



Barilla
Center
FOR FOOD
& NUTRITION

people, environment, science, economy

DOUBLE PYRAMID 2014

FIFTH EDITION: DIET AND ENVIRONMENTAL IMPACT





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6th INTERNATIONAL FORUM ON FOOD AND NUTRITION

Milan, December 3-4, 2014

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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*).



science, people, environment, economy

DOUBLE PYRAMID 2014

FIFTH EDITION: DIET AND ENVIRONMENTAL IMPACT

.....

The importance of nutrition for people's health has been confirmed by a large number of studies carried out on a daily basis. In recent years, research has shown that the agriculture and food sector is one of the major responsible for greenhouse gas emissions and water use.

Despite this scientific evidence, people are only gradually becoming aware of the fact that the food we should eat more frequently is also the least harmful food for the environment. This is the reason why the BCFN once again proposes the food and environment Double Pyramid in an updated version which includes the most recent research results.

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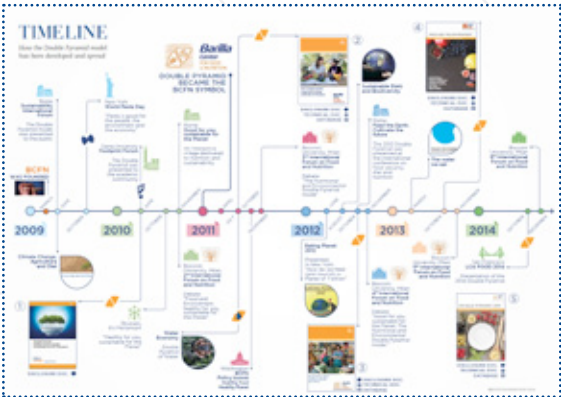
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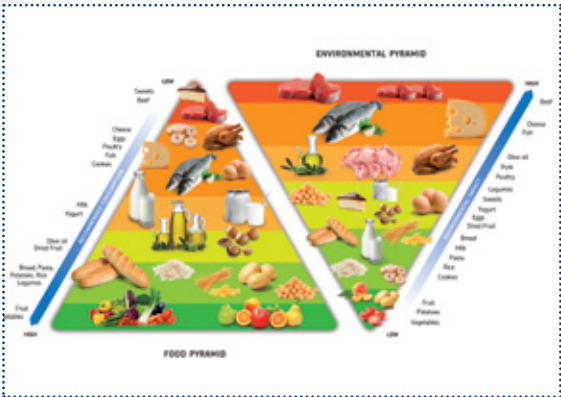


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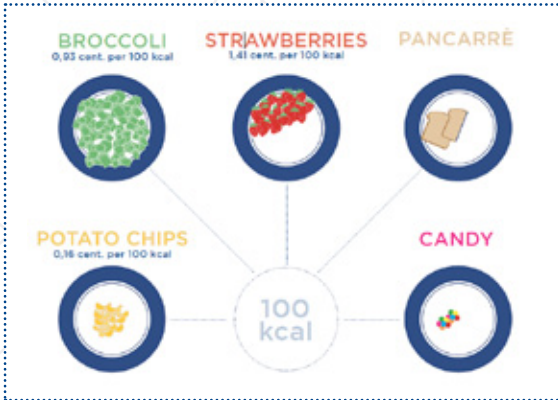
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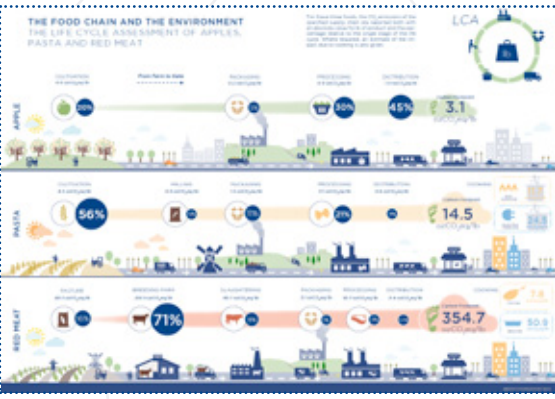


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INTRODUCTION

The Double Pyramid model which was presented by BCFN for the first time in 2009 has become a line of research over the years: it is a course of study that has been enriched year after year through new stages and by adding new scientific issues that have consolidated the initial schema.

The first idea, which led us to create the environmental pyramid as the inverted image of the classic food pyramid, thus communicating the inverse relationship between nutritionally recommended foods and their environmental impact, marked the beginning of a more and more articulated project.

In the subsequent editions of the report which have been published over the last five years, not only has there been an almost tenfold increase in the amount of scientific data supporting and validating the initial thesis but some model changes have been proposed which take into account the various nutritional needs such as those of children.

We then decided to take a step forward with the aim of finding the most effective way to transform the "good for you, good for the Planet" knowledge acquired through the double pyramid into new dietary lifestyles.

In fact it is clear that we need to find new ways to help people improve their behaviour since even the

most health conscious people are not always able to change their eating habits and attitudes which are influenced by advertising and other forms of promotion on a daily basis. Price issues may also influence people's choices, especially those who are not able to evaluate the alternatives of purchase correctly due to lack of information.

In this perspective, the family, which is traditionally the guardian of food culture and plays a key role in educating the young, should be supported in its educational task. This is why it is more and more important to collaborate with other institutions (starting from schools) and private businesses such as food companies and distribution channels, as well as new and traditional types of media.

The BCFN's message in recent years is that food represents the second most important factor of global sustainability (following the energy industry): it is therefore a priority for all concerned in the food production chain to reduce its environmental impact since whoever does not take part in finding a solution is part of the problem.

In this context, price is an important issue as it influences consumers' choices, especially considering how difficult it is for people to compare the true value of the various foods and gain access to all the possible alternatives of purchase.



THE DOUBLE PYRAMID MESSAGE

.....
*There is a diet that enables you to eat healthily without spending more
and does not negatively affect the environment*
.....

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 sustainability of people and the environment without negatively affecting the economy.

HOW THE DOUBLE PYRAMID MODEL HAS BEEN DEVELOPED

The conceptual model of the Double Pyramid was created in response to the need to explain the environmental impact of our food preferences on the environment. 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 con-

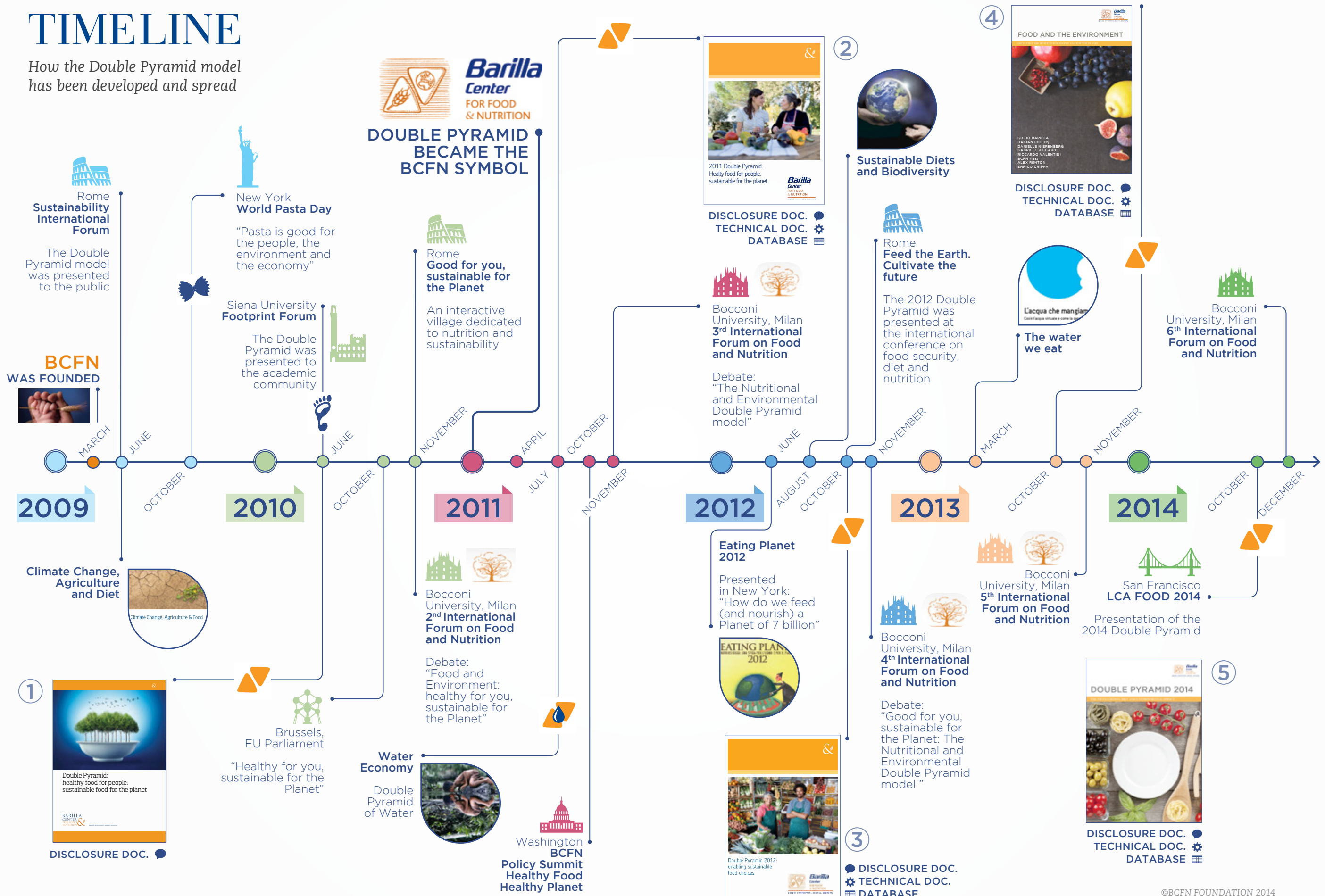
sumed in larger quantities while those that have a more pronounced environmental footprint on the Planet should be consumed in moderation.

Based on that, the BCFN decided the goal to inform 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. Over time, the concept of the Double Pyramid has been improved as demonstrated by the publication of five papers dedicated entirely to the topic.

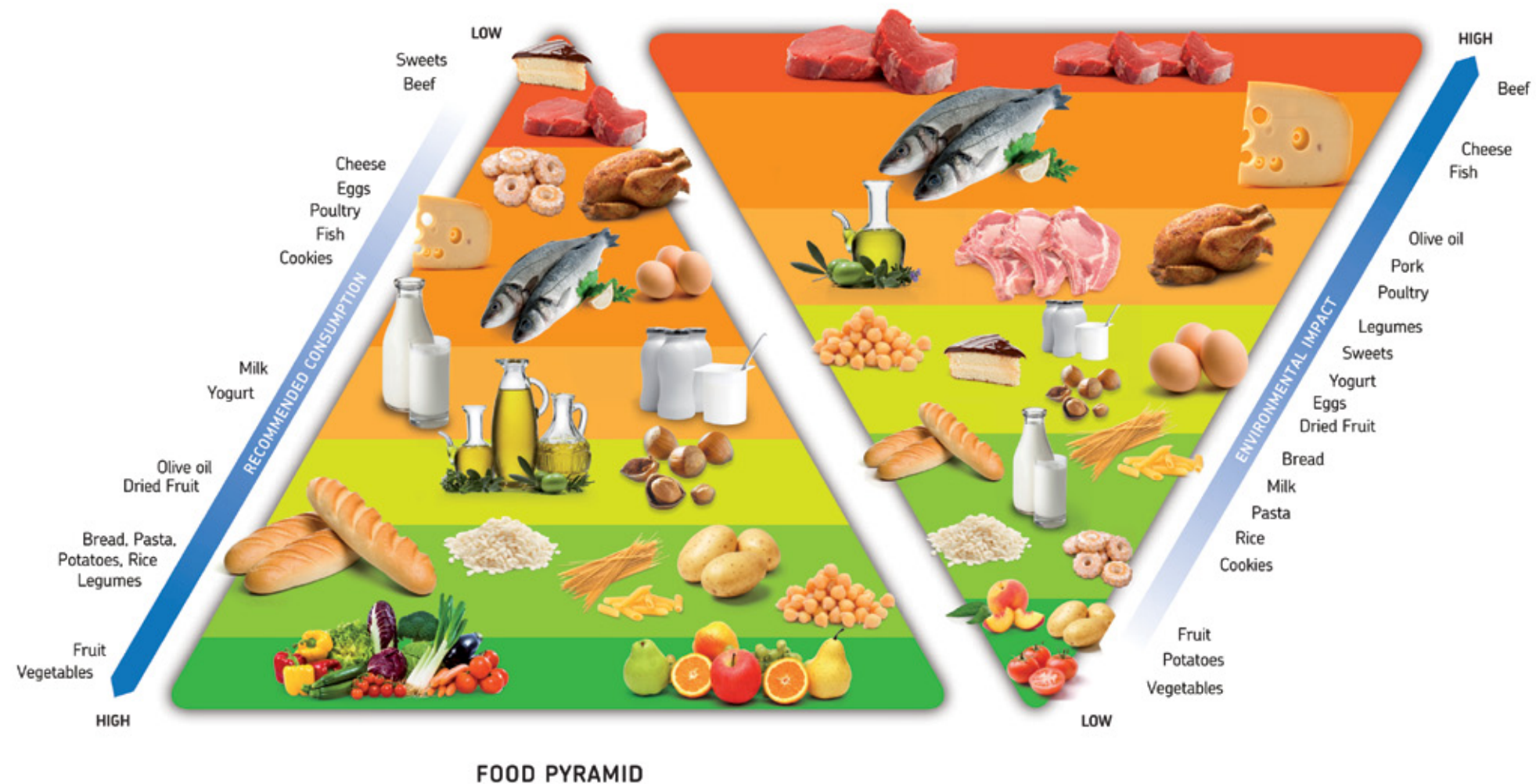
The first study entitled *Double Pyramid: healthy diet for people, sustainable food for the Planet* was presented at Milan Science Museum in 2010 and proposed the environmentally-friendly food pyramid as a tool for educating people to eat the right food.

TIMELINE

How the Double Pyramid model has been developed and spread



BARILLA CENTER FOR FOOD & NUTRITION DOUBLE PYRAMID



The following year *Double Pyramid 2011: healthy diet for all and environmentally sustainability*, analyzed the nutritional requirements of children and adolescents and their relative impact on the environment. The next paper *Double Pyramid 2012: enabling sustainable food choices* started a debate on the economic sustainability of a healthy diet, while in 2013 the BCFN Magazine *Food and the Environment: diets that are healthy for people and for the Planet* provided further information on how to improve and reduce the Carbon Footprint of our food system. This fifth edition, which was presented at LCA FOOD 2014 in San Francisco, is aimed at determining the en-

vironmental impact of various diets (other than the Mediterranean diet) focusing especially on American eating habits.

In 2011 Double Pyramid became the symbol of BCFN in order to emphasize the centrality of the concepts expressed.

Thanks to its ability in summarizing complex scientific concepts, the Double Pyramid model has become rapidly widespread and has been the subject of various publications: *Water Economy* (BCFN, 2011) examined the Double Pyramid water concept concerning the impact of food and beverages; the book *Eating Planet 2012 – Nutri-*

tion today: A challenge for mankind and the Planet (BCFN, 2012) analyzed the effects of individual eating habits on health and the environment among other things; the book *Sustainable Diets and Biodiversity* (FAO, 2012) contained a whole chapter regarding the Double Pyramid; while *The Water We Eat* (Edizioni Ambiente - WWF, 2013) analyzed the issue of water and its economic, social and political implications using a multidisciplinary approach, and there is also a report by BCFN concerning the concept of the food and water Double Pyramid as well as some data regarding the virtual water contained in cereals. Over the years, many events have been organ-

ized to present and discuss these concepts for both the scientific community and the general public. In fact, at the International Forum on Food and Nutrition which has been organized by the BCFN annually at the Bocconi University in Milan since 2009, large areas are set aside to discuss global issues related to food, sustainable diets and the Double Pyramid, and make concrete proposals for improving sustainability in the agro-industrial food sector.

DIET FOR PEOPLE'S HEALTH

The food section of the Double Pyramid is the graphic representation of the most important international nutritional guidelines and the main indications for the prevention of non-infectious diseases (cardiovascular, diabetes, cancer). The Mediterranean diet is 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 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 is a powerful tool for educating people on consumption thanks to its simple and intuitive diagram.

DIET AND EARTH HEALTH

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 unit of measurement (per kilogram or liter) for the products in the Food Pyramid is possible to obtain an upsidedown pyramid, which sees foods with a greater environmental impact at the top and those with less environmental impact at the bottom.



The environmental impact of food products are evaluated according to the Life Cycle Assessment (LCA) methodology, by analyzing the three environmental indicators; Carbon Footprint, Water Footprint and Ecological Footprint. BCFN only used data and information of public domain – databases and scientific publications – so that people are able to 're-construct' the original data and carry out in-depth analysis by downloading data from a special database at everyone's disposal. The database can be accessed from the BCFN site.

www.barillacfn.com

THE BCFN DOUBLE PYRAMID

On combining the two pyramids was born the agro-environmental Pyramid food that the BCFN called '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 the populations and the safeguarding of 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).



The BCFN has selected publications, videos, interviews, and articles dedicated to food security and sustainability for you.
<http://www.barillacfn.com/en/focus-on/world-food-day/>

A SUSTAINABLE DIET FOR EVERYONE

Especially for countries hit by the economic crisis, particular attention should be paid to the cost of diets and therefore to their social sustainability in terms of including people in the correct dietary models. Similarly to what was required for the analysis of environmental values, the BCFN used available data for calculating the economic impact of some 'types of diet' in Italy and analyzed the scientific literature published in the United States and in other European countries.

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

Therefore generally speaking, if eating a sustainable food does not necessarily mean spending more, people and families should make more effort in terms of the time spent in selecting products and opt for low-cost foods with a high nutritional value, such as pasta, legumes, certain types of vegetable oil, dried fruit and nuts, and especially low-fat dairy products and eggs are the least expensive sources of protein.

DIET AND PEOPLE'S HEALTH

Better or worse do not exist due to their nature: a well-balanced diet should include a variety of foods to be eaten in the right amounts to avoid excesses or deficiencies

In the various 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 nuts, 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.¹

The nutritional value of the Mediterranean diet was scientifically demonstrated in the “Seven Country Study” carried out by Keys² in the 1970s. The study compared the diets used by different populations to verify their benefits and main issues and strong correlations were observed between the type of diet and the risk of the onset of chronic illnesses especially cardiovascular disease.

Since then many other studies have been carried out on the connections between diet and health³ which confirmed that the Mediterranean diet helps to prevent the most common chronic



illnesses more than any other type of nutrition which was also acknowledged by UNESCO as being an intangible heritage of humanity in 2010.

With the aim of implementing 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 which was re-proposed in a FAO report in 1997 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 CIIS-CAM (Interuniversity Centre for International Studies on Mediterranean Food Cultures) have developed systems of communication based on the image of the food pyramid. 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 variety is one of the key principles of good nutrition. Over the years several versions of the food pyra-

mid have been published. 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.).

¹ Willett et al., 1995

² Keys et al., 1970; Keys et al., 1980

³ World Cancer Research Fund. 1997; Willett, 1998

THE FOOD PYRAMID EVOLUTION

The Mediterranean diet and other worldwide dietary plans

USDA
1992



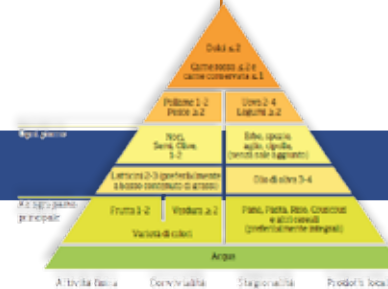
OLDWAYS
1993



OMS
2000



CIISCAM
2009



UNESCO
2010

"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"

BCFN
2011



FOOD PYRAMID

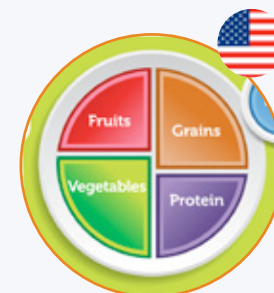
OTHER DIETARY PLANS



Temel Besin Grupla
Turkey



Pagoda
China



Choose My Plate
United States



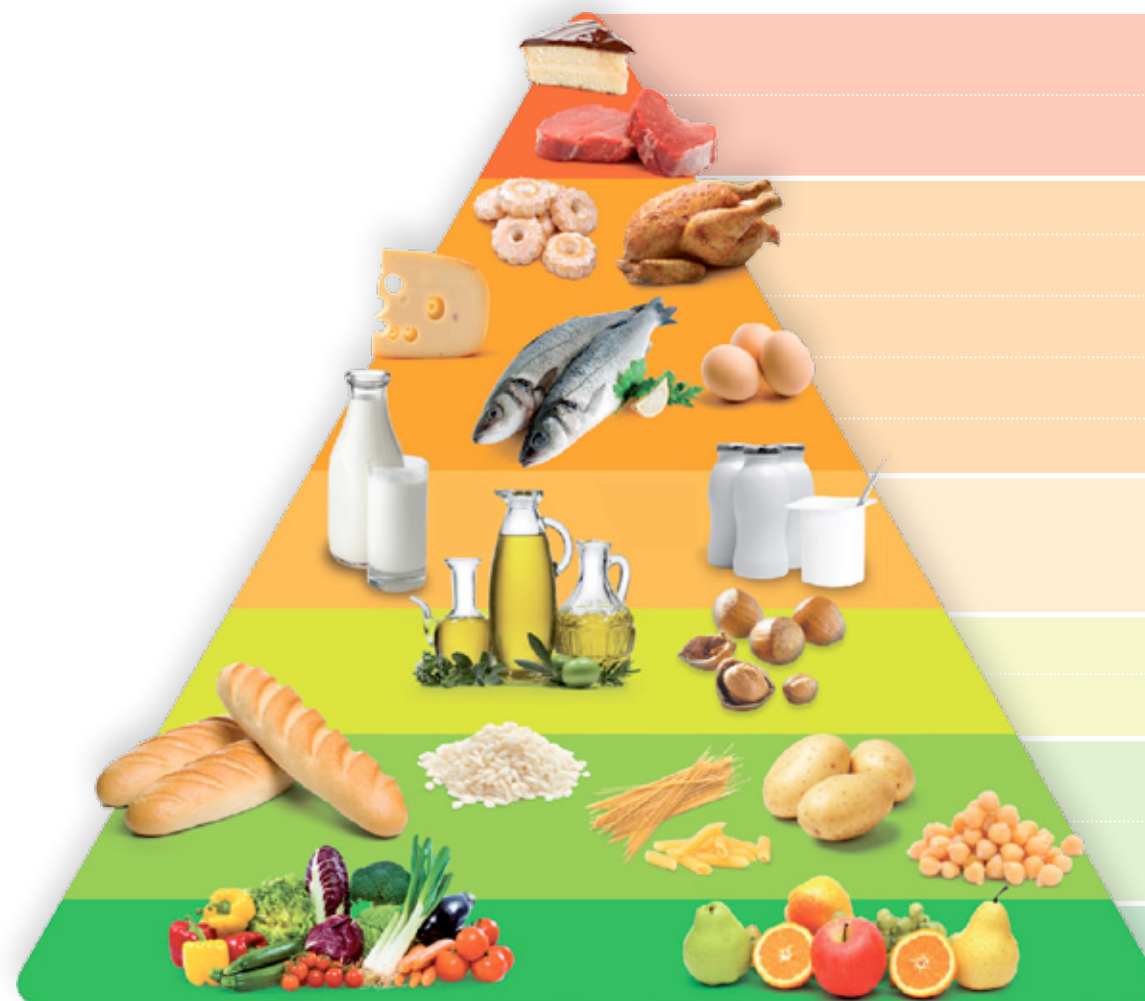
Guide to Healthy Eating
Australia



The Food Circle
Sweden

THE FOOD PYRAMID

The dietary value of its components



Saturated and unsaturated fats, simple 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 sugars



Protein, saturated fats, calcium, vitamin A



Protein, saturated fats, omega 3



Water, calcium, proteins, saturated fats, sugars, vitamin A and B, pantothenic acid



Vitamin E, polyphenols, triglycerides, essential fatty acids



Vitamins, minerals, antioxidants, unsaturated fats, omega 3, omega 6



Starch, carbohydrate



Protein, fiber, essential amino acids, vitamin B, iron, zinc



Water, vitamins, minerals, fiber, simple sugars



Water, vitamins, minerals, fiber, simple sugars

on foods of vegetable origin, as they are rich in vitamins, minerals, fiber, complex carbohydrates, water and plant proteins, while the foods at the top of the pyramid should be eaten in moderation, as they are high in fat and simple sugars.

THE MEDITERRANEAN DIET: UNESCO INTANGIBLE CULTURAL HERITAGE OF HUMANITY

The United Nations Educational, Scientific and Cultural Organization (UNESCO) was founded in 1975 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 begun to draw up a list of global intangible cultural heritages, namely, traditions which often do not have a 'written' canon, but which are handed down orally from one generation to another. In 2010 the Mediterranean diet was added to this list which UNESCO described as follows:

"The Mediterranean diet constitutes a set of skills, knowledge, practices and traditions ranging from the landscape to the table, including the crops, harvesting, fishing, conservation, processing, preparation and, particularly, consumption of food. The Mediterranean diet 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."





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 – a child requires an adequate quantity of energy. In the first year of life, the energy requirement for growth is remarkable but it decreases rapidly; in fact it goes from 35% in the first month of life to 5% at one year of age. 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. The consumption of fat in the diet represents 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 nuts. 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. Protein is the second essential macronutrient required to ensure a proper and well-balanced energy intake for a child. Excellent sources of high-quality protein are meat, fish, cheese, milk, eggs, and some products of vegetable origin, such as soy and green beans, legumes and wheat by-products. Carbohydrates (sugars, starches and fiber) are the body's third most important energy source; they supply energy to all of the tissues in the human body especially to the brain and the red blood cells which use glucose as the 'fuel' for cellular activity. Together with the main macronutrients, vitamins and minerals are essential elements of a



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

proper diet for preschool 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 and anemia caused by iron deficiency is in fact one of the most widespread diseases associated with bad eating habits. It is therefore important to increase the consumption of iron-rich foods such as lean meats and fish, legumes, dark green vegetables, nuts, and iron-enriched cereals during adolescence in order to overcome this problem. 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 calcium-rich foods, espe-

cially 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. 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 to people of all ages.

⁴American Academy of Pediatrics, 1999

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 sports aid the

cardiovascular and skeletal systems as well as the metabolism. Moreover, regular physical activity helps us to maintain 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 MACRO-GUIDELINES FOR HEALTHY GROWTH

1. Adopt a healthy and balanced diet, alternating daily all the main foods, supplying all the nutrients and micronutrients (calcium, iron, vitamins, etc.).

2. Avoid excessive calorie intake caused by consuming high-calorie foods or those with high concentrations of fat.

3. Start afresh to balance nutrients during the day, ensuring that there is a balance between the intake of animal protein and vegetables, which must be one to one, of sim-

ple and complex sugars (less consumption of sweets, more bread, potatoes, pasta or rice), of animal and vegetable fats (using less lard and butter and more olive oil).

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

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.

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

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



HEALTHY EATING AND LIFESTYLE FOR EVERYONE



- 30 minutes of physical activity per day
- Avoid overweight conditions and obesity
- Avoid excess consumption of alcohol
- No smoking
- Adopt a balanced diet
- Increase consumption of fruits and vegetables
- Choose complex carbohydrates and increase consumption of whole grains
- Increase consumption of legumes
- Eat fish once or twice a week
- Choose vegetable-based condiments
- Limit consumption of high-fat foods
- Limit consumption of fried foods
- Limit consumption of red meat and poultry to 3 or 4 times a week
- Limit additional consumption of salt
- Limit consumption of foods and beverages with a high sugar content
- Avoid daily use of food supplements



190 g/day
per capita
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.

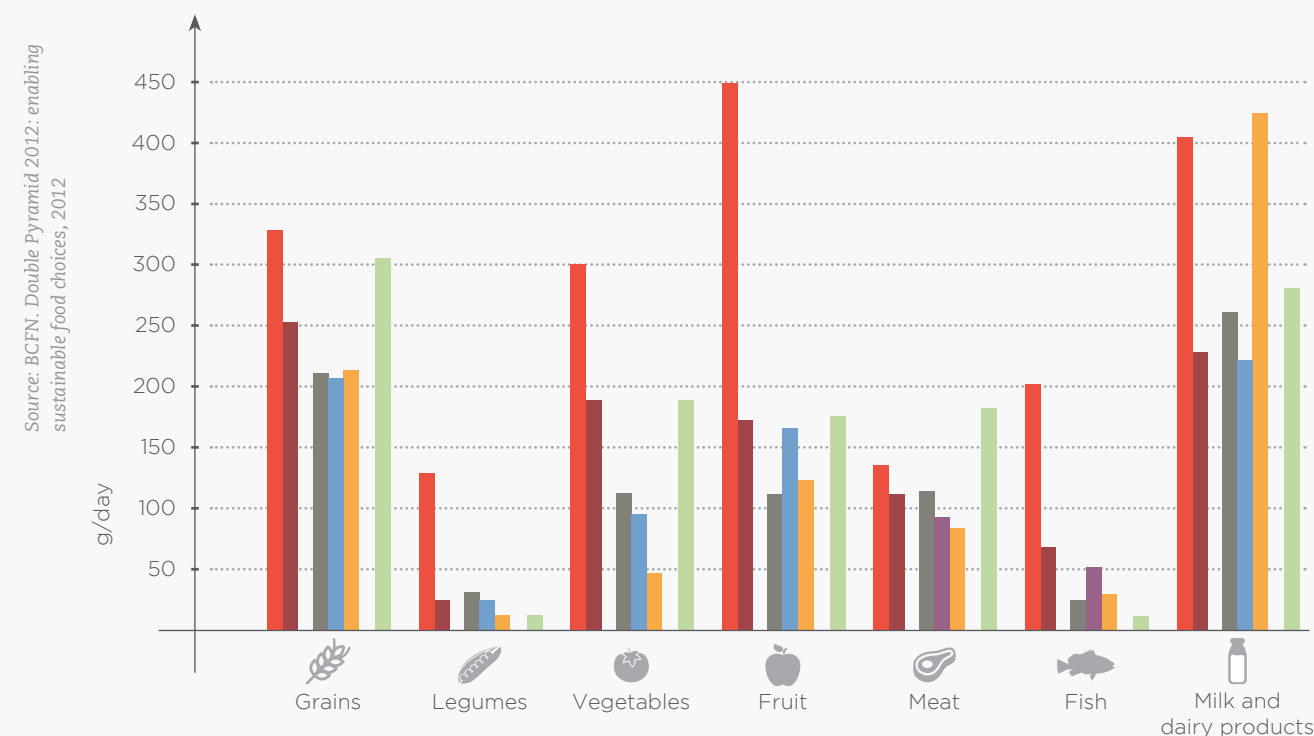
Research related to Italian food consumption is mainly based on surveys by the National Institute of Research on Food and Nutrition (INRAN), which over the last twenty years has carried out various comprehensive surveys on the eating habits of the Italian population aimed at monitoring food and nutrition in order to raise people's awareness concerning food consumption. 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.⁵

The data concerning the other EU countries were taken from the European Food Safety Authority which developed "The EFSA European Food Consumption Database" that published a docu-

ment 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 USDA⁶ 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 if some macroscopic considerations can be made.

The average amounts of food of the eight main food categories consumed in Italy, France, Germany, Sweden and U.S. can be seen below and are compared with the quantities recommended by INRAN⁷: the data are based on the percentage of actual consumers of a certain food, i.e. a true average is calculated on the part of the people who make up the sample that eats that type of food. It is important to note that in all countries leg-



Average of the eight main food categories in four European countries (source: EFSA) to which the values of US consumption were added (source: USDA).

umes 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 percentage 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 less meat (75 g/day). Unfortunately, as disaggregated data concerning meat consumption are unavailable (beef, poultry, pork), it is impos-

sible to estimate the consumption of red meat as opposed to white meat.

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

⁵ Leclercq et al., 2008

⁶ EPA, 2007

⁷ INRAN, 2003

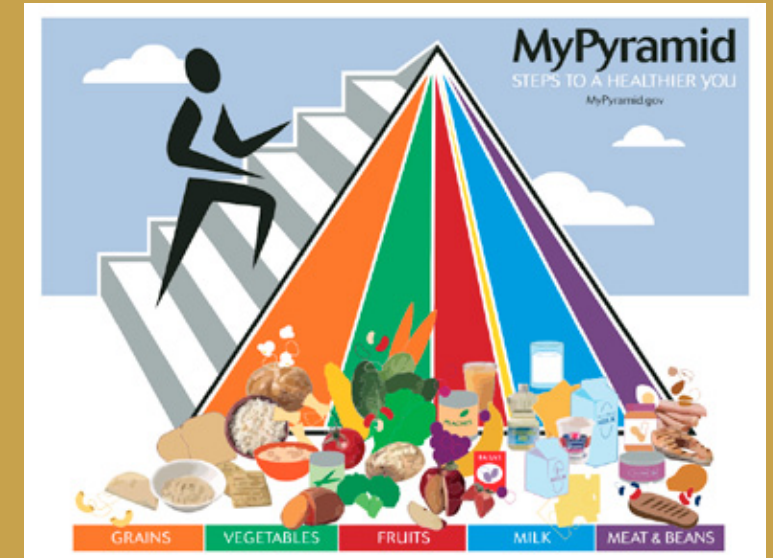
UNITED STATES: FROM THE FOOD PYRAMID TO MY PLATE

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 similar nutritional characteristics: a greater consumption of fruit, vegetables, cereals (especially whole grain) and legumes and a low consumption of protein, animal fat and simple sugars. In 1992 the U.S. Department of Agriculture (USDA) released

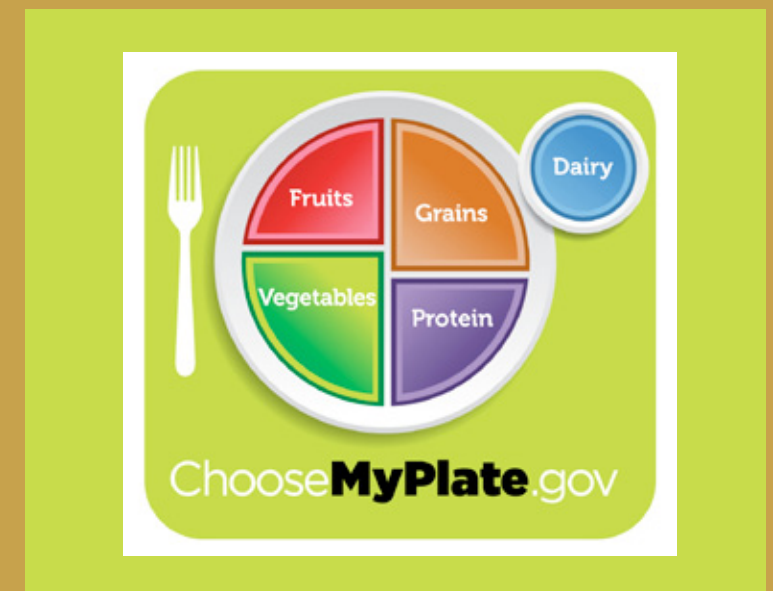
the first American food pyramid. This nutritional education tool has been widely recognized by the international scientific community and has been the foundation for the evolution of nutritional recommendations on the various types and amounts of foods to eat every day. In 2005 the USDA published MyPyramid which was an update of the original pyramid and was designed as an educational tool in addition to the Dietary Guidelines for Americans 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, as part of a larger communication initiative based on the Dietary Guidelines for Americans 2010 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 of 20% 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”. In short, American nutritionists recommend a diet mainly composed of fruit, vegetables, whole grains and low-fat dairy products. One should eat meat, fish, beans, eggs and nuts 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.



Source: www.mypyramid.gov



Source: www.choosemyplate.gov

DIET AND EARTH HEALTH

In an era affected by climate change, agribusiness does not only concern nutritional issues but it must take into account the impact it may have on the environment, from food production to consumption

The evaluation of the impact of a process can be carried out with various methods which focus on the characteristics of the supply chain or on specific indicators according to the case.

LIFE CYCLE ASSESSMENT (LCA) AND ENVIRONMENTAL INDICATORS

Of all the methods of evaluation, Life Cycle Assessment (LCA) 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 of the environmental aspects of the supply chain. Life Cycle Assessment studies each phase from production to transportation and distribution and the cooking phase whenever necessary.

Summary 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 size of the territory used for producing the resources.



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_2 .



The **Water Footprint** (or the *Virtual Water Content*), which quantifies consumption and analyzes the various methods of using water; it is measured in volume (liters) of water.



The **Ecological Footprint**, which calculates the amount of biologically productive land (or sea) required for supplying the resources 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 wide view of the impacts even if 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 Pyramid was constructed with the Ecological Footprint even if the pyramids relative to the Carbon and Water Footprint indicators will also be presented in the paper in order to provide a wider view.



INDICATORS USED IN THE ENVIRONMENTAL PYRAMIDS

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 (CO₂eq). 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 CO₂ value as if the system only emitted CO₂ by means of fixed parameters defined by the IPCC which is the Intergovernmental Panel on Climate Change that operates under the aegis of the United Nations.

Due to its simplicity in terms of communication and understanding, it is the most widely used indicator for public disclosure activities.

www.ipcc.ch

WATER FOOTPRINT

The Water Footprint is an indicator that measures the amount of fresh water used to manufacture a product in liters or m³ by totaling the amount used in all stages of the production chain. It is also known as the 'virtual water content' because it takes into account both the water used in the production phase (direct consumption), and the water required for producing the raw materials (indirect consumption). The calculation method was developed by the Water Footprint Network and was designed so that the indicator takes into account three fundamental components:

- *Green Water*, the volume of evapotranspired rainwater from the soil and plants (which represents the most important item in the food chain);
- *Blue water*, the volume of water originating from surface waterways or underground aquifers used in the production chain, which is not returned to its original source;
- *Grey Water*, the volume of water which is polluted during the production process of the products in question, measured as the volume of water theoretically required for diluting the pollutants and restoring the water to its natural level of quality.

www.waterfootprint.org

CARBON FOOTPRINT



WATER FOOTPRINT



ECOLOGICAL FOOTPRINT



ECOLOGICAL FOOTPRINT

The Ecological Footprint is an indicator that measures the surface area of land and water (biologically productive) 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 and includes the following components in the calculation.

- *Energy Land*, represents the land required to absorb the CO₂ emissions generated by the production of goods or services;
- *Crop Land*, is the land needed for the cultivation of 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.

www.footprintnetwork.org

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.

FOOD CHAIN AND ENVIRONMENT

More and more attention is paid to Agri-food chains both for the quality and safety of the food they produce and for the impact they generate. In an era affected by climate change, nutrition is not the only matter concerning agribusinesses but they must also bear in mind the impact they may have on the environment from the production phase to food consumption. It is above all 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.

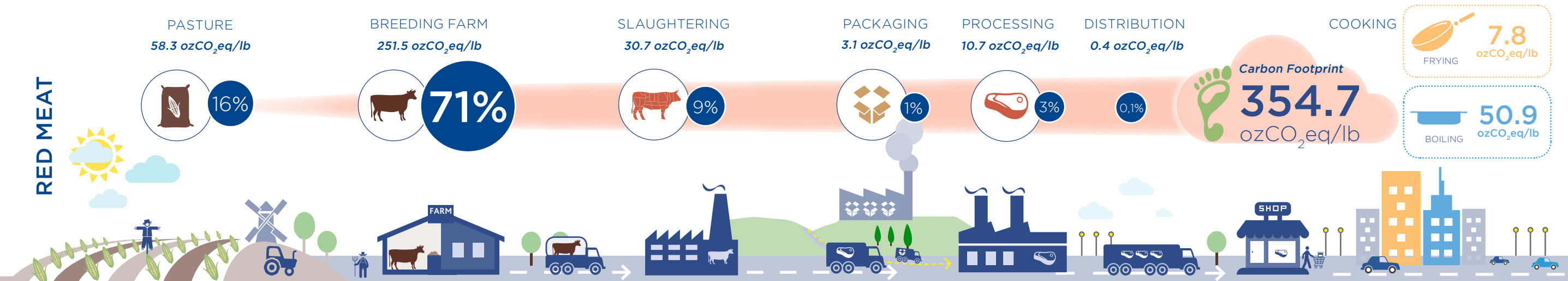
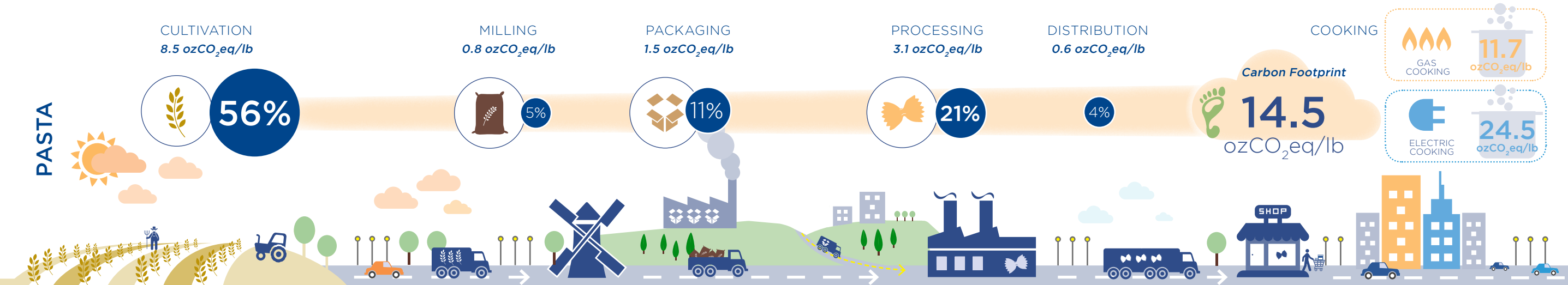
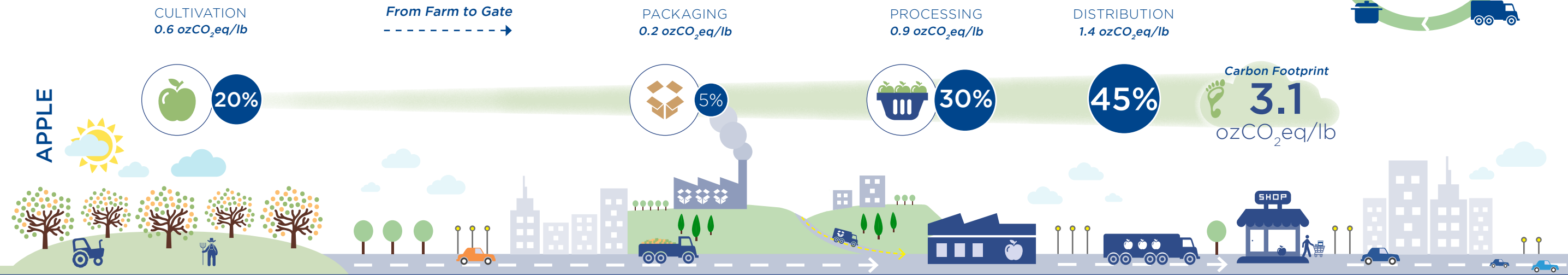


THE SEVEN PHASES OF THE AGRI-FOOD CHAIN	
	CULTIVATION OF RAW MATERIAL The agricultural phase is the stage in which we produce the raw materials to be used for human consumption or as fodder for farm animals. Several factors are responsible for the impacts of this phase such as: seed production, the use 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. The agricultural phase is usually the link of the chain that creates most impacts. Cultivation techniques may influence the impact of the agricultural phase substantially, 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.
	FIRST TRANSFORMATION 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.
	PRODUCT PROCESSING 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.
	PRODUCT PACKAGING 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 the disposal of waste, while the impact of the actual packaging is low.
	TRANSPORT AND DISTRIBUTION 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.
	COOKING 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 at home environment or in a commercial kitchen.
	DISPOSAL OF PACKAGING 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.

THE FOOD CHAIN AND THE ENVIRONMENT

THE LIFE CYCLE ASSESSMENT OF APPLES, PASTA AND RED MEAT

For these three foods, the CO₂ emissions of the specified supply chain are reported both with an absolute value for 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 with 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 the greenhouse gases.



FOOD LIFECYCLE RELEVANT ELEMENTS

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.

For some types of foods, such as fruit and vegetables, the environmental impact may vary significantly if they are purchased out of season, as they may be cultivated in greenhouses or in far-away countries in order to make them available.

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.

Farming practices

As the most environmental impact is caused by 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 to grow raw materials 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 the optimization of 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 prod-

ucts, 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 ecotoxicity.

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 same can be said for the cold chain, i.e. refrigerated and frozen products. For this phase, the calculation of environmental impacts may vary, and greatly depends on where the product is stored (in household fridges or industrial refrigerating rooms), 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 the freezing of 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 becoming more and more popular nowadays. 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 associated caused by the transportation of food products and those related to their production beginning with the raw materials. The results indicate that the distri-

bution 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 CO₂ emissions per kilometre, a large amount of goods is 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 produce a food product

far from the place of consumption if this occurs in areas which create less environmental impact due to their nature (possibility of irrigation or appropriate average temperature).

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 have environmental impacts (mainly CO₂), which are greater than in the entire production chain and the transportation of the product.

The environmental impacts caused by cooking on an electric hob depend strongly on the energy mix that characterizes their electricity supplier (and consequently the country or region of location) and the method of cooking that can significantly affect the amount of CO₂ emissions.

The preparation phase is one of the most relevant aspects: for example, when boiling, it is possible to reduce the overall impact by covering the saucepan with a lid during the heating phase of the water.





THE BCFN DOUBLE PYRAMID

The food industry is a field for which it is possible to reconcile the well-being of the Planet with that of its inhabitants without them having to give up any pleasures

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 environment. It shows that the foods with higher recommended consumption levels are also those that have less impact on the environment. Contrarily, the foods that should be eaten in moderation are those with a greater environmental impact. This means that all of us can definitely conciliate our personal well-being (personal ecology) with the environment (contextual ecology) by eating in a responsible way.

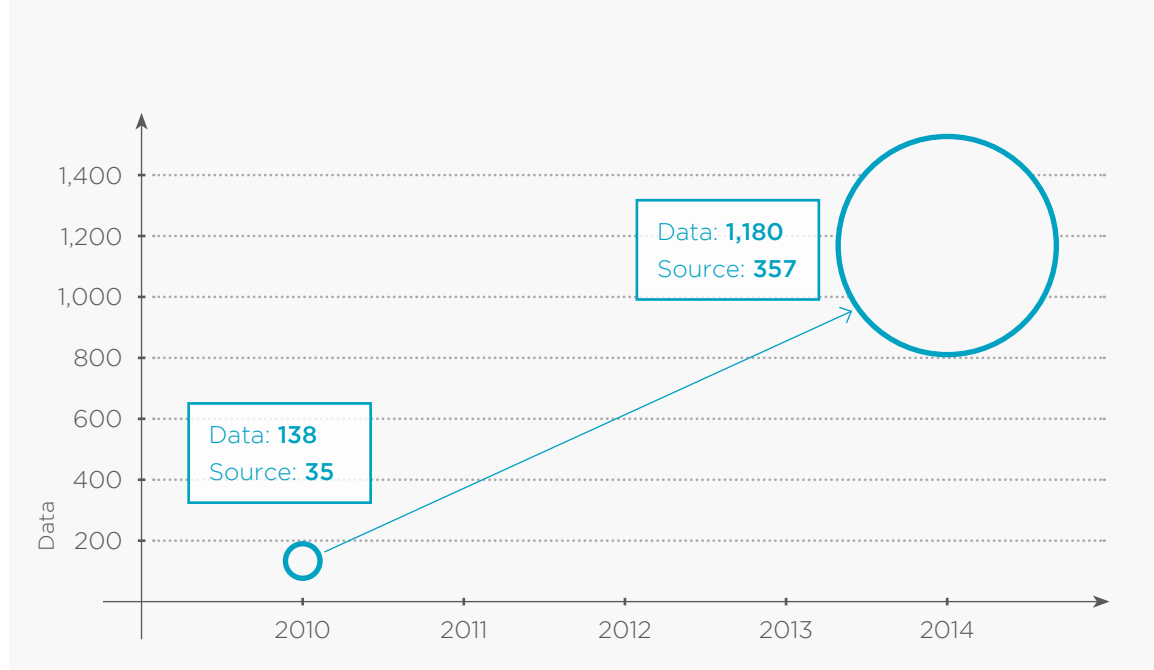
THE SCIENTIFIC BASIS

Ever since the first edition in 2010, the environmental impacts of food have been quantified by using data from three environmental indicators

(Carbon Footprint, Water Footprint and Ecological Footprint) made available by open-door 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 reconstruct the origin of the data.

The BCFN database

The data used in these five 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 which enable us to quantify the overall impacts of individual foods.⁸



The data used for calculating the averages of the environmental impacts of food has greatly increased since the publication of the first edition of the Double Pyramid. The size of the sphere indicates the number of sources, the height of the sphere indicates the amount of data.



Statistical coverage

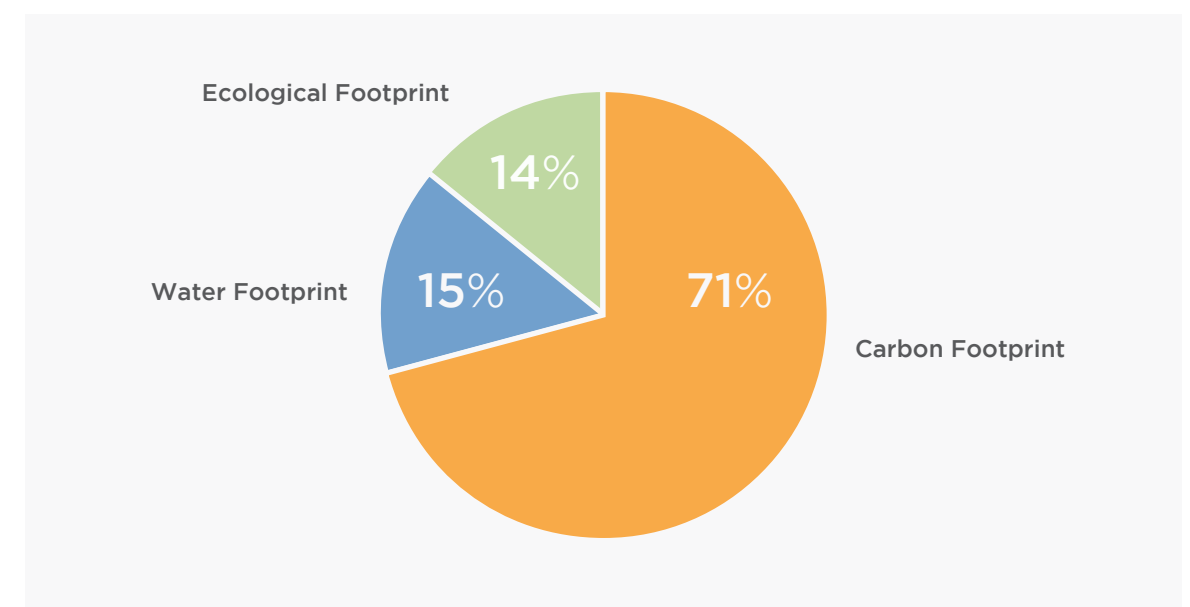
The amount of scientific data used for creating the Double Pyramid model has increased greatly over the years, from a database containing approximately 140 values in the first 2010 edition, it has reached 1,200 items of data in the fifth publication. The growing number of sources has strengthened the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

⁸ The statistical coverage obtained and the aggregation method used leads to more and more reliable values. More information about the database can be found in a support document which explains how the BCFN Double Pyramid database is structured in detail. The database and the support document can be downloaded from the BCFN website

www.barillacfn.com

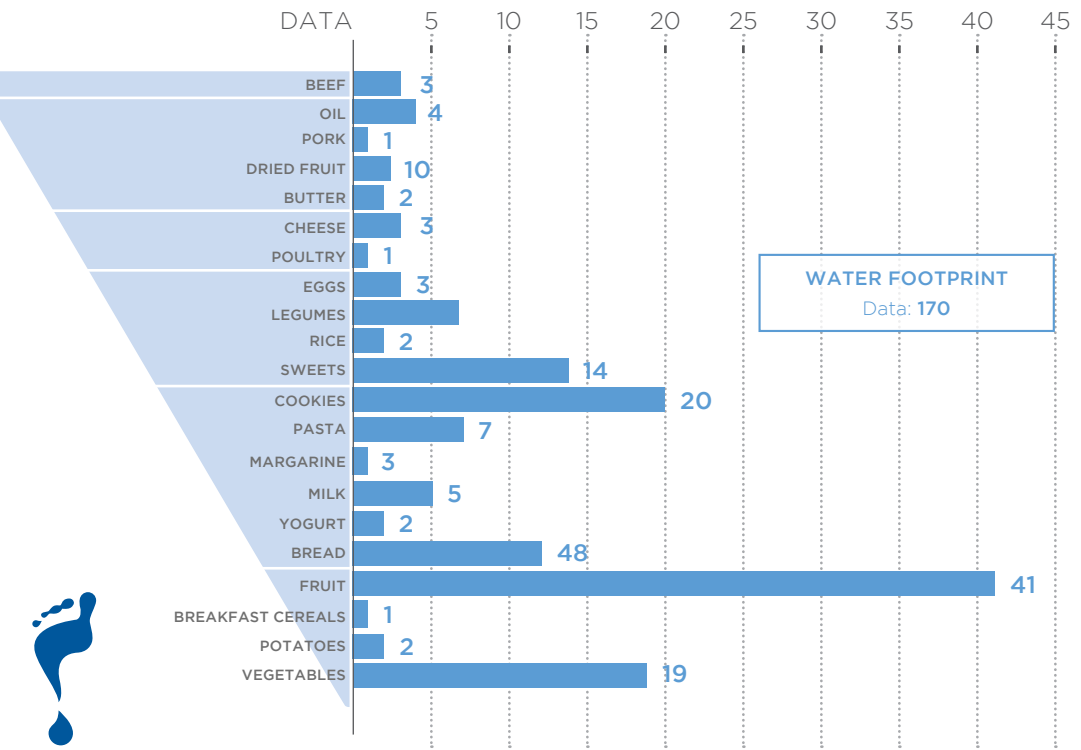
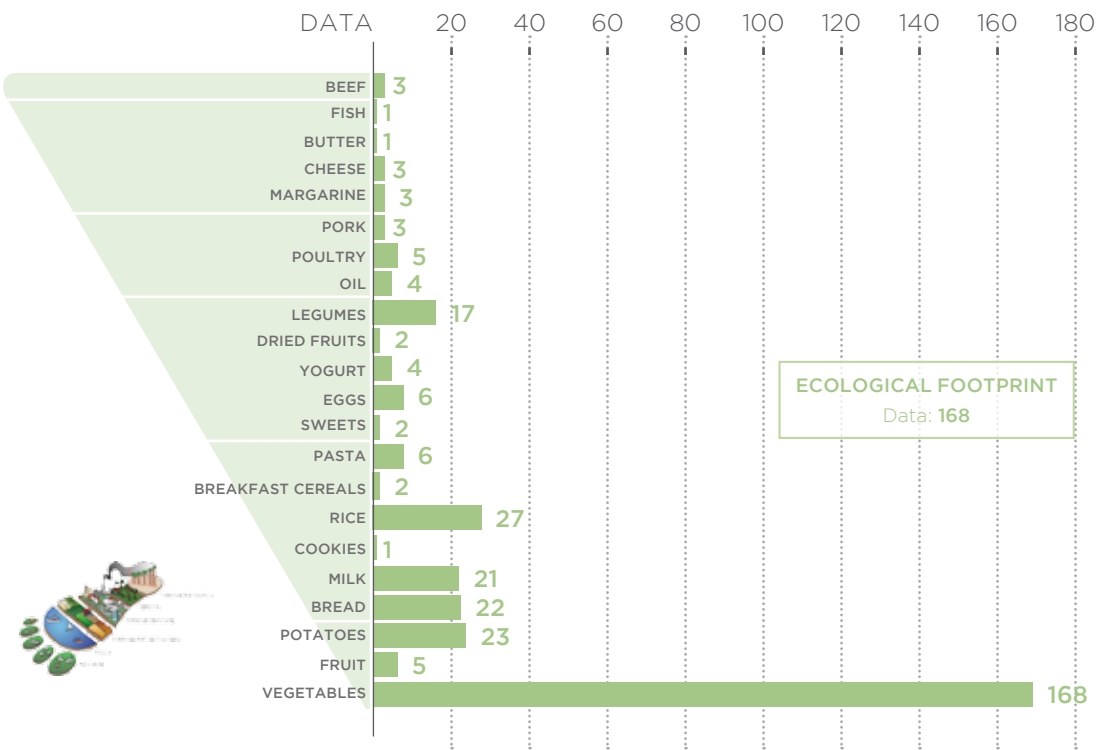
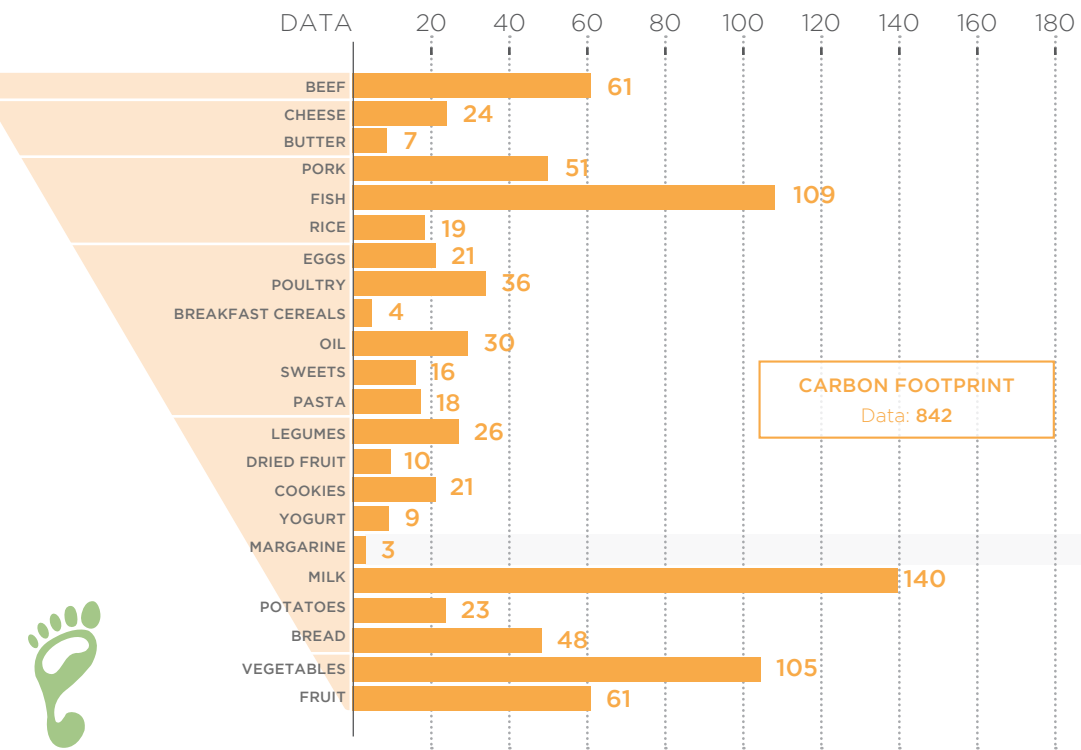
It is important to note that the percentage distribution of the studies varies for each of the three environmental indicators. Most of the sources used refer to the Carbon Footprint, followed by the Water and Ecological Footprints. This is due to various reasons. Firstly, the Carbon Footprint is the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

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



Distribution of bibliographic sources relative to environmental impacts of all types of data.

For each of the three environmental indicators, the percentile distribution of the scientific sources for every macrocategory that form the environmental pyramids can be seen in the table below.



The sources and data are accessible in the database of DOUBLE PYRAMID downloaded from the website www.barillacfn.com

THE THREE BCFN 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 for constructing the BCFN Double Pyramid.

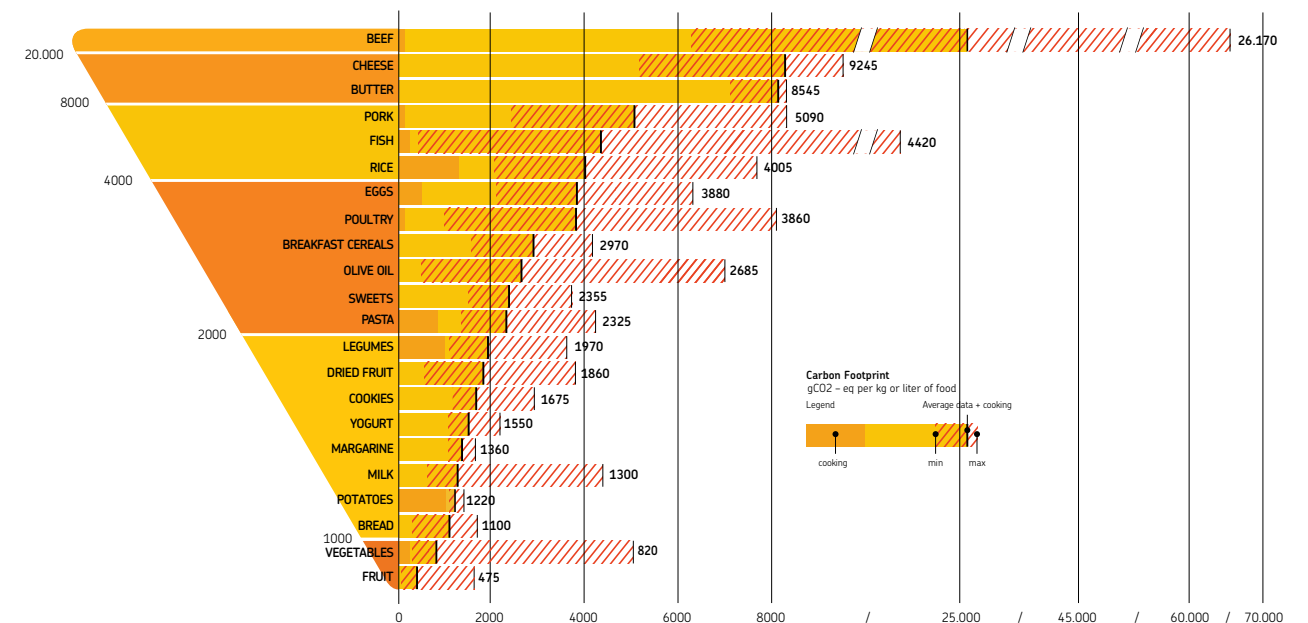
It is important to note that the three environmental pyramids shown below were very similar to those published in the first edition: the increased statistical coverage only marginally modified the numeric values.

The considerations made in the first edition of the document are

the same as for the fifth edition: meat and cheese have higher impact values per kilogram while fruit and vegetables have lower values of environmental impact.



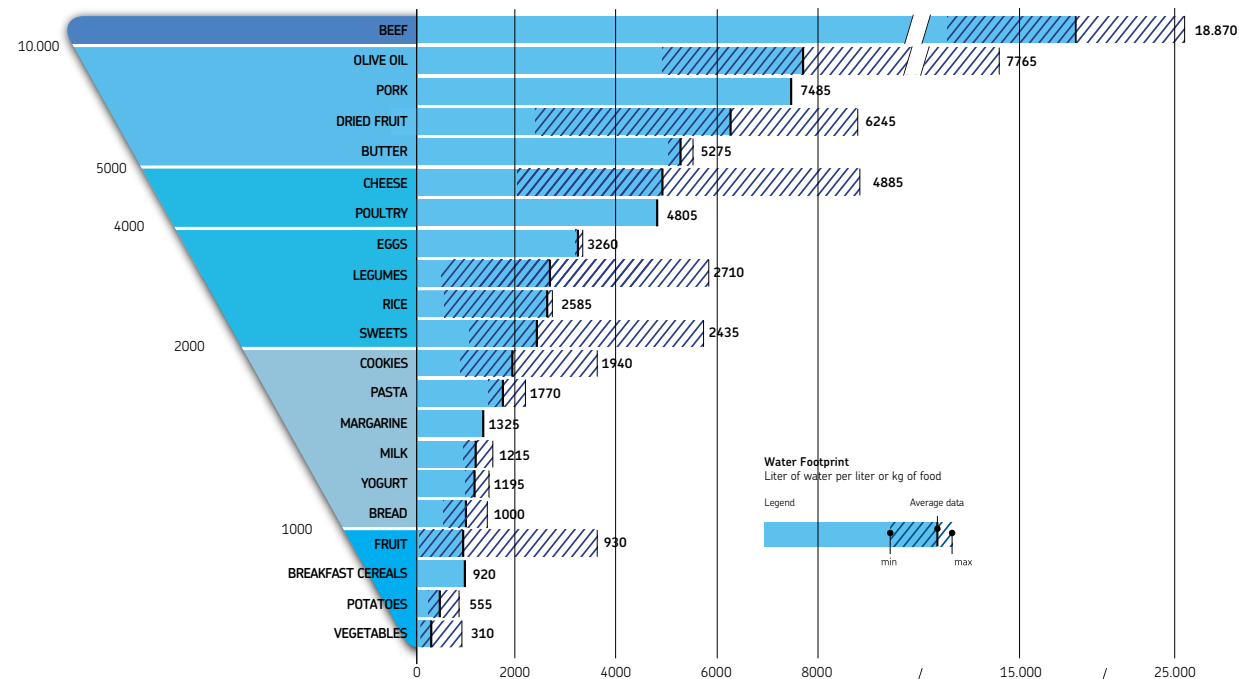
CARBON FOOTPRINT



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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 CO₂ (gCO₂ - eq). 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.

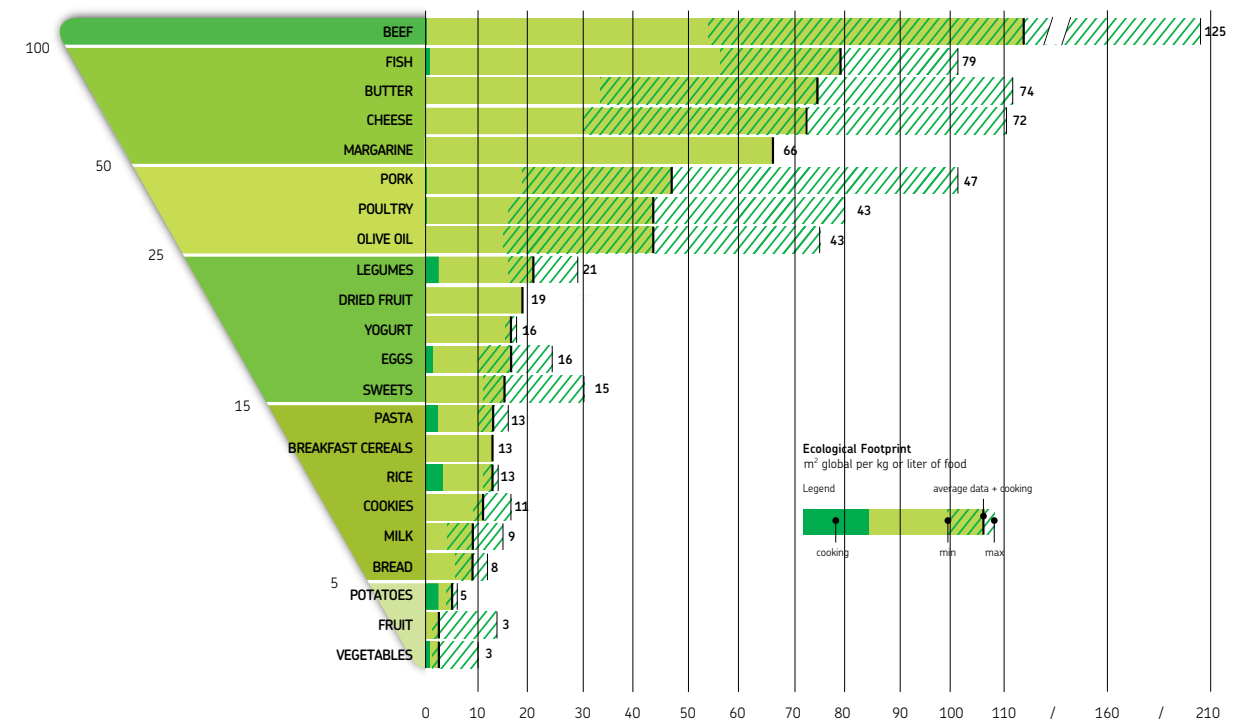
WATER FOOTPRINT



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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 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.

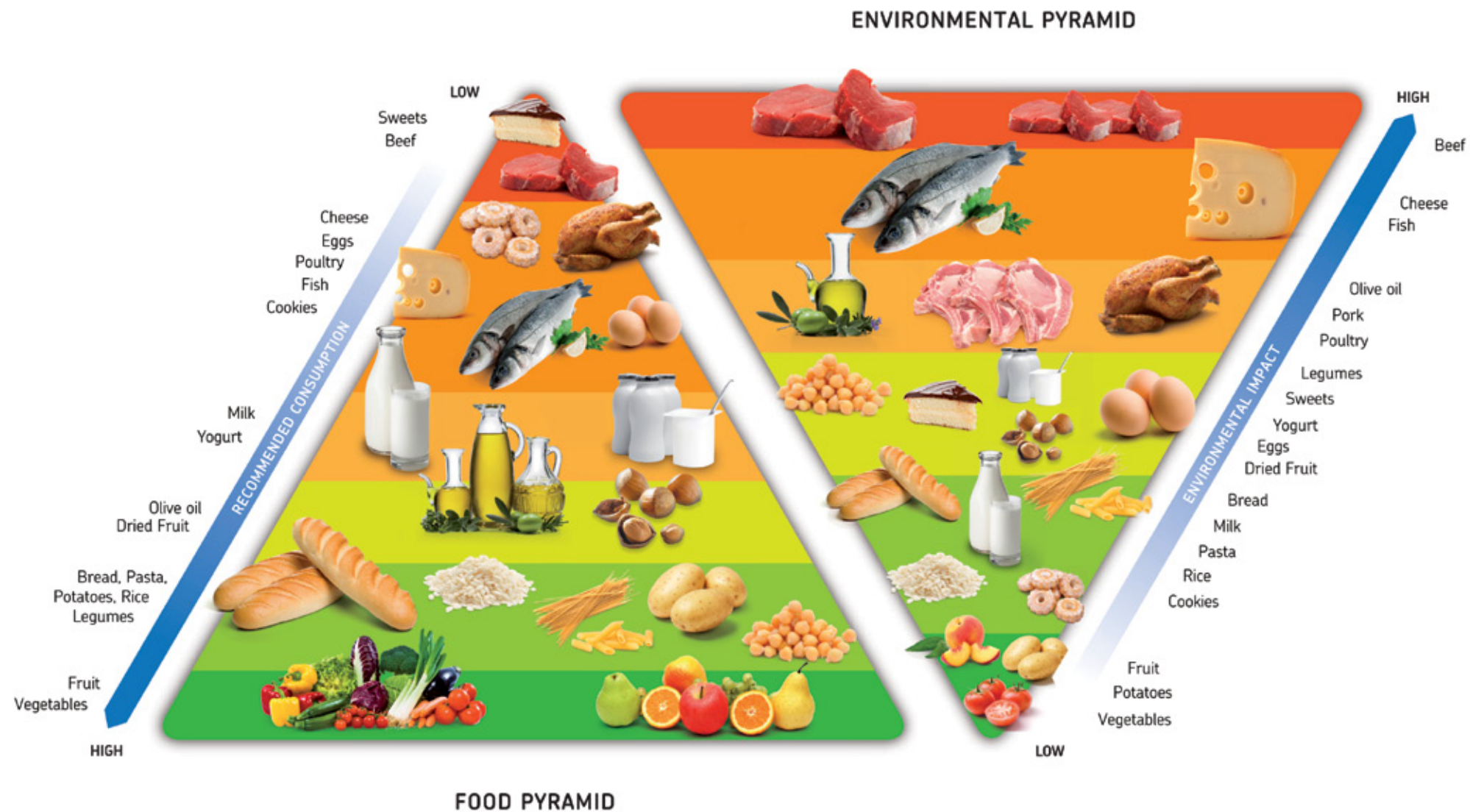
THE DOUBLE PYRAMID FOR ADULTS

The fifth 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 balanced 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. In this way we are more aware of what we should eat.

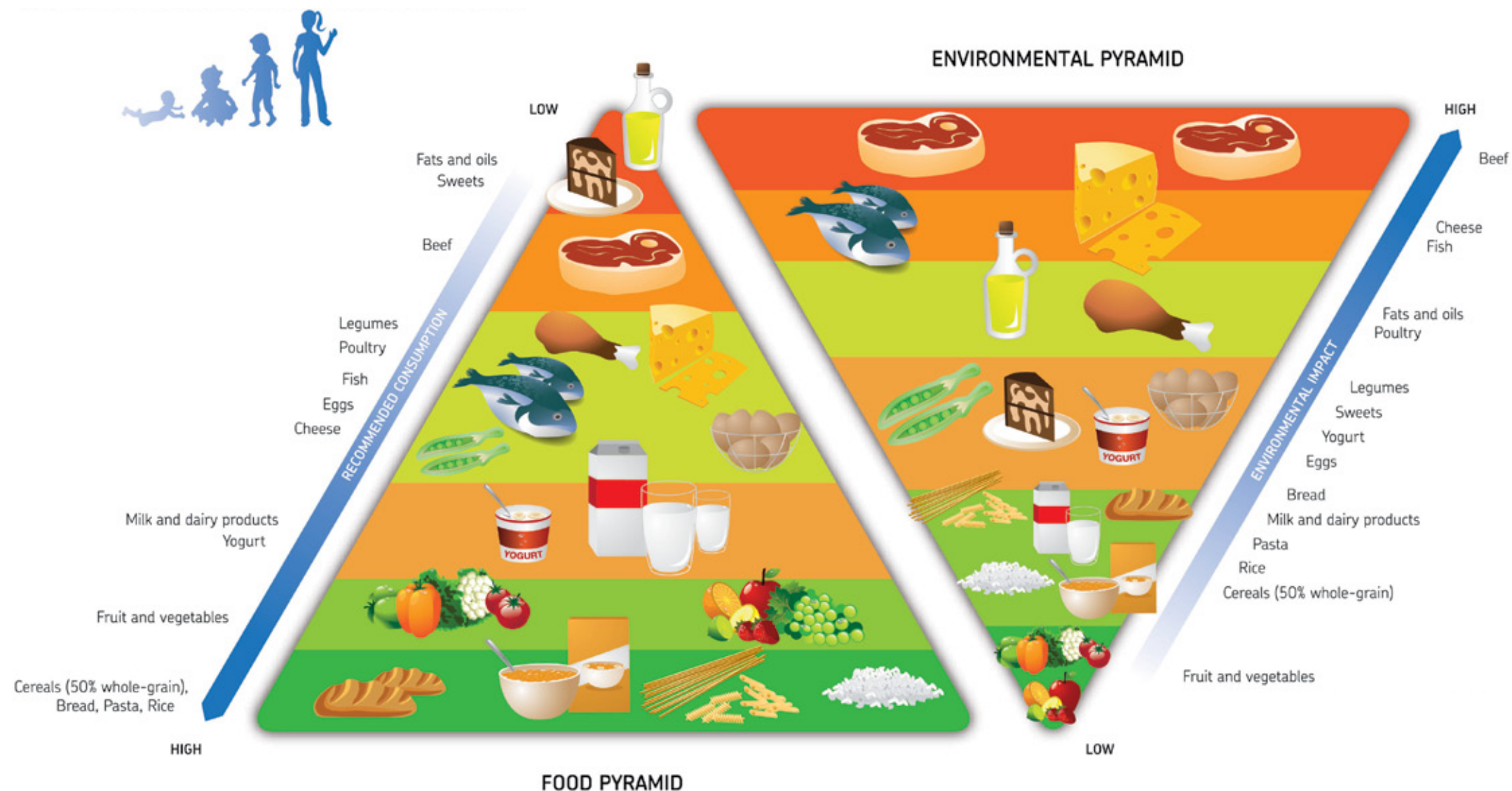
Thanks to its scientific credibility, the role of the Double Pyramid is to provide support by spreading the word of a sustainable diet that respects our health and the environment.



THE DOUBLE PYRAMID FOR THOSE WHO ARE GROWING

For adults, it is now a well-known fact that poor nutrition, excessive body weight and chronic diseases are closely related, while children and adolescents do not appear to be so aware of this relationship: 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.



A SUSTAINABLE DIET FOR EVERYONE

There should be a combination of environmental safeguarding, correct nutrition, and spatial development throughout the entire food chain, from the field to the table

As we know, 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 integrated the environmental variables with some estimates relating to the cost of the diets.

SUSTAINABLE DIETS ACCORDING TO THE FAO

In November 2010, the UN Food and Agriculture Organization and Biodiversity International organized an international scientific conference called "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 and to further develop this concept concerning nutrition and the availability of food. In the early 1980s, the term 'sustainable diet' meant the set of dietary recom-

mendations 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 has been neglected for many years.⁹

Due to the 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 dietary guidelines are required in order to deal with the issues concerning nutrition and the availability of food as well those concerning the various phases of the food chain from a sustainable viewpoint.



The final definition approved at the conference sponsored by FAO and Biodiversity International 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 CO₂ 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, FAO believes that it is necessary to involve private in-

dividuals and communities in both supply and demand in the fields of agriculture, nutrition, health, the environment, education, and culture.

Institutions should immediately take charge of orientating and supporting food production and consumption to be appropriate and sustainable everywhere in the world. Denis Lairon, the president of the Federation of European Nutrition Societies¹⁰, proposed hypothetical sustainable diets with low inputs including local and seasonal foods, as well as reasonable trade networks in close proximity.

The cultural heritage, food quality, and culinary skills are other key aspects which determine sustainable dietary models and food availability. Worldwide nutritional education programs should also be implemented.

⁹ From D. B. Burlingame's preface of the FAO book “Sustainable Diets and Biodiversity”, 2010. The last article in the chapter concerning the Mediterranean diet is dedicated to the Double Pyramid of the Barilla Center for Food & Nutrition [Ciati R., Ruini L. *Double Pyramid: Healthy food for people, sustainable food for the Planet*].

¹⁰ Lairon D, *Biodiversity and sustainable nutrition in a food-based approach*. In FAO, 2010, p. 31-35

Source: FAO, 2010

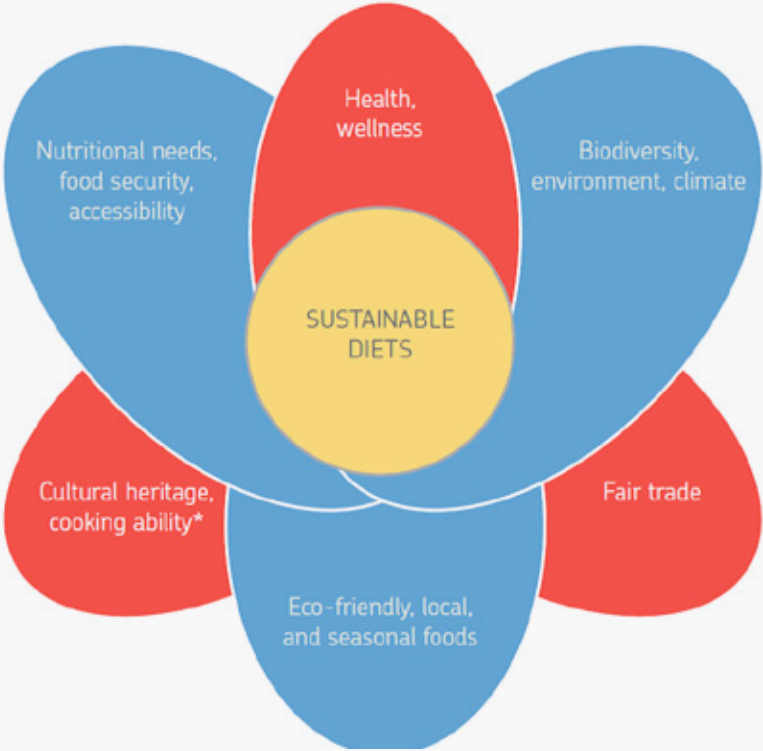


Diagram illustrating the key components of sustainable diets



	ENVIROMENTAL ASPECTS	NUTRITIONAL ASPECTS	ECONOMIC ASPECTS	SOCIO-CULTURAL ASPECTS
AGRICULTURE	Substitute 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 convenient 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.	Preserve nutrients along the food chain.	Produce culturally acceptable food.
CONSUMPTION	Reduce the environmental impact of food consumption.	Promote a diversified balanced and seasonal diet.	Promote a diversified balanced and seasonal diet.	Safeguard food traditions and culture. Meet local tastes and preferences.

An example of a sustainable food system

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 collective festivities. There is also a relatively new concept of the Mediterranean diet: biocultural diversity which originates from the many ways in which humans have interacted with their natural environment. Their co-evolution has led to ecological knowledge and some practices: an essential reservoir of experiences, methods, and skills that help the various companies to manage their resources.¹¹ Some researchers from the Mediterranean Agron-

omy Institute of Montpellier and Bari state that the traditional Mediterranean diet can be considered sustainable for various reasons. Firstly, for the large variety of foods which guarantee its nutritional and biodiversity values. 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 environ-

mentally-friendly diet thanks to the reduced consumption of animal products.¹²

The definition of a 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, from the farmer to the consumer.

BCFN SUSTAINABLE 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 (they all contain well-balanced nutritional components). The differences lie in the choice of foods that provide the nutrients required with particular reference to proteins.

These menus, which can be daily, are regularly used in BCFN publications for estimating the environmental impacts of the various food choices that people can make.

The environmental impact was calculated according to the database used for the Double Pyramid, while the economic calculus was carried out using available Italian data, obtained from the database of the Osservatorio dei Prezzi – Price Observatory¹³ (relative to the average prices observed in Milan and Palermo in March 2014).

Unlike environmental and nutritional issues for which data tend to be quite coherent, there are many complex variables concerning prices.

In fact, the price of food is influenced by the type of product (i.e. meat or vegetables) and by other aspects, such as its quality (real or perceived), the retail outlet (hypermarket, supermarket, retailer) where it is purchased, the geographic region, etc. Therefore, some simple elaborations were proposed to help you to understand how consumers' eating habits can affect food expenditure and the environment, in order to determine whether well-

balanced diets are affordable and environmentally sustainable. This is a purely indicative elaboration based on some of the food preferences used by BCFN for assessing environmental impacts.

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 mixture of products (in terms of type and quantity) eaten on a daily or weekly basis.

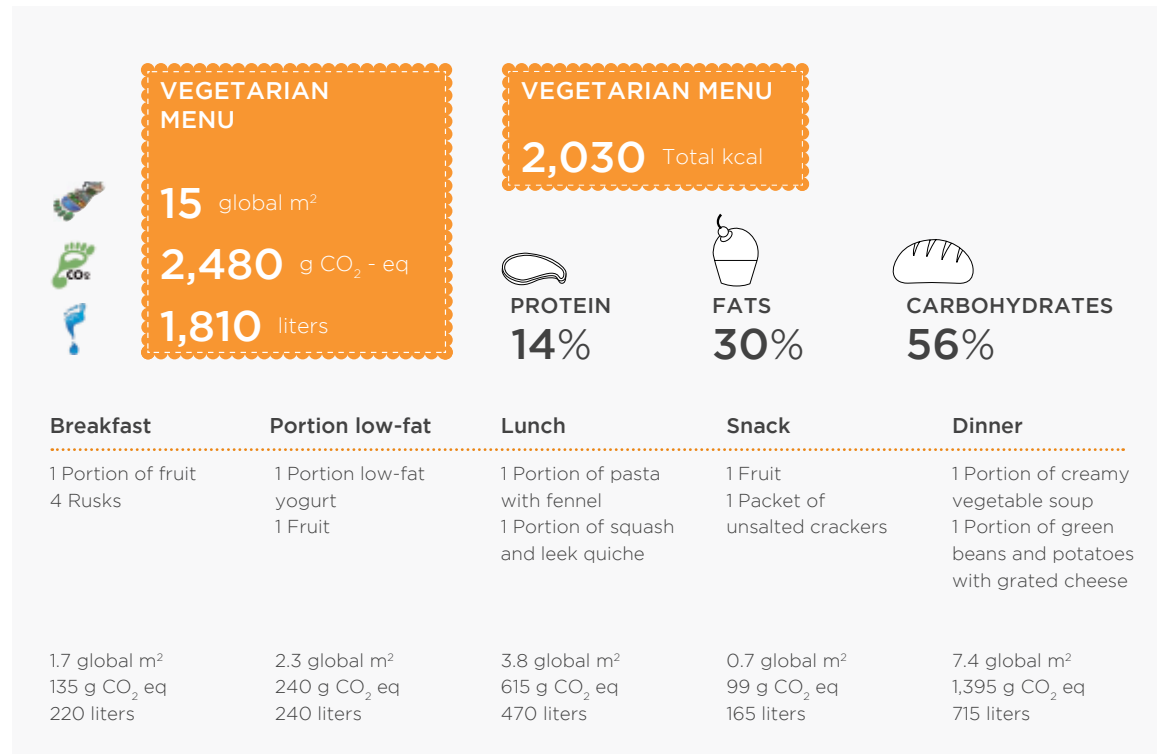
The daily menu

Two daily menus were analyzed in order to estimate the extent to which the food choices of individuals affect the Ecological Footprint: both are balanced in terms of calories and nutrients (proteins, fats and carbohydrates) from a nutritional point of view, yet the first menu contains proteins of plant origin (*vegetarian menu*) while the second contains proteins of mostly animal origin (*meat menu*).

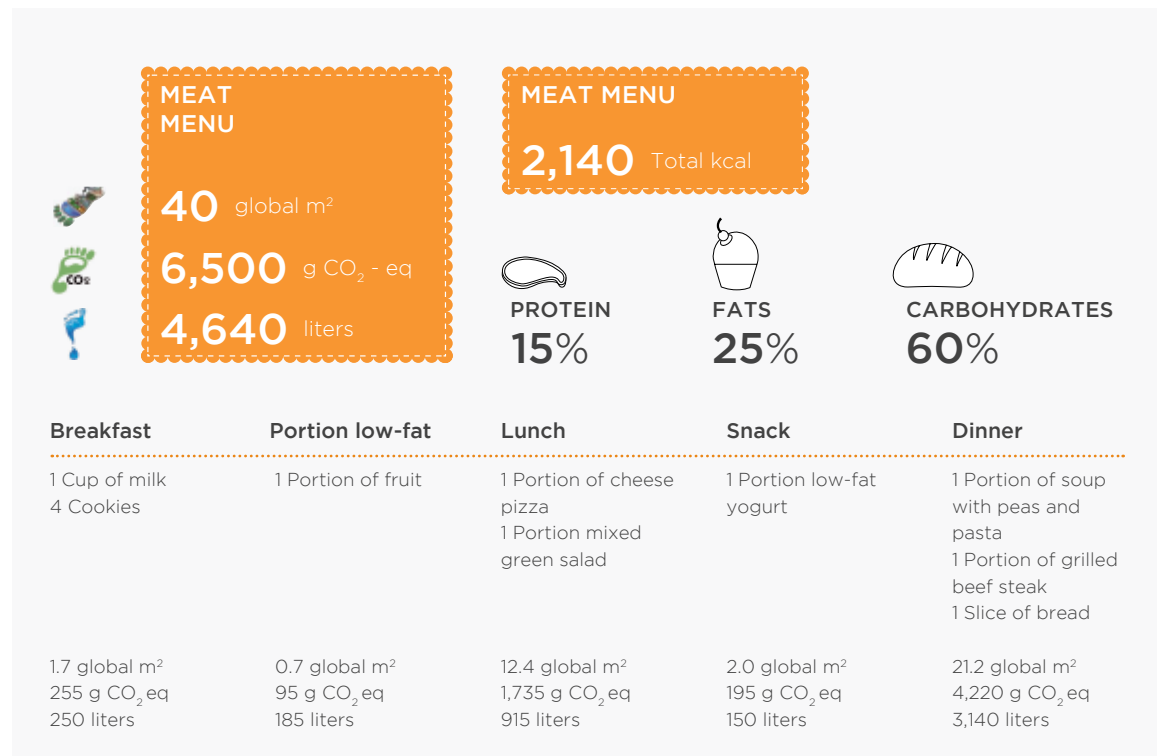
¹¹ Petrillo P.L., *Biocultural diversity and the Mediterranean diet*. In FAO, 2010, p. 224-229.

¹² Padilla M., Capone R., Palma G., *Sustainability of the food chain from field to plate: the case of the Mediterranean diet*. In FAO, 2010, p. 230-241.

¹³ The Prices and Rates Observatory carried out by the Italian Ministry of Economic Development. For further details concerning the complete dataset used for the elaboration, please see the BCFN technical support document for the Double Pyramid.



Composition of a vegetarian menu and relative environmental impact



Composition of a meat menu and its environmental impact

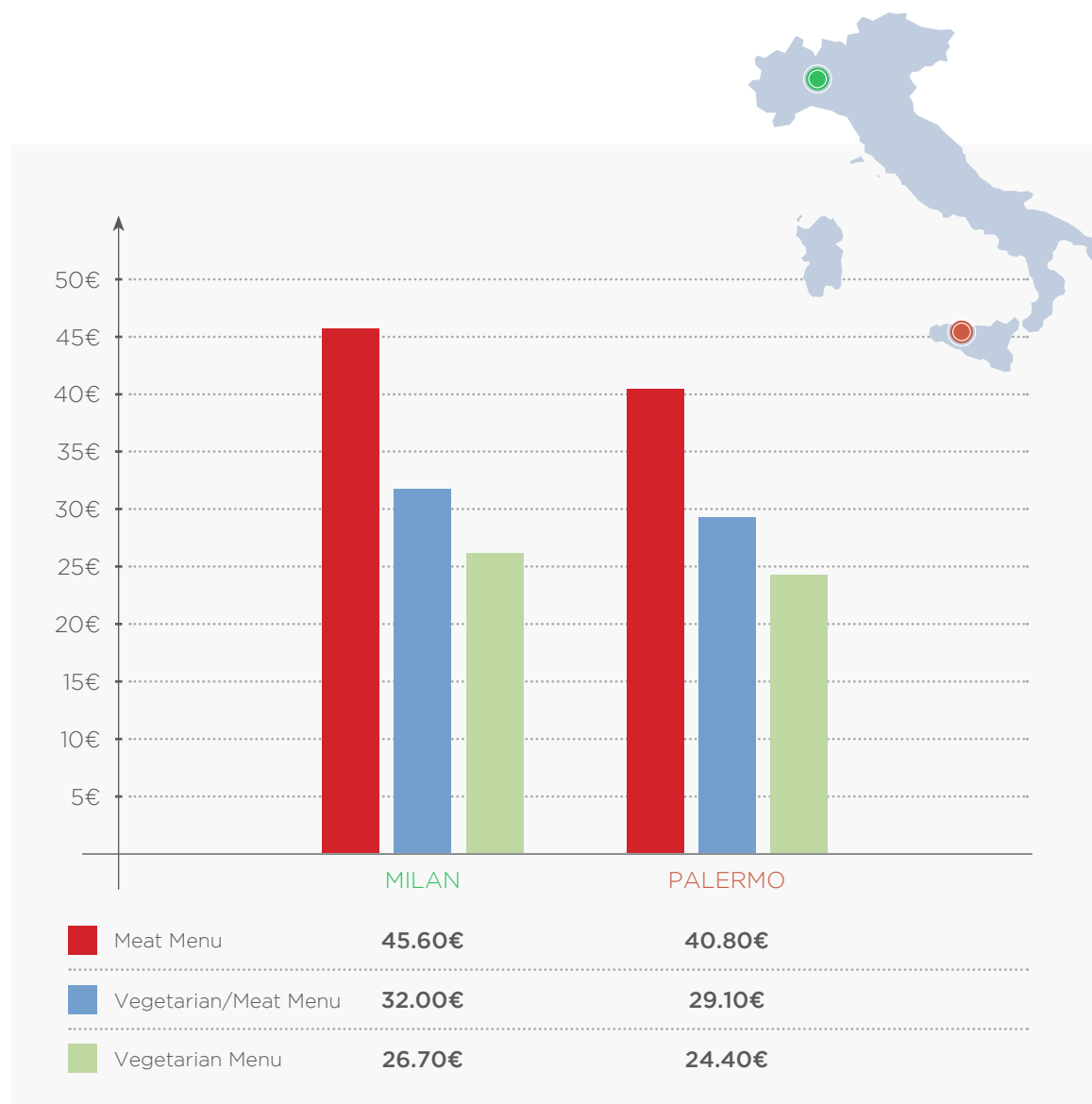
The meat menu has an environmental impact that is two and a half times higher than the vegetarian menu: a considerable share of the daily impact of an individual.

With this data it is possible to estimate how much an individual can reduce his/her food expenditure and environmental impact simply by changing his/her eating habits. By analyzing the food consumed in a week, we can hypothesize three different diets according to how many times a vegetarian menu is eaten and how many times the menu is based on meat: if one limits the intake of animal protein to twice a week, which is in line with nutritionists' recommendations, one can 'save' up to 20 square global meters per day.



How the Ecological Footprint varies according to the choice of food: the first diet is calculated assuming that only the menu with one meat dish will be eaten throughout the entire week; the second diet foresees two days with a menu featuring one meat dish, and five days following the vegetarian menu. The third diet is totally based on the vegetarian menu.

	WEEKLY IMPACT			DAILY IMPACT		
	Carbon Footprint [gCO ₂ eq]	Water Footprint [liters]	Ecological Footprint [global m²]	Carbon Footprint [gCO ₂ eq]	Water Footprint [liters]	Ecological Footprint [global m²]
7 TIME MEAT MENU	45,500	32,480	280	6,500	4,640	40
5 TIME VEGETARIAN MENU + 2 TIME MEAT MENU	25,200	18,200	140	3,600	2,600	20
7 TIME VEGETARIAN MENU	17,360	12,670	105	2,480	1,810	15



The price of three possible weekly diets

The weekly menu

An additional analysis was based on the calculation of the characteristics of four weekly menus, all well-balanced from a nutritional point of view, but with the only difference that their source of protein is from either animal or plant origin. The sustainable (or BCFN) menu includes both meat and fish, with a preference for white meat, and provides 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, eggs, etc.) and plant (legumes) sources. Lastly, the meat menu and the meat and fish menu foresee the consumption of larger quantities of protein from animal sources.

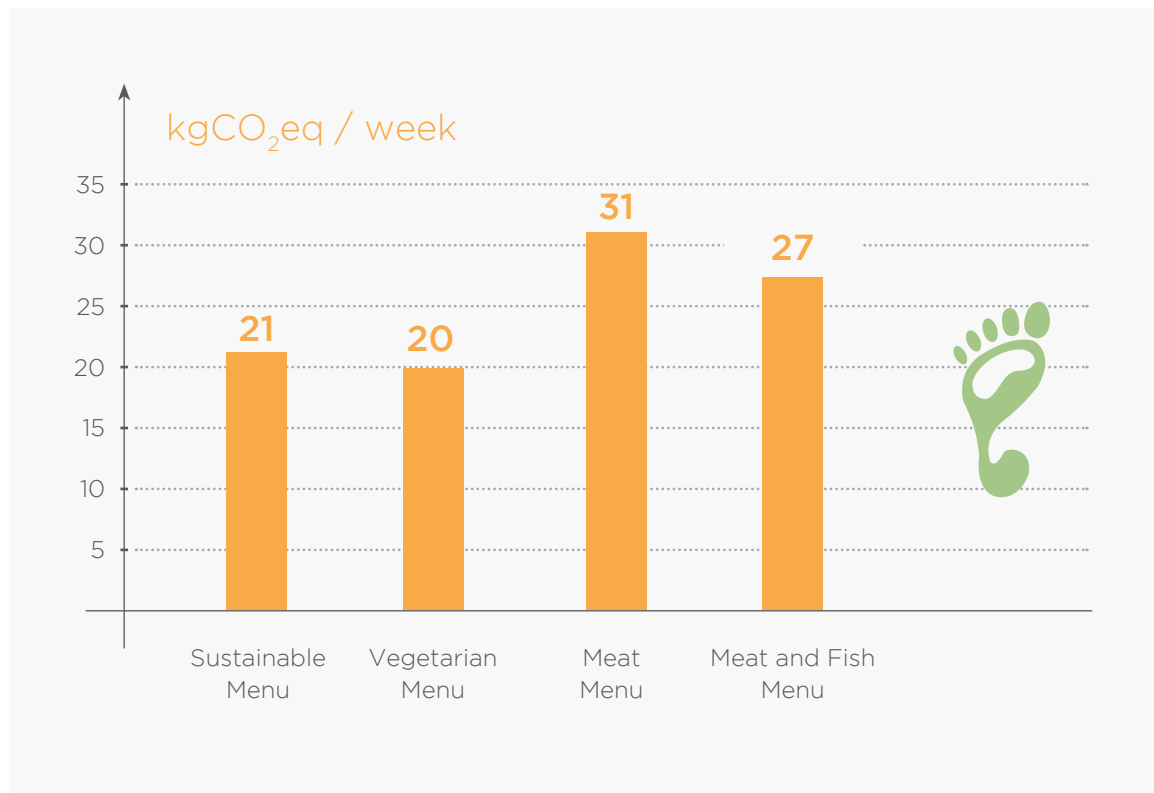
The differences in impact are minimal between the BCFN and the vegetarian menu, while the meat and the meat and fish menus have significantly higher values.

From an economic point of view, the menus have some minor differences. Specifically, the vegetarian menu and the sustainable (BCFN) menu have almost the same costs, due to the absence of meat in the first diet and their limited presence in the second diet; the menus which are the richest in protein of animal origin (especially meat and fish), however, have a slightly higher cost. Therefore we can say, from these preliminary elaborations, that in Italy, sustainable eating has a lower cost than diets rich in animal protein (meat or meat and fish).

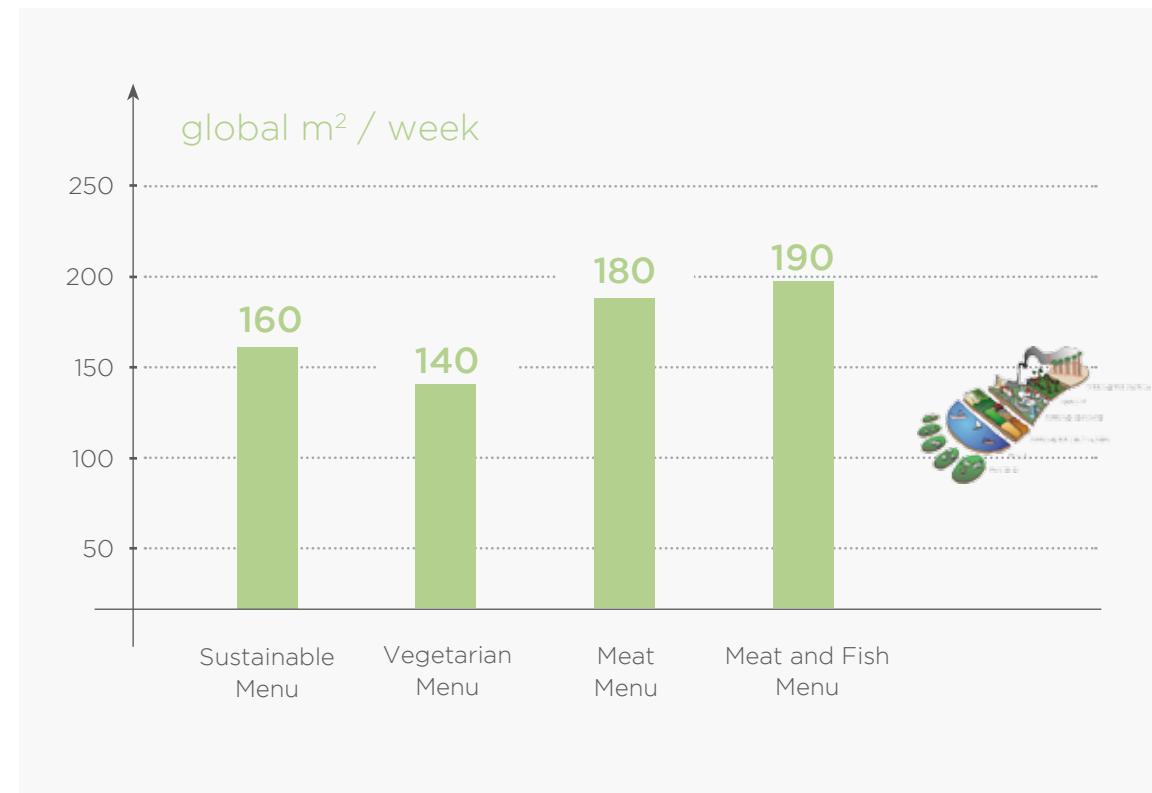
Regarding environmental impact, the two menus richest in meat and fish have values that are higher compared to the sustainable (BCFN) menu and to the vegetarian menu.

¹⁴ Please see the BCFN Double Pyramid technical support sheet for details of complete menus used for elaboration.

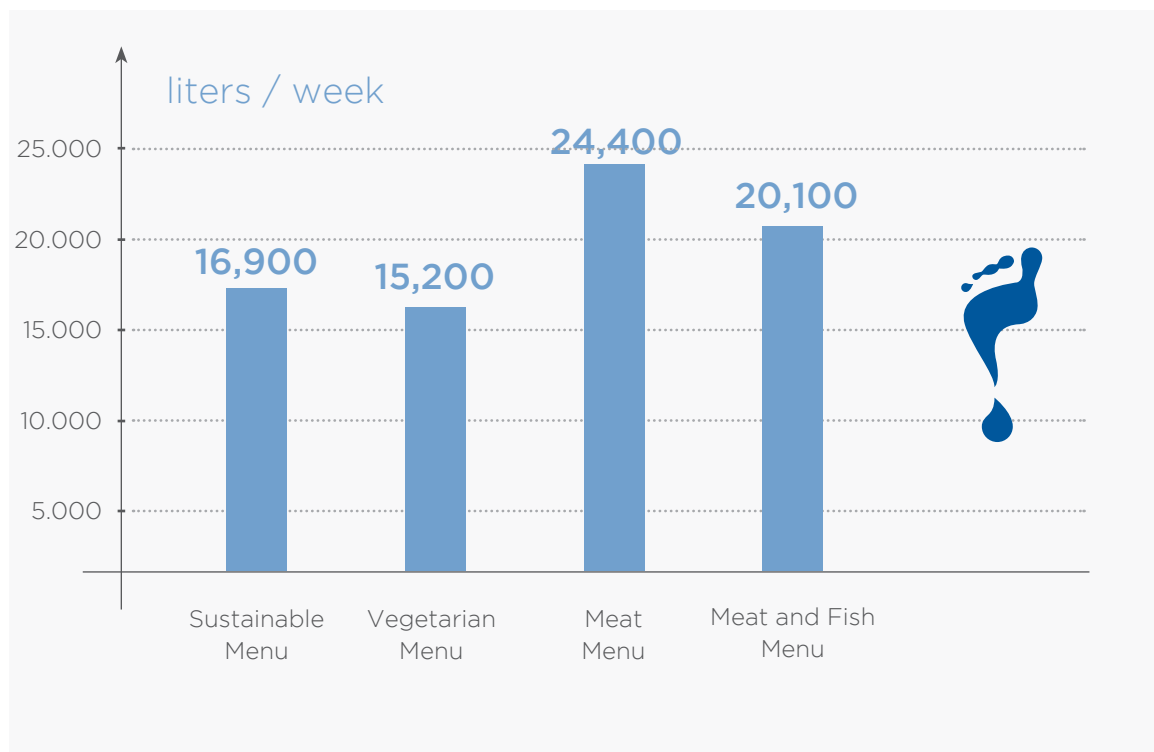




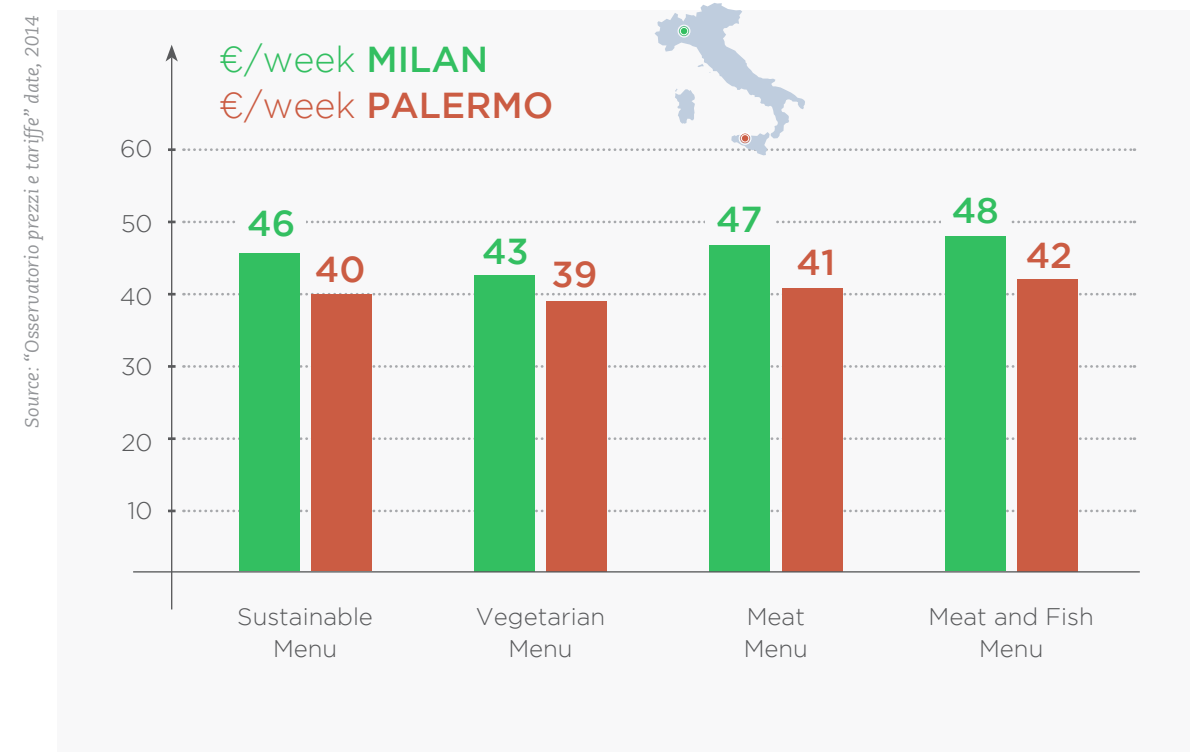
Carbon Footprint of the four menus analyzed, all well balanced from a nutritional point of view.



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



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



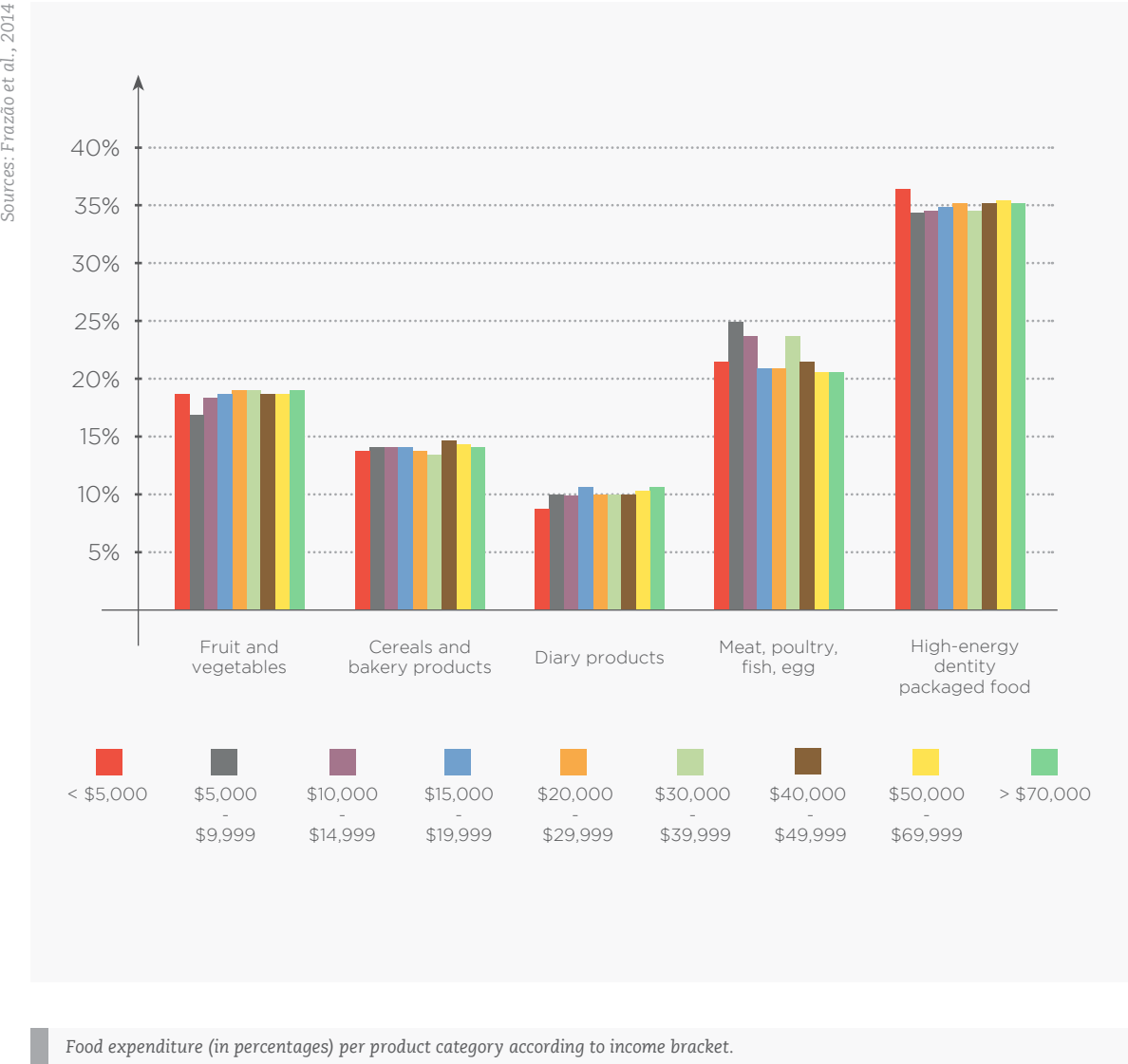
Cost of the four menus analyzed, all well balanced from a nutritional point of view.

SCIENTIFIC DEBATE
ON THE COST OF DIETS

According to a recent study¹⁵, the American population, regardless of income bracket, spends most of their food budget on meat (between 20 and 25%) and on the so-called ‘other products’ (about 35%), which generally refer to processed foods that are high in calories, salt, fats, and sugar.

According to some experts¹⁶, this trend of substituting healthy food such as fruit and vegetables with those considered to be ‘less healthy’ which are high in calories, is due to the fact that they cost less. But this issue is still the cause of much debate.

Let’s see why.



Comparison between the 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 of energy per calorie, the price per edible gram, and the price per average-sized serving.¹⁷

The price of food energy (price per calorie)

The price of food energy is the most frequently used metric in scientific literature, which is calculated as the ratio between the price for 100 grams of food and the number of calories it contains. According to some experts¹⁸, this measurement is misleading, since food that is high in calories is less expensive than food that is low in calories.¹⁹ 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 and is therefore misleading.

Price per edible gram

Measuring 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 the USDA analysis

In 2012, the USDA 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.²⁰

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’ in the study, i.e. foods that contain quantities of fat, added sugar or sodium which are above the levels recommended by the U.S. Dietary Guidelines).

¹⁵ Frazão et al., 2014

¹⁶ Especially Drewnowski

¹⁷ Carlson et Frazão, 2012

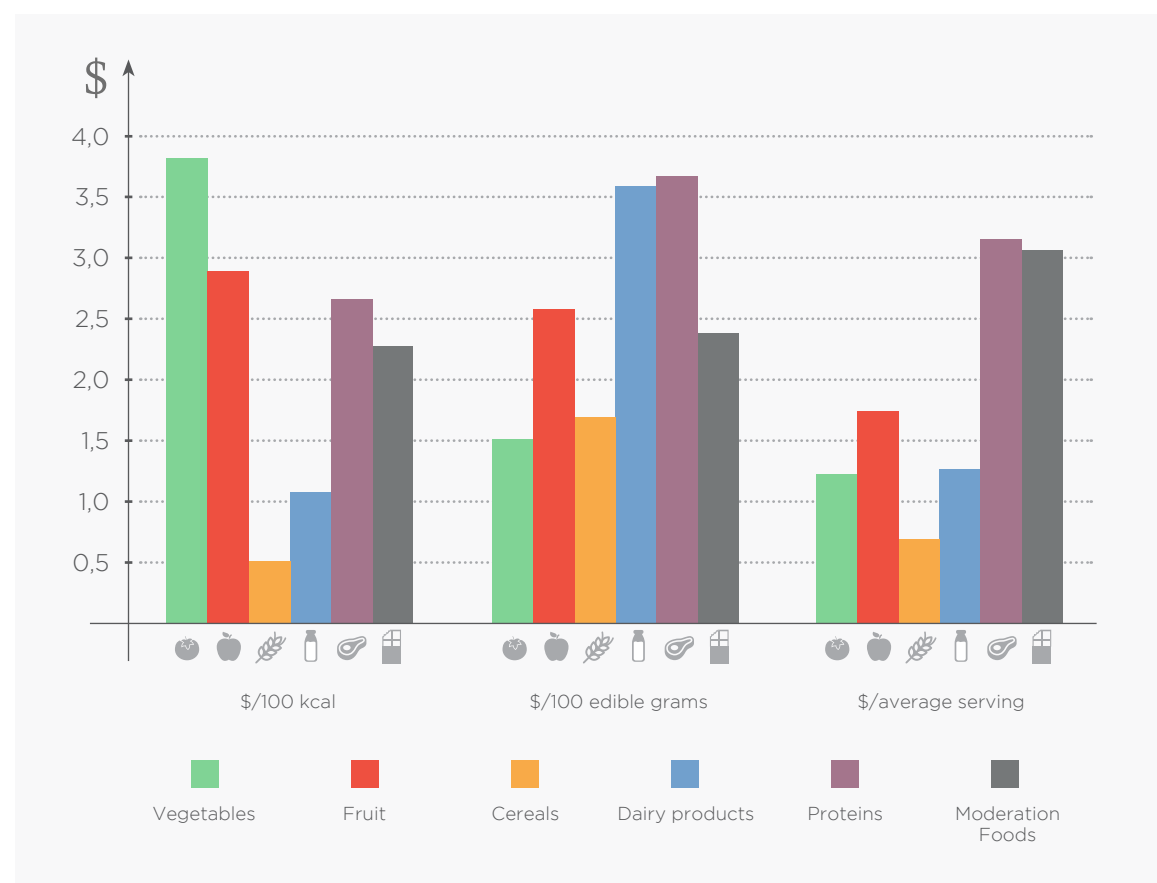
¹⁸ Carlson et Frazão, 2012

¹⁹ Lipski, 2009; Rao et al., 2013

²⁰ Carlson et Frazão, 2012

THE COMPARISON OF PRICES BASED ON KCAL DOES NOT TAKE INTO ACCOUNT THE AMOUNT OF FOOD EATEN

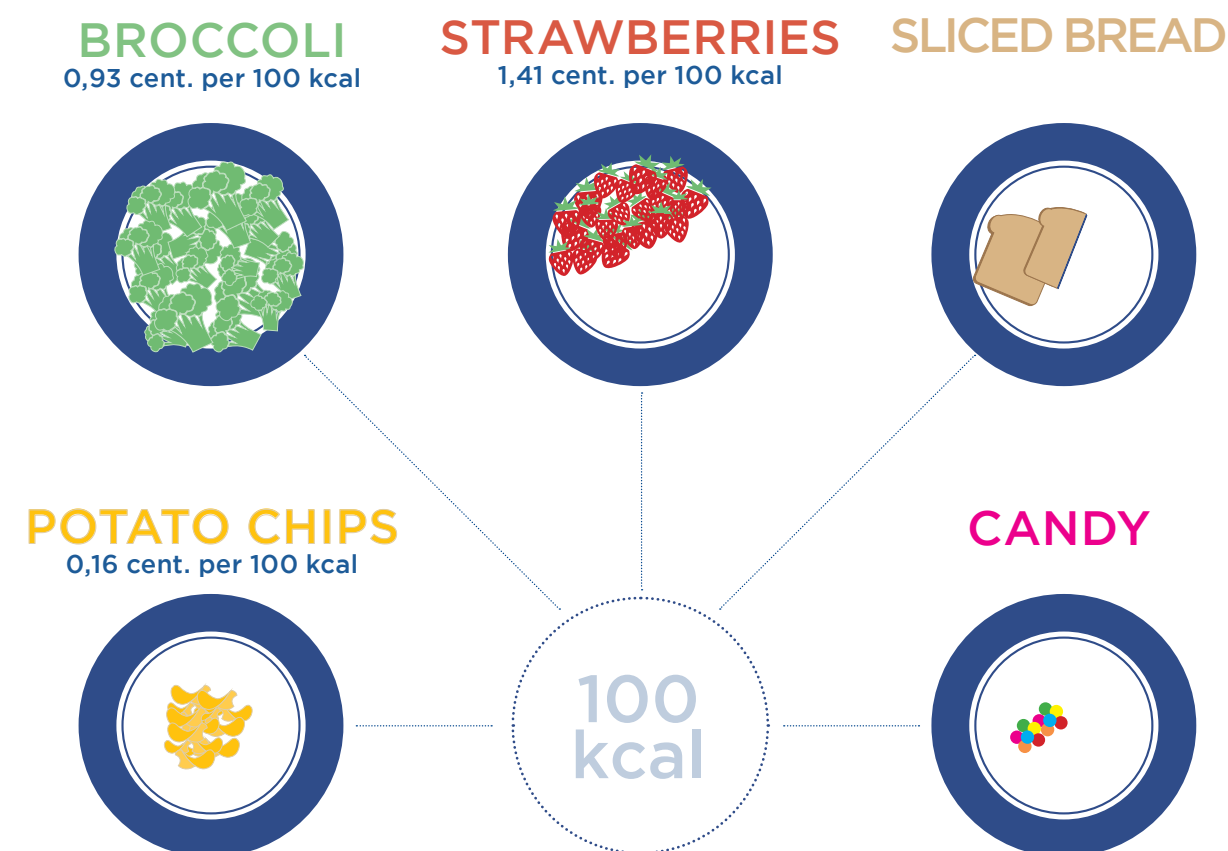
Source: Carlson e Frazão, 2012



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.

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 vegetables 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 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
 (http://www.ers.usda.gov/datafiles/Fruit_and_Vegetable_Prices/Snack_Substitutions/snackprices.xls)

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.²¹

An opposite trend²² was observed between the energy content of a food, its cost per calorie, and its content of micronutrients. It is evident from this report that the relationship 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.²³ The relationship between obesity and socio-economic status has been confirmed by several studies²⁴: 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%), who also have a better diet in terms of nutritional intake.²⁵

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.²⁶ The authors compared the cost of a ‘healthy’ diet compared to a less healthy one, both in terms of individual foods and dietary regimen in general. The results show that healthier di-

ets 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 for consumers, especially if they belong to a low socio-economic category.

For example, the USDA Food Plans state that it is possible to feed a family of four on a budget of 640 dollars per month²⁷, although there may be limitations concerning palatability and the preparation times required.

Another study²⁸ showed that, for certain food categories, the ‘healthiest’ version can cost even less than the original version containing a large amount of fat.

Other studies²⁹ 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. This is also confirmed by two studies concerning the adoption of the Mediterranean diet by Canadian and American citizens: if you select the cheapest foods for an equal amount of nutri-

ents, the regimen based on the Mediterranean diet is no more expensive than the high-calorie alternative. In some cases, an improvement in the nutritional quality of the diet may even save money.

Another research study³⁰ 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 program, their meat expenditure dropped by 54% and their weekly food expenditure by 45%, from 67.68 to 37.12 dollars per week, which is equal to a monthly saving of approximately 124 dollars.

Similar results were observed in the analysis³¹ regarding the eating habits of the Latin American population in the United States, which involved 20 low-income Latin-American families in an intensive program of nutritional education. The families were given advice on how to follow a correct budget-friendly diet. At the end of the program, the participants were able to select healthier food independently and follow a low-calorie diet while reducing their food expenditure at the same time.

The scientific literature analyzed demonstrates that it is possible to eat healthily regardless of income level: in fact, ‘healthy’ diets do not necessarily cost more.

Since it is necessary to modify one’s eating habits, education plays an important role in order to acquire the necessary information and purchase the right food for a correct diet.

Therefore, public authorities should intervene in order to break down all those physical and educational barriers that may jeopardize the most vulnerable citizens’ access to healthy food.

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²¹ Katz et al., 2011; Frazão et al., 2014
²² 2004, 2005, 2012
²³ Drewnowski et al., 2004, 2007
²⁴ Aggarwal et al., 2012
²⁵ Aggarwal et al., 2012
²⁶ Rao et al., 2013
²⁷ Dati aggiornati a Gennaio 2014
²⁸ Katz et al., 2011
²⁹ Mitchell et al., 2000; Raynor et al., 2002; Goulet et al., 2008
³⁰ Flynn et al., 2013
³¹ Cortès et al., 2013



DOES AN HEALTHY DIET COST MORE IN THE U.S.?



PRICE PER AVERAGE PORTION

- 3.1 \$ Moderation Foods
- 1.7 \$ Fruit
- 1.4 \$ Vegetables
- 0.7 \$ Wholegrain Cereals



PRICE PER EDIBLE GRAM

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



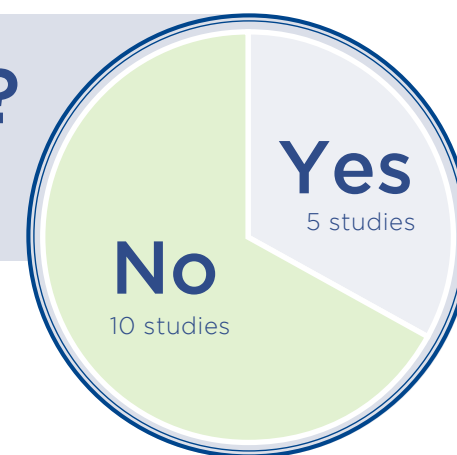
PRICE PER CALORIE

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

It depends on how the price is measured

Does it cost more?

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

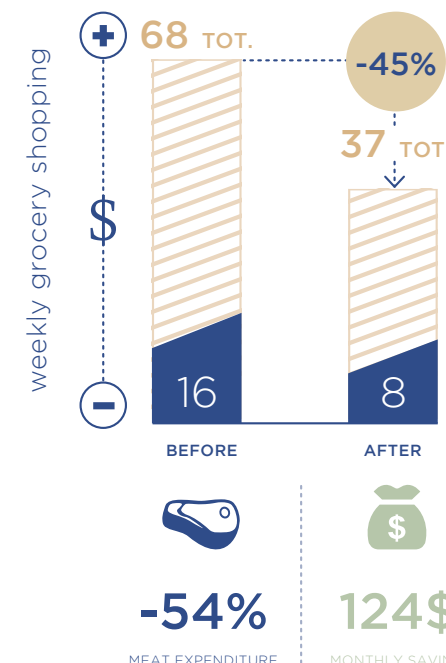


No, not if you choose cheaper foods which are high in nutrients

“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 showed by the graph on the right side, “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).



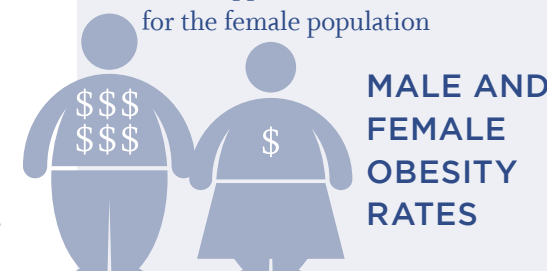
10 STUDIES show **EDUCATION** plays an important role

5 STUDIES

Yes, it does cost more 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



CONTROVERSIAL



HOW TO PROMOTE SUSTAINABLE FOOD CHOICES

The family alone is no longer capable of distinguishing the proper dietary behavior or limiting or counterbalancing the effect of advertising which conveys unbalanced messages in terms of nutrition

In order to obtain real results concerning people's eating habits by delivering the three main messages of the Double Pyramid, comprehensive training programs must be implemented involving various participants from the family environment as well as from society as a whole.

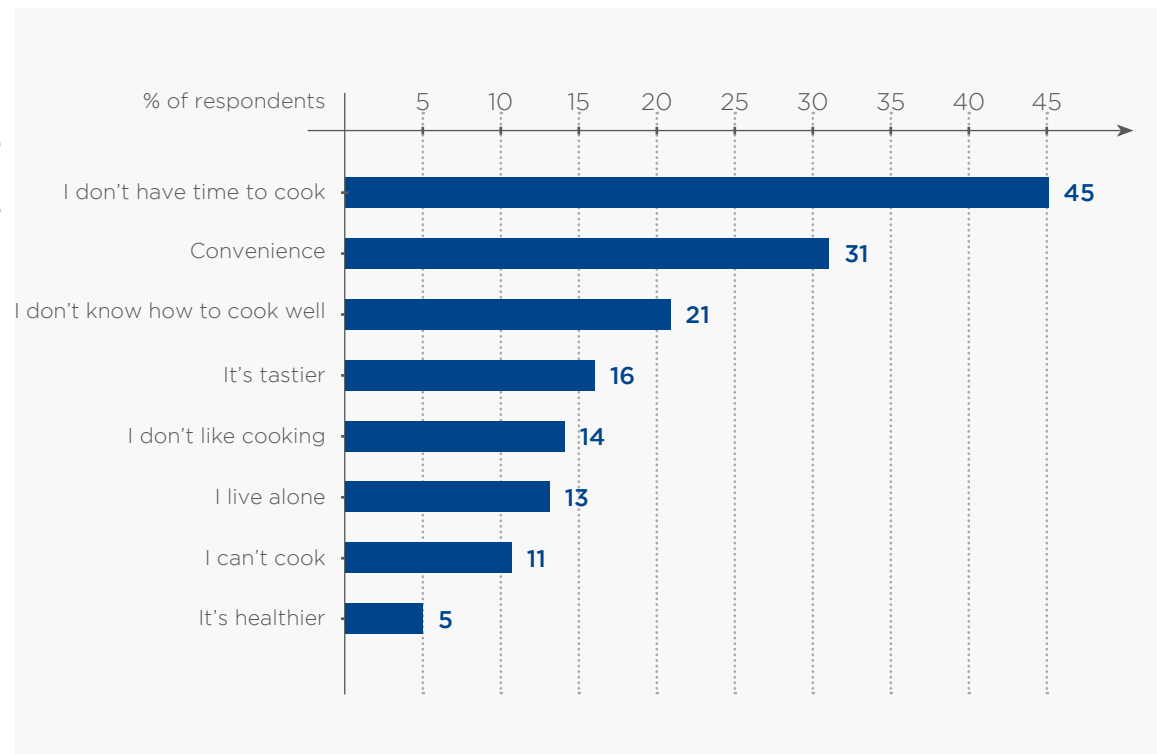
Since the second edition of the Double Pyramid came out in 2011, the BCFN has tried to find the most effective ways for spreading the culture of the 'sustainable diet' among people. For this reason, various studies concerning eating habits have been analyzed in order to understand the importance of the role of the family regarding consumer education by considering food advertising and other forms of education through the mass media (social communication). The hypothesis is that the family alone is no longer sufficient, due to

lack of time, motivation, and sometimes adequate knowledge and awareness. Parents are no longer able to give their offspring the right orientation, to limit or compensate for the effect of advertising which sends confusing messages in terms of nutrition.

THE SOCIAL ENVIRONMENT

The family

Parents and close relatives have always been the first to explain the basic principles of healthy eating to children. A positive relationship has been found between the presence of parents during the evening meal and a higher consumption of fruit and vegetables by adolescents, as well as a drop in the probability of them skipping breakfast,



Reasons that lead people to purchase convenience food.



which is one of the worst food habits. Even better results are observed in extended families where grandparents influence the eating habits of youths much more than parents. Unfortunately, various global trends demonstrate that in the home there has been a sharp increase in the consumption of snacks and convenience food, and a decrease in scheduled lunches and dinners, combined with a general decrease in the time dedicated to meals and an increase in their consumption on the go. From 2006 to 2011 the purchase of ready-prepared meals worldwide increased by 27% and according to a research survey carried out by Euromonitor International, 31% of households buy them on a regular basis.

The graph above shows the reasons justifying this behavior provided by the respondents. Less time spent at the table, less time spent eating with parents, less time for cooking: these are all trends

that trivialize the ritual of the meal and reduce the general dietary knowledge required for a healthy and well-balanced diet, especially among the younger generations.

Friends

What we eat is greatly influenced by the table-mates with whom we share our meals. In fact, when eating with our friends, we tend to lose control of the situation and let others decide about the length of meals, the number of courses, and the size of servings.³⁶ We unconsciously imitate the behavior of the group to which we belong, therefore whenever we are surrounded by foodies, we are not likely to prefer a serving of fruit to dessert. The psychologist John De Castro has demonstrated how the presence of other people at the table increases both the time we spend at the table

and our food intake.³⁷ You tend to eat 35% more when dining with someone else than you would on your own. If you eat with a group of seven or more friends, you tend to eat almost double (96%). This has been confirmed by the University of Birmingham, where it has been proved that eating with friends is often responsible for weight gain and an incorrect choice of food.³⁸

Workplace

The workplace may also try to train its workers to lead a healthier lifestyle. A report published by the ILO (International Labour Organization) analyzed dietary habits in various parts of the world and observed that a diet which is either too rich or too poor can lead to a decrease in productivity of almost 20%.³⁹ Obesity increases the likelihood of sickness leave, difficulty of movement within the

workplace, and fatigue. According to a report by the UK National Audit Office, in England alone in 2001 obesity was responsible for 18 million days of sickness leave and 30,000 premature deaths. The promotion of healthy lifestyles appears to be essential for companies, with the aim of positively affecting not only the well-being of the workers, but also efficiency, yield, and productivity.⁴⁰

³² Videon et Manning, 2003

³³ Monash University, 2013

³⁴ Report Euromonitor International, 2012

³⁵ Datamonitor, 2011

³⁶ Robinson et al., 2014

³⁷ De Castro, 1994

³⁸ British Journal of Nutrition, University of Birmingham

³⁹ ILO, 2005

⁴⁰ Baccolo et al., 2010

FOOD COMPANIES' MARKETING

The producers

In recent years the most far-seeing companies, both producers and distributors, have been actively committed to implementing campaigns aimed at promoting healthy diets.

Let's take a look at the most interesting examples provided by the main food companies which are committed to promoting sustainable diets.

COMPANY	COMMITMENT/INITIATIVE
	Has changed some of the ingredients in its drinks in order to reduce the amount of sugar and has implemented a number of programs aimed at the nutritional education of the younger generations. In 2011, the project "Bon app��tit, bouge ta sant��!" was launched in Belgium, which involved primary school pupils in an educational program focused on the importance of physical activity and a well-balanced diet.
	Launched its strategy of sustainable business "The Sustainable Living Plan" in 2010, which concerns three important topics: improving people's health by promoting healthy products and lifestyles, safeguarding the environment, and improving the living conditions of the communities in which it operates. Furthermore, it is committed to reducing the calorie content of ice cream and the amount of added sugar in its beverages. It does not implement advertising campaigns directly targeted at children under 12 years of age.
	Is committed to fighting diseases caused by overeating or bad eating habits by providing the foundations of a correct nutritional education through scientific research programs (to improve the nutritional quality of the products), and educational programs (to promote proper nutrition). Among these, there is the international Nestle Healthy Kids Global Programme, a project aimed at children and implemented in collaboration with EPODE International Network.
	Has made nutritional education its strong point by carrying out educational campaigns on the Internet, voluntary nutritional labels, and initiatives in schools. Its website kelloggnutrition.com was established in 2012, which is for nutritionists and contains useful scientific information on nutrition and wellness. With the initiative Breakfast for Better Days (2012-2013), Kellogg's has funded 98 school projects in order to ensure a complete breakfast for students.
	Makes the safeguarding of their consumers' health one of the main objectives of its Nourishing Lives mission. Since 2005, it has reformulated the recipes of over 750 products in order to improve their nutritional profiles. It is known for its advertising campaign aimed at promoting reasonably sized portions of food and discouraging overeating. It is committed to not implementing advertising campaigns aimed at primary school children.
	Has launched Live Positively which is an integrated sustainability strategy including Balanced Living that explains how to fight obesity and promote a healthy lifestyle. In this context, it has sponsored over 290 programs with strategies that vary from country to country. It also founded Coming Together which is a website where people can share their ideas for fighting obesity. It does not implement advertising campaigns addressed to children under 12 years of age.
	Promotes sport for fighting childhood obesity and physical inactivity. It supports "Media Smart" which is an educational program for children aimed at creating a critical approach to television programs and the content of advertising commercials.
	Has implemented a sustainable business strategy based on respect for people and the environment: "Good for You, Good for the Planet." The Group has adopted the Double Nutritional and Environmental Pyramid model as a reference point for its way of business. In this context, it is continually trying to improve the nutritional profile of its products. In 2011, Barilla launched the Si.Mediterraneo project, aimed at increasing its staff's nutritional knowledge and promoting a sustainable diet in its staff canteens.

The distribution initiatives

In the distribution phase, retail outlets play an important role in promoting healthy diets and there are generally no conflicts of interest among the various product categories which is typical of

some manufacturers. Several chains of retailers have recently implemented practices of corporate social responsibility in order to improve their brand image.

A summary of the most interesting initiatives carried out in various countries can be seen in the table below.

COMPANY	COMMITMENT/INITIATIVE
	Has measurable performance indicators and is committed to having a healthy range of products. With the aim of promoting healthier food, even in the so-called 'impulsive purchasing' phase, at the end of 2014 it announced that chocolate and snacks would no longer be kept on the shelves near the cash desks and that they would be replaced with healthier products.
	Announced that it would donate 9.5 billion dollars to non-profit organizations in order to promote healthy food habits. The funds will be used for implementing dietary education programs, cookery courses, and for teaching consumers to shop for healthy food according to their available budget.
	In 1992 it launched its "Quality Lines", food products which respect social and environmental criteria; in 1996 it started producing food without OGM with its brand name; in 1997 it launched its own line of organic products.
	Founded Passport to Nutrition, a program created on the Internet to educate children, parents, and teachers to lead a healthy lifestyle, which included lessons on the food pyramid, physical activity, and on how to interpret food labels.
	Launched a program for eliminating hydrogenated fats from its products and it periodically checks its products in order to reduce excessive fats.
	Coop Switzerland launched a food education program on a bus which travelled across the country, and at each stop people were invited on board to take part in games aimed at teaching them organic and sustainable practices.
	Coop Italy created an ad hoc line for children with balanced nutritional values Club 4 - 10, as well as drafting the "guidelines for a correct diet for children".
	Each supermarket promotes the consumption of fruit and vegetables by means of reasonable prices and assortment. It has reduced the amount of salt contained in products with its brand name.
	Launched the program "Nutrition and Health" with the aim of promoting a consciously healthy diet. They have focused on products that require a plan of action with the aim of eliminating 'unhealthy' ingredients and creating new recipes with less salt content.
	Offers a wide range of products with its own brand name in compliance with nutritional and environmental standards. Nordiconad promotes "by eating we learn", which is a program especially for teaching children to eat healthily both from a nutritional and environmental point of view.

THE ROLE OF FOOD LABELS IN FAVOURING HEALTHIER DIETS

Not all studies show a positive correlation between the information found on food labels and the consumers' choice of products. It has been proved that 91% of consumers do not pay attention to the amount of calories on the labels⁴¹ and that many consumers are not aware of the ideal quantities of calories, fats, and salt required per meal.⁴² Moreover, a 'light' version of a food may make consumers eat more than they should.⁴³

⁴¹ Borgmeier, I., Westenhoefer, J., 2009

⁴² Burton, S. et al., 2009

⁴³ Wansink, B., Chandon, P., 2006



SOCIAL COMMUNICATION

The purpose of social communication initiatives is to find the solution to moral, civil and educational issues involving the whole community by organizing campaigns aimed at modifying people's behavior in a positive way. Social communication is not very successful due to lack of investment compared to commercial communication and the difficulty in finding the right message capable of modifying collective behavior. Below are the main initiatives of social campaigns in favor of healthy diets promoted in Italy and abroad.



Europe

In Europe, there are several public support programs for the fight against childhood obesity and two more have recently been launched: the "School Fruit Scheme", aimed at stimulating young people to eat more fruit and vegetables, and the "School Milk Scheme", aimed at promoting milk and dairy products as sources of essential nutritional components. Many Italian schools participate in the "School Fruit" program.



Italy

Salute al piacere - Health and Pleasure is the name of the food education campaign launched in 2012 and promoted by the Italian Association of Dietetics and Clinical Nutrition, the Association of diabetologists and Slow Food Italy. The program is aimed at investigating diabetes and obesity issues, providing useful tips for living with these diseases and preventing them as far as possible by promoting a healthy diet and lifestyle. The Ministry of Agriculture, Food and Forestry implemented a program for teenagers called "Eat Well, Grow Better", which was sponsored from 2007 to 2011. It consisted in a competition for junior high school pupils and teachers who were divided into teams and asked to create an advertisement on healthy eating and the variety and quality of our food heritage. The authors of the best advertisement won a vacation at an Italian resort famous for its agricultural heritage.



France

With the “Programme national nutrition santé” (PNNS) sponsored from 2001 to 2006, France set itself the goal of improving the health of the population by acting on one of its main determinants: nutrition. The PNNS 2011-2015 “Bouger Manger” project was launched with the aim of: reducing obesity and weight problems; increasing physical activity, discouraging a sedentary lifestyle at all ages, improving eating habits, and reducing the percentage of dietary disorders. The PNNS is therefore aimed at promoting access to varied and sustainable quality food, making food labels mandatory, and improving individuals’ awareness with regard to food.



Great Britain

Change4Life is the first national social campaign for reducing obesity. Change4Life’s motto is “Eat well, move more, live longer” and its purpose is to give helpful advice to children and adults on how and where to practice sports and eat better.



The United States

In the United States, Michelle Obama is actively engaged in the fight against childhood obesity and in 2010 promoted the “Let’s Move!” program which was a nationwide initiative aimed at improving children’s eating habits while encouraging them to do more exercise. At the same time the program offers advice and tries to find ways of stimulating children to play ‘actively’ every day for at least an hour. In 2014, in order to inaugurate the fourth consecutive year of Let’s Move!, the First Lady produced a video entitled “Show Me How You Move” in which she herself carried out several physical exercises, from pushups to skipping while inviting all Americans to do the same, to move and have fun and to publish videos of their performances on the Net.



THE LIVEWELL EUROPEAN PROJECT



WF-UK has developed the program Livewell 2020. The initiative, developed in collaboration with the Rowett Institute of Nutrition and Health, University of Aberdeen, aims at modifying people’s eating hab-




its towards a more sustainable diet which would lead to a 25% reduction of greenhouse gas emissions by 2020 and reduce the per-capita consumption of meat from 79 to 10 pounds per year. The project proposes five basic principles for eating in a healthy and environmentally-friendly way:

- Eat more fruit and vegetables;
- Waste less food (40% of the world’s food is wasted);
- Eat less meat;
- Eat less processed foods (i.e. products with a higher intensity of resources);

- Eat foods that are certified, guaranteed by a standard (such as MSC for fish, RSPO for palm oil or RSPCA Freedom Foods for meat and eggs).

The program was launched in three pilot countries: France, Spain, and Sweden.

For each country, the researchers identified the specific food trends and created an ad hoc Livewell plate, starting with the national guidelines. The results are very encouraging and do not effect the costs incurred.

THE RESULTS OF THE LIWELL IN THE 3 PILOT COUNTRIES		
Country	GHG emissions	Reduction of average daily expenditure
 France	- 25 %	From 4.90 to 4.36 euros
 Spain	- 27 %	Same expenditure
 Sweden	- 25 %	From 44.64 to 44.07 kronor

THE RESULTS OF THE CAMPAIGN LET'S MOVE!

Thanks to the numerous campaigns and initiatives implemented in recent years and the First Lady's involvement in the front line, a comparative analysis carried out in recent years has shown that the number of overweight children between the age of 2 and 5 has dropped by 43% and that there has been a decrease in the obesity rate from

14% in 2003-2004 to just over 8% in 2011-2012. This result was achieved thanks to a lower overall consumption of sugary drinks, a general increase in breastfeeding and the effect of various initiatives (governmental and otherwise) which promote the purchase of healthier products such as fruits and vegetables. However, the initiative succeeded in drawing criticism.

In particular, the replacement of 'ordinary' school meals with better menus from a nutritional point of view has led to a decline in the number of children eating in school canteens.

The main reason for criticism seems to be the 'desirability' of the proposed menus which are designed to be low in calories and fat.

CATERING

Another relevant context is eating 'away from home'. Regarding restaurants and fast food chains, trends show that consumers have recently been more careful in their choice of menu, preferring less expensive dishes and decreasing their consumption of appetizers and desserts. Yet there is also an increase in demand for special offers in restaurants, therefore fast food chains often advertise food at discounted prices.

Below is a list of the main initiatives implemented in Italy and abroad by catering services to promote well-balanced diets.

Italy

In Italy there are various Slow Food programs which propose food as a source of pleasure, culture, and conviviality, which emphasize that eating has an effect on people's attitudes and emotions. "Slow Food at the table" is a program designed to reinforce these values by working in direct contact with the catering sector, operators and consumers. In particular, it explains and promotes the two already-mentioned European programs; the School Fruit Scheme and School Milk Scheme.

France

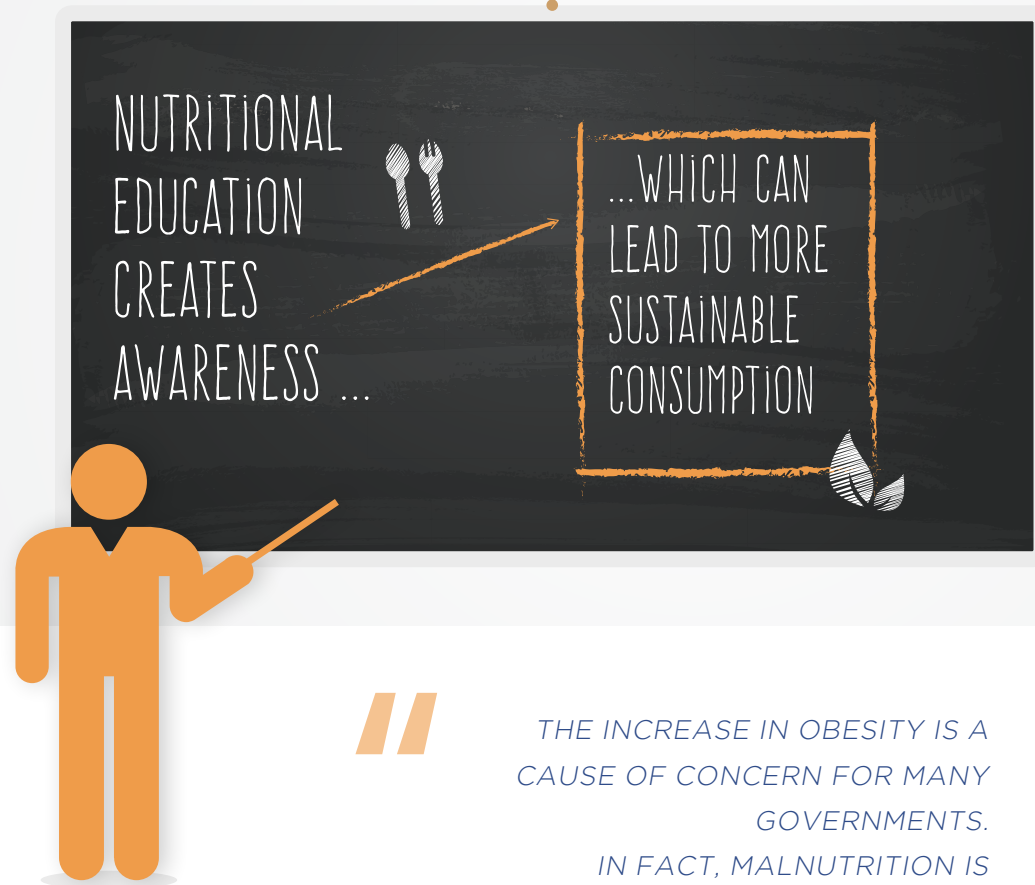
In France, the "Bien manger à la cantine" initiative is worth noting, which was launched by the Ministry of Agriculture, Food and Forestry and aims at improving the quality of meals served in school canteens and encourages them to provide seasonal menus. Mary Brighton's blog called "Brighton Your Health" is also of interest, as it offers advice on how to live well and eat healthily.

United States

In 2007, New York city introduced a series of strict regulations regarding the meals served in restaurants, which must not contain more than 0.5 grams of trans fat per serving. It was later made compulsory to indicate the number of calories which obliged all the major fast food chains to change their recipes in order to comply with the new limits. Regarding school canteens, the project called "Choose MyPlate for Kids: Make Half Your Plate Fruits and Vegetables" is still ongoing. The poster, which features the iconic image of the project, shows how half the tray or plate should contain fruit and vegetables. This initiative is part of a broader "MyPlate" project that promotes healthy eating by using the image of a plate as the representation of a meal.



WHERE AND HOW TO PROMOTE SUSTAINABLE FOOD CHOICES



THE INCREASE IN OBESITY IS A CAUSE OF CONCERN FOR MANY GOVERNMENTS.
IN FACT, MALNUTRITION IS ONE OF THE MAIN THREATS TO PEOPLE'S HEALTH AND THEREFORE NEGATIVELY AFFECTS ECONOMY.
BCFN, 2014

Cooking at home and eating with the family

A positive relationship has been found between the presence of parents during the evening meal and a higher consumption of fruit, vegetables, and dairy products by adolescents
Videon e Manning, 2003.



The importance of friends

Our eating patterns are influenced by what our peers eat.
Robinson et al., 2014.



The workplace

A diet which is either too rich or too poor can lead to a decrease in productivity of almost 20%.
ILO, 2005.



School

In Italy the "School Fruit Scheme" has involved 870,000 children in 5,000 schools.



Marketing of food companies

FOOD COMPANIES - 7 producers analyzed

DISTRIBUTION - 8 retail chains analyzed

COLLECTIVE CATERING - 11 initiatives analyzed




Institutional campaigns and social communication

Positive results of social communication campaigns: in the U.S., the number of overweight children between the age of 2 and 5 has dropped by 43% also thanks to Michelle Obama's "Let's Move" campaign. The obesity rate has decreased from 14% (2003-2004) to just over 8% (2011-2012).











PUBLISHING EXAMPLES

In recent years, various experts have published books on how to promote healthy diets effectively. Some of the most interesting editorial cases are reported below.

PUBLISHING EXAMPLES		DESCRIPTION
	Pollan: In defense of Food: An Eater's Manifesto	Michael Pollan in his best seller In Defense of Food focuses on nutritionists and criticizes the way they divide food into single nutrients, forgetting what 'real food' is. He calls us back to our origins, to eating natural products with a varied diet in which you eat a little of everything in smaller quantities.
	Pollan e Kalman: Food Rules: An Eater's Manual	In his latest book Food Rules , Michael Pollan focuses on some simple eating rules in order to 'de-complicate' our daily decisions concerning nutrition. He consulted and involved doctors, anthropologists, nurses, nutritionists, dieticians, mothers, and even grandmothers in the drafting of the 64 rules.
	Wansink: Mindless Eating: Why We Eat More Than We Think	Brian Wansink, in his famous book entitled Mindless Eating , focuses on the fact that we often eat while we are doing other activities and we are not always aware of the quality and quantity of the food we intake. According to a survey carried out in the U.S., 91% of the respondents generally watch TV while eating meals, 62% are too busy to sit down at the table, 35% eat while they work and 22% eat while they are driving.
	Thaler e Sunstein: Nudge: Improving Decisions About Health, Wealth, and Happiness	Nudging is the term that is used to define the set of approaches and techniques aimed at promoting better life styles and behavior. The method developed by Richard Thaler and Cass Sunstein is based on the concept of 'libertarian' or 'soft' paternalism. People must be guided through the decisional process without having specific behavior imposed on them.
	Wansink, Just e Mckendry: Lunch Line Redesign	Following the Nudging theory, Brian Wansink proposes an "intelligent lunch line" in which students are persuaded to change their usual eating habits simply by the way foods are arranged.

APPS FOR SMARTPHONES AND TABLETS

Various initiatives have been implemented for apps on smartphones and tablets, with the aim of promoting healthy lifestyles and well-balanced diets. Below is a non-exhaustive overview.

APPS FOR SMARTPHONES AND TABLETS		DESCRIPTION
Nutrino www.nutrino.co/app.php		It is a virtual nutritionist which creates an ad hoc diet according to the medical and physical profile, dietary habits, aims, and preferences of the user.
iFood Pro www.vitobellini.com/ifoodpro/it		It counts the number of calories ingested and consumed. It calculates the daily requirements of proteins, fats, and carbohydrates according to the personal plan of the user.
Fresh & Local cloudintouch.it/portfolio/fresh-local		It gives advice on the consumption of local and seasonal foods. By indicating the food and its place of origin, it calculates how far that food has travelled and whether it is in season or not.
Mio Coach miocoach.altervista.org		It offers information for a healthy lifestyle. It calculates: BMI protein-based factors, calorie requirements, basal metabolic rate, and lean and fat body mass. It puts a Personal Wellness Coach at the disposal of its users.
Fresh Fruit itunes.apple.com/it/app/fresh-fruit/id323895540?mt=8		It provides information on any type of fruit. There is a table with essential information such as country of origin and beneficial properties.
GreenApes www.greenapes.com/en		It is an online community that promotes eco-sustainable living. The app is divided into four categories: food, mobility, home, and shopping. The users are in competition with one another and are given a score for each of their actions.
Restaurant Food Game itunes.apple.com/us/app/restaurant-food-game-eat-well/id604394664?mt=8		It is an album for younger children to color so that they can learn about fruit and vegetables in a fun way.
Attivo! itunes.apple.com/it/app/attivo-libro-da-colorare/id863014235?mt=8		It is an album for younger children to color so that they can learn about fruit and vegetables in a fun way.

THE FLEXITARIAN DIET

The key point of the Flexitarian or semi-vegetarian diet is to drastically reduce the consumption of meat in favour of more vegetables, fruit and vegetable protein.

It was developed by the American nutritionist Dawn Jackson

Blatner and it is based on the principles of the vegetarian diet without totally excluding proteins of animal origin which are reduced to the minimum.

In the same way another international campaign that promotes the health of people and

the environment is MeatLess Monday which was launched in America in 2003 and consists in eliminating meat from one's diet one day a week with the aim of reducing meat consumption by 15%.

This is a global initiative involving 28 nations.



The promotion of sustainable diets in the Universities of the U.S.

Initiatives to promote sustainable diets are increasing in the most renowned United States universities.



UNIVERSITY OF UTAH

The University manages an Edible **Campus Garden** that provides seasonal products for the campus dining services. The University Dining Service has committed to follow a code of sustainable conduct that includes the use of eggs from cage-free chickens, sustainable seafood, and antibiotic-free chicken products.



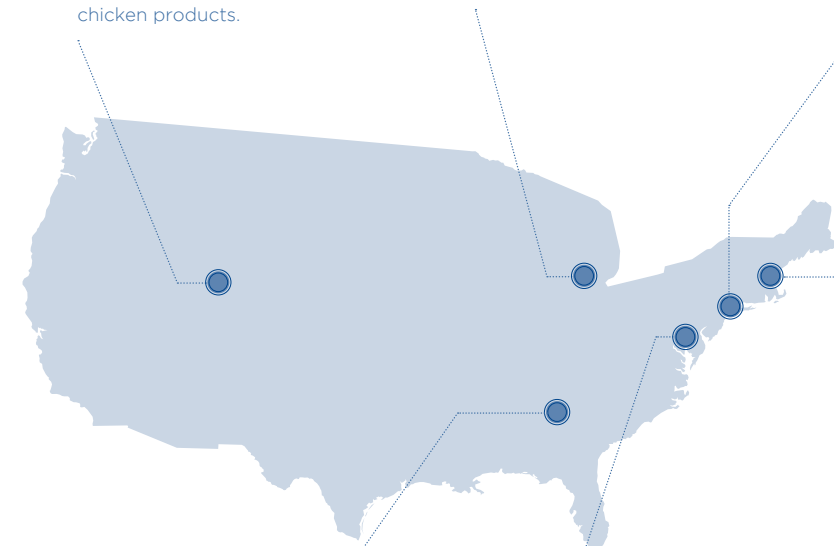
UNIVERSITY OF MICHIGAN

The UM **Sustainable Food Program** is committed to creating a sustainable food system at the University of Michigan. The University hosts a **Campus Farm**, primarily operated by student interns and volunteers, that increases the campus' availability for locally-grown, fresh, and sustainable food.



YALE UNIVERSITY

Yale's **Sustainable Food Program** manages two farms available for learning and research purposes. The Program also hosts regular workshops and conferences, and works to enrich and expand coursework and hands-on learning opportunities in partnership with faculty and staff across the campus.



EMORY UNIVERSITY

Emory has set an ambitious goal of 75% local or sustainably grown food in its hospitals and campuses by 2015. In order to pursue this commitment, a set of **Sustainability Guidelines for Food Purchasing** was adopted in 2007. The set provides clear goals and implementation steps for 10 categories of food purchases.



JOHNS HOPKINS UNIVERSITY

The **Johns Hopkins Meatless Monday Project** provides technical assistance and scientific expertise to the national Meatless Monday campaign. The University promotes the Meatless Monday campaign across the dining services of its Homewood Campus, every Monday offering a delicious vegetarian-meal option.



HARVARD SCHOOL

Harvard School runs several Food-related Centers and Programs.

- The **Healthy Eating Plate** helps you create healthy and tasty meals.
- The **Healthy and Sustainable Food program** informs consumers and institutions about how our choices for diet and menus can promote healthier people, more secure food supplies, and thriving communities.
- The **Food Literacy Project** gives Harvard students a complete nutritional education, starting with information on different kinds of seasonal fruit and vegetables, cooking courses as well as practical advices on leading a healthy and sustainable lifestyle.

AN EXPLORATIVE ANALYSIS ON ITALIAN YOUTHS

It is essential to promote sustainable eating habits from an early age. An exploratory analysis was carried out in two high schools, one in the North of Italy (Modena) and one in Central Italy (Viterbo), with the aim of investigating adolescents' lifestyles, dietary habits, and awareness of the environmental impacts caused by the production and consumption of food.

The analysis launched in spring 2014 was organized in the following way: 291 students (69% female and 31% male) between 14 and 20 years of age were requested to fill in a questionnaire with close-ended questions, for which the main results are reported below.

Eating habits at home

On analyzing the eating habits of the youngsters at home, approximately 61% replied that they had breakfast every day while 12% of the participants replied that they never had breakfast.

The averages concerning the consumption of fruit and vegetables are good: approximately 45% of the respondents eat fruit and vegetables at least twice a

day. The values regarding meat consumption are high: 39% of the students eat meat every day (14% twice a day), while the consumption of pulses is low: about one-third of respondents stated that they eat legumes "less than once a week" or "never": 57% of the respondents declared that they eat pasta once a day.

Eating habits at school

Only 13% of respondents eat fruit as a snack at school, 35% eat a salty snack and 27% have a sweet snack.

Physical activity

About 7 out of 10 students said they exercise or practice sports "a few times per week".

More smartphone and less TV

Concerning free time, we can see how the use of mobile phones and the Internet has surpassed television. 45% stated that they watch television less than an hour a day while 47% spend over three hours per day on their mobile phone (sending text messages or making phone calls, on chat lines, or surfing the web and applications).

The participants appear to be aware of the environmental impacts of food

Nearly 70% stated that eating fruit and vegetables has an "extremely" or "quite" low impact on the environment. Nearly 7 out of 10 students think that eating meat has a high impact on the environment, while only 1 in 10 is convinced that eating meat has an "extremely" or "reasonably" low impact.

Yet few of them act accordingly

Slightly less than 20% of the students agreed with the statement "my diet is influenced by the effects that the food I eat may have on the environment".

The Double Pyramid Model

Finally, regardless of their knowledge of the Double Pyramid model, all students were asked to indicate which of the three pyramids reported the correct scale of the environmental impact of food. Approximately 70% of participants identified the pyramid rightly.

70% of teenagers are aware of the correct scale of food impact but few act accordingly



BREAKFAST: 61% have breakfast regularly, while 12% never have it.



SNACK AT SCHOOL: only 13% of them eat fruit.



FRUIT AND VEGETABLES: they declare to eat a fair amount but meat consumption is still high.



FEW LEGUMES: more than 30% of teenagers eat legumes less than once a week or never.



SMARTPHONE: 47% of teens use it more than 3 hours per day.

Sample of 291 students (70% girls) attending two High Schools (located in Modena and Viterbo).



BCFN RECOMMENDATIONS

SIX REASONS TO ADOPT A SUSTAINABLE DIET

Why is what we eat so important for us and the environment? Let's find out together.

1 EATING HEALTHILY LENGTHENS (AND IMPROVES) YOUR LIFE

Those who can choose what to eat are primarily responsible for their state of health. In fact, obesity, and many other serious diseases are often the result of incorrect lifestyles which combine an unbalanced diet with insufficient physical activity. **Prevention through nutrition should be the first priority of public health policies**

2 EATING HEALTHILY MAKES US MORE ENVIRONMENTALLY SUSTAINABLE

Eating in a well-balanced way is not only a responsible choice for our health, but it is also a form of respect towards others. In fact, today we are aware of the fact that a nutritionally correct diet can significantly reduce our impact on the Planet and there are already many sustainable ways for producing and consuming food. **Scientists can be of great help to us in order to accomplish this.**

3 NUTRITION PLAYS AN IMPORTANT ROLE IN SUSTAINABLE DEVELOPMENT

It is essential to raise people's awareness, especially the young, of the great economic, social and environmental impact of food. **Nutritional education should be considered to be an important tool for reducing the health care costs of the community.**

4 EATING HEALTHILY DOES NOT NECESSARILY COST MORE

Several studies prove this. But, it is necessary to find alternative foods to those at the top of the food pyramid in order to eat correctly without negatively affecting the family budget.

The prerequisite of the economic sustainability of a diet is to spread correct nutritional informational among people and recover ancient local culinary cultures.

5 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. It is therefore necessary to define messages, channels and communication targets by carrying out an overall social marketing campaign.

The various stakeholders should implement a persuasion strategy and allocate the funds required for modifying people's behavior and achieving their goal.

6 "THINK GLOBAL, ACT LOCAL": YOU MUST BE 'GLOCAL'

Guidelines are essential, but they must be defined bearing in mind the culture of the various countries in order for them to be truly effective. Educational campaigns can only be successful if they are designed according to an overall view of the local area that takes into account health status, access to food, food culture, and budget. **In the face of global guidelines, it is the task of the individual governments to find the right path of agroindustrial sustainability for each specific country.**

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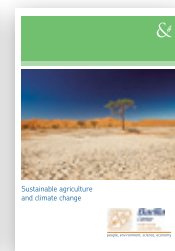


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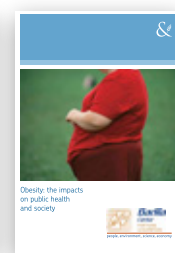
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