day than one based on processed foods, meat, and refined cereals. This

is a seemingly small figure, amounting to approximately 550 dollars a year, that can have a considerable effect on low-income families.

### Thanks to education, sustainable diets also cost less

Many studies show that it is possible to maintain a diet in line with nutritional recommendations without spending more than usual on one's food budget. Yet all of these studies underline the importance of nutritional education, especially if they belong to a low socio-economic category.

For example, the USDA Food Plans<sup>84</sup> state that it is possible to feed a family of four on a budget of less than 600 dollars per month<sup>85</sup>, although there may be limitations concerning palatability and the preparation times required.

Other studies<sup>86</sup> demonstrated that the transition from a high calorie diet to one which is rich in fruit, vegetables and legumes, does not have a negative effect on food expenditure, on condition that, the nutrients being equal, the cheapest foods are selected. A diet based on the principles of the Mediterranean diet is not more expensive, on the contrary: in some cases, an improvement in the nutritional quality of the diet may even save money.

Another research study<sup>87</sup> showed that by introducing three meals per week based on vegetables, whole grain cereals, and olive oil into one's diet, it is possible to halve our food budget, as well as improve our general state of health.

The experiment involved a series of cooking classes where dishes were prepared with vegetables and whole grains, which were integrated with lectures on the basic principles of healthy eating and the advantages of a balanced diet from a nutritional point of view. At the end of the program, 60% of the participants had introduced at least three vegetarian meals per week, compared to 5% at the beginning of the program.

This change in eating habits was accompanied by variations in the allocation of their food budget: the participants significantly decreased their consumption of meat, snacks, fizzy drinks, and sweets. In respect to the beginning of the pro-

gram, their meat expenditure dropped by 54% and their weekly food expenditure by 45%, from 67 to 37 dollars per week, which is equal to a monthly saving of approximately 124 dollars.

<sup>82</sup> Aggarwal *et al.*, 2012.

<sup>83</sup> Rao *et al.*, 2013.

<sup>84</sup> USDA Food Plans: Cost of Food report <http://www.cnpp.usda.gov/sites/default/files/CostofFoodJan2015.pdf>.

<sup>85</sup> Updated to January 2015.

<sup>86</sup> Mitchell *et al.*, 2000; Raynor *et al.*, 2002; Goulet *et al.*, 2008.

<sup>87</sup> Flynn *et al.*, 2013.





# IS A HEALTHY DIET MORE EXPENSIVE IN THE U.S.?

**PER AVERAGE PORTION IT COSTS LESS**

**COST PER AVERAGE PORTION**

- \$ 3.1 Moderation foods
- \$ 1.7 Fruit
- \$ 1.4 Vegetables
- \$ 0.7 Wholegrain cereals

**PER EDIBLE GRAM IT COSTS LESS**

**COST PER EDIBLE GRAM**

- \$ 2.6 per 100 g Fruit
- \$ 2.4 per 100 g Moderation foods
- \$ 1.7 per 100 g Wholegrain cereals
- \$ 1.6 per 100 g Vegetables

**PER CALORIE IT COSTS MORE**

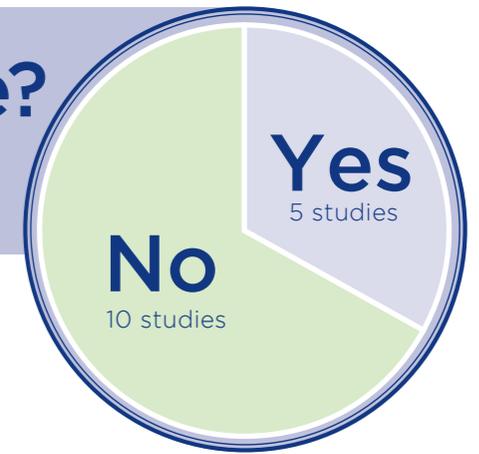
**COST PER KCAL**

- \$ 3.7 per 100 Kcal Vegetables
- \$ 2.9 per 100 Kcal Fruit
- \$ 2.3 per 100 Kcal Moderation foods
- \$ 0.5 per 100 Kcal Wholegrain cereals

It depends on how the price is measured

## Is it more expensive?

Results from a metaanalysis of 15 studies carried out on the cost of food in the U.S.

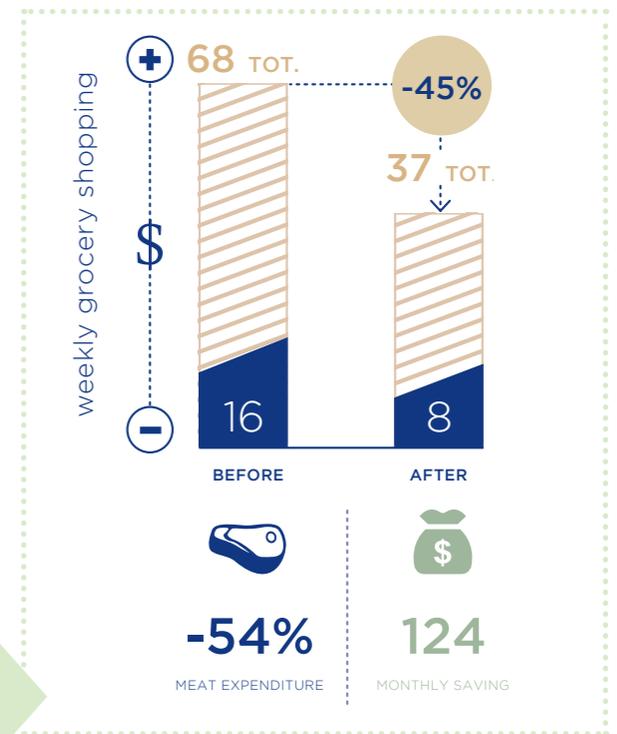


**No**, not if you choose cheaper foods which are high in nutrients

“Following a Mediterranean diet in America does not mean spending more on daily food shopping” (Goulet et al., 2008).

**No**, after attending an adequate nutrition education program

As shown by the graph on the right, “after attending the program, meat shopping decreased by 54% as you can see in the graph on the right. Overall, weekly grocery shopping expenditure decreased by 45% from 68 to 37 dollars a week which is equal to a monthly saving of approximately 122 dollars” (Flynn, 2013).



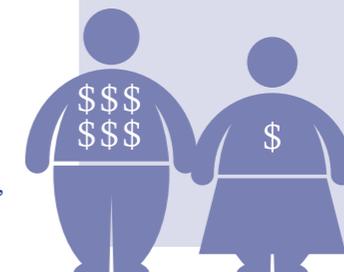
10 STUDIES show EDUCATION plays an important role

5 STUDIES

**Yes**, it is more expensive but only \$1.50 per day

A healthy diet is only a little more expensive: “it costs 1.54 dollars more per day which amounts to approximately 550 dollars a year” (Rao et al., 2013).

“There is an inverse relationship between socio-economic status and obesity rate”  
“Some studies show that the obesity rate in the male population rises in accordance with the increase in income, while an opposite trend was observed for the female population”



**Male and female obesity rates**

**CONTROVERSIAL**

## THE COST OF DIETS IN EUROPE

### United Kingdom

According to a recent study by the University of Cambridge<sup>88</sup>, in the United Kingdom the healthiest diets are alleged to be associated with the highest prices. The variations in price between healthy and less healthy food in the decade 2002-2012 were analyzed, taking into consideration 94 food products, classified according to healthiness.

The healthiest foods include milk, yogurt, fruit and vegetables, fish and lean meat; whilst the others include bacon, beef burgers, sweetened drinks, donuts and ice cream.

The results show that not only the healthier products cost more, but their price also tends to increase more than the price of the less healthy foods. It is sufficient to think that in 2012, the most calorific and least healthy foods cost on average £2.50 per 1000 kcal, whilst the healthiest foods cost £7.49, about three times as much. From 2002 to 2012 the average price of healthy food grew by £0.17 a year per 1000 calories, against £0.7 for the less healthy foods.

Other studies, on the other hand, suggest that a healthy diet is not necessarily more expensive. For example, the report by WWF UK on the food education project LiveWell<sup>89</sup> analyzes the cost of a sustainable diet (characterized by a low carbon footprint) compared to the average food spend outlined by the British Department for Environment, Food and Rural Affairs (DEFRA).

The results show that the cost of the 2020 LiveWell diet is less than the average expenditure for food of families in the United Kingdom: this proves that in England too it is possible to make healthier food choices, with a low environmental impact, spending less.

### France

Studies have also been carried out in France<sup>90</sup> aimed at showing that healthy diets cost more. From a study carried out by Professor Drewnowski and his team<sup>91</sup>, 100 additional grams of fruit and vegetables are associated with a daily increase of costs for food, which can vary from 0.23 to 0.38 dollars. Again, it has been shown that diets with a high energy density (calculated in kilocalories per gram of food) are poor in nutrients and cost less (in terms of dollars per kilocalorie).

On the other hand, diets with a lower energy density and with a greater quantity of micronutrients are associated with higher costs. If a man who follows a diet with a high energy density, ingesting on average 18,798 kcal a week (about 2700 kcal a day), decides to reduce the calories to about 16,730 per week, he has to bear an additional cost (measured in dollars per 2000 kcal) of about 25%. Therefore, if 2390 kcal are consumed per day, the additional price to pay against the lesser energy density will be equivalent to 764 dollars a year<sup>92</sup>.

Encouraging results are however also emerging in France from the study by the WWF in the European LiveWell for LIFE project (LiveWell for low-impact food in Europe)<sup>93</sup>; in this case, adopting a sustainable diet would not only allow reducing the greenhouse gas emissions compared to the current levels, but would also be translated into an economic saving for the country (for more information see the box).

<sup>88</sup> Jones, Conklin, *et al.*, 2014.

<sup>89</sup> WWF, 2011.

<sup>90</sup> Schröder, Marrugat *et al.*, 2006.

<sup>91</sup> Drewnowski, Darmon *et al.*, 2004.

<sup>92</sup> Drewnowski, Monsivais, *et al.*, 2007.

<sup>93</sup> WWF, 2012b.



# LIVEWELL FOR LIFE: SUSTAINABLE DIETS FOR THE UNITED KINGDOM, FRANCE, SPAIN AND SWEDEN

As part of the food education campaigns, WWF-UK started a program called LiveWell 2020 in 2011.

The principle on which this initiative is based is that the food we eat has a significant impact, not only on our health, but also on the health of the Planet.

The initiative, developed by the WWF in collaboration with the Rowett Institute of Nutrition and Health of the University of Aberdeen, taking into account the nutritional guidelines of the British government, has as its objective to modify the food habits of the British, directing them towards a more sustainable diet that could lead to a reduction of 25% of the green-

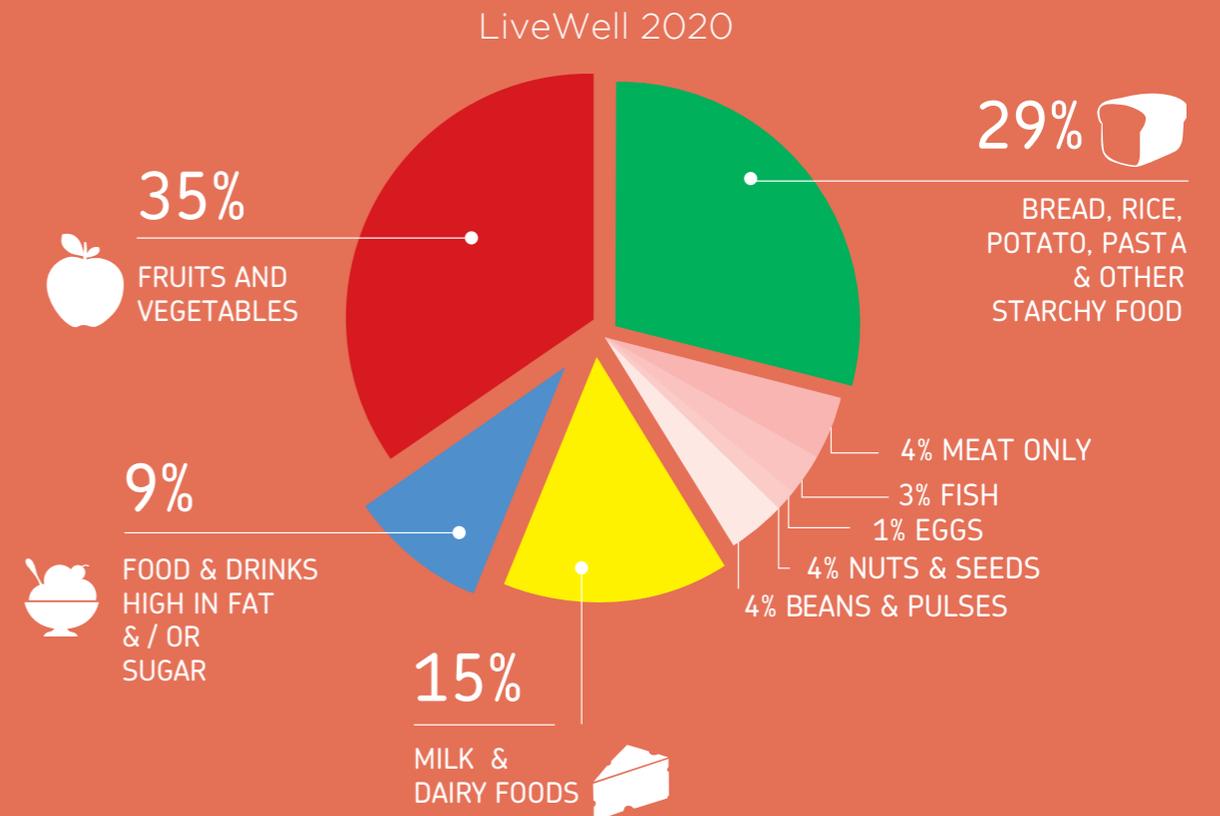
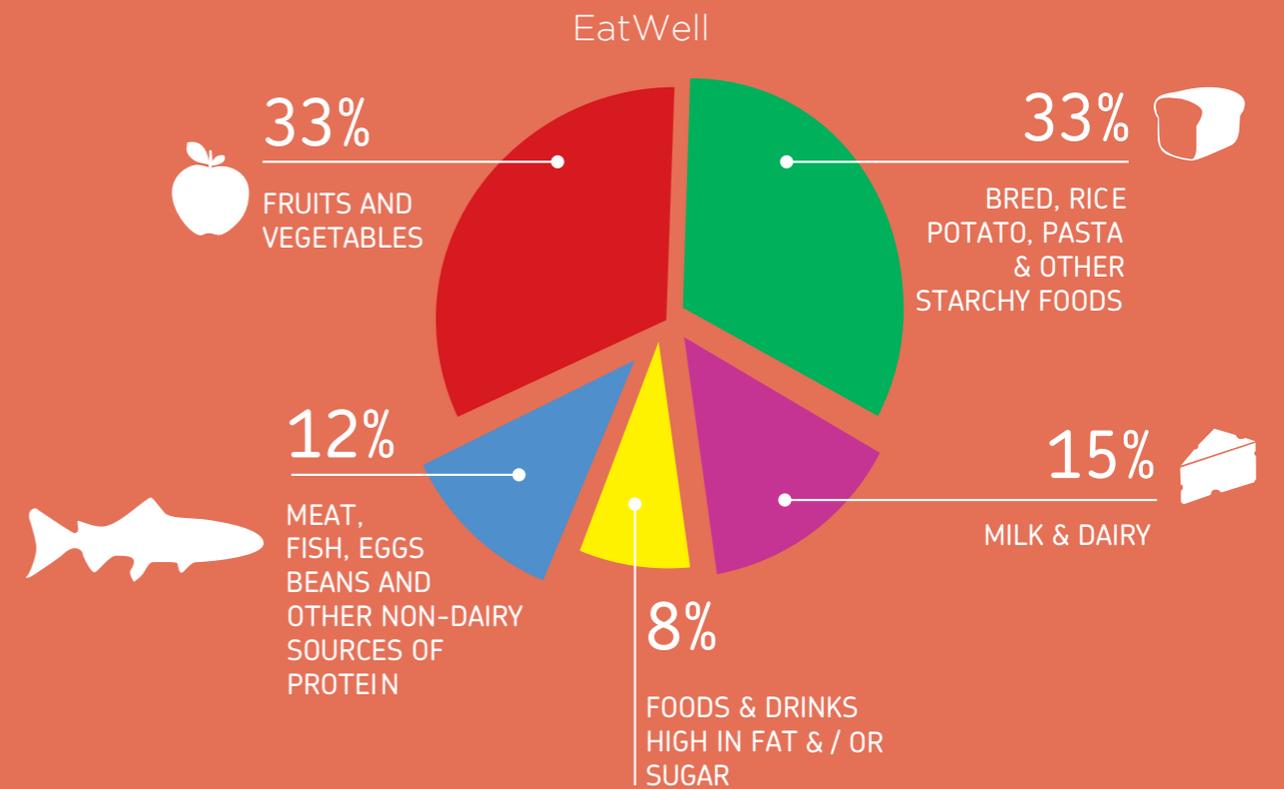
house gas emissions by 2020, as well as reducing the per capita consumption of meat from 79 to 10 kilos a year.

Starting from the EatWell plate, a tool to graphically communicate the proportions for a correct diet developed by the Food Standard Agency of the United Kingdom, in its 'plate', (LiveWell 2020), LiveWell suggests a division of the food groups which differs by a maximum of 10% from the original. This slight difference is enough to substantially reduce the greenhouse gas emissions and thus make the diets more sustainable from the environmental point of view, limiting the consumption of animal proteins and increasing

those derived from other foods such as pulses and dried fruit.

The initiative has been extended with the LiveWell for LIFE+ (Plate for low-impact food in Europe) project, funded by the European Union and launched in February 2012 by WWF UK, WWF European Policy Office and the think tank Friends of Europe<sup>94</sup>.

<sup>94</sup> WWF, 2012b.



The program, resulting from the desire to introduce the concept of a healthy and sustainable diet at European level, involved three countries: France, Spain and Sweden.

Here, the researchers identified the food trends and, from real consumption, created a

local LiveWell plate. All the plates were calculated so that the daily cost for food was the same, or less, than the original one.

The results are encouraging: in France, the LiveWell diet could reduce greenhouse gas emissions by 25% and reduce

the average daily costs for food expenditure of one person, from the present euro 4.90 to 4.36.

The French should increase their consumption of pulses and cereals and reduce that of meat and derivatives.

	CURRENT AVERAGE DIET gCO <sub>2</sub> eq/day	LIVEWELL PLATE gCO <sub>2</sub> eq/day	AVERAGE COST PER DAY gCO <sub>2</sub> eq/day	LIVEWELL PLATE gCO <sub>2</sub> eq/day
France	3.47	2.60	4.90€	4.36€

The LiveWell diet for Spain could reduce greenhouse gas emissions by about 27% at a cost that is almost identical to

the present one (on average, euro 3.48 per day per person), reducing the consumption of meat, dairy products, sugar,

sweets and fruit-based products, and increasing vegetables, cereals and dried fruit;

	CURRENT AVERAGE DIET gCO <sub>2</sub> eq/day	LIVEWELL PLATE gCO <sub>2</sub> eq/day	AVERAGE COST PER DAY gCO <sub>2</sub> eq/day	LIVEWELL PLATE gCO <sub>2</sub> eq/day
Spain	3.75	2.71	3.47€	3.47€

In Sweden, the LiveWell diet would allow reducing the emissions by 25% to a cost

slightly below that of the current diet (from 44.64 krona to 44.07 krona per day): the

proposed diet reduces the consumption of meat and increases that of fruit and vegetables.

	CURRENT AVERAGE DIET gCO <sub>2</sub> eq/day	LIVEWELL PLATE gCO <sub>2</sub> eq/day	AVERAGE COST PER DAY gCO <sub>2</sub> eq/day	LIVEWELL PLATE gCO <sub>2</sub> eq/day
Sweden	5.72	4.29	44.64 SEK	44.07 SEK



### Sustainable diets can also be less expensive in Europe

Ultimately, beyond some contrasting data, the case studies analyzed show that it is possible to eat healthily independently of the level of income;

the 'healthiest' and most sustainable diets do not necessarily have the highest costs, on the contrary. However, it is necessary to modify one's dietary habits, carefully choosing the most nourishing, cheapest and environmentally-friendly food: an action for which education is the key factor.

# FOOD POLICIES FOR HEALTH AND THE ENVIRONMENT

*To achieve sustainability, all the stakeholders in the food sector  
have to become involved.  
In this context, the institutions play a central role*

Eating is one of the primary needs of mankind, so food has always been at the center of legislators' attention.

Food policies are the rules, incentives, taxes, and information and education or information campaigns undertaken by the institutions on the various economic, social, and environmental activities in the agrifood sector. The objective is to govern and, if possible, improve the way food is produced, processed, distributed, and consumed, while ensuring the health of people, society, and the environment, and the legitimate interests of citizens represented by pressure groups<sup>95</sup>. Essentially, food policies have an effect on what, when,

and how you eat, and on the related economic, social, and environmental consequences.

Food policies directly or indirectly involve different actors (from the farms to the workers, from society in the broadest sense to the individual end consumers, and finally, the environment) and require an interdisciplinary approach for their preparation and implementation that covers several aspects: nutrition, health, the environment, psychology, and economics.

In this chapter, we will try to analyze the main food policies adopted to protect people's health and, at the same time, to reduce the impact of food on the Planet.

In particular, we will explain a few emblematic cases of institutional activities aimed at ensuring adequate nutrition for the most vulnerable sections of the population; policies to reduce obesity and overweight conditions; regulation of food marketing addressed to children; policies that guarantee access to food in the face of climate change; the new guidelines for a sustainable diet; and, finally, the environmental labels used in the food sector. Along the way, we will be highlighting some controversial topics involving actors with potentially divergent interests or complex issues on which it is often difficult to legislate.

According to Professor Tim Lang<sup>96</sup>, there are three distinct avenues of research in nutrition that lawmakers should take into account. The first focuses on the biochemical interactions of nutrients and their health implications; the second highlights how social factors influence food choices; the third one examines the links between nutrition issues and environmental protection. The most important challenge for policy makers, which the Barilla Foundation has promoted since 2009 with the Double Pyramid model, is to promote sustainable lifestyles that, along with public health objectives, take into account the impact different foods have on the environment.

### THE IMPORTANCE OF ENSURING ADEQUATE NUTRITION FOR VULNERABLE POPULATION

If the first policies came into being to try to ensure that everyone would have adequate access to food, in recent years, their objective has also extended to include the opposite extreme, namely the excessive consumption of food.

In general, the institutions today are trying to ensure appropriate nutrition for the vulnerable sectors of society: alongside children and populations still suffering from hunger, there are also obese people and people on low incomes. Below we will see the policies that have been developed at an international level.

### Reducing obesity and overweight conditions

The obesity epidemic is a serious problem for public health, not only in developed countries but also in developing ones. According to the latest estimates by the World Health Organization (WHO)<sup>97</sup>, the number of overweight or obese people in the world continues to increase and has exceeded two billion. The United States, followed by China and India, is the country with the highest number of obese people (with almost 13% of the world's obese people)<sup>98</sup>.

Policies for reducing the rates of obesity and overweight conditions of the population<sup>99</sup> can be divided into soft and hard approaches. The former include education campaigns to raise people's awareness on the gravity of the phenomenon and its impacts, and the rules on information to be included on food labels. The latter are more complex and require a systemic approach to be implemented, and include: the prohibition of the consumption of certain foods, fiscal measures (for example, the taxation of certain types of foods or ingredients), and the request to reformulate product classes to bring them into line with specific guidelines.

International organizations generally propose optional guidelines and recommendations for national governments which in practice are soft policies, whereas it is up to the individual states to legislate on matters of hard policy.

Hard policies, however, are often opposed for being too coercive, especially in the U.S., where the right to choose was one of the four consumer rights proclaimed by President Kennedy in his 1962 speech. Food choices of individuals have always been part of the private sphere in America, and it is only recently that the social and economic consequences of the obesity epidemic on its national health system has been analyzed (estimated at 147 billion dollars<sup>100</sup>).

Until the twenty-first century, the focus of international policies towards food focused primarily on issues related to food security and under-nutrition, rather than the over-consumption of food. The



first time anyone officially spoke of obesity and the diseases related to it was in 2003, in a joint report by the FAO and WHO<sup>101</sup>, following a UN declaration stating the importance of proper nutrition and physical activity to prevent being overweight. The following year, the World Health Assembly (the legislative body of the WHO) passed a resolution calling on governments, international partners, the private sector, and civil society to take action at global, regional, and local levels to support healthy diets and physical activity.

One of the latest international policy proposals was the one put forward in 2013 by the WHO, in which, the nine targets suggested for improving the conditions of global public health, included stopping the growth of diabetes and obesity and reducing the consumption of salt by 30%<sup>102</sup>. In addition, this year the WHO recommended<sup>103</sup> adults and children reduce their daily consumption of sugar to less than 10% of their total energy in-

take, underlining that if it were to remain below 5% (equal to about 25 grams, the equivalent of 6 teaspoons) per day, even greater health benefits would be obtained.

<sup>95</sup> Adapted by Lang T., Barling D., Caraher M., *Food Policy, Integrating Health Environment and Society*, Oxford University Press, 2009.

<sup>96</sup> *Ibid.*

<sup>97</sup> WHO, *Obesity and Overweight*, Fact sheet N°311, updated January 2015.

<sup>98</sup> Ng M., et al., *Global, Regional, and National Prevalence of Overweight and Obesity in Children and Adults During 1980–2013: A Systematic Analysis for the Global Burden of Disease Study 2013*, "The Lancet", vol 384, Issue 9945, 2014.

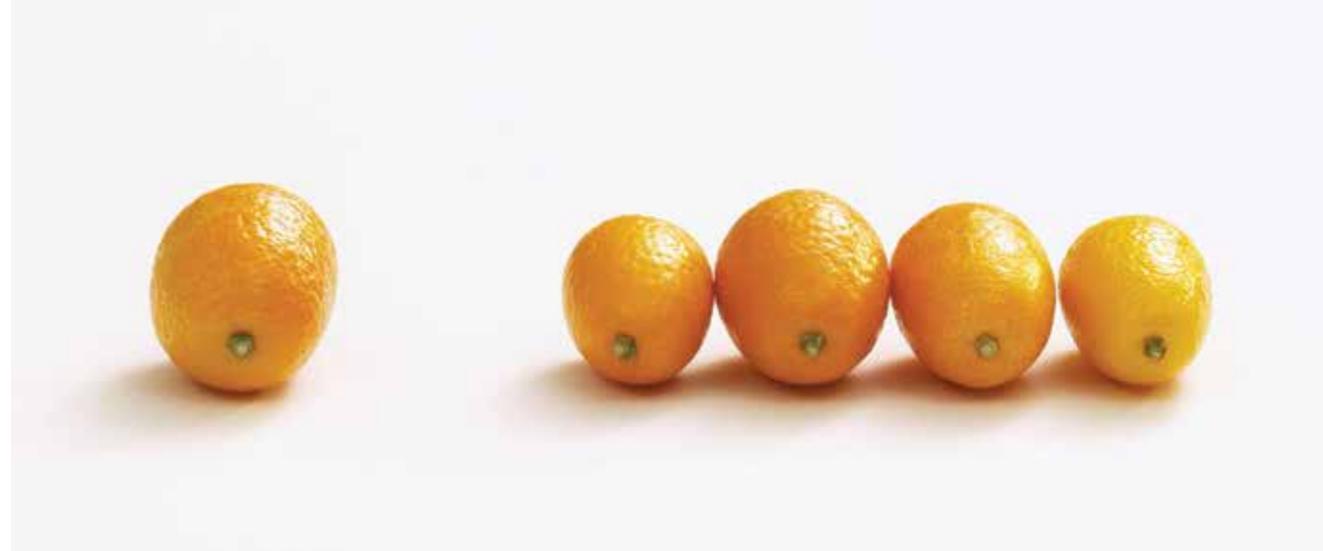
<sup>99</sup> See Tim Lang p. 1.

<sup>100</sup> Finkelstein E. A., et al., *Annual Medical Spending Attributable To Obesity: Payer-And Service-Specific Estimates*, "Health Affairs", 28, no.5, 2009.

<sup>101</sup> WHO/FAO, *Diet, Nutrition and the Prevention of Chronic Diseases*, Report of the joint WHO/FAO expert consultation. WHO Technical Report Series, No. 916 (TRS 916), 2003.

<sup>102</sup> WHO, *Global Action Plan for the Prevention and Control of Ncds 2013-2020*, 2013.

<sup>103</sup> WHO, *Guideline: Sugars Intake for Adult and Children*, 2015.



At the European level, in 2005 a round table was set up on obesity involving large companies, health-care professionals, and several other stakeholders. In 2007, the European Commission, with the adoption of the White Paper *A Strategy for Europe on Nutrition, Overweight, and Obesity*<sup>104</sup>, indicated the actions that can be taken at the local, regional, national, and European levels to reduce the risks associated with a poor diet and reduced physical activity. However, as required by the Maastricht Treaty, the European Commission's role in stemming the phenomenon is solely to suggest policies, educate people (through social campaigns, etc.), and allocate resources for scientific research. At the national level, it is worth mentioning the case of the United Kingdom, where a study lasting two years produced the best governmental analysis on obesity<sup>105</sup>. The report proposes a map of factors that affect obesity, including the social context, the production and consumption of food, and individual behavior<sup>106</sup>. In the United States, one of the most important national laws against obesity is the "Healthy, Hunger Free Kids Act", passed in 2010, which reformed school food programs, influencing the eating habits of 31 million children. The law increased the subsidies for access to school lunchrooms, making portions of fruit, vegetables, and whole grains larger, and reducing the total calories, sugar, and salt. Unfortunately, its impact was partly reduced by the action of some lobby groups (an example is that of pizza, where tomato sauce

is considered a vegetable and then calculated in the daily percentage). Although international organizations have long been committed to bringing obesity to the attention of governments, and some countries are struggling to fight it with regulations and laws, the results are not encouraging<sup>107</sup>. According to a study recently published in "The Lancet", since the 1980s, no country in the world has managed to achieve significant progress in reducing rates of overweight conditions and obesity<sup>108</sup>. When he was interviewed by Bloomberg, Christopher Murray, one of the authors of the study and Professor of Global Health at the University of Washington, declared that food policies promoted by the different nations have not been effective, nor have the social campaigns, developed to promote proper nutrition<sup>109</sup>.

<sup>104</sup> CE. White Paper: *A Strategy for Europe on Nutrition, Overweight, and Obesity*, 2007.  
<sup>105</sup> According to Lang T., *Ibid*, p. 1.  
<sup>106</sup> Foresight, *Tackling Obesity Future Choices*, London: Government office of science, 2007.  
<sup>107</sup> Lang, *Ibid*, p. 1.  
<sup>108</sup> Ng M., et al., *Global, Regional, and National Prevalence of Overweight and Obesity in Children and Adults During 1980–2013: A Systematic Analysis for The Global Burden of Disease Study 2013*, "The Lancet", vol 384, Issue 9945, 2014.  
<sup>109</sup> Walls H., et al., *Public Health Campaigns and Obesity – A Critique*, BMC Public Health, pp. 11-136, 2011.

# TAXING JUNK FOOD AND SUGARY DRINKS

**K**elly Brownell, Professor of Public Policy at Duke University, proposed introducing taxes on sugary drinks in 1994. Assuming that eating behavior is influenced by the price vari-

able, this proposal argued that adopting fiscal measures could have a role in reducing the consumption of some foods classified as 'junk food', just as in the campaign against smoking, where the rise in prices seems

to have been an effective deterrent to consumption. In this regard, however, there have been conflicting opinions. For some, imposing taxes on unhealthy and unsustainable products is a severe measure

that demonizes certain foods and forces consumers to pay additional costs. Others see it as an effective weapon for guiding people towards better choices, seeing as so far the recommendations have essentially failed. In addition, some<sup>110</sup>, point out that fats, as well as salt and sugar, are present in almost all foods, and so it is hard to understand the threshold designating that one food is classified as unhealthy instead of another.

The scientific evidence on the effectiveness of these measures is controversial. According to a recent study by Ecorys for the European Union<sup>111</sup>, taxing foods with a high content of salt, sugar, and fat leads to an effective reduction in consumption. At the same time, however, care must be taken, because the poorest people, who are also those that are most likely to become obese or overweight, could move their choices towards foods that are cheaper but whose nutritional value is even worse than the taxed foods, or to foods that are equally unhealthy but not taxed. Such as in France, where the taxation of sugary drinks appears to have led to an increase in the consumption of potato chips.

In Europe, there are not many countries that have enacted this type of economic governance as a tool to change peoples' diets, but those that have done so appear to have achieved the desired result. The countries that have successfully applied taxes on food and drinks are: Denmark (saturated fat), Finland (sweets, ice cream, sugary drinks, and some alcoholic beverages), Hungary (sweets and condiments, sugary and energy drinks, chocolate) and France (sugary drinks). The Hungarian government, supported by the WHO, has persuaded 30% of citizens to change their consumption habits; of these, 80% have reacted to the higher prices, while in other countries, there are also other factors that have had an effect, such as increased awareness of the phenomenon which has formed thanks to the discussions preceding the adoption of legislation.

The United States has debated at length on such actions and in April 2015, the first experiment in such tax measures was selected: the Navajo Indian Reservation (which covers some areas of Arizona, Mexico and Utah). Here the population suffers from obesity rates above the American average and, in some

areas, nearly 60% of the population have type 2 diabetes. The regulation enacted calls for a 2% tax on so-called junk foods, balanced by the elimination of the 5% tax on fresh fruit and vegetables. The revenue from this 'sin tax' will be allocated to projects to promote the health and well-being of the community, including the provision of incentives to increase the number of fresh fruit and vegetable markets.

Seeing as obesity rates continue to grow and, consequently, so does spending in health services for the treatment of related diseases, taxation is bound to become actual leverage for action by policy makers. The challenge for governments will be in determining where and how to impose taxation and how to measure its effectiveness.

<sup>110</sup> Including Prof. Tim Lang.

<sup>111</sup> Ecorys, *Food Taxes and Their Impact on Competitiveness in The Agri-Food Sector: A Study*, 2014.



# SUBSIDIES AND FOOD ASSISTANCE PROGRAMS FOR LOW-INCOME PEOPLE

An alternative to taxing junk foods is the subsidies for food that is low in calories and has a high nutritional level. Starting from the same premise, namely that the price has a significant influence on people's purchasing decisions, a financial incentive can influence behavior towards healthier products, especially for people with low incomes.

There has been plenty of criticism concerning this measure, too. The first criticism is that the people who benefit from a subsidy can still use the money to buy unhealthy foods. One study found that people use the money saved thanks to subsi-

dies to buy more food in general, including products that contain high levels of sugar, salt, and fat<sup>112</sup>. In addition, subsidies represent a significant expense for the State and it is not easy to find the necessary funds.

Other than subsidies, there are also food assistance programs that provide economic aid for purchasing food to the most needy families. A typical example in the United States is SNAP (*Supplemental Nutrition Assistance Program*), a federal program that annually assists about 47 million Americans. Conversely, however, with the checks from this kind of food subsidy project, people can buy

any kind of food, with the obvious risk of encouraging the consumption of unhealthy food as well. There have been several law proposals on excluding the possibility of junk food purchases with SNAP, but none of them have ever passed because they were considered as limiting individual freedom.

<sup>112</sup> Epstein L.H. et al., *The Influence of Taxes and Subsidies on Energy Purchased in an Experimental Purchasing Study*, "Psychological Science", vol. 21, issue 3, pp. 406-414, 2010.

## REGULATION OF CHILDREN FOOD MARKETING

Children have always been a vulnerable and impressionable target, and need to be protected by strict policies. If this does not happen it is because the economic interests at stake are very high. It has been shown that, if not integrated with parental control, exposure to the advertising and promotion of food products can encourage the adoption of unbalanced eating habits, with possible effects on health<sup>113</sup>.

Internationally, in 2010 the WHO approved a series of recommendations on the marketing of foods and non-alcoholic beverages for children. These guidelines should assist countries in designing policies to reduce the impact the marketing of foods deemed unhealthy has on children.

Interestingly, consumption of snacks for children has declined in countries where there are regulations: Australia has prohibited any advertising of foods to children under 14 years of age, Holland banned any advertising of sweets for children under 12, Sweden banned the use of cartoon characters for advertising, and Norway has prohibited any form of advertising aimed at children.

Walt Disney America, which also advocates more control of food advertising in children's programs, has gotten rid of junk food commercials on its own television channels, website, and radio stations, and is promoting healthy foods, such as fruit and vegetables, and other foods with fewer calories, and less saturated fat, salt, and sugar.

## ACCESS TO FOOD AND CLIMATE CHANGE

According to the FAO, worldwide there are 805 million people suffering from hunger, about 11% of the world population, the vast majority of whom live in poor or developing countries<sup>114</sup>. Although the numbers are still high, the results of the food policies of recent decades are encouraging, with 209 million fewer starving people than in 1990-92, so we are not so far from achieving the Millen-

nium Development Goal: to halve the proportion of undernourished people by 2015.

However, according to a new UN report<sup>115</sup>, risks due to climate change could actually reverse years of progress against poverty and hunger. The scenarios of climate change in the medium to long term are catastrophic: food shortages, refugee crises, the flooding of major cities and entire island nations, the extinction of plants and animals, and a climate so drastically altered that could make it dangerous for people working outdoors (including in fields) during the hottest periods of the year.

According to the International Food Policy Research Institute (IFPRI)<sup>116</sup>, in 2050, 25 million children under the age of five will be malnourished due to the effects of climate change, equal to the number of all the children of the same age in the United States and Canada.

According to Oxfam<sup>117</sup>, there are several factors that influence access to food in a world affected by climate change. First of all, 80% of world agriculture (and 90% in Africa) uses rainwater for irrigation, a factor which subjects it to changes in the quantity and intensity of rainfall. Then we have to consider that the diversity of seeds has decreased by 75% over the last 100 years, thus depriving farmers of those species that could better adapt to climate change.

<sup>113</sup> Halford J.C.G. et al., *Effect of Television Advertisements for Foods on Food Consumption in Children*, "Appetite" 42, pp. 221-225, 2004.

<sup>114</sup> FAO, *The State of Food Insecurity in the World*, 2014.

<sup>115</sup> IPCC, *Climate Change 2014*.

<sup>116</sup> IFPRI, *Climate Change: Impact on Agriculture and Costs Of Adaptation*, 2014.

<sup>117</sup> Oxfam, *Hot and Hungry – How to Stop Climate Change Derailing the Fight Against Hunger*, 2014.



In unstable weather conditions, crop insurance can make a big difference in stabilizing a farmer's income: although 90% of U.S. farmers benefit from it, whereas only 15% of Indian farmers, 10% of Chinese farmers, and around 1% of those in developing countries are able to have access to insurance. Out of 20 African countries that have pledged to spend 10% of their budgets on agriculture, only four have achieved this goal. The world grain reserves are at historically low levels, which could drive up prices in case of extreme weather events, leading to a severe food crisis. Finally, again according to Oxfam, technology is very useful in dealing with climate change. In particular, access to weather data can be crucial in helping farmers plan their irrigation and crops. Again, the differences between the developing and developed countries are relevant: in California, for example, there is a weather station per 2,000 km<sup>2</sup>, whereas in Chad, there is one every 80,000 km<sup>2</sup>. Considering all these factors, there is considerable work to be done at the political level (both global and local). The Chicago Council on Global Affairs, in a recent report on this matter<sup>118</sup>, urges the U.S. government to integrate climate change into its strategy on food security. One of the recommendations is to create long-term rules on food security and increase funding for agricultural research linked to climate change, in particular focusing on some species' adaptation to extreme weather events.

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<sup>118</sup> Bereuter D. et al., *Advancing Global Food Security in the Face of a Changing Climate*, 2014.



# LOCAL FOOD AND ITS INFLUENCE ON CLIMATE CHANGE

The social movement that promotes the consumption of local food made inroads in the United States in 2005 when Jessica Prentice coined the term locavore to indicate a person in search of food grown and produced within a radius of 100 miles from their home (about 160 kilometers). This movement is expanding so much in the industrialized countries that Wal-Mart, the largest distribution chain in the United States, promised to double its sales of local products between 2009 and 2015. There is no single definition for 'local' food. The U.S. Department of Agriculture, which invested 78 million dollars to support local farms in 2014, describes a product as a local or regional

if it comes from the same state or within a radius of about 640 kilometers (400 miles). The distribution chains use the 'local' label with different meanings. Wal-Mart views a product as local as long as it comes from the same state of distribution, while for the U.S. chain Whole Foods, it is if it has traveled for no more than seven hours by road.

But does buying local food really affect climate change by reducing CO<sub>2</sub> emissions related to transportation? The subject has been under much debate; just think that transport is responsible for only 11% of greenhouse gas emissions produced by the agri-food system<sup>119</sup>. A striking example is proposed by Robert Paarlberg in his book *Food Poli-*

*tics*<sup>120</sup>: tomatoes exported from Mexico to the United States during the winter months have a smaller carbon footprint than the same type of tomatoes grown in a local greenhouse.

<sup>119</sup> Paarlberg R. *Food Politics*, Oxford University Press, 2013.

<sup>120</sup> *Ibid.*

## GUIDELINES FOR A HEALTHY AND SUSTAINABLE DIET

The first attempts to introduce environmental considerations into the field of nutrition date back to the mid-eighties, when Gussow and Glancy<sup>121</sup> conducted a study on the environmental effects related to the adoption of the U.S. dietary guidelines. Recently, a growing number of international organizations and governments have recognized that in the future, food policies should aim to integrate the dual objective of improving health for people and the environment. Some countries have actually begun to incorporate the concept of environmental sustainability in their traditional food guidelines<sup>122</sup>. But putting them into practice is not easy, because interpretations of the definitions of sustainability vary widely depending on the different sensibilities and cultures; and the analysis of environmental, social, and economic impacts does not always result in concurring indications.

Many countries in Europe have developed guidelines for a healthy and sustainable diet including France, Sweden, the United Kingdom, Belgium, Germany, the Netherlands and the Nordic countries. In the first four, government agencies drew up the guidelines, whereas non-governmental agencies<sup>123</sup> did so in the others.

The guidelines mentioned share a qualitative nature and are based on the theory that a mainly vegetable diet, with limited consumption of animal protein, is preferable from the environmental and nutritional standpoint. In most of the cases there is no information on the precise amount and frequency with which various foods should be eaten, or for which ones consumption should be encouraged or discouraged, but only a recommendation on buying behavior<sup>124</sup>.

In April 2015, the UK government published *The principles of healthy and sustainable eating patterns*<sup>125</sup> as part of the Global Food Security Program. The guidelines, described in eight principles, are intended as the natural complement to the much better known Eat Well Plate and provide

information on the measures to adopt to reconcile the objective of a healthy diet with the protection of the environment. The principles are the point of arrival of a journey taken with the Green Food project, aimed at identifying margins of action and the opportunities to improve the sustainability of the British food system. The principles are based on advices previously elaborated by the Sustainable Development Commission<sup>126</sup> and by the WWF in the LiveWell for LIFE project<sup>127</sup>.

The French<sup>128</sup>, Belgian<sup>129</sup>, and German<sup>130</sup> guidelines were proposed respectively by the French Agency for the Environment and Energy (ADEME), by the Department for the Environment of the Brussels region (Bruxelles Environment) and by the German Council for Sustainable Development. In all the cases, recommendations and advice of a qualitative nature are given, part of broader programs aimed at promoting responsible purchasing and consumption in the different product sectors. *The Nordic Nutrition Recommendations 2014*, produced by the Nordic Council of Ministers<sup>131</sup> has a whole chapter dedicated to the concept of sustainable diet which stresses the interrelationships between food, health, and environmental protection, and highlighting the benefits of a sustainable diet and the possible trade-offs between environmental and nutritional goals.

<sup>121</sup> Gussow J., Clancy K., *Dietary Guidelines for Sustainability*, "J Nutr Educ" 18, 1-5, 1986.

<sup>122</sup> Garnett T., *What is a sustainable healthy diet?*, 2014.

<sup>123</sup> Respectively the UK Sustainable Development Commission and the WWF-UK for the United Kingdom, the Health Council of the Netherlands for Holland, the Barilla Center for Food & Nutrition for Italy.

<sup>124</sup> Westland *et al.*, 2012.

<sup>125</sup> Global food security Program working Group, 2015.

<sup>126</sup> Sustainable Development Commission, 2009.

<sup>127</sup> WWF-UK, 2014.

<sup>128</sup> ADEME, 2012.

<sup>129</sup> Bruxelles Environment, 2014.

<sup>130</sup> German Council for Sustainable Development, 2008.

<sup>131</sup> The Nordic Council is a forum of cooperation between the governments of the Nordic countries (Denmark, Sweden, Finland, Norway, Iceland, and Greenland) which defines the nutritional requirements and values on which the individual member States work out their food guidelines.



In addition, it lists the eating choices required in order to switch from the current diet to a more sustainable one, and for each one, highlights the implications (positive and negative) that such actions would have on the environment and health<sup>132</sup>. The report by the *Health Council of the Netherlands* is addressed to the government and provides a detailed overview of the interconnections between health and the environmental effects of different foods. The report examines the 2006 Dutch dietary guidelines, which are then classified according to their potential synergies or conflicts in terms of environmental sustainability. The study identifies recommendations with a positive impact both on health and for the environment as “total winners”, the cases in which the benefit in terms of nutrition is achieved at the expense of the environment as “winners-losers”, and as “winners from an environmental perspective,” those recommendations having a positive impact on the environment, but neutral from the point of view of health (for example, those relating to the reduction of food waste). The report identifies the recommendation on the transition to a predominantly vegetable diet as totally winning, while a strong point of contention

is the consumption of fish, considered healthy but not always sustainable from an environmental point of view<sup>133</sup>.

The Swedish guidelines, published in 2013 by the National Food Agency together with the Agency for Environmental Protection, reach similar recommendations: eat less meat, eat only fish that is not at risk and from certified sources, store vegetables appropriately, reduce the consumption of sweets, and reduce food waste. The Swedish guidelines stand out by their accuracy in analyzing the different environmental impacts of individual foods<sup>134</sup>.

The following table lists the indications given by the various sustainable dietary guidelines with reference to the various food groups.

Like the report by the Advisory Committee which recognized the fact that the production and consumption of food have impacts on the environment, the U.S. nutritional guidelines to be published in fall 2015 will include aspects of sustainability for the first time<sup>135</sup>. We should remember that the Mediterranean diet is cited in this report as a positive example of a sustainable

diet. A similar approach has already been adopted by the Brazilian guidelines, published at the end of 2014, where it is acknowledged that ‘healthy’ food comes from ‘healthy’ ecosystems, recognizing that preserving the biodiversity, health and equilibrium of the ecosystems, and people’s health is interconnected. The Brazilian guidelines stress in particular the importance of eating vegetables and whole cereals, and of reducing the consumption of transformed foods and food rich in fats, salt and added sugars<sup>136</sup>.

The WWF’s project, LiveWell, launched in the UK and then extended to Sweden, France, and Spain, is the only one that provides not only qualitative, but also quantitative recommendations on how to follow a sustainable diet. The study involved devising weekly menus that are adapted to the food and cultural needs of the population, balanced in terms of nutrition, and can reduce greenhouse gas emissions compared to the current diet. The results showed that a significant reduction in CO<sub>2</sub> emissions is possible without ‘upsetting’ the eating habits of the population. LiveWell has been instrumental in introducing the issue of sustainable diets in the European political agenda. In particular, the project has developed a series of recommendations for institutions, including: the revision of national food guidelines with the integration of the concept of environmental sustainability and reduction of greenhouse gas emissions, the need to update agricultural and food policies taking into account sustainability, the need to support education in healthy and sustainable eating habits, strengthening preventive measures on diseases related to nutrition, and promoting local-global synergies.

<sup>132</sup> Nordic nutrition recommendations 2014.

<sup>133</sup> Health Council of the Netherlands, *Guidelines for a Healthy Diet: The Ecological Perspective*, The Hague, 2011.

<sup>134</sup> National Food Agency, 2013.

<sup>135</sup> Dietary Guidelines Advisory Committee, *Scientific report of the 2015 Dietary Guidelines Advisory Committee*, <http://www.health.gov/dietaryguidelines/2015-scientific-report/PDFs/Scientific-Report-of-the-2015-Dietary-Guidelines-Advisory-Committee.pdf>.

<sup>136</sup> Ministry of the Health of Brazil, 2014.



COUNTRY FOOD	FRANCE Mes Achats	GERMANY The Sustainable Shopping Basket	SWEDEN Towards Environmentally Sound Dietary Guidelines	NETHERLANDS Guidelines for a Healthy Diet: The Ecological Perspective	UNITED KINGDOM The principles of healthy and sustainable eating patterns	NORDIC COUNTRIES Nordic Nutrition Recommendation 2014	BELGIUM Nutrition and the Environment
 <b>FRUIT, VEGETABLES, LEGUMES, CEREALS, POTATOES</b>	Buy local, varied, seasonal, and when possible, organic food.  Avoid fruit and vegetables with bulky packaging.	Consume at least 5 portions of fruit and vegetables a day.  Choose local and seasonal products.	Increase your consumption of cereals, fruit and vegetables.  Choose local and organic products in season.  Prefer vegetables that stay fresh longer, such as cruciferous ones.  Eat more legumes.	Follow more of a vegetarian than an animal-based diet.  Less meat and dairy produce, more whole-grain cereals and legumes, vegetables and vegetable-based protein substitutes. <i>(win-win situation)</i>	Eat at least 5 portions of fruit and vegetables a day.  Eat more peas, beans, dried fruit and other sources of vegetable proteins.	Eat more cereals, fruit, and vegetables, especially potatoes and fibrous vegetables.  Reduce consumption of vegetables grown in heated greenhouses.  Eat more legumes.  Choose local and organic produce.	Eat more cereals, fruit, and vegetables.  Choose local and organic food in season.  Eat more legumes.  If you buy exotic product, choose the Fair Trade brand.
 <b>MEAT</b>	Reduce consumption to the levels indicated by nutritionists. Alternate a meat-based menu with vegetarian meals.	-	Moderate your consumption. Buy meat from local free-range farms.		Eat in moderate quantities	Reduce your consumption.	Reduce your consumption of meat. Try different types of meat. Alternate animal and vegetable proteins.
 <b>DAIRY PRODUCTS, EGGS</b>	Reduce consumption to the levels indicated by nutritionists.	-	-		Include milk and dairy products in your diet, or try plant based alternatives fortified with calcium and vitamins.	Reduce your consumption of dairy products. Eat more eggs.	-
 <b>FISH, SEAFOOD</b>	Eat fish from sustainable stocks.	Reduce your consumption. Eat fish from sustainable stock.	-	Eat 2 portions of fish per week, 1 of which oily fish. <i>This recommendation could have negative repercussions on the environment. The consumption of less exploited species needs to be encouraged. (a win-lose situation)</i>	Eat only fish that is certified and from sustainable stocks and /or fish farms.	-	Avoid buying fish species in danger of extinction . Eat only fish that is certified and from sustainable stocks and/or fish farms.
 <b>FAT AND OIL</b>	-	-	Increase your consumption of locally produced rapeseed oil. Reduce your consumption of palm oil.	-	-	Use vegetable oils. Reduce your consumption of butter and palm oil.	Avoid palm oil.
 <b>WATER, BEVERAGES</b>	Drink tap water. If you buy bottled water, choose water in 5-liter recyclable PET containers.	Choose recyclable packaging.	-	-	Drink tap water.	-	Drink tap water. If you buy bottled water, choose recyclable bottles.
 <b>SNACKS HIGH IN SUGAR AND SALT</b>	-	-	-	Moderate your calorie intake by eating less food little nutritional value. <i>(win-win situation)</i>	Eat fewer foods high in saturated fat, sugar and salt.	Reduce your consumption of foods with little nutritional value.	Eat fewer foods high in salt, sugar and fat.
 <b>OTHER GENERAL ADVICE</b>	Eat a balanced diet. Try Fair Trade products. Reduce your waste. Try not to go to do the shopping by car.	Eat healthily. Try Fair Trade products. Avoid producing waste.	-	Reduce your food waste. <i>(environmental win-health neutral)</i>	Eat a balanced diet. Reduce your food waste. Value what you buy and what you eat. Ask about where it comes from and how it is produced.	-	Eat a varied and balanced diet. Store food properly and avoid wasting food. Make a shopping list. Avoid products with very bulky packaging.

# EATING BETTER AND PROMOTING SUSTAINABLE DIETS

Eating Better, is an alliance of different organizations in the UK that aim to help people change their eating habits by reducing the consumption of animal protein in favor of healthy and environmentally sustainable foods<sup>137</sup>. In its report *Let's talk about meat*, published at the end of 2014, Eating Better identified the most effective strategies for promoting more sustainable consumption patterns. The report also contains some policy recommendations on how to

integrate the concept of sustainability with the policies and the practices for proper nutrition, how to promote and provide information on sustainable diets by updating national dietary guidelines to include sustainability, promote education on healthy and sustainable eating, support research on successful behavioral change strategies, how to monitor people's diets and report on progress towards lower meat consumption, ensure that public health, agriculture, trade, and fiscal measures

or other policies support and guide the transition to a healthy and sustainable production and consumption of food, and involve various stakeholders to share knowledge and create practical approaches to promoting sustainable consumption.

<sup>137</sup> <http://www.eating-better.org/uploads/Documents/EB-policy-briefing14-web.pdf>.



## ENVIRONMENTAL LABELING

Over the past three decades, different labels or special logos have been created, driven by public and private initiatives, to be placed on food packaging to communicate information to consumers on sustainability. Some of the best known are those of Fair Trade groups, the logo of the Rainforest Alliance (which promotes sustainable agriculture in favor of the farmers and the environment in developing countries), and those related to environmental impacts and welfare in animal breeding. A study by the European Commission found that there are 129 nutritional information schemes related to sustainability in Europe<sup>138</sup>. The goal of these programs is to increase transparency in the food chain and inform consumers to promote responsible consumption.

In general, consumer awareness about the sustainability labels and their influence on consumption is low<sup>139</sup>, even though some studies reveal consumers' readiness to pay a slightly higher price for certified food products<sup>140</sup>. The most appreciated labels, aside from those of organic products, are

those indicating a product comes from free range farming and certifying animal welfare. The environmental labels, such as the *Carbon Label*, are considered less attractive and associated with less willingness to pay a higher price. This is due to the fact that, while recognizing the label, consumers often do not fully understand the concept expressed (for example, what the "carbon footprint of food" actually means)<sup>141</sup>.

<sup>138</sup> European Commission, *Food Information Schemes, Labelling and Logos*, Internal Document DG SANCO, 2012.

<sup>139</sup> Eufic Forum, *Sustainability and Social Awareness Labelling – A Pan-European Study on consumer attitudes, understanding and food choice*, 2014.

<sup>140</sup> McCluskey J., Loureiro M., *Consumer Preferences and Willingness to Pay for Food Labeling: A Discussion of Empirical Studies*, "Journal of Food Distribution Research", vol. 34, 3, November 2003.

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# FOOD POLICY

GOVERNMENTS HAVE A FUNDAMENTAL ROLE TO PLAY IN PROPOSING AND IMPLEMENTING **ADEQUATE MEASURES** TO GUARANTEE THAT EVERYONE HAS ACCESS TO **HEALTHIER AND SUSTAINABLE DIETS**

Main food policy instruments in the world





# THE BCFN RECOMMENDATION FOR INSTITUTIONS

The BCFN Foundation is profoundly convinced that adopting sustainable diets and improving the functionality of the food system can make a significant contribution to reaching the objectives of development. We share the positions expressed in this regard by the FAO, the OECD, the WWF and, recently, the USDA. We hope that institutions and policy makers at national and international level will come to consider food as the keystone for a more sustainable low carbon economy. In particular, they ought to begin defining ambitious and long-term political programs to promote sustainable diets. In order to achieve this they must:



**INFORM** with an open database that gathers and evaluates information about the programs and projects for the promotion of sustainable diets in different countries to ensure both governments and institutions tasked with developing programs, and the stakeholders implementing them, are better informed.



**INVOLVE** operators of the whole supply chain, from the field to the table in defining the programs, as well as sectors that have a direct or indirect impact on food habits: public institutions, producers, farmers, families, retailers, restaurants and catering businesses, schools, marketing and NGOs.



**REGULATE** with a combination of voluntary guidelines and legislative measures where necessary that involve the most important stakeholders, dispose of adequate economic resources and make possible the implementation of social programs to support a sustainable diet.



**MEASURE** by defining specific objectives to assess on a periodic basis the progress made. These objectives should take into consideration the specific food habits and traditions of each country.



# THE BCFN RECOMMENDATION FOR PEOPLE

Considering the prime importance of food for the well-being of people and for the environment, the BCFN Foundation proposes the following recommendation to promote the adoption of sustainable lifestyles. Being aware is not enough. Convincing people to change their behavior in opposition to current trends requires the involvement of all the participants in the food system, whether schools, companies, distribution or media. To implement actions and introduce services and products inspired by the guidelines for a sustainable diet:



**EDUCATE** to ensure everyone understands the fundamental role food plays in sustainable development. Raising awareness of the great economic, social and environmental impact of food, especially amongst the young, is a priority. Families must consider nutritional education as the first tool to guarantee their children's well-being.



**PREVENT** with correct diet choices for a longer and healthier life. Consumers making diet choices are primarily responsible for their health. Obesity and other non-transmittable pathologies can be the result of incorrect lifestyles, which combine an unbalanced diet with insufficient physical activity. Prevention through nutrition must become a priority for everyone.



**SAVE**, a balanced and correct diet does not necessarily cost more. However consumers must be aware of the correct combination (portions and frequency of consumption) of foods in the food pyramid to maintain a reasonable budget. The prerequisite of the economic sustainability of a diet is to spread correct nutritional information among people and recover traditional local culinary cultures.



**CARE**, a nutritionally correct diet is more sustainable also from an environmental point of view. Adopting a balanced diet is not only a responsible choice for ourselves, but also as a form of respect towards others. Today we know that a nutritionally correct diet can reduce our impact on the Planet and much of the knowledge necessary for more sustainable food production and consumption is already available.

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- Barilla Center for Food and Nutrition: <<http://www.barillacfn.com/>>
- Ecoinvent: <[www.ecoinvent.ch](http://www.ecoinvent.ch)>
- Global Footprint Network – GFN: <[www.footprintnetwork.org](http://www.footprintnetwork.org)>
- Intergovernmental Panel on Climate Change – IPCC: <<http://www.ipcc.ch/>>
- Istituto Nazionale di Ricerca per gli Alimenti e la Nutrizione - INRAN. <<http://www.inran.it/>>
- Istituto Nazionale di Statistica – ISTAT: <<http://www.istat.it/it/>>
- Joint Research Centre – JRC: <<http://lct.jrc.ec.europa.eu/>>
- LCA Food Database: <[www.LCAfood.dk](http://www.LCAfood.dk)>
- Organizzazione delle Nazioni Unite per l’Alimentazione e l’Agricoltura – FAO: <<http://www.fao.org/home/en/>>
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- Organizzazione Mondiale della Sanità – OMS: <<http://www.who.int/en/>>
- Sistema Internazionale EPD: <<http://www.environdec.com/it/>>
- UK Department for Environmental, Food & Rural Affairs – DEFRA: <<http://www.defra.gov.uk/>>
- United Nations Environment Programme – UNEP: <<http://www.unep.org/>>
- United States Department of Agriculture – USDA: <<http://www.usda.gov/>>
- Water Footprint Network - WFN: <<http://www.waterfootprint.org/>>

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### RECOMMENDATIONS FOR A SUSTAINABLE DIET

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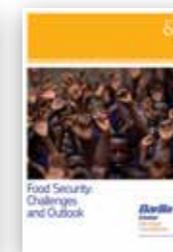


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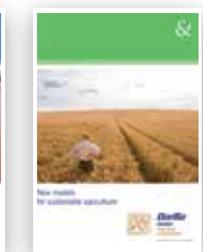
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