



2011 Double Pyramid:
Healthy food for people,
sustainable for the planet

Barilla
Center

FOR FOOD
& NUTRITION

people, environment, science, economy



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Dear Reader,
In recent years, the importance of proper nutrition for health and disease prevention has been confirmed by an increasing number of scientific studies and analyses. All research programs on the subject have consistently revealed the very close link between diet and health.

Therefore, the Barilla Center for Food & Nutrition once again proposes the food pyramid, by now a tool that is well-known and established in scientific circles, in an updated version that covers the latest research results.

However, it has done so in the original manner which it already presented last year: the Double Pyramid of food and the environment. As you know, this is the outcome of a very focused endeavor by some of the experts on our Advisory Board, which led us – a year ago – to identify the connection between good eating habits and a positive contribution to environmental sustainability.

To understand which foods are most “sustainable” for the planet, the Barilla Center for Food & Nutrition has reclassified the foods of the food pyramid in terms of their impact on the environment, resulting in a second pyramid – the environment pyramid – through which you can discover how the best foods in terms of health are also those in which the processes of production and consumption have greater respect for the environment.

Enjoy the read!
Guido Barilla

Guido Barilla

THE VISION OF THE BARILLA CENTER FOR FOOD & NUTRITION

TO OFFER A VARIETY OF HIGHLY SCIENTIFIC CONTRIBUTIONS AND BECOME A VALUABLE SERVICE TO THE INSTITUTIONS, THE SCIENTIFIC COMMUNITY, THE MEDIA AND CIVIL SOCIETY OVER TIME; A MEETING POINT FOR ANYONE WHO CARES ABOUT FOOD, THE ENVIRONMENT, SUSTAINABLE DEVELOPMENT AND ITS IMPLICATIONS ON PEOPLE'S LIVES.

THE FUTURE OF FOOD IS GROWING WITH US

THE BARILLA CENTER FOR FOOD & NUTRITION

The Barilla Center for Food & Nutrition (BCFN) is a center of multidisciplinary analysis and proposals which aims to explore the major issues related to food and nutrition on a global scale.

Created in 2009, BCFN intends to listen to the demands emerging from society today by gathering experience and qualified expertise on a worldwide level and promoting a continuous and open dialogue. The complexity of the phenomena under investigation has made it necessary to adopt a methodology that goes beyond the boundaries of different disciplines: hence, the breakdown of the topics under study into four broad areas: *Sustainable Growth for Food*, *Food for Health*, *Food for All* and *Food for Culture*. The areas of analysis involve science, the environment, culture and the economy; within these areas, BCFN explores topics of interest, suggesting proposals to meet the food challenges of the future.

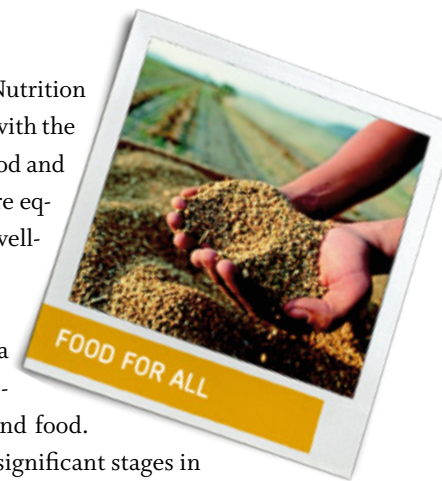


In the field of *Food for Sustainable Growth*, the Barilla Center for Food & Nutrition focuses on the issue of the optimization of natural resources within the framework of the food and agricultural sector. More specifically, the studies conducted so far have identified some critical issues and have evaluated the environmental impact of food production and consumption, putting forward a series of proposals and recommendations on individual and collective lifestyles which may have a positive effect on the environment and on natural resources.

In the field of *Food for Health*, Barilla Center for Food & Nutrition has decided to start its research work by analyzing the existing relationship between nutrition and health. It has studied in depth the many recommendations provided by the most distinguished nutrition institutes in the world and the results of ad hoc panel discussions with some of the most accredited scientists at the international level. As a result, it has been able to provide civil society with a clear set of concrete proposals for more easily adopting a correct lifestyle and a healthy diet.



In the field of *Food for All*, the Barilla Center for Food & Nutrition deals with the issue of food accessibility and malnutrition with the aim to reflect how to promote better governance of the food and agricultural sector on a global scale, in order to have a more equitable distribution of food and a better impact on social well-being, health and the environment.



In the *Food for Culture* area, the Barilla Center for Food & Nutrition aims at describing the relationship between man and food.

In particular, BCFN has traced the most significant stages in the evolution of the man-food relationship, refocusing on the fundamental role of the Mediterranean diet.



In line with this approach, the activities of BCFN are guided by the Advisory Board, a body composed of experts from different but complementary sectors, which makes proposals, analyzes and develops the themes, and then drafts concrete recommendations regarding them.

One or more advisors have been individuated for each specific area: Barbara Buchner (expert on energy, climate change and the environment) and John Reilly (economist and expert on environmental issues) for the area *Food for Sustainable Growth*; Mario Monti (economist) for the area *Food For All*; Umberto Veronesi (oncologist), Gabriele Riccardi (nutritionist) and Camillo Ricordi (immunologist) for the area *Food for Health*; Claude Fischler (sociologist) for the area *Food for Culture*.

In its first two years of activity, BCFN created and divulged a number of scientific publications. Driven by institutional deadlines and priorities found on the international economic and political agendas, in these first years of research it has reinforced its role as a collector and connector between science and research, on the one hand, and policy decisions and other governmental actions, on the other.

BCFN has also organized events which are open to civil society, including the International Forum on Food & Nutrition, an important moment of confrontation with the greatest experts in the field, now in its second edition. BCFN continues its path of analysis and sharing for the third year, making its content accessible to as many interlocutors as possible and acting as a reference point on issues of food and nutrition.

The document presented here is the updated version of the Double Pyramid, which was published for the first time in 2010 with the aim of linking nutrition with the environmental aspects of our food choices. Compared with the past edition, in addition to a more extensive bibliography, we have created a new pyramid with those “who are growing” in mind, i.e., taking into account the nutritional needs of children and adolescents.



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2011 DOUBLE PYRAMID: INTRODUCTION TO THE SECOND EDITION



2011 DOUBLE PYRAMID: INTRODUCTION TO THE SECOND EDITION

The publication of the *Double Pyramid* paper in June 2010 sent a strong signal about the importance of food choices, not just concerning people's health, but also – and this is the main novelty – for environmental protection. The uncommon comparison between the classical food pyramid regarding nutritional food properties and the new environmental pyramid, where every type of food takes its place according to its impact on our planet, has highlighted the fact that the most environmentally-friendly food is the one that nutritionists mainly recommend.

One year has passed and numerous studies have been published about the environmental impact of food, as numerous as the comments we have received (from experts and non-experts) during many meetings and presentations.

In this new 2011 edition, the amount of data gathered from scientific literature and public environmental databases has tripled. Our latest data confirms how well we have worked and makes the Double Pyramid model by the Barilla Center for Food & Nutrition even more scientifically consistent.

The Mediterranean diet, recognized by UNESCO in 2010 as an “Intangible Cultural Heritage” and internationally recognized as a complete and balanced diet pattern, proves to be a sustainable model for the environment.

Like last year, this year too, the analysis of the environmental impact is not just limited to the production phase, but is maintained throughout the whole food life-cycle. This analysis takes into account three specific indicators: the *Ecological Footprint*, the indicator used to design the environmental pyramid, measuring our Earth's ability to regenerate utilized resources; the *Carbon Footprint*, measuring green-house gas emissions; and the *Water Footprint*, representing the consumption of water resources.

The most innovative element of the 2011 Double Pyramid is represented by its coherence with the needs of those who are still growing. Since food needs during the age of development differ from those of adults, it was decided to design a specific nutritional pyramid.

The same approach used to design the “adult version” of the pyramid was employed to realize the “Double Pyramid for those who are still growing” and its environmental impact has been calculated according to the same criteria. However, when we talk about children, or more generally people in their development phase (up to 20 years of age), some food items are more important than others. The guidelines released by the USDA – United States Department of Agriculture – (the starting point for our analysis) recommend, for example, that children take more proteins and consume more meat, in particular, compared to adults. This fact, even though it changes the layout of the food pyramid, would not affect that general rule, according to which, the more environmentally-friendly foods are also

highly recommended by nutritionists.

Some specific estimates on the impact of cooking techniques can also be found in this edition, and even some considerations on the importance of food preservation techniques (cold chain), seasonality and several growing techniques. In particular, it has been proved that the energy consumption and the time needed to cook food, especially for food at the base of the pyramid, are particularly significant for the general environmental impact. Finally, we have also studied food transportation in detail.

We did not simply print a survey; the Barilla Center for Food & Nutrition is already at work on new, detailed studies that will back up the outcome of the research. Next year's edition will investigate to what extent some food items are influenced by their geographic origins and the impact represented by the preservation methods used for some foods.

As usual, we ask those with a particular interest in this topic to share their comments, observations and criticism. In the third edition of this paper, which is currently under development, our efforts will focus on widening the statistical coverage of the data, in order to become a reference point for those who are interested in receiving more information on the environmental impact of the food they eat.

Enjoy the read and see you next year.

Why two documents

The information in this second edition was organized in favor of readers who are interested in different aspects. The section regarding the technical studies, the data analysis and the specific bibliography on the sources of information had grown so long that two different documents were drawn up: a more popular one, for the general audience, and a more technical one, for experts.

The *popular document*, that you are reading right now, explains the basic concepts of food and environmental pyramids, and illustrates the Double Pyramid without going into detail. The technical aspects, data and considerations are highly summarized in order to provide proper scientific information and conclusions.

The *technical document*, on the contrary, is for “experts only” and presents detailed data and elaborations. This document may be downloaded from the BCFN website (www.barillacfn.com).

These two documents were drawn up to be mutually supportive, but they can be read separately as well: this is why some information can be found in both texts.

Collaborations:

Carlo Alberto Pratesi – Roma Tre University

Claudio Maffei – University of Verona

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Life Cycle Engineering

The European House – Ambrosetti

Ecodynamics Group, Chemistry Department – University of Siena

What the Double Pyramid tells us about our future

The symbolic value of the Double Pyramid acquires greater significance when it is interpreted in a long-term time perspective. Moreover, the very concept of “sustainability” is intrinsic to the fundamental value of “durability”, meaning the ability of any system (whether natural or social) to remain intact and viable in the long run.

It is in this perspective that the model proposes the evaluation of all the choices and eating behaviors, even those which apparently, and at the present time, determine less obvious impacts on the individual or the community, but which can become substantial when measured cumulatively and over time.

With this in mind, the decline of the food and environmental pyramid regarding future generations, beginning with children, leads to some implications briefly mentioned below that can be further analyzed and distributed to families and educators.

On the one hand, the dietary habits that are increasingly widespread among large sections of the population are

leading to a gradual deterioration of the health of children (particularly in regard to the prevalence of overweight conditions and obesity) and a consequent reduction in life expectancy, a fact which reverses an established trend of gradual improvement.

On the other hand, the excessive intake of certain foods – generally the same ones that should be eaten less frequently – determines a significant impact on the environment and the natural resources which, ultimately, can further reduce the quality of life and the overall well-being of future generations.

Therefore, for its positive nutritional and environmental effects, the adoption of a correct food model impacts both directly and indirectly on the future of our children. This makes it absolutely vital today to start a process of collective responsibility, without excluding the children themselves, to put leverage upon parents and the school systems, stressing that they must be more intensely and synergistically involved in the food education of future generations.

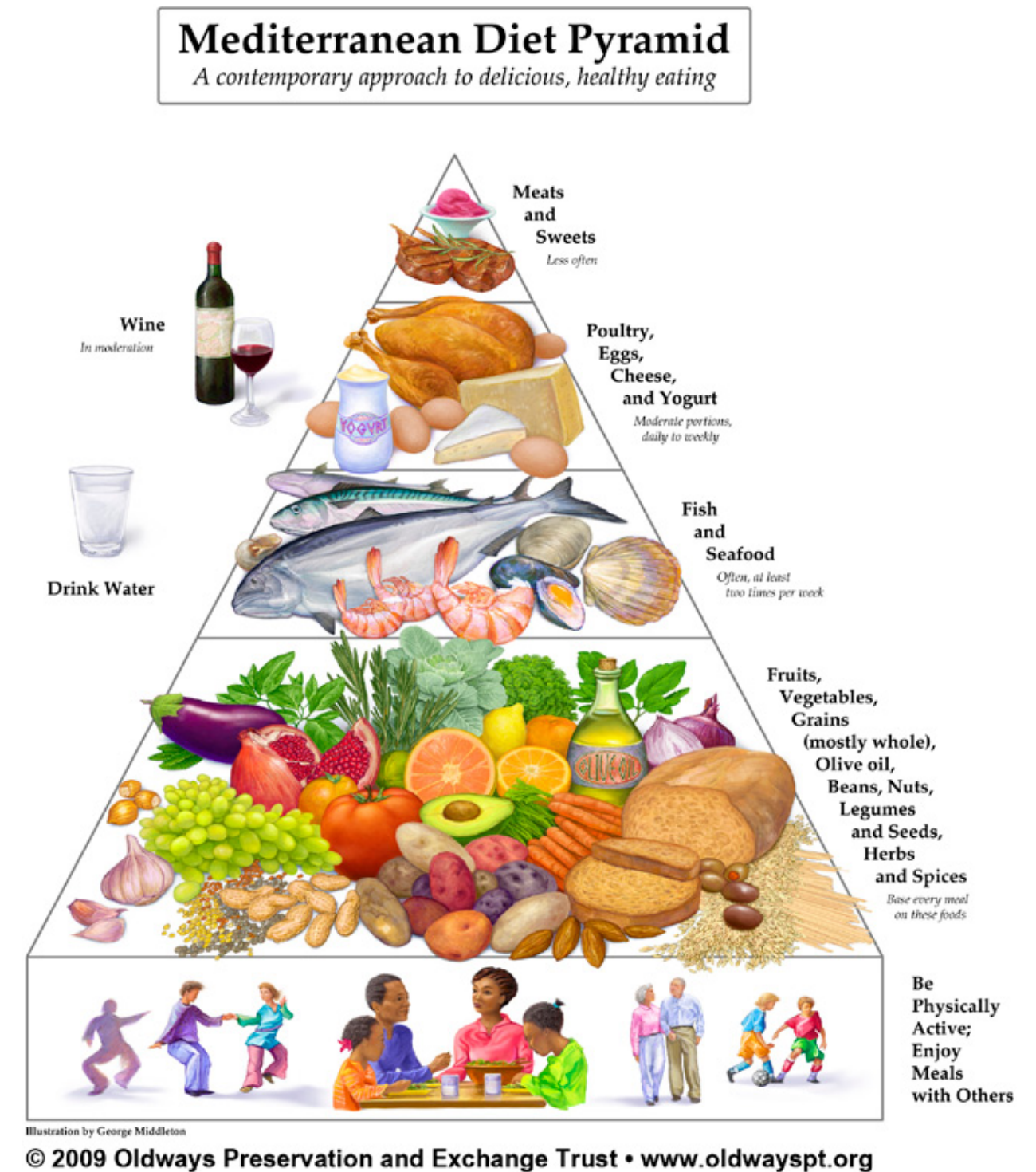




1. THE FOOD PYRAMID MODEL

1.1 THE FOOD PYRAMID AS AN EDUCATIONAL TOOL

Figure 1.1. The Oldways food pyramid model



WIDESPREAD DISEASE DISSEMINATION IS PARTLY DUE TO OVEREATING AND THE RELATIVE REDUCTION IN THE NUMBER OF PEOPLE DOING PHYSICAL EXERCISE, AT ALL AGES

The number of people who can choose what and how much food they can eat has highly increased in the last few years. A lack of proper food culture and shared nutritional guidelines which are clearly described and applicable can lead these people to adopt unbalanced food habits. This is also proven by recent and widespread disease dissemination due to overeating, which is often associated with incorrect nutritional habits, and the relative reduction in the number of people of all ages doing physical exercise, including youngsters.

IT WAS THE AMERICAN PHYSIOLOGIST ANCEL KEYS WHO EXPLAINED TO THE WORLD WHY SOME REGIONS HAD A MORE LONG-LIVED POPULATION

It was the American physiologist Ancel Keys, who published his book *Eat Well, Stay Well* in the '70s, that explained to the world why some regions had a more long-lived population: their secret was that they had a balanced diet consisting of natural food; their intake of fruits, vegetables and cereal derivatives was high, thus decreasing foods rich in saturated fats, meat and sweets. In particular, Keys discovered that with this diet (which he named "Mediterranean"), the death rate due to heart diseases in Southern European and North African countries was lower than in Anglo-Saxon and Northern European ones, where diets are richer in saturated fats.

THE MEDITERRANEAN DIET IS NOW COMPETING WITH GLOBAL DIETARY PATTERNS EVEN IN ITALY

Unfortunately, the Mediterranean diet is now competing with global dietary patterns (first of all, the *fast food* diet, very popular in North America), even in Italy. More generally, the presence of increasingly standardized food, to make the food production, distribution and preparation process more efficient and effective, was crucial to provide more accessible dietary solutions, to the detriment of an appropriate nutritional balance.

SEVERAL RESEARCH INSTITUTES HAVE DEVELOPED COMMUNICATION SYSTEMS BASED ON THE FOOD PYRAMID MODEL

Several research institutes have developed communication systems based on the food pyramid model through the years, so that good nutritional principles could be passed on more effectively.

The base of the food pyramid consists of food that everyone should eat more often, while food items that should be consumed less frequently are at the top. Oldways, a U.S. non-profit organization promoting correct dietary patterns by carrying out specific projects and initiatives, released a version of the pyramid, which can be found here below as an example.

This pyramid was realized on the basis of available research data regarding nutrition, according to Cretan, Greek and Italian tradition. These were, in fact, the countries where the rate of chronic diseases was the lowest in the world in the '60s.

Although they share a common scientific basis, every pyramid fits its graphic scheme according to the specific peculiarities of its final target: with three different age ranges

Source: oldwaystable.org

THE BASIC IDEA OF THE PYRAMID IS THAT AS ONE GOES UPWARD, ONE SHOULD GRADUALLY DECREASE THE CONSUMPTION OF THE SEVERAL FOOD CATEGORIES, WITHOUT EXCLUDING ANY SPECIFIC FOOD ITEM, IN ORDER TO HAVE A SUFFICIENTLY VARIED DIET

(children, adults, the elderly), main lifestyles (sedentary, sports, etc.), special periods (pregnancy, breast-feeding) or personal nutritional habits (vegans, vegetarians, etc.). Furthermore, almost every latest version of the pyramid - for example, the food pyramid of the modern Mediterranean diet - includes further recommendations that better illustrate a correct lifestyle (e.g., how much water should be drunk, the right amount of time for physical exercise, etc.).

The basic idea of the pyramid is that as one goes upward, one should gradually decrease the consumption of the several categories, without excluding any specific food item, in order to have a sufficiently varied diet. More specifically, foods of plant origin, typical in Mediterranean cooking, which are rich in vitamins, mineral salts, water, protective compounds (such as dietary fibers) and bioactive elements of plant origin. As we go up, we will find increasingly energetic food, such as animal fats, red meat and food high in simple sugars.

The food pyramid has a double value: on the one side, it represents an excellent summary of the main medical and nutritional knowledge, crucial for anybody looking after their own health; on the other side, it is a powerful education tool regarding food consumption, thanks to its simple and understandable layout.

1.2 FROM THE FOOD PYRAMID TO THE ENVIRONMENTAL PYRAMID

Nutrition is becoming ever more relevant, even in terms of the environmental impact of the food production, distribution and consumption process. This is why the Barilla Center for Food & Nutrition first published the Double Pyramid in 2010. It is a communication tool that matches nutritional food features and their environmental impact. This unpublished pyramid was created through the re-classification of the foods included in the food pyramid according to their environmental impact (the ones with the highest impact are at its base, whereas the most environmentally-friendly foods are at the top). It was then discovered that the food sequence was more or less the same, but upside down. This relation seems evident when the environmental pyramid is turned upside down.

The Double Food-Environmental Pyramid is obtained by comparing the two pyramids (one in its correct position and the other one upside down). It is clear that, in general, the more recommended foods have a lower impact on the environment as well. Conversely, foods which are recommended for a lower consumption are also the ones that have the greatest impact on the environment.

In practice, two different but equally relevant goals – people's health and environmental protection – fit into one single food model.

THE DOUBLE PYRAMID IS A COMMUNICATION TOOL THAT MATCHES NUTRITIONAL FOOD FEATURES AND THEIR ENVIRONMENTAL IMPACT

IN GENERAL, MORE RECOMMENDED FOODS HAVE A LOWER IMPACT ON THE ENVIRONMENT AS WELL

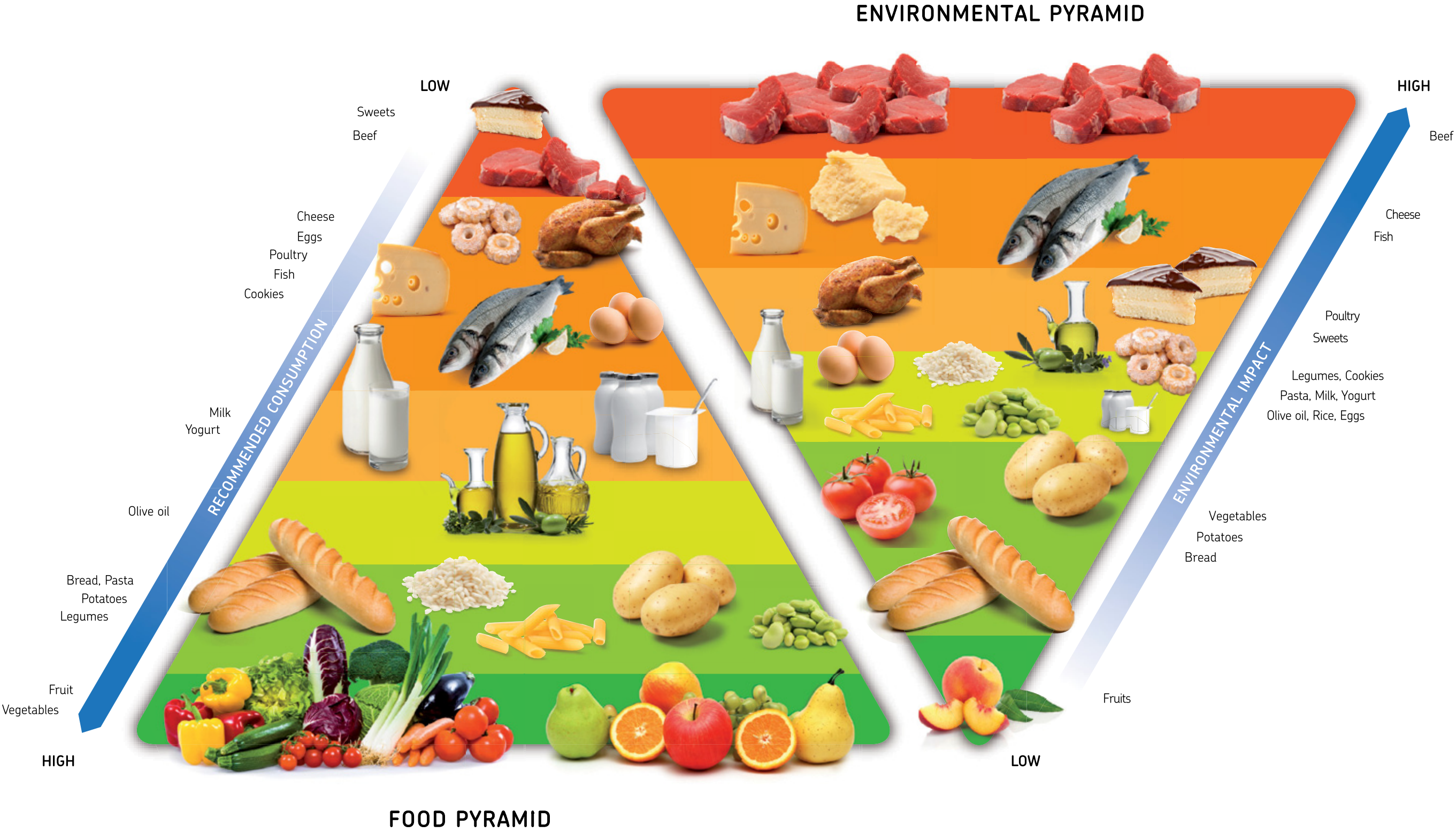


Todd Gipstein/National Geographic Image Collection



Dean Conger/National Geographic Stock

Figure 1.2. The double food and environmental pyramid model, proposed by BCFN in 2010



2. THE ENVIRONMENTAL IMPACT OF FOOD PRODUCTION



2. THE ENVIRONMENTAL IMPACT OF FOOD PRODUCTION

The design of the environmental pyramid is based on the available public information, which was “reasonably re-organized,” thus ensuring that sources and data are fully transparent.

In this new edition, we have tried to add some elaborations to fill the gaps within the scientific literature and fulfill the purpose of this document.

Every theoretical detail is included in a technical document supporting the 2011 BCFN Double Pyramid, which is downloadable at www.barillacfn.com.



Sisse Brimberg/National Geographic Image Collection

2.1 ENVIRONMENTAL INDICATORS

The estimated environmental impact for each single food item was calculated on the basis of the information and public data which was measured through the *Life Cycle Assessment* – LCA: an objective assessment methodology to detect energy and environmental loads in a process (either an activity or a service). This kind of assessment includes the analysis of the whole value chain, starting from growing or extraction practices, raw material processing, manufacturing, packaging, transportation, distribution, use, re-use, re-cycling and final disposal.

On the one hand, the LCA approach has the advantage of offering a fairly objective and complete assessment of the system; on the other hand, the disadvantage lies in a difficult transmission of the resulting complex outcome.

Synthetic indicators are then used to fully understand this outcome. These indicators are meant to preserve the scientific basis of the analysis as much as possible; they are selected according to the kind of system analyzed and must simply and correctly represent the relations with the main environmental categories.

The process analysis, more specifically and focusing our attention on food production, highlights the main environmental loads: greenhouse gas generation, the use of water resources and the ability to regenerate local resources. According to this input, and considering this work's aim to provide valid results in an initial analysis, the following environmental indicators were chosen:

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

It is, nevertheless, important to notice that the impacts this research takes into consideration are not just the ones generated by a food production chain; they can be the most relevant ones in terms of real impact and communication.¹ Even though the environmental pyramid has been represented through the ecological footprint, for synthetic reasons the food environmental impact was measured by water and carbon footprint indicators, to avoid partial and sometimes misleading ideas of the phenomena.

LIFE CYCLE ANALYSIS:
METHODOLOGY AND
OBJECTIVE ASSESSMENT
OF ENERGY AND
ENVIRONMENTAL LOADS
IN A PROCESS

THE PROCESS ANALYSIS
HIGHLIGHTS THE MAIN
ENVIRONMENTAL LOADS:
GREENHOUSE GAS
GENERATION, THE USE
OF WATER RESOURCES
AND THE ABILITY TO
REGENERATE LOCAL
RESOURCES

Figure 2.1. The LCA analysis is regulated by the international standards ISO 14040 and 14044



2.2 THE ENVIRONMENTAL PYRAMIDS OF FOOD: WHAT HAS CHANGED

A FAR HIGHER AMOUNT OF INFORMATION AND DATA HAS BEEN TAKEN INTO CONSIDERATION TO ANALYZE THE FOOD ENVIRONMENTAL IMPACT

THE EMPLOYED DATA HAS TRIPLED, COMPARED TO THE FIRST EDITION

Environmental pyramids, presented in the first edition, have been updated in relation to the new literature gathered last year and mentioned in the technical part. Compared to the first edition, a far higher amount of information and data has been taken into consideration to analyze the food environmental impact, thus significantly increasing the statistical representationality of the given information. In some cases, to meet the needs of the pyramid for those who are still growing, new food items were introduced, such as breakfast cereals. More specifically, notice that some data has tripled, compared to the first edition. Even though some data concerning some specific food items was highly changeable, the “classification” of the impact of each single food item has been confirmed: red meat is the food with the highest impact, whereas fruits and vegetables have a much more limited impact. The pyramids concerning the three environmental impact indicators are displayed below. Only the last one will be employed in the new version of the BCFN Double Pyramid. The data gathering process was concluded on May 2011; therefore, the publications which became available after that date were not analyzed.

Figure 2.2. Amount of data used to calculate the average values of the food environmental impact

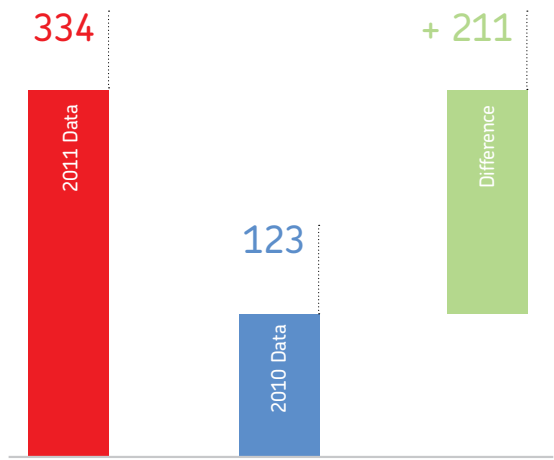


Figure 2.3. Increase in the statistical coverage and value change

FOOD	INCREASE IN THE STATISTICAL COVERAGE AND VALUE CHANGE (the values displayed below indicate the amount of data used to calculate the average values)								
	CARBON FOOTPRINT			WATER FOOTPRINT			ECOLOGICAL FOOTPRINT		
	STATISTICAL COVERAGE		VALUE CHANGE*	STATISTICAL COVERAGE		VALUE CHANGE*	STATISTICAL COVERAGE		VALUE CHANGE*
	2011 DATA	INCREASE IN THE DATA USED		2011 DATA	INCREASE IN THE DATA USED		2011 DATA	INCREASE IN THE DATA USED	
BEEF AND VEAL	20	+7	↓	1	--	=	5	+3	=
CHEESE	3	+2	=	1	--	=	2	+1	↑
BUTTER	5	+4	NEW	1	+1	NEW	3	+2	NEW
EGG	6	+3	=	1	--	=	3	+2	=
PORK	14	+6	↓	1	--	=	2	+1	↓
FISH	27	+15	=	--	--	--	3	+1	=
RICE	3	+2	↑	1	--	=	2	--	=
POULTRY	9	+2	↓	1	--	=	2	+1	↓
OIL	10	+6	↓	3	+2	=	4	+3	↑
DRIED FRUIT	1	+1	NEW	2	+1	NEW	--	--	--
PASTA	7	+6	↑	6	+5	↑	6	+5	↓
COOKIES	2	-1	↓	2	+1	↓	3	+2	↓
SWEETS	4	+3	↓	1	--	=	4	+3	↓
LEGUMES	3	--	=	5	+4	↑	5	+1	=
MARGARINE	3	+3	NEW	--	--	--	1	+1	NEW
BREAKFAST CEREALS	2	+2	NEW	1	+1	NEW	1	+1	NEW
MILK	21	+18	=	1	--	=	2	+1	=
YOGURT	1	--	=	1	--	=	2	+1	=
BREAD	9	+3	=	1	--	=	4	+3	=
FRUIT	13	+12	↑	21	+19	↑	13	+7	↑
POTATOES	3	--	=	1	--	=	5	+3	↓
SEASONAL VEGETABLES	10	+8	=	12	+11	↑	22	+20	↓
TOTAL	176	+104	--	64	+45	--	94	+62	--

*Variations have been highlighted when the data slightly changed (+/- 15%) compared to the value used in the last edition

Figure 2.4. Carbon Footprint of food

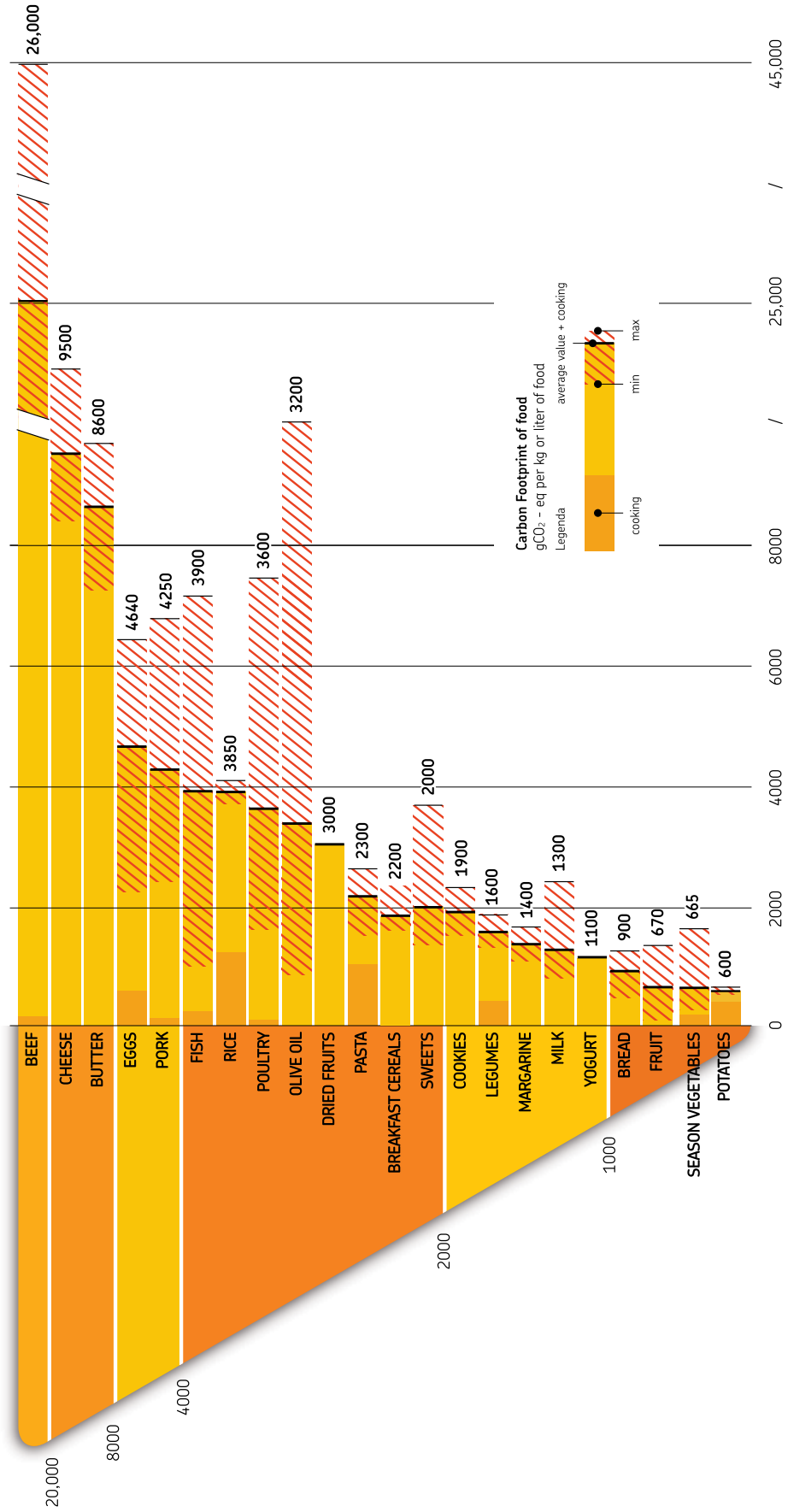


Figure 2.5. Water Footprint of food

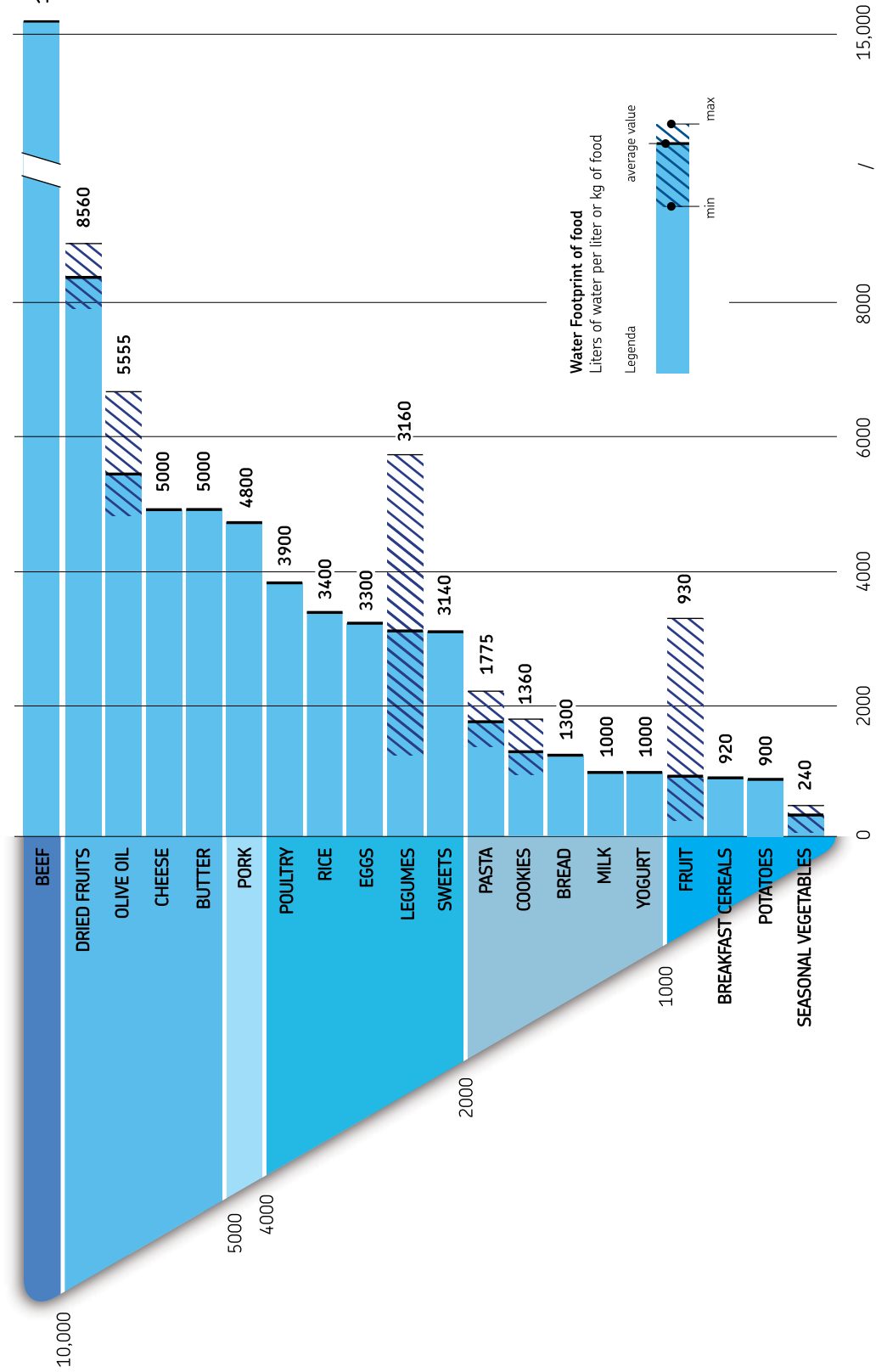


Figure 2.6. Ecological Footprint of food

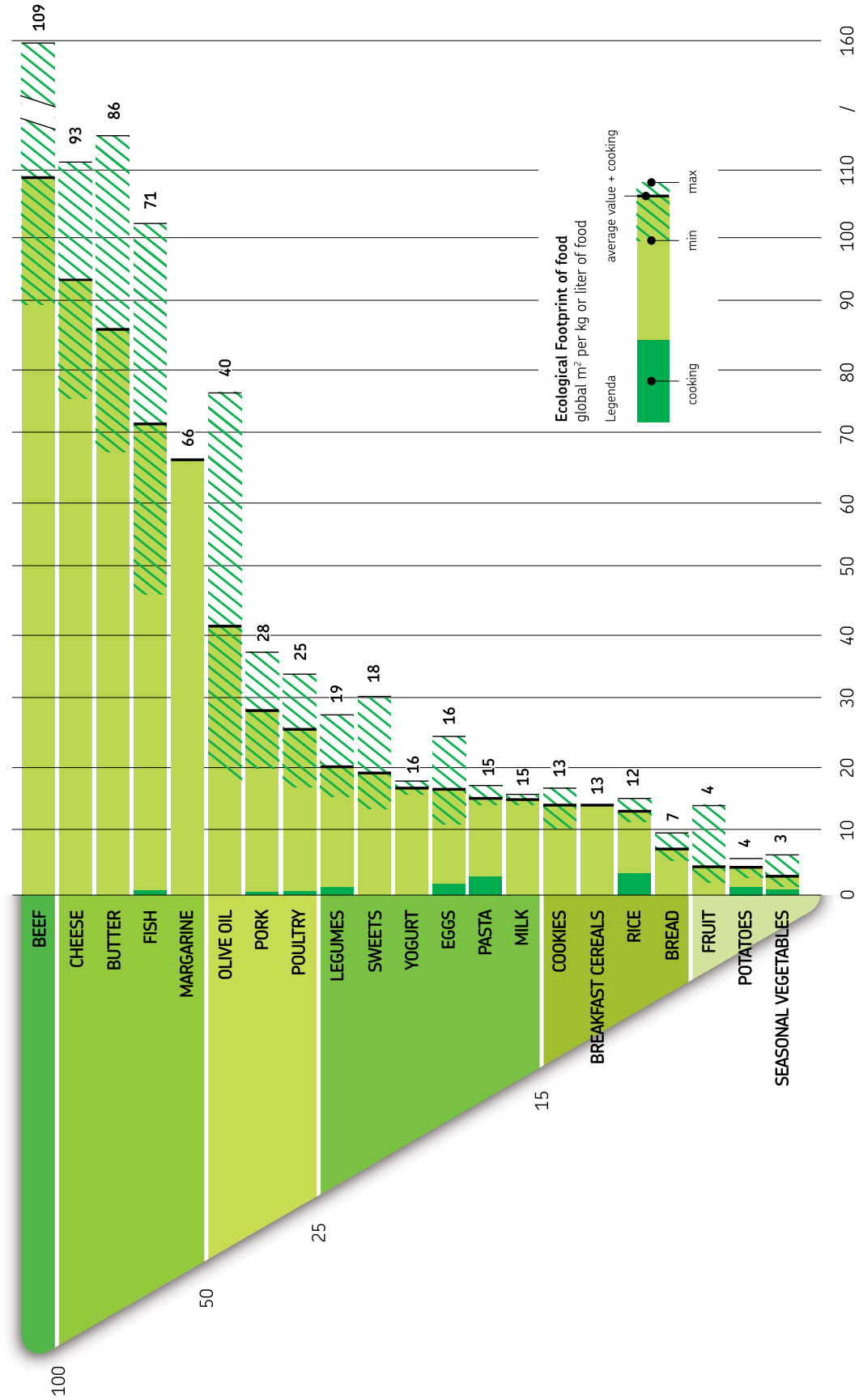
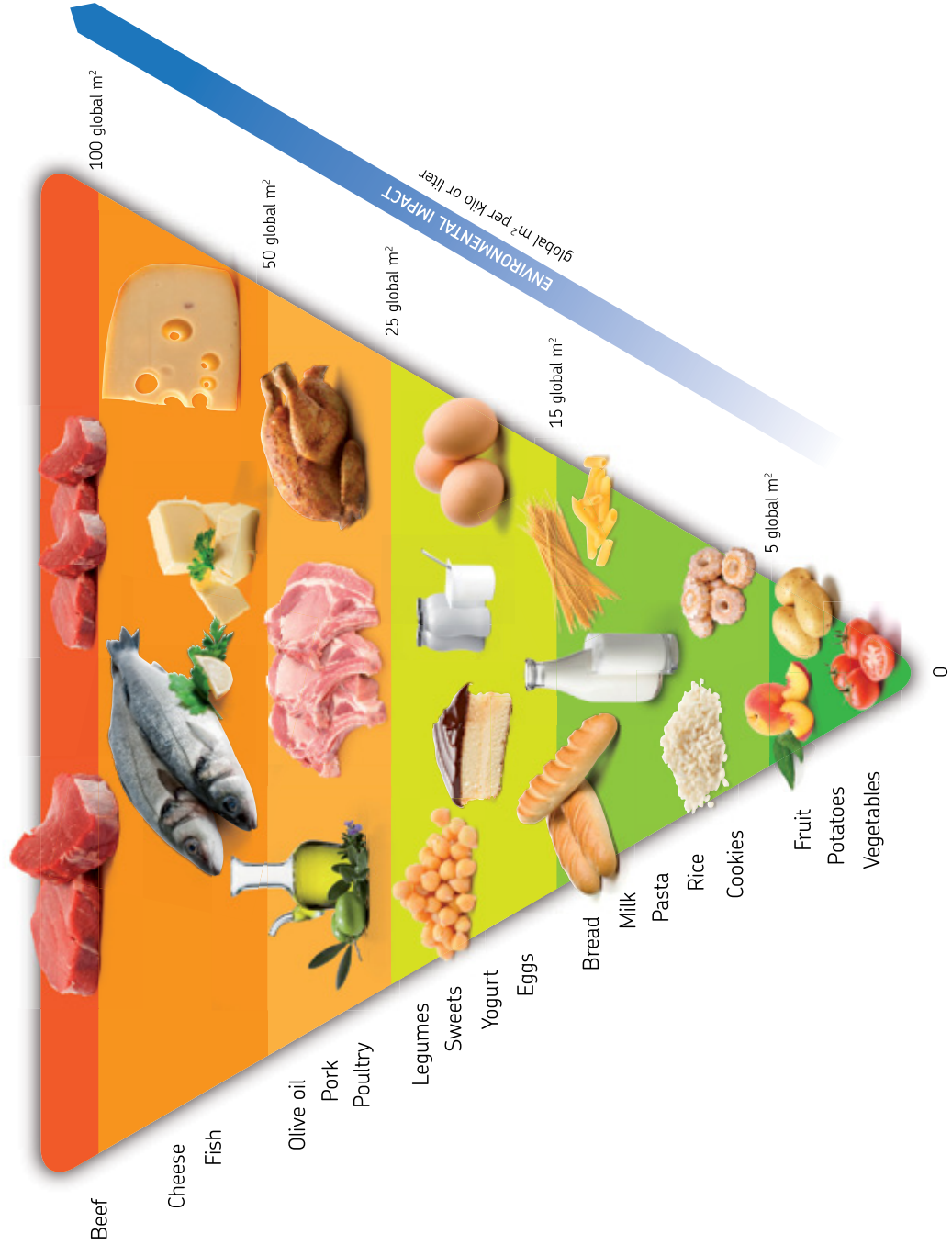


Figure 2.7. The BCFN environmental pyramid. Its layout is based on the re-classification of the foods' environmental impact, represented through their ecological footprints



2.3 THE ENVIRONMENTAL IMPACT OF COOKING, COLD CHAIN AND TRANSPORT

To precisely measure the food environmental impact during the whole life-cycle of a specific food item, both the agricultural and/or industrial phase must be taken into consideration - as well as the final part of the process, including: cold chain, transport and cooking. Other important features that must be considered for some food items (such as fruit and vegetables) are: seasonality and growing techniques used in agriculture (for cereals, for example). All of these aspects have been analyzed in the technical document, even if not so specifically, due to the reduced amount of available data. Considering its importance in the design of the environmental pyramid, the environmental impact of the various cooking techniques has been studied. The numerical evaluation here below, concerning the other above-mentioned features, is simply aimed at pinpointing which food items require further and more specific studies.

CONSIDERING ITS IMPORTANCE IN THE DESIGN OF THE ENVIRONMENTAL PYRAMID, THE ENVIRONMENTAL IMPACT OF THE VARIOUS COOKING TECHNIQUES HAS BEEN STUDIED

2.3.1 Cooking

Cooking techniques can be widely diverse, according to the recipe, the consumer's tastes (steamed or boiled vegetables, underdone or well-cooked meat), and whether the dish is homemade or cooked in a professional kitchen. Therefore, it is not so simple to objectively quantify the environmental impact of cooking per food kilogram.

Having said that, the reference point that was adopted to design the environmental pyramids was the following - *home cooking for four people on a medium-sized gas fire*. The values we used shall be considered as a rough guide. They also concern one single recipe and specific assumptions.²

The environmental impact of cooking also depends on the energy mix characterizing the electricity provider (that is to say, the country or region) and some consumer behaviors that may relevantly affect CO₂ emissions.

Relevant features surely include the "cooking preparation steps," such as water heating - the water quantity should be minimized - , in case of boiling, or oven preheating.

Two examples that clearly show how our cooking habits can have a large impact are reported below.

As can be seen in the following figure, using half a liter of water less (4.5 instead of 5) to cook half a kilo of pasta on a gas ring reduces the cooking impact by 7%, as much as 30 grams of CO₂.

In case an electric oven is used, the environmental impact can be decreased if the food is baked as soon as the oven reaches the desired temperature, so as not to waste any energy

EVEN THOUGH COOKING TECHNIQUES CAN BE WIDELY DIVERSE, THE REFERENCE POINT THAT WAS ADOPTED TO DESIGN THE ENVIRONMENTAL PYRAMIDS WAS HOME COOKING FOR FOUR PEOPLE ON A MEDIUM-SIZED GAS FIRE

TWO EXAMPLES THAT CLEARLY SHOW HOW OUR COOKING HABITS CAN HAVE A LARGE IMPACT

or generate any CO₂ emissions. For example, in Italy, an oven at the desired temperature that is left empty may generate more than 200 grams of CO₂, according to the employed energy mix.

Figure 2.8. How the carbon footprint changes in relation to the water used to cook pasta. 500 grams of pasta being cooked, assuming a \pm 20% pasta/water variable ratio and 10 min. cooking time. The 5 liters of water value was highlighted, since it represents the recommended amount of water for this cooking purpose

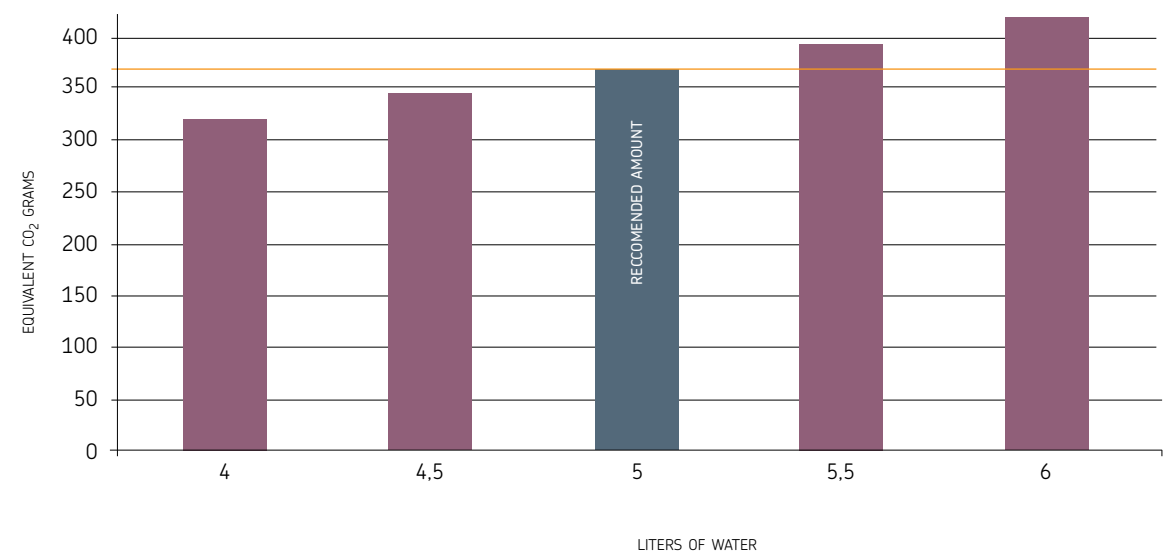
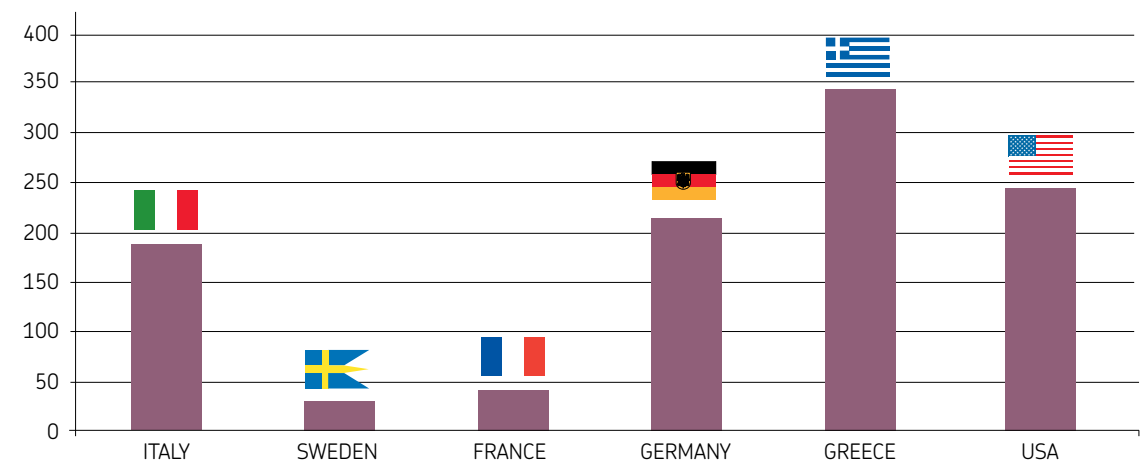


Figure 2.9. How the carbon footprint of an electric oven changes in various countries (equivalent CO₂ emissions due to a 10 min. use of an electric oven operating at 70% of its maximum power)



2.3.2 Cold chain

Assumptions to better calculate environmental impact can change even after refrigeration and may depend on three factors:

- where the product is stocked (in a home fridge or in industrial cells);
- temperature (4° or -18°C);
- preservation time.

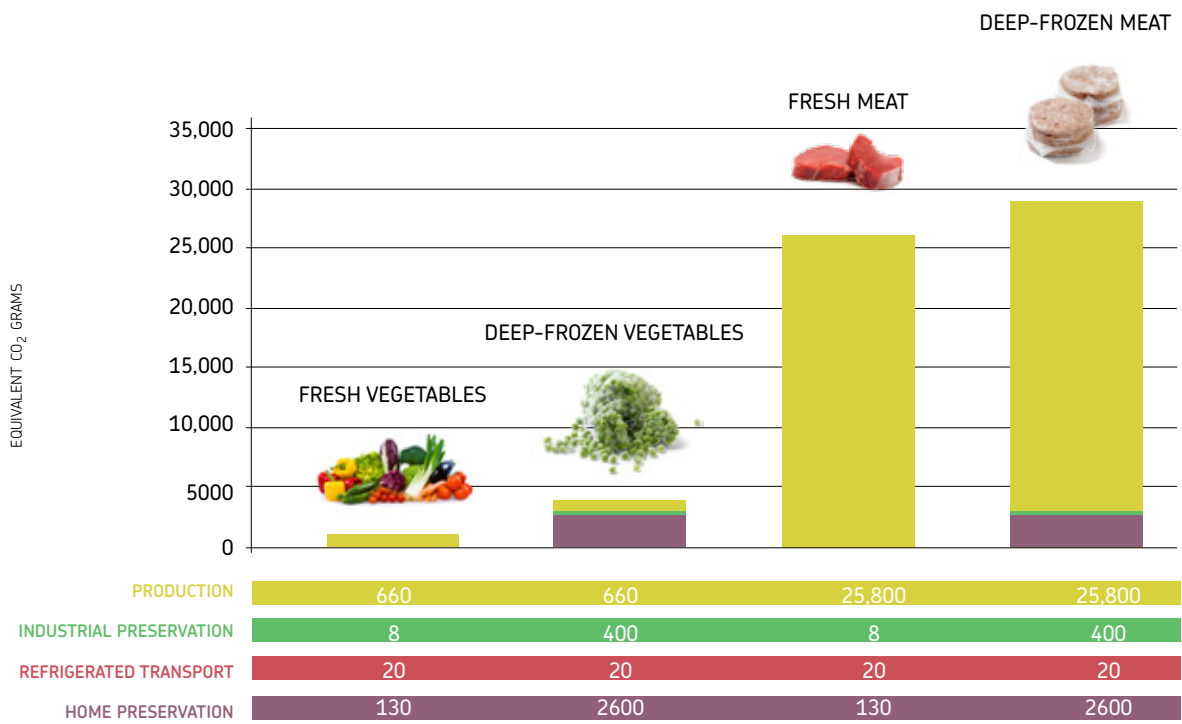
Despite these limits, according to the first observation, we can claim that:

- products with a “very fresh” classification, fruits and vegetables, are generally preserved for very short periods of time (a few days) and this is the reason why the environmental impact is very low and unimportant when they are preserved in a home fridge;
- the cold chain is a relevant impact source only for deep-frozen food, products kept in storage for a long time at low temperatures, both in terms of industrial production and distribution;
- refrigerated transport implies an increase in environmental impact that can be considered unimportant in terms of the overall product impact.

This is clearly shown in the figure below, where the cold chain impact is relevant only for products at the base of the pyramid (such as fruits and vegetables) when deep-frozen.

THE COLD CHAIN IMPACT IS RELEVANT ONLY FOR PRODUCTS AT THE BASE OF THE PYRAMID (SUCH AS FRUITS AND VEGETABLES) WHEN DEEP-FROZEN

Figure 2.10. The relative importance of cold chain (estimated carbon footprint regarding the preservation of food at the top or at the bottom of the environmental pyramid)



2.3.3 Transport

"FARM-TO-TABLE PRODUCT = ENVIRONMENTALLY-FRIENDLY PRODUCT" IS A SIMPLISTIC EQUATION

IT IS CLEAR THAT LONG-DISTANCE TRANSPORT IS A RELEVANT FEATURE ONLY FOR THOSE KINDS OF FOOD AT THE BOTTOM OF THE PYRAMID

THE HIGHER THE NUMBER OF GOODS BEING TRANSPORTED, THE LOWER THE IMPACT PER KILOGRAM

IT IS NOT ALWAYS TRUE THAT "FARM-TO-TABLE PRODUCTS" ARE MORE ENVIRONMENTALLY-FRIENDLY

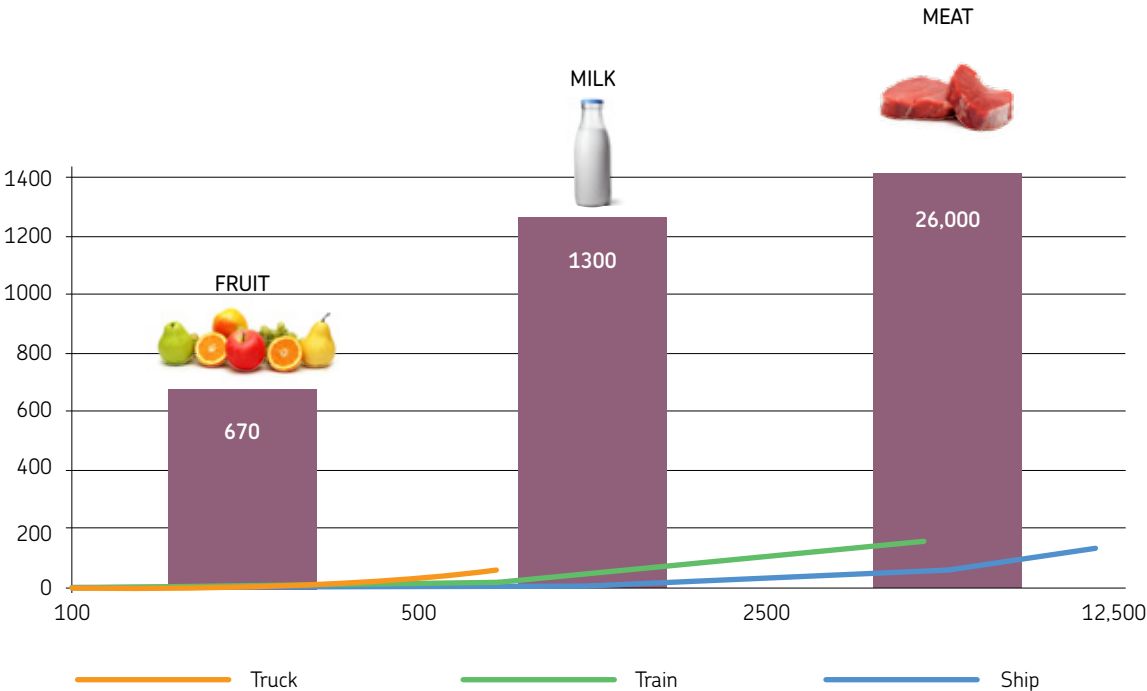
Food distribution is an interesting issue, both in terms of social implications - for the protection of local communities or traditions - and for environmental reasons. The "farm-to-table" approach is becoming popular nowadays. This approach is generally associated with a simplistic equation: "farm-to-table product = environmentally-friendly product." Granted that the more "social" issues should be discussed at another time and place, environmental issues regarding food transport and distribution will be closely analyzed here. By using the life-cycle analysis approach, the impact regarding food transport was associated with the one regarding food production, starting from raw materials. The analysis is once again focused on the study of the relevant carbon footprint for the effects of global-scale transport.

The analysis of the impact due to the transportation of several kinds of food – fruit, milk, meat – is displayed here below. The values clearly show that long-distance transport is a relevant feature only for those kinds of food at the bottom of the pyramid. Air transport is a totally different matter.

It is true that using a truck implies high CO₂ emissions at every km, but the higher the number of goods being transported, the lower the impact per kilogram.

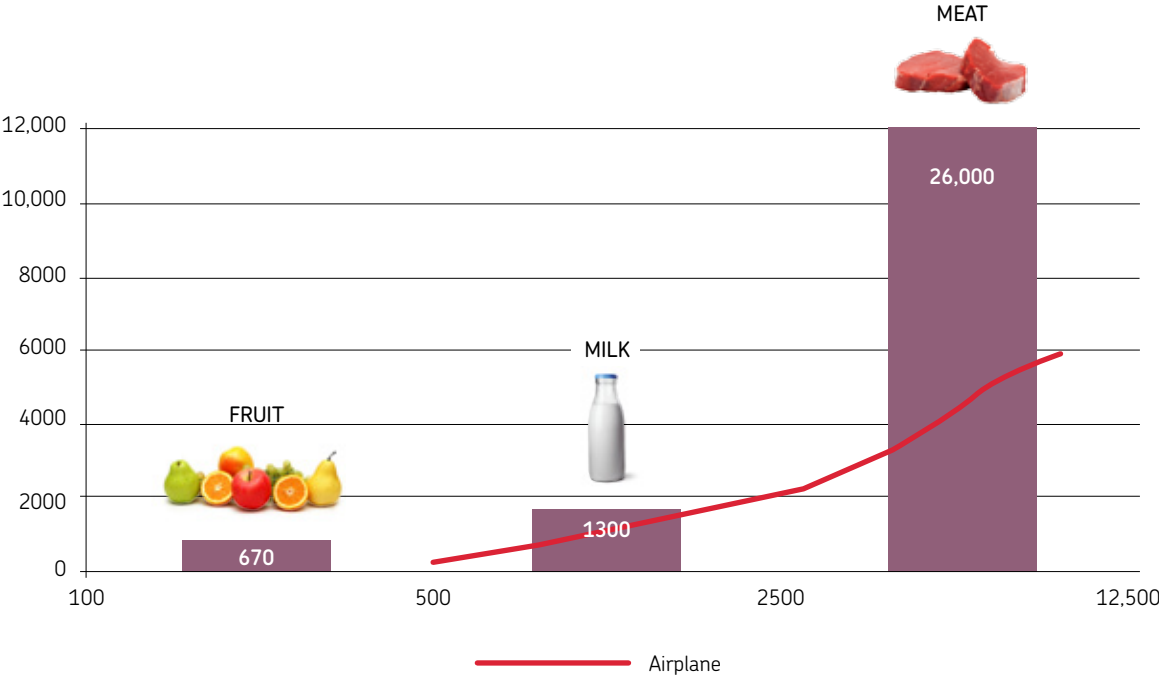
It is, thus, evident that "farm-to-table products" are not always more environmentally-friendly, compared to traditionally produced goods; on the contrary, if traditional production processes are more effective both in terms of raw materials and the process itself, the former claim could be wrong.

Figure 2.11. Unimportant transport carbon footprint compared to food production



Transport via truck, train or ship: CO₂ emissions due to transport are generally very low compared to the emissions due to the production phase, except for fruit, where long-distance transport (5,000-10,000 km) could result in a relevant impact. Data expressed in CO₂ grams per kg.

Figure 2.12. Strong impact due to air transport



Air transport: this kind of transport normally generates the highest emissions in the whole production chain. Except for red meat, where production impact results in the highest emission of greenhouse gases. Data expressed in CO₂ per kg.



2.4 GROWING TECHNIQUES, ORGANIC AGRICULTURE AND SEASONALITY

Among the most relevant aspects, those regarding growing raw materials particularly stand out. Since the majority of environmental impact is referred to agriculture, growing techniques are important, both from a quantitative and an environmental point of view.

Please refer to the technical part for further details; some general considerations on three main topics can be found below.

2.4.1 Growing techniques

The growing practices employed by farmers to grow raw materials include cultivation - or agronomic - techniques that may have a large impact on the environment, just think of fertilizers (especially nitrogenous ones) or diesel oil for machines.

Several studies aim at optimizing agricultural practices, in order to get high quality products, by protecting both farmers' income and the environment. For instance, some research on hard wheat cultivation proved that crop rotation, and species succession in particular, directly determine the proper cultivation technique to apply. Growing hard wheat where alfalfa or vegetables had been grown the previous year allows a significant reduction in the use of fertilizers, resulting in a large impact on environmental indicators: some variations indicate that this method may cut the environmental impact in half.

2.4.2 Organic agriculture

The available studies – partly indicated in the technical document – regarding environmental agriculture stress the limit in the LCA analysis methodology. Standard indicators to assess environmental impact do not sufficiently measure the benefits of organic agricultural practices, since even minor impact values are applied on less productive cultivations than on intensive ones. However, the benefits may be measured by using typical agricultural indicators, such as soil fertility, in particular if it is calculated on a ten-year basis.

2.4.3 Seasonality

Studies supporting the available literature are being carried out and these prove that raw materials that are cultivated out-of-season increase the environmental impact. For instance, the use of heated greenhouses implies a greater use of energy. Not just that – an off-season crop yield may decrease by half.

IT SEEMS EVIDENT THAT RAW MATERIALS THAT ARE CULTIVATED OUT-OF-SEASON INCREASE THE ENVIRONMENTAL IMPACT



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3. THE DOUBLE PYRAMID FOR ADULTS



3. THE DOUBLE PYRAMID FOR ADULTS

THE MEDITERRANEAN DIET HAS BEEN RECOGNIZED BY MANY FOOD SCIENTISTS AS ABSOLUTELY ONE OF THE BEST

The diet traditionally adopted in the Mediterranean countries (in particular Italy, Spain, Portugal, Greece and southern France) is a dietary model that is characterized by its completeness and good nutritional balance. It is, in fact, recognized by many food scientists as absolutely one of the best diets for promoting physical well-being and the prevention of chronic diseases, especially cardiovascular ones.

The Mediterranean diet, therefore, has become a nutritional model of reference for the construction of the nutritional portion of the Double Pyramid, which was introduced in 2010.



Otis Imboden/National Geographic Stock

3.1 MEDITERRANEAN FOOD STUDIES

The nutritional value of the Mediterranean diet was scientifically proven by the famous “Seven Countries Study” conducted by Keys,³ in which the diets of different populations were compared to assess their benefits and critical points. What we have learned from the study is the association between the type of diet and the risk of developing chronic diseases, discovering how high levels of saturated fatty acids in the diet and cholesterol in the blood are factors that can both explain the differences in mortality rates and predict future coronary heart disease in the populations analyzed.

From the first of the “Seven Countries Studies” until now, many other studies have analyzed the characteristics and associations between eating styles adopted and the onset of chronic diseases.⁴ Since the mid-nineties, a line of study to investigate the association between diet and longevity has also been developed. In general, what emerges is that a protective factor against the most common chronic diseases is to adopt an eating style based on the Mediterranean nutritional model, which consists of a high consumption of vegetables, legumes, fruits and nuts, olive oil and cereals (which in the past were mostly whole); a moderate consumption of fish, dairy products (especially yogurt and cheese) and wine; and a low consumption of red meat, white meat and animal fatty acids.⁵

It is interesting to note that research conducted on the PubMed scientific database, in a time span of just three months, shows the presence of about 70 scientific publications whose main theme is the Mediterranean diet.⁶

These publications present the results of clinical or epidemiological studies in which adherence to a Mediterranean diet results in measurable benefits in many areas of human health that include, for example, metabolic conditions, preventive effects of cardiovascular, neurological or psychiatric diseases (such as Alzheimer’s disease), respiratory diseases or allergies, disorders of both male and female sexuality (e.g. erectile dysfunction), and certain oncological diseases.

In this latter regard, interest has been sparked by the recent findings in the large European EPIC study, which evaluated 485,044 adults over a period of about nine years; EPIC showed that a greater adherence to the Mediterranean diet is associated with a significant reduction (-33%) of the risk of developing gastric cancer. Finally, it is interesting to note that scientific literature shows a positive impact of the Mediterranean diet in all ages of life, from the prenatal period to childhood, adulthood and into old age.

The eating habits of the Mediterranean diet are among those consistent with the indications expressed by the nutritional guidelines of the most authoritative scientific societies and institutions dealing with the major diseases that afflict our era (particularly cardiovascular disease, cancer and diabetes).

THE ASSOCIATION BETWEEN THE TYPE OF DIET AND THE RISK OF DEVELOPING CHRONIC DISEASES

A PROTECTIVE FACTOR AGAINST THE MOST COMMON CHRONIC DISEASES IS TO ADOPT AN EATING STYLE BASED ON THE MEDITERRANEAN NUTRITIONAL MODEL

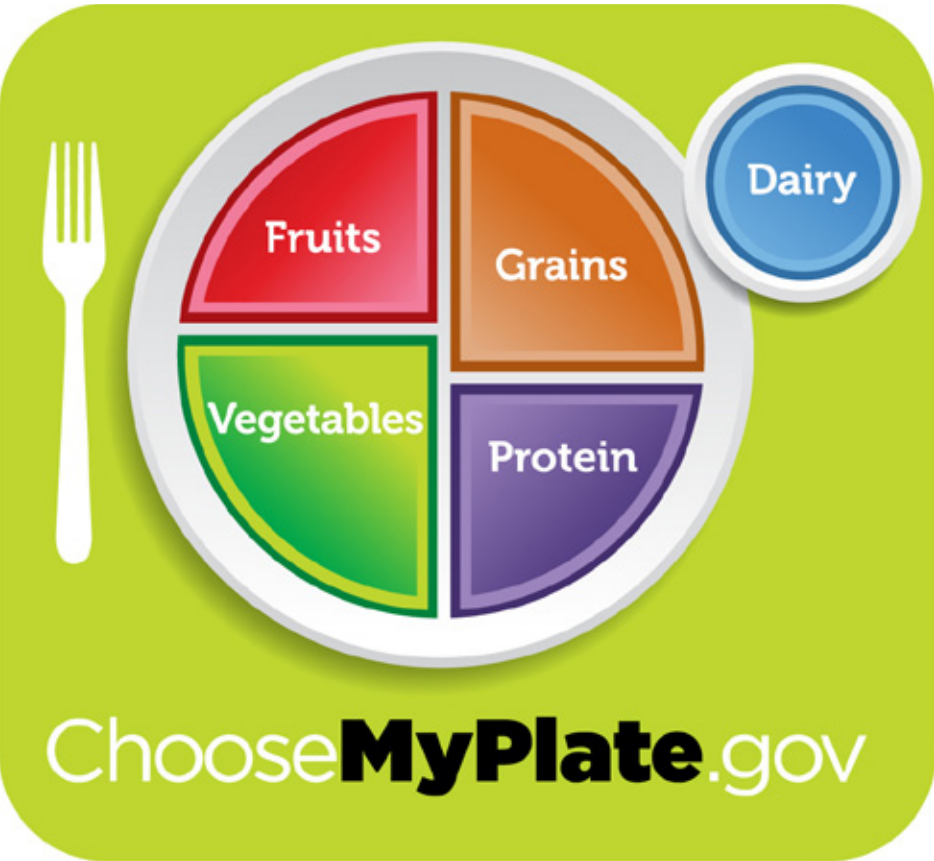
GREATER ADHERENCE TO A MEDITERRANEAN DIET IS ASSOCIATED WITH A SIGNIFICANT REDUCTION (-33%) OF THE RISK OF DEVELOPING GASTRIC CANCER

WITH THE AIM OF MEASURING OTHER DIETS' ADHERENCE TO – OR DISTANCE FROM – THE MEDITERRANEAN DIET, SOME "MEDITERRANEAN ADEQUACY" INDICES HAVE BEEN DEVELOPED

THE MEDITERRANEAN DIET IS A PROTECTIVE FACTOR AGAINST ALL CAUSES OF DEATH

From the results of the analysis it can clearly be seen how the Mediterranean diet's close adherence to the recommendations suggested on a scientific level make it one of the most effective in terms of the promotion and preservation of well-being and the prevention of major chronic diseases. With the aim of measuring other diets' adherence to – or distance from – the Mediterranean diet, some "Mediterranean adequacy" indices have been developed. In particular, Trichopoulou,⁷ after creating an index that quantifies adherence to the Mediterranean diet on a scale from 0 to 9 (where the maximum value means maximum adherence and vice versa), found an inverse association between the score obtained by a population and the mortality rates of the elderly. The studies conducted by Panagiotakos⁸ also revealed how the increase in the level of adherence to the Mediterranean diet is significant in the prediction of cases of hypertension, high cholesterol, diabetes and obesity in adults. An increase of approximately 20% of adherence to the Mediterranean diet⁹ reduces the occurrence of cardiovascular disease by 4% over a 10-year period. Other studies conducted by Trichopoulou¹⁰ showed that adherence to the Mediterranean diet produces significant reductions in overall mortality rates of the population, especially in deaths from cardiovascular disease and cancer. The same results can be found in recent studies which Mitrou¹¹ conducted for 10 years on a sample of more than 380,000 Americans. Specifically with regard to coronary heart disease, De Lorgeril¹² showed that the Mediterranean diet reduced the risk of heart attack by 72%. The results of studies by Fung¹³ have, once again, confirmed the diet's cardio-protective effects. A recent meta-analysis by Sofi¹⁴ has shown that the Mediterranean diet represents a pro-

Figure 3.1. Graphics of the dietary recommendations developed by the USDA



tective factor against all causes of death and mortality and, specifically, those related to cardiovascular disease and cancer, as well as to Parkinson's disease and Alzheimer's. Finally, it highlights how a major worldwide effort is still underway to make these clear and logical arguments in the food pyramid increasingly accessible to, and usable by, people: one last example is the United States Department of Agriculture's (USDA) food "dish," a translation of the content of the food pyramid.

In addition to the graphical representation of the dietary advice, it is important to note that much of the most authoritative scientific research on the relationship between diet and chronic diseases reveals, beyond any reasonable doubt, that the Mediterranean dietary model should be taken as the reference point for a good diet and that it should be associated with "healthy" lifestyles. A summary of these recommendations has already been developed and published by BCFN in previous works.

MUCH OF THE MOST AUTHORITATIVE SCIENTIFIC RESEARCH ON THE RELATIONSHIP BETWEEN DIET AND CHRONIC DISEASES SHOWS THAT THE MEDITERRANEAN DIETARY MODEL SHOULD BE TAKEN AS THE REFERENCE POINT

Figure 3.2. Convergence of guidelines for the prevention of cardiovascular diseases, diabetes and cancer: synthesis pathway.

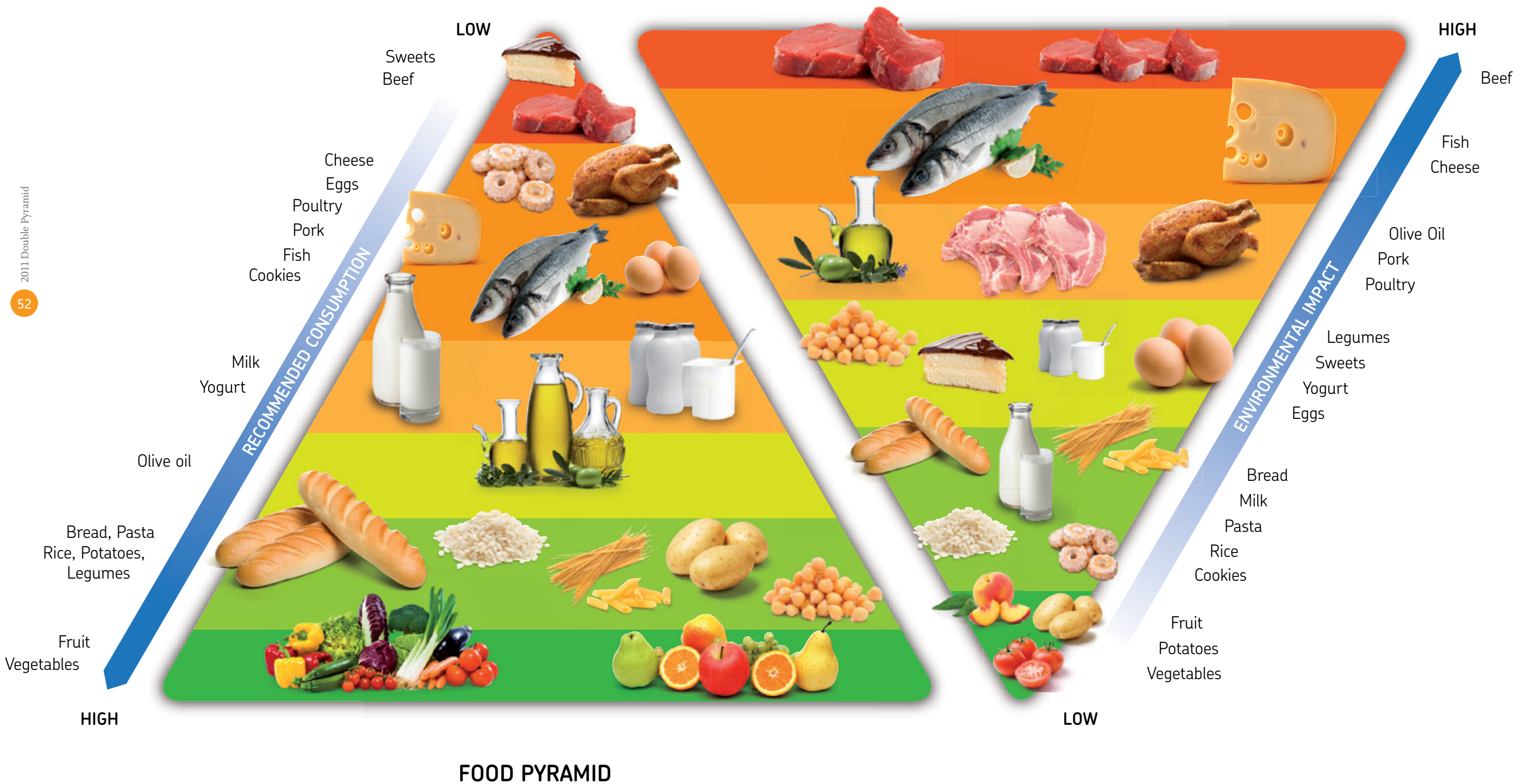
HEALTHY EATING AND LIFESTYLE			
1 30 minutes of physical activity per day	2 Avoid overweight conditions and obesity	3 Avoid excess consumption of alcohol	4 No smoking
5 Adopt a balanced diet	6 Increase consumption of fruits and vegetables	7 Choose complex carbohydrates and increase consumption of whole grains	8 Increase consumption of legumes
9 Eat fish once or twice a week	10 Choose vegetable-based condiments	11 Limit consumption of high-fat foods	12 Limit consumption of fried foods
13 Limit consumption of red meat and poultry to 3 - 4 times a week	14 Limit additional consumption of salt	15 Limit consumption of foods/beverages with a high sugar content	16 Avoid daily use of food supplements

Source: Barilla Center for Food & Nutrition, *Food and Health*, September, 2009.

3.2 THE DOUBLE PYRAMID FOR ADULTS

By maintaining unaltered the food portion of the Double Pyramid and substituting the environmental portion with the revisions resulting from the developments of this new edition, the updated BCFN Double Pyramid, below, is achieved:

ENVIRONMENTAL PYRAMID



4. THE DOUBLE PYRAMID FOR THOSE WHO ARE GROWING



4. THE DOUBLE PYRAMID FOR THOSE WHO ARE GROWING

As in the chapter relating to adults, this chapter discusses the concept of the Double Pyramid for those who are growing, starting with the nutritional aspects and then combining these considerations with environmental ones.

Before considering the merits of the nutritional aspects, it should be noted that in 2010 the BCFN published the document *Healthy growth and nutrition in children*, regarding the relationship between diet and health in children. This chapter is a summary of the considerations presented in that published document.

4.1 FACTORS FOR GOOD GROWTH

Growth is a continuous process: it begins at conception and ends with the attainment of sexual maturity; somatic growth is accompanied by neural-psychological development.

This process can be divided into three time phases, distinguished by specific anatomical, physiological and psychological changes occurring in the individual:

- childhood (birth to 11 years);
- adolescence or puberty (including the period between 11 and 18 years of age in males and between 11 and 16 years of age in females);
- youth (from 18 to 25 years of age in males and from 16 to 20 years of age in females).

At each stage, the behavior of parents is crucial for growth - for the development of the child, the adolescent and the young adult - and very different approaches are required at different ages.

Moreover, to obtain the best final result, along with how to report adherence to the most up-to-date teaching tips specific to each stage of growth, the nutritional and movement habits and the lifestyle acquired in the family are very important.

For example, regarding the food diet, it has been clearly shown that there is a strong relationship between unhealthy diet, excess body weight and an increased risk of chronic diseases. However, while there is greater awareness of this relationship for adults, public opinion continues to have difficulty in accepting the crucial importance of nutrition in the prevention of many diseases in children and young people. This, despite the studies conducted to date, all of which agree on the importance of risk conditions and behavior related to eating habits (in terms of quantity and composition of the diet) in promoting the onset of chronic diseases (cardiovascular, diabetes and cancer) in childhood and later in life.

One of the first studies – conducted in the '30s by Boyd Orr¹⁵ and taken up again in 1998¹⁵ by Frankel, Gunnell and Peters¹⁶ – confirms the existence of a positive relationship between the amount of calories consumed during growth and the mortality rates for cancer in adult life.

Also, the recent revision (Weight Control and Physical Activity) conducted by the International Agency for Research on Cancer (IARC) leads to the same conclusions, showing a link between a state of obesity (both during childhood and adolescence) and the risk of chronic disease.

Must and Limpman¹⁷ have shown that proteins, especially those of animal origin, if consumed in excess, may promote weight gain up to obesity and, consequently, increase the risk of contracting diseases such as cancer of the breast, uterus and colon.

GROWTH IS A CONTINUOUS PROCESS: IT BEGINS AT CONCEPTION AND ENDS WITH THE ATTAINMENT OF SEXUAL MATURITY

THE NUTRITIONAL AND MOVEMENT HABITS AND THE LIFESTYLE ACQUIRED IN THE FAMILY ARE VERY IMPORTANT

THERE IS A STRONG RELATIONSHIP BETWEEN AN UNHEALTHY DIET, EXCESS BODY WEIGHT AND AN INCREASED RISK OF CHRONIC DISEASES

THERE IS A POSITIVE RELATIONSHIP BETWEEN THE AMOUNT OF CALORIES CONSUMED DURING GROWTH AND THE MORTALITY RATES FOR CANCER IN ADULT LIFE



THE STATE OF HEALTH IN ADULT LIFE IS ALSO DETERMINED BY THE CONTEXT OF THE FAMILY AND THE SOCIAL AND ECONOMIC ENVIRONMENT IN WHICH THE CHILD GROWS UP

THREE CRITICAL FACTORS

The state of health in adult life is also determined by the context of the family and the social and economic environment in which the child grows up. A condition of social deprivation and malnutrition in childhood has been associated with the risk of cardiovascular disease and diabetes in adulthood. Likewise, the presence of overweight people in the family leads to a higher risk of adopting a diet that is inadequate quantitatively (due to excess) and qualitatively unbalanced, and to acquiring and developing obesity and sedentary habits.

There are three critical factors which, if not avoided during the period of adolescence, may significantly affect the risk of chronic diseases in adult life:

- exposure to risk factors such as the adoption of an unhealthy diet, alcohol and tobacco consumption or an excessive increase in weight;
- acquisition of a sedentary lifestyle, such as replacing the hours of physical activity with the entertainment of TV, video games or the computer;
- neglecting the prevention and the control of risk factors, such as regular weight checks by subjecting the teenager to a verification by a pediatrician.

The combination of these three factors can produce phenomena that occur more immediately (obesity, insulin resistance, dyslipidemia, hypertension) and, at the same time, generate long-term effects, such as the acceleration of the processes that lead to diabetes and cardiovascular disease in adulthood.



4.2 THE RELATIONSHIP BETWEEN DIET AND HEALTH IN CHILDREN AND ADOLESCENTS

The following is an analysis of the relationship between diet and health in children during early childhood and adolescence.

During the period of early childhood – characterized by very rapid growth – it is more necessary than ever to provide the child with an adequate amount of energy. In the first year of life, the energy requirement for growth is large compared to the total, 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 World Health Organization¹⁸ shows that there is a substantial similarity between the recommendations provided by various countries and organizations in relation to the amount of energy needed by pre-school age children. Thus, there is a range of values that can be considered as reliable overall, calculated through the product of the estimated amount of energy needed per kilogram of body weight and the average weight characteristic of the child within a few macro-age ranges.

Therefore, also based on the increasing incidence of obesity among children and adolescents, the WHO suggests limiting an excessive intake of fats and sugars at an early age. In particular, the macronutrients found in food that can provide energy to the child are fats, carbohydrates and proteins.

For the child, the fats acquired by eating food represent a source of energy and essential fatty acids. Structural fats are an essential part of cell membranes, of neural tissue and cellular architecture as a whole, while those deposited – found particularly in adipose tissue, mainly composed of triglycerides – act as a long-term energy reserve for the body. As a priority, the daily intake of fat is achieved through food groups such as fish and nuts; in the case of the use of condiments, it is preferable to use vegetable oils, particularly olive oil. This assumption also allows for an optimal absorption of fat-soluble vitamins (A, D, E, K). Tale assunzione consente inoltre un ottimale assorbimento delle vitamine liposolubili (A, D, E, K).

The second essential micronutrient for ensuring the proper and balanced intake of energy for the child is represented by proteins. The best sources of high quality protein are represented by animal liver, meat, fish, cheese, milk, eggs and some plant products such as soy, green beans and legumes.

Following in importance are products derived from wheat, which are also a source of proteins, while most fruits and vegetables contain them in limited quantities. Please remember, however, that in developed countries there is an excessive consumption of pro-

DURING THE PERIOD OF EARLY CHILDHOOD, IT IS MORE NECESSARY THAN EVER TO PROVIDE THE CHILD WITH AN ADEQUATE AMOUNT OF ENERGY

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IN DEVELOPED COUNTRIES
THERE IS AN EXCESSIVE
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CARBOHYDRATES PROVIDE
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TISSUES

ADOLESCENCE IS
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tein (rather than a lack): the food usually consumed in Western families, in fact, has an amount of protein that is 3-4 times the level considered adequate to meet the needs of pre-school and school age children.

Following in importance are products derived from wheat, which are also a source of proteins, while most fruits and vegetables contain them in limited quantities. Please remember, however, that in developed countries there is an excessive consumption of protein (rather than a lack): the food usually consumed in Western families, in fact, has an amount of protein that is 3-4 times the level considered adequate to meet the needs of pre-school and school age children.

Carbohydrates are the third and most important (in quantitative terms) source of energy for the body. Carbohydrates (sugars, starches and fibers) provide energy to all body tissues, especially the brain and red blood cells that use only glucose as “fuel” for cellular activities. Alongside the main macronutrients, the essential elements of proper nutrition for children in preschool and school are vitamins and minerals. Among these, of utmost importance are vitamin D, which is essential for proper bone mineralization, and iron, whose deficiency, especially at an early age, can lead to deficits in remote neural-cognitive functions.

Adolescence is the period in which the transition from the prepubertal condition to adulthood occurs and is characterized by the appearance of major changes on the physical, psychological and social levels. It can be divided into two phases: first and second adolescence. The first corresponds to the period of puberty, when the body develops and completes the acquisition of its reproductive capacity, approximately between 10 and 15 years of age, while the second phase corresponds to the period of completion of the mental and physical development, roughly between 15 and 18-22 years of age. Adolescence is characterized by intense metabolic activity, during which there is a strong acceleration of the growth rate, in both males and females.

The important physical changes relating to rapid growth and changes caused by puberty are associated with a greater need, both quantitative and qualitative, for nutrients (carbohydrates, proteins, fats), vitamins, minerals, fiber and water. In this phase, the most common nutrient deficiencies are those of iron and calcium, to the point that anemia due to iron deficiency is one of the most common diseases associated with bad eating habits.¹⁹

To overcome these problems it is, therefore, important that during adolescence there be an increase in the consumption of iron-rich foods such as lean meats and fish, legumes, dark green vegetables, nuts and cereals fortified with iron.

Calcium also plays a key role in the body of the rapidly growing adolescent, in that it goes into the composition of bones and teeth. That is why it is important to eat foods rich in calcium for boys and especially for girls, who in years to come, with the onset of menopause, are most at risk of osteoporosis.

Youth, after all, is the time when food needs gradually become similar to those of adults.

4.3 PHYSICAL ACTIVITY IN ADDITION TO PROPER NUTRITION

In addition to strictly nutritional information, it seems necessary to strongly emphasize how regular physical activity (practiced mainly in the open air) is one of the factors considered crucial to the health of children and adolescents (and also has important positive impacts on reducing the risks associated with the occurrence of major chronic disease in later life, up to adulthood).

Physical activity helps burn calories, relieve tension and stress, and improve one's mood and psychological well-being. The constant practice of physical activity and sport provides great benefits to the cardiovascular apparatus and skeletal system, as well as to the metabolism. In addition, the regular practice of movement helps maintain a healthy weight and optimal body composition, makes adolescents stronger and gets them used to adopting a lifestyle that will enable them to be in better health to deal with the years to come.

Against this background, the lack of physical activity in adolescents plays an important role in the development, in the progression and in the perpetuation of certain diseases such as obesity. Studies in Europe and the U.S. have found the majority of adolescents today to be either not very active physically or adopting a lifestyle that does not call for adequate physical activity.

For example, the steady increase in the time spent by young people in front of a video has been confirmed by a U.S. study,²⁰ which calculated that children between 8 and 18 years of age spend an average of 7 hours and 38 minutes a day in front of a video, based on the average of 2009.²¹ Compared to five years earlier (2004), there had been an increase of 1 hour and 17 minutes; compared to that of 10 years earlier (1999), 1 hour and 19 minutes.

Physical inactivity is not only a major contributor to the development of overweight conditions and obesity, but also to the development, in later stages of life, of chronic diseases such as heart disease, diabetes, hypertension, constipation and intestinal diverticulosis, osteoporosis, and certain forms of cancer.

Moreover, physical activities and sports such as swimming, gymnastics, cycling or simply walking, cycling, skating, playing ball sports and dancing, for about 60 minutes a day, three to five times a week, can help increase bone mass and density.

In addition, adequate physical activity is positively related to improvements in body flexibility, balance, agility and coordination, and the strengthening of bones.

According to current recommendations, kids aged 5 to 17 should accumulate at least 60 minutes a day of daily physical activity (moderate to vigorous), through play and recreation, sport and physical education, mobility, etc., in the contexts of the family, school and activities organized by the community.

As reported in the document *Global Recommendations on Physical Activity on Health*, released by the World Health Organization,²² the goal of 60 minutes does not necessarily mean conducting

PHYSICAL ACTIVITY HELPS
BURN CALORIES, RELIEVES
TENSION AND STRESS,
IMPROVES ONE'S MOOD
AND PSYCHOLOGICAL
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PHYSICAL ACTIVITY

Figure 4.1. The Italian pyramid of physical activity of La Sapienza University in Rome



physical activity continuously for an hour, but provides the possibility of daily physical activity through a series of actions that last less time.

Furthermore, physical activity for a cumulative time of 60 minutes a day would result in additional benefits to health. Although most physical activity should be aerobic, activities that involve a more intense effort should also be integrated at least three times a week.

Faced with the great benefits in terms of health and prevention of serious diseases in adulthood, the cost of the adoption of these recommendations is minimal and concerns the activities of communication, promotion and dissemination in each country.

In the Italian pyramid for physical activity²³ – which is also valid for adults – the “Well-being Quantity” (WQ) of the motor activity of reference is 1 WQ, which is equal to 15 minutes. Thus, as shown in the following figure, at least 2 WQs per day, which equals 30 minutes of walking, are recommended to combat a sedentary lifestyle; more vigorous activity (swimming, soccer, tennis, etc..) several times a week is recommended for a more active or sporting lifestyle.

These recommendations related to the promotion of beneficial effects on the state of he-

alth through a sporting or physical activity are consistent with the objectives of the World Health Organization (2004) and the European Union (2005), which aim to promote “continuous operations, multi-instrumental systems for the prevention of obesity,” acting on information and the education of individuals.

The ultimate goal is for children to make healthy life choices in complete awareness, building motivation for change rather than being driven by an imposed or external “duty toward health.”

PROMOTE “CONTINUOUS OPERATIONS, MULTI-INSTRUMENTAL SYSTEMS FOR THE PREVENTION OF OBESITY.”



J. Baylor Roberts/National Geographic Stock

AT LEAST 30 MINUTES PER DAY OF WALKING IS RECOMMENDED TO COMBAT A SEDENTARY LIFESTYLE

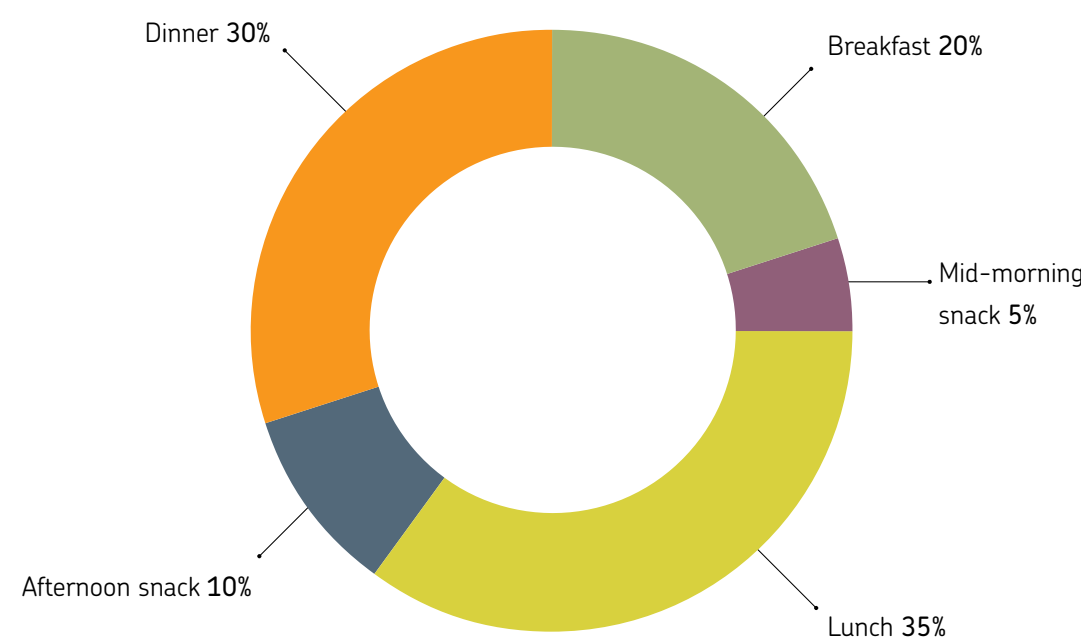


4.4 THE NUTRITION PYRAMID FOR THOSE WHO ARE GROWING

If the main connections are changed between macro- and micronutrient intake and proper development at different stages of growth in an average diet which is adequate for meeting the requirements identified by pediatricians and nutritionists, it is possible to achieve the definition of a weekly composition of food eaten by children and adolescents that - as a whole - is both correct and balanced, in terms of type of food ingested and the distribution of daily calories.

DEFINITION OF THE WEEKLY COMPOSITION OF FOOD EATEN BY CHILDREN AND ADOLESCENTS THAT IS BOTH CORRECT AND BALANCED.









Figure 4.2. Breakdown of recommended calorie intake throughout the day



Source: The European House-Ambrosetti elaboration of data from the Italian Society of Human Nutrition.

A correct diet is characterized by the principle of variety, that is, a mixed supply that includes food from plants (fruits, vegetables, legumes, grains, seeds, etc.) and animals (meat, cheese, dairy products, ham, etc.) and alternation of food during the week. More specifically, the diet of children and adolescents should be composed as described below, in terms of frequency of consumption.

Figure 4.3. Composition of optimal weekly diet

Consumption of cereals (bread, pasta and rice) especially whole-grain  EVERY DAY	Consumption of fruits and vegetables  EVERY DAY	Consumption of dairy products  EVERY DAY
Consumption of meat  2/3 TIMES DURING THE WEEK	Consumption of fish  AT LEAST 3 TIMES A WEEK	Consumption of cheese  TWICE A WEEK
Consumption of eggs  1/2 TIMES DURING THE WEEK	Consumption of legumes  AT LEAST 2 TIMES A WEEK	

MANY INTERNATIONAL STUDIES HAVE HIGHLIGHTED THE PREVALENCE AMONG CHILDREN AGED 6 TO 10 OF EATING HABITS THAT DO NOT PROMOTE HARMONIOUS GROWTH

THE DAILY CALORIE INTAKE OF THE MAJORITY OF CHILDREN IS SUPERIOR TO THEIR NEEDS

Despite these recommendations, many international studies²⁴ have highlighted the prevalence among children aged 6 to 10 of eating habits that do not promote harmonious growth and predispose for the gaining of weight. In fact, it has been observed that only 1% of children have food habits that are in line with the optimal composition of the weekly diet and, thus, consume portions and a variety of food products in accordance with the recommendations of a proper nutrition pyramid. The same studies also show that the daily calorie intake of the majority of children observed at school age is not only superior to their needs, but is also primarily oriented toward the consumption of fats and sugars (especially in children characterized by a tendency to obesity), at the expense of fruits and vegetables. As a conclusion of its detailed work on the issues of nutrition and growth of children, the

BCFN has created a summary of the macro-guidelines that should be followed to adopt a healthy diet and a lifestyle that is suitable for promoting the development of healthy children and adolescents. The United States has also chosen to support the recommendations for the childhood diet contained in My Pyramid for Kids, made up of simple tips for families to promote the physical activity of parents and children. Among these is the exhortation to “lead by example” within one’s own family (promoting walks, playing with kids and pets, etc.); to establish a “routine” by setting aside time to devote to physical activity every day; to “move” even when watching TV (for example, getting up during the commercials) or talking on the phone (walking, lifting weights, etc.); to give gifts that encourage physical activity (active games, sports equipment, etc.); to organize parties that include games and competitions; to set up a home gym using the household furniture, the stairs, etc.

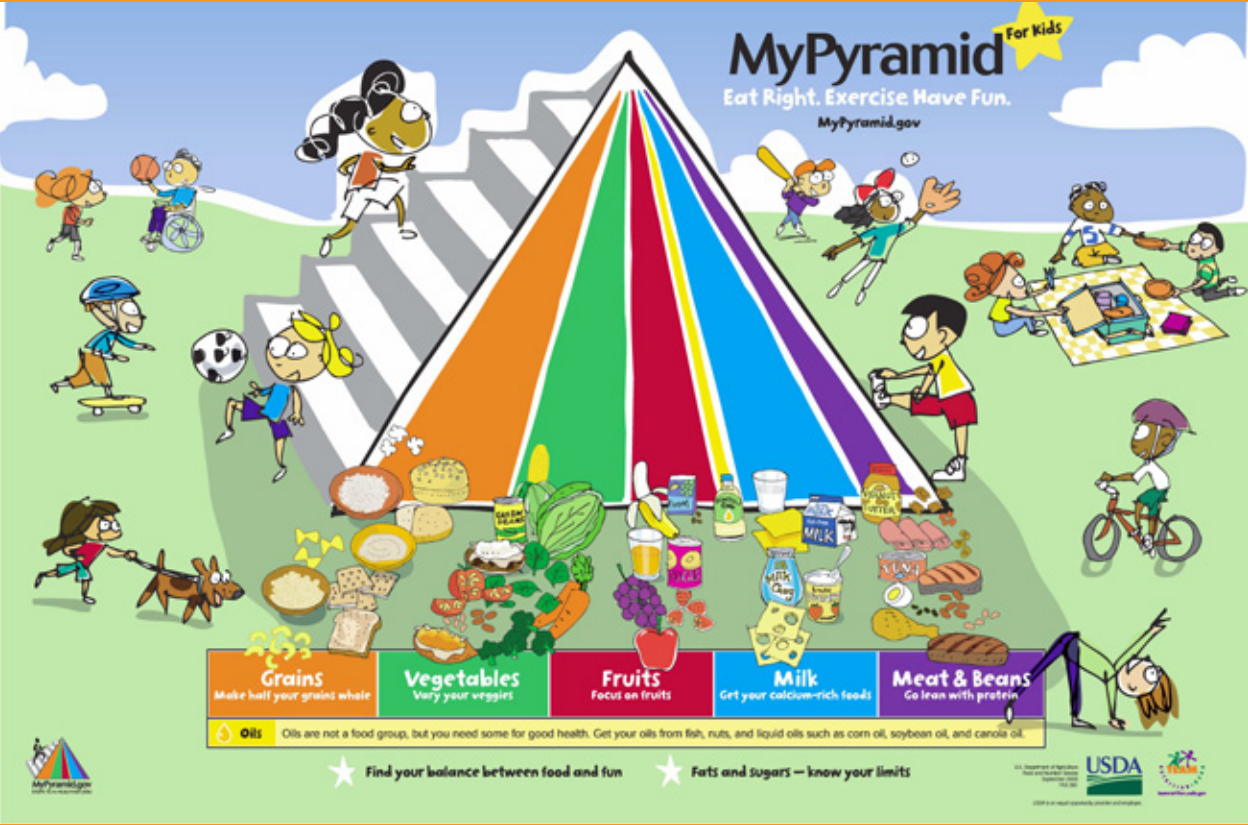
SUMMARY OF THE MACRO-GUIDELINES FOR HEALTHY GROWTH

- 1 Adopt a healthy and balanced diet, alternating daily all the main foods, supplying all the nutrients and micronutrients (calcium, iron, vitamins, etc.) that adolescents need.
- 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 simple 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 (television and computers).

My Piramid for Kids

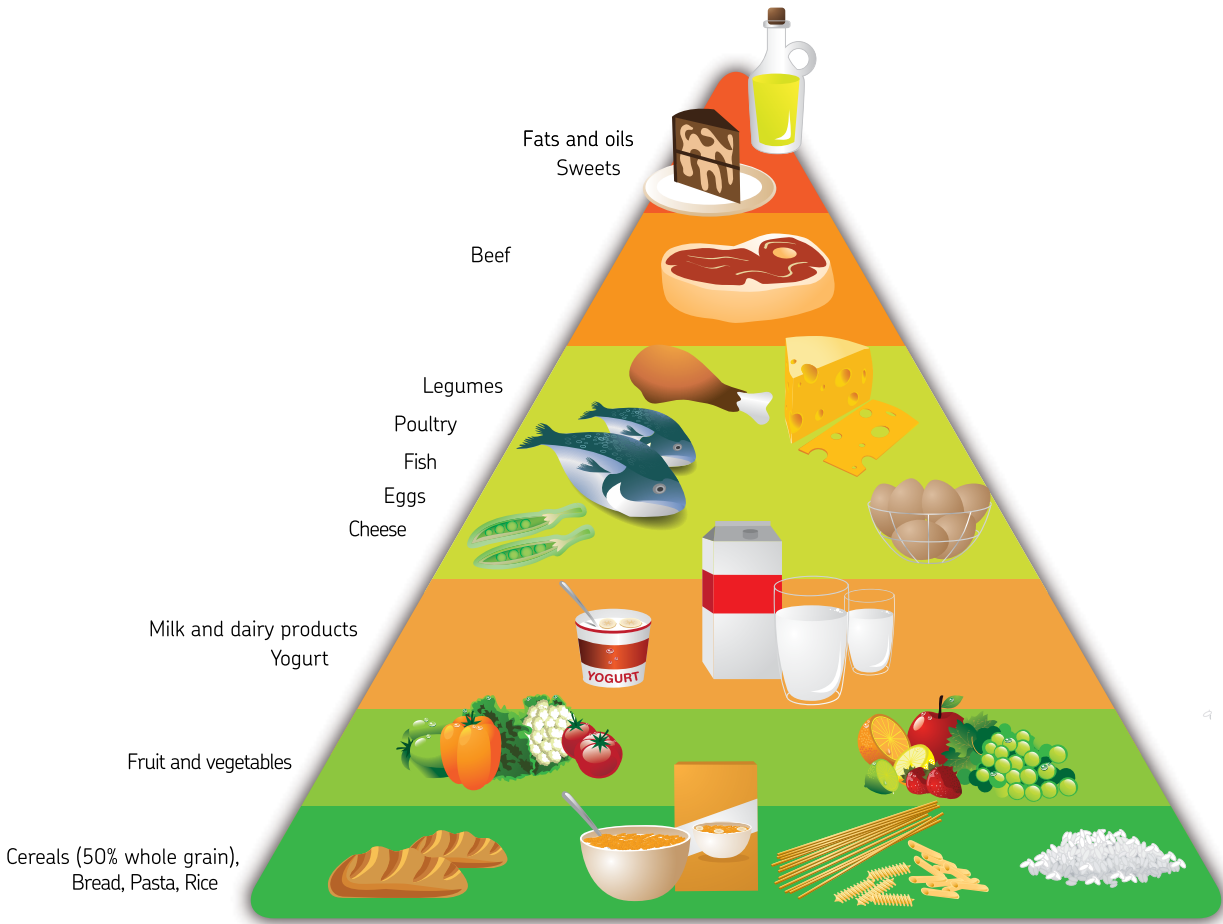
The Center for Nutrition Policy and Promotion, an organization of the United States Department of Agriculture (USDA), was established in 1994 to improve the nutrition and welfare of Americans. Its activities, which are designed to guide consumers toward healthy eating habits, led to the development of programs and recommendations on the introduction and frequency of consumption of foods in a balanced diet. These programs are carried out according to age and are based on the recommendations of the Dietary Guidelines for Americans, published and updated every five years by

the USDA and the Department of Health and Human Services (HHS). Among these, a food pyramid has been defined for children (aged 6 to 11 years), *My Pyramid for Kids*, in which the different types of food that should be consumed every day are highlighted in a colorful and fun way. The messages addressed to the children are accompanied by suggestions for the family, encouraging the proper distribution of food during the day and highlighting the vital role of physical activity for healthy growth. More details are available at www.mypyramid.gov.



4.4.1 The food pyramid for those who are growing

On the basis of what is specified in these pages, and with reference to children (in particular, age two and older) and adolescents, the BCFN has created a food pyramid that is also a component of the Double Pyramid (the following period, youth, is comparable to that of the consumption frequency of adults).



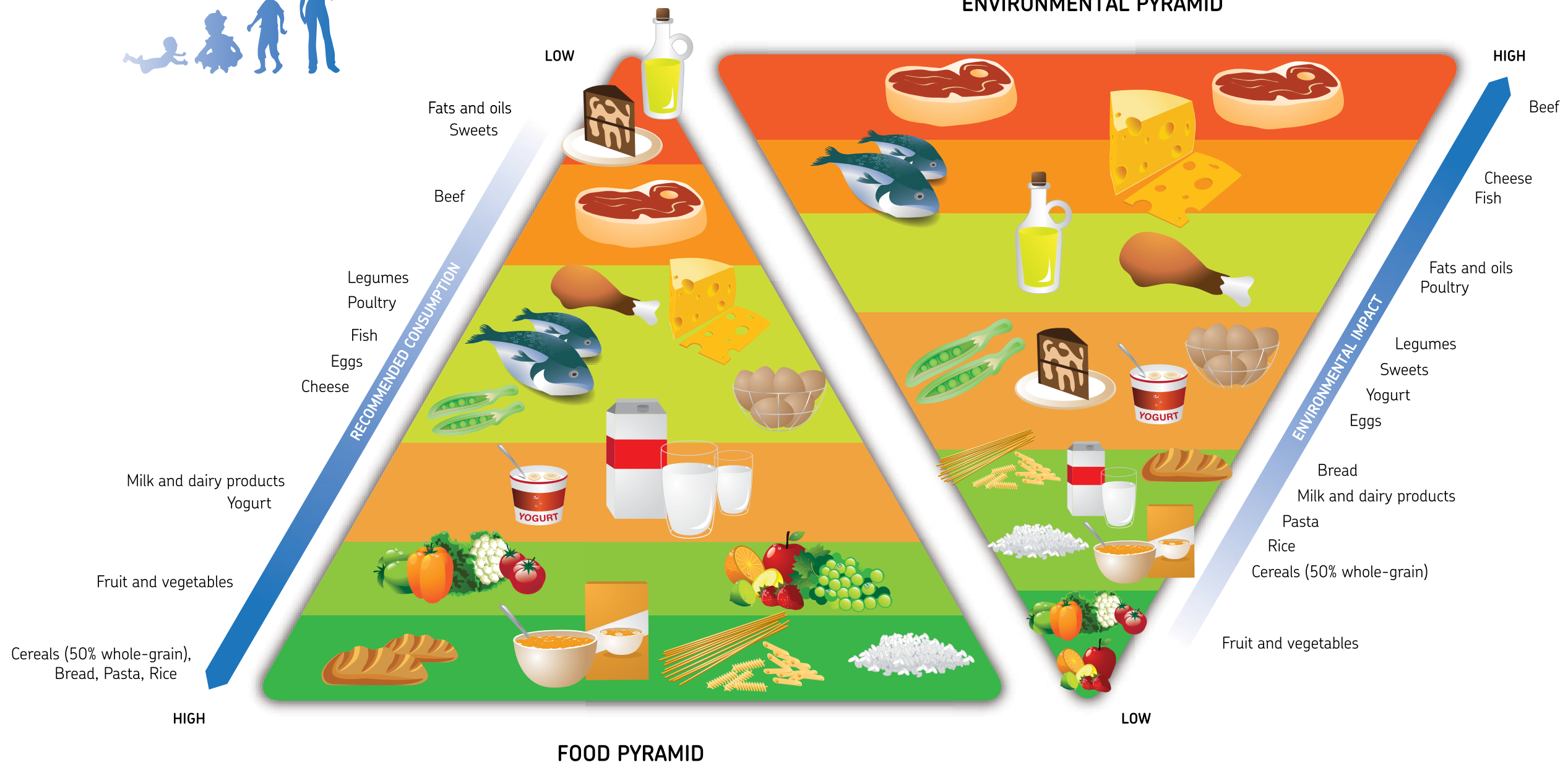
As in the case of adults, the diet of children and adolescents, too, should be based mainly on plant foods, particularly the various cereals, especially whole-grains, which are very important for their fiber content and protective components, and fruits and vegetables. Slightly above, we find milk and dairy products, preferably low-fat versions, as well as meat and fish; while higher up we get to products with a higher fat and sugar content, for which we suggest a relatively low frequency of consumption. The necessary intake of unsaturated fats should be covered by fish and dried fruit, preferably by using vegetable oils for condiments.

4.5 THE DOUBLE PYRAMID FOR THOSE WHO ARE GROWING

The combination of an environmental and a nutritional pyramid for children has allowed us to create the BCFN Double Pyramid, dedicated to those who are growing.



ENVIRONMENTAL PYRAMID



5. THE IMPACT OF DIFFERENT DIETARY HABITS



5. THE IMPACT OF DIFFERENT DIETARY HABITS

Using the ecological footprint – the indicator that was used for the Double Pyramid – as a point of reference, this chapter examines how the eating habits of people have an environmental impact. Significant reductions can be achieved both by changing eating habits (as demonstrated by some examples of menus) and by reducing waste.



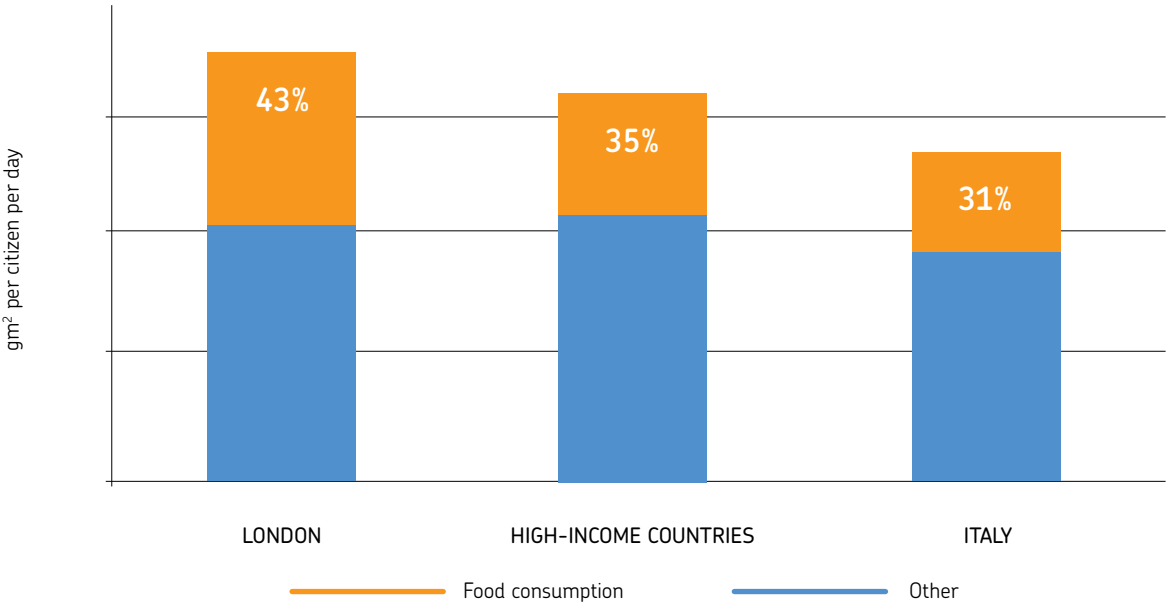
Randy Olson/National Geographic Stock

5.1 FOOD FOOTPRINT

According to recent statistics published by the Global Footprint Network (GFN), a citizen who lives in a country with a high income, in order to maintain the desired level of well-being, requires an ecological area of about 6.1 global hectares (*global hectare* - gha; approximately 170 square feet total per day), more than twice the global average (2.7 global hectares²⁵).

A CITIZEN WHO LIVES IN A COUNTRY WITH A HIGH INCOME, IN ORDER TO MAINTAIN THE DESIRED LEVEL OF WELL-BEING, REQUIRES AN ECOLOGICAL AREA OF ABOUT 6.1 GLOBAL HECTARES

Figure 5.1. Estimation of surface area to produce the necessary resources for an average citizen in several areas of the world

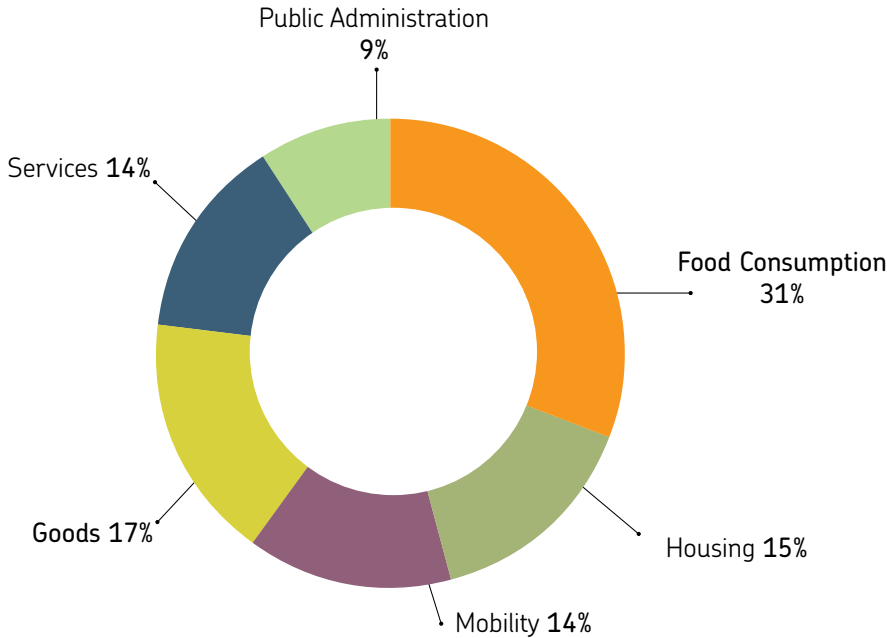


Source: elaboration by the University of Siena and the BCFN.

Analyzing the data in its components, one finds that food consumption is the first entry in terms of impact, with a significant Ecological Footprint totaling around 30-40%, which corresponds to about 1.8/2.4 global hectares per year. Referring to the average consumption (2.1 global hectares) and the reported daily impact, one can assume that every individual needs approximately 60 square meters to meet their global needs for food. The estimate takes into account the fact that, on average, a citizen who lives in a high-income country

EVERY INDIVIDUAL NEEDS APPROXIMATELY 60 SQUARE METERS TO MEET THEIR DAILY GLOBAL NEEDS FOR FOOD

Figure 5.2. Italian ecological footprint breakdown as to category of consumption



Source: elaboration by the University of Siena of data kindly provided by the Global Footprint Network, 2010.

follows a diet of 2650 kcal per day,²⁶ considering the consumption of both food and drink, including food waste (unfortunately, a very common phenomenon). As an example, we can also cite the case of the average Italian citizen,²⁷ 42 square global meters exploited for food compared to 137 total, and that of a citizen of London with a global impact of 75 square meters out of 180.²⁸ At this point, it is interesting to see to what extent the eating habits of individuals affect the Ecological Footprint.



Greg Dale/National Geographic Stock

Figure 5.3. Ecological footprint of each country (data per person)



Source : Ewing, B. et al., *The Ecological Footprint Atlas 2010*, Global Footprint Network, Oakland, CA, 2010.

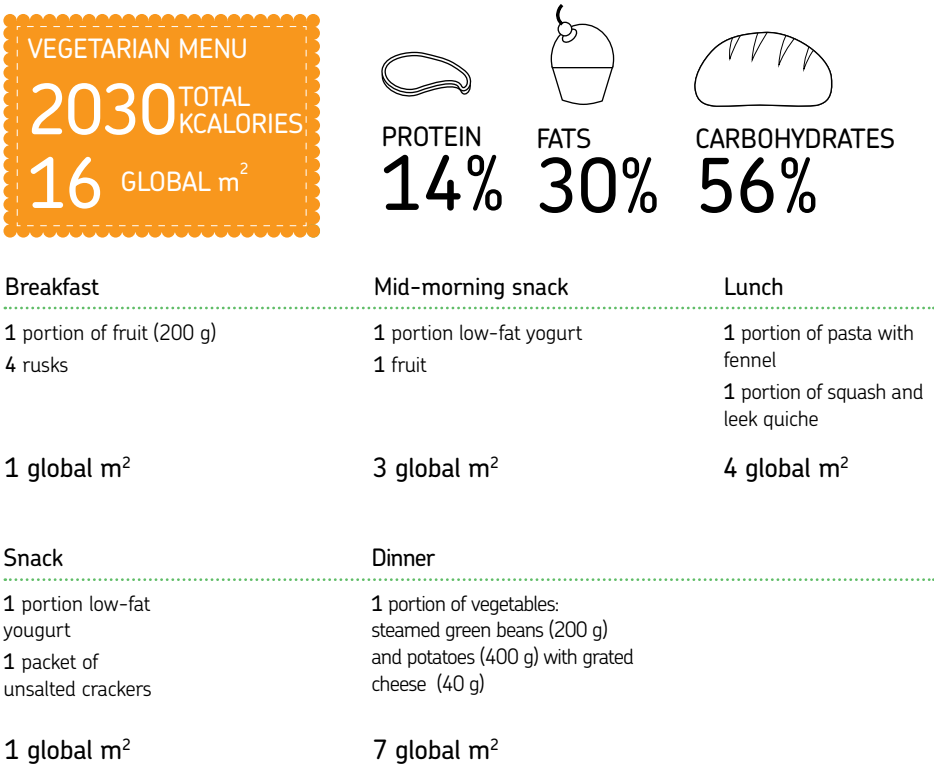
5.2 THE INFLUENCE OF FOOD CHOICES

In order to estimate the extent to which the food choices of individuals affect the Ecological Footprint, two different daily menus were analyzed: both are balanced from a nutritional point of view, both in terms of calories and nutrients (proteins, fats and carbohydrates), but in the first one, the protein is of plant origin (“vegetarian menu”), while in the second, it is mainly of animal origin (“meat menu”).

The meat menu has an environmental impact that is two and a half times higher than the vegetarian one: 42 square global meters compared to 16; that is, a difference of at least 26, which represents a very significant share in the daily impact of an individual. Based on this data, we can hypothesize what the reduction of environmental impact of an individual might be if he or she simply changes eating habits. Taking the example of a

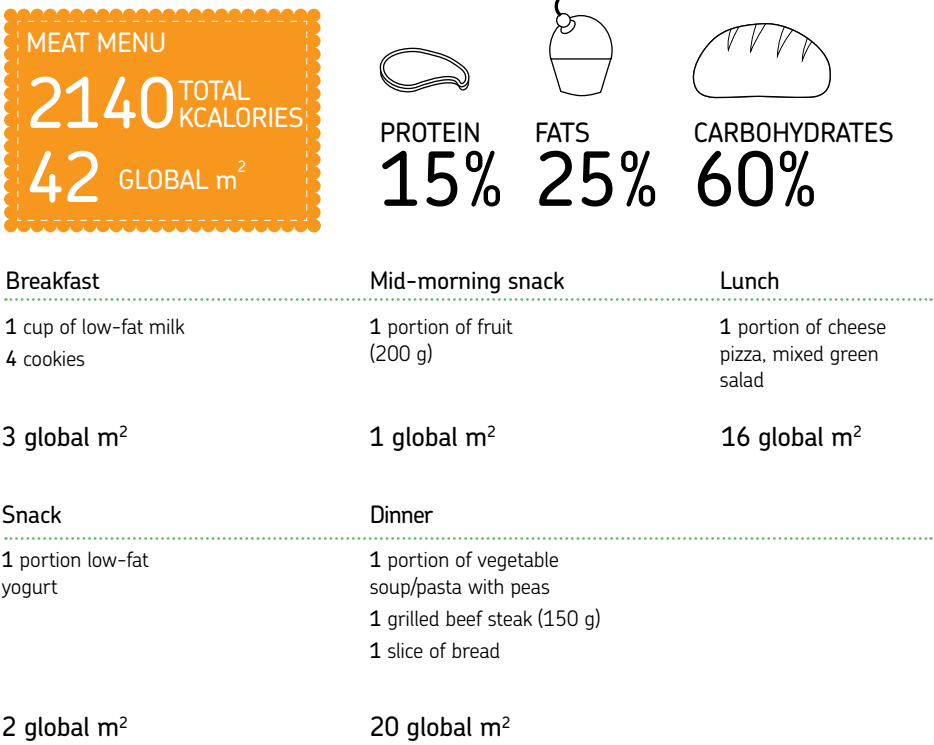
THE VEGETARIAN MENU HAS AN ENVIRONMENTAL IMPACT THAT IS TWO AND A HALF TIMES LOWER THAN THE MEAT ONE

Figure 5.4. Composition of a vegetarian menu and its environmental impact



Source: BCFN, 2011.

Figure 5.5. Composition of a meat menu and its environmental impact



Fonte: BCFN, 2011.

week’s worth of food, we can hypothesize having three different diets on the basis of how many times a vegetarian menu is eaten and how many times the menu is based on meat: limiting animal protein to just twice a week, in line with the recommendations of nutritionists, you can “save” up to 20 square global meters per day.

LIMITING MEAT TO JUST TWICE A WEEK, YOU CAN “SAVE” UP TO 20 SQUARE GLOBAL METERS PER DAY

Figure 5.6 Variations in the ecological footprint depending on food choices²⁹

WEEKLY DIET	WEEKLY IMPACT [GLOBAL m²]	AVERAGE DAILY IMPACT [GLOBAL m²]
7 TIMES “MEAT” MENU	294	42
5 TIMES “VEGETARIAN” MENU + 2 TIMES “MEAT” MENU	164	23
7 TIMES “VEGETARIAN” MENU	116	16

Source: BCFN elaboration of data from the Ecological Footprint Network.



5.3 FOOD WASTAGE

In recent years, food wastage has become a topic of great interest, with many implications of not only ethical but also economic and environmental aspects. Traditionally, the wasting of food has been condemned according to a logic of values, especially in relation to the uneven distribution of food worldwide.

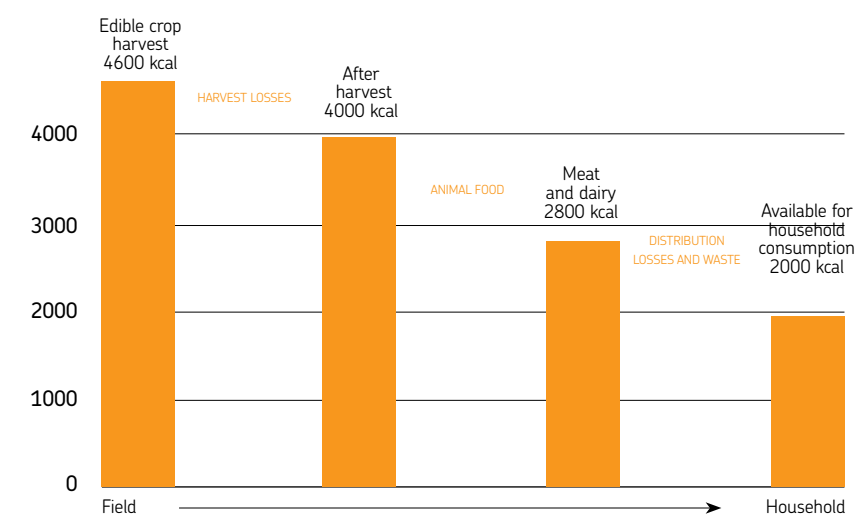
Today, the issue can also be addressed by evaluating its environmental impact. Each ton of food waste generates 4.2 CO₂. In Great Britain, 6.7 million tons of still perfectly consumable food (WRAP) are thrown away every year, resulting in an annual cost of 10 billion pounds. In Sweden, on average, every household throws away 25% of the food purchased. According to a U.S. study conducted by PLoS One, since 1974, food waste has increased by 50%: every day in the Western world, 1,400 calories per person are wasted, for a total of 150 trillion calories a year.

Another study by the National Institute of Diabetes and Digestive and Kidney Diseases shows that 40% of the food produced in the United States is thrown away. In Europe, the amount of food wastage is alarming. According to the FAO and the Stockholm Environmental Institute, if the entire world had the same levels of consumption as Europeans, it would take three planets to produce the amount of food needed.

EACH TON OF FOOD WASTE GENERATES 4.2 CO₂

IF THE ENTIRE WORLD HAD THE SAME LEVELS OF CONSUMPTION AS EUROPEANS, IT WOULD TAKE THREE PLANETS TO PRODUCE THE AMOUNT OF FOOD NEEDED

Figure 5.7. Gross estimate of the global picture of losses, conversions and wastage in the different stages of the food supply chain



Source: Lundqvist *et al.*, 2008.

FOOD WASTAGE CAN OCCUR AT DIFFERENT TIMES

Food wastage can occur at different times. Already at the time of harvest, a large part of agricultural production remains in the field (when the product is off-size or when the cost of harvesting is higher than the price paid to farmers). During industrial processing and distributing, strict quality standards generate waste, but also the consumer, especially in countries with higher incomes, is responsible for serious wastage (poor storage of food, over-stocking and over-consumption that gives rise to waste).

ALERT THE EUROPEAN INSTITUTIONS SO THAT FOOD WASTAGE IS REDUCED BY 50% BY 2025

It is, therefore, easy to understand the many economic, environmental and social implications of the issue. That is why in 2010, the *Joint Declaration against wasting food* was drawn up, supported by several European organizations - such as the Stockholm Environmental Institute (Sweden), ANDES (France), FoodCycle (United Kingdom), and the Stop Wasting Food Movement (Denmark) - to alert the European institutions so that food wastage is reduced by 50% by 2025 and to promote its struggle to finally become a priority on the agenda of the European Commission. This declaration calls for the European Commission to review existing laws and to prepare a special EU directive regulating the recycling of food waste and limiting waste by 2015.



B. Anthony Stewart/National Geographic Image Collection

A year against waste

On October 28, 2010, Last Minute Market – within the project “One year against waste” – organized a conference entitled “Transforming Food Waste into a Resource” at the European Parliament in Brussels. The conference, sponsored and supported by the Committee on Agriculture and Rural Development, was attended by academics, MEPs, members of civil society and nongovernmental organizations.

Following the conference, Prof. Andrea Segrè and Dr. Silvia Gaiani presented the *Joint Declaration against wasting food*, the purpose of which is to alert and activate the European institutions to combat the waste so that it becomes a priority on the agenda of the European Commission and food waste is reduced by 50% by 2025.

Joint Declaration against wasting food

“We academics and researchers from universities in different countries around the world, members of the European

Parliament and politicians, representatives of international organizations and civil society working in NGOs, associations and charities have gathered to take common action to prevent and reduce global food waste.

1. In adopting this statement, we intend to make explicit our commitment at national, regional and global levels to reduce by at least 50% the amount of food waste throughout the food chain and we call on all stakeholders involved in it (from farm to fork, i.e., farmers, distribution and marketing system) to mobilize to make this goal possible.

2. We ask that the reduction of at least 50% of food waste at the global level be an essential element of all food policies, both in developed countries as well as those in the developing world, and that this objective be achieved by 2025. Indeed, we are deeply alarmed by the amount of waste in the world (in Italy alone, 240,000 tons of unsold food are thrown out each year) and at the same time, by the number of hungry people (about one billion on the planet).

3. We hope, therefore, that the European Parliament takes a stand on this issue

and we ask that the fight against food waste be placed on the agenda as a priority for the European Commission.

4. We want to create a Global Partnership Against Food Waste, starting from the institutions originally involved in such declaration, to expand its reach of action and involve more and more communities.

5. We call on the United Nations so that the fight against wasting food becomes part of the ninth Millennium Development Goal target or as an additional target in the seventh goal ('Ensure environmental sustainability') and that its reduction is achieved in a way that is coordinated and with agreement as to intermediate stages. The international institutions, on many occasions, have pointed out the urgent need to assist countries of developing and emerging economies to expand their agricultural and food production and increase both public and private invest-

ments in agriculture, agribusiness and rural development. We believe we must do more to increase the quantity and improve the quality of agricultural production, but we also believe that much needs to be done to reduce waste and improve the effectiveness of the food chain.

6. In total agreement with the final declaration of the agriculture ministers of the G8 countries in 2009 on 'Agriculture and food security at the International Agenda,' we call for increased support, including investments in science and research, technology, education, dissemination and innovation in agriculture to reduce food waste.

We also commit ourselves to a greater degree of sharing with other countries the technologies, processes and ideas for increasing the capacity of national and regional institutions and governments and to promote the fight against food waste.

LOVE
FOOD
hate waste





NOTES

1. Examples of other impacts are the use of chemicals in agriculture, the release of nitrogen in the soil, emissions of other pollutants in the air, and so on.
2. In the technical document you can find all the elements to be able to reconstruct the assumptions made in a transparent manner, but also to allow those interested to develop the specific calculation once you know how to prepare the recipe (boiled, baked, fried, etc.), cooking times, the technology used (gas or electric stove) and the country in which you are cooking (because the energy mix is very different from country to country).
3. Keys *et al.*, 1970; Keys *et al.*, 1980.
4. World Cancer Research Fund, 1997; Willett, 1998.
5. Willett and Sacks, 1995.
6. PubMed, 2010.
7. Trichopoulou *et al.*, 1995.
8. Panagiotakos *et al.*, 2007.
9. The scale used in the study is between 0 and 55, so an increase of 10 points on the scale of Mediterranean adequacy is equivalent to one of approximately 20%.
10. Trichopoulou *et al.*, 2007.
11. Mitrou *et al.*, 2007.
12. De Lorgeril *et al.*, 1999.
13. Fung *et al.*, 2005.
14. Sofi *et al.*, 2008.
15. Nobel Peace Prize in 1949 for scientific research conducted on nutrition.
16. Frankel *et al.*, 1998.
17. Must, 1999.
18. OMS, 2003.
19. American Academy of Pediatrics, 1999.
20. Victoria, 2010.
21. The analysis includes television, audio and music content, computers, video games, newspapers, books, magazines and movies.
22. WHO 2010.
23. La Sapienza University of Rome, 2005.
24. Compare, among others, Ramic (2008) and Gonzalez (2007).
25. GFN, 2010.
26. Nikos, 2006.
27. Estimate prepared by the Global Footprint Network with the approach of the economic input-output matrices, referring to data of 2007 (GFN; 2010).
28. Best Foot Forward, 2002.
29. However, please note that the recommended behavior is a balanced one that includes the consumption of all foods, of both animal and vegetable origin.

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* Complete bibliography and sitography are contained in the technical paper downloadable from the website: www.barillacfn.com



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