Fondazione Barilla

il tuo cibo, la tua terra

EATING PLANET

CIBO E SOSTENIBILITÀ: COSTRUIRE IL NOSTRO FUTURO

Edizioni Ambiente

Fondazione Barilla

il tuo cibo, la tua terra

EATING PLANET

FOOD AND SUSTAINABILITY: BUILDING OUR FUTURE

Edizioni Ambiente

EATING PLANET
FOOD AND SUSTAINABILITY: BUILDING OUR FUTURE

EDITORIAL PROJECT
Edizioni Ambiente Srl
www.edizioniambiente.it

Editorial coordinator: Diego Tavazzi
Graphic project: Mauro Panzeri – GrafCo3 Milan, Roberto Gurdo
Layout: Roberto Gurdo
Cover image: Guido Scarabottolo
Infographics: Bruno Olivieri
Photo credits:
p. 20 © Richard Cummins/Corbis/Contrasto
p. 30 © Keren Su/Corbis/Contrasto
p. 86 © Michael Hanson/Corbis/Contrasto
p. 152 © Gallo Images/Corbis/Contrasto
p. 214 © Jack Fields/Corbis/Contrasto

Translations: Antony Shugaar, Isobel Butters, Maddalena Gerini, Valentina Gianoli, Wendy Ann Huning, Franco Lombini, Roberta Marsaglia, Richard Nybakken, Mario Tadiello

The royalties resulting from the sales of this book will support the activities of BCFN Alumni

Printed in January 2016
by Geca S.r.l., San Giuliano Milanese, Milano, Italy

Printed in Italy
Printed on FSC certified paper

EDIZIONI AMBIENTE

www.edizioniambiente.it
twitter.com/EdAmbiente
www.puntosostenibile.it

EATING PLANET
FOOD AND SUSTAINABILITY: BUILDING OUR FUTURE

APPENDIXES

BCFN: WORKING TOGETHER TO SOLVE THREE PARADOXES

*Guido Barilla**

The Barilla Center for Food & Nutrition (BCFN) was set up in 2009 as a research center with a multidisciplinary approach to study and deepen our understanding of the many complex global issues related to food and nutrition. From the beginning, we focused on three great paradoxes characterizing the current global food system that can no longer be ignored. The first edition of *Eating Planet* already zeroed in on these paradoxes, but it is worth repeating them here as a reminder of just how stark they are: first, for every person who is undernourished in the world today, there are two people who are considered overweight. Approximately 795 million people in the world currently suffer from hunger or famine, while 2.1 billion people are overweight or obese.

The second paradox concerns agriculture: some 40% of harvested crops are used to produce animal feed and biofuels, despite all the people suffering from hunger. We deliberately choose to provide fuel for our cars rather than feed people in perpetual need.

The third paradox is tied to food waste: globally, we throw out one third of all food produced, four times what would be enough to feed those 795 million undernourished people worldwide.

In recent years, we have become increasingly aware of the extreme urgency of these issues, and of the need to provide answers. In response, we have developed the double food and environmental pyramid, which has grown from a mere model into a true research agenda: animated by new data and scholarly contributions, it is receiving an increasing amount of attention in an ever-broader range of scientific fields. In addition to its scientific value, the double pyramid also contains practical implications as simple as they are powerful: If we eat well, we naturally do some good both to ourselves and to our planet!

In 2014, the Barilla Center for Food and Nutrition (now the BCFN Foundation) developed the *Milan Protocol*, with the goal of raising awareness among governments, institutions, and the wider general public regarding the urgent need for action to make the global food system truly sustainable. Developed by the Foundation's Scientific Committee, the Protocol has received contributions from more than 500 international experts, while gaining the support of more than one hundred organizations and thousands of individuals.

The Protocol's three objectives are directly linked to the three paradoxes that are the focus of the BFCN: promoting healthy lifestyles, encouraging more sustainable agriculture, and reducing food waste by 50% by 2020.

The *Milan Protocol* inspired the *Milan Charter*—the proposed global agreement to guarantee healthy, safe, and sufficient food for all—promoted by the Italian government as the main legacy of Milan's Expo 2015 and presented to the Secretary General of the United Nations Ban Ki-moon.

The *Milan Protocol* was developed by the Foundation's multidisciplinary Advisory

Board, with important contributions from many international experts, civil society, and the youth network that the BCFN has sponsored for years: the BFCN Alumni. These young researchers from around the world took part in a competition held by the Barilla Foundation to come up with innovative and practicable ideas for a more sustainable food system: the BFCN Young Earth Solutions, or BFCN YES! In September 2015 we brought these Alumni to Italy and asked them to express their thoughts—in the form of concrete plans and projects—regarding the future of food and nutrition. This gave birth to the *BFCN Youth Manifesto*, a document that contains seven actionable proposals to confront the challenges presented by the food paradoxes via seven key roles in the food system: policymakers, farmers, educators, food industry, business people, journalists, activists, and researchers.

The *Youth Manifesto* was delivered and presented to the various national and international institutions that took part at the Milan Expo: an assumption of great responsibility on the part of these young men and women—for they will be the ruling class of of the future—and a strong appeal to world leaders.

After three years we thought it was time to update *Eating Planet* to reflect the advances made by the BCFN Foundation: studies and concrete proposals concerning the big issues surrounding food and nutrition, with significant contributions by an increasingly multidisciplinary scientific team, and close attention to the role and ideas of the younger generations, into whose hands we will bequeath this planet.

The second edition of this volume maintains the same organization as the first—divided into the four macro-areas "Food for All," "Food for Sustainable Growth," "Food for Culture," and "Food for Health"—revised and enriched with meaningful content from members of the Advisory Board and from several internationally-recognized figures and experts, whom we would like to recognize here: Pavan Sukhdev, Gianfranco Bologna, Barbara Buchner, Paolo De Castro, Danielle Nierenberg, Paul Roberts, Carlo Petrini, Riccardo Valentini, Hans R. Herren, Tony Allan, Ricardo Uauy, Sara Farnetti, Camillo Ricordi, Gabriele Riccardi, Marion Nestle, Aviva Must, Alexandre Kalache, Shimon Peres, Jamie Oliver, Ellen Gustafson, Michael Heasman, Vandana Shiva.

The forecasts for the future—as demonstrated by the 17 Sustainable Development Goals proposed by the United Nations—present a considerable challenge. The rapid pace of change in the external scenarios we must confront reinforces our pressing need to better understand worldwide phenomena like climate change, migration, variations in eating habits, and the sustainability of agriculture. These are all themes that the BCFN has studied and will continue to study, offering objective and empirically validated perspectives: contributing to our knowledge of complex global phenomena so that we might confront them in the appropriate way to provide the best possible future for both people and the Planet.

** Chairman of the Barilla Center for Food & Nutrition Foundation*

EATING PLANET: FOOD BEYOND SIMPLIFICATIONS

*Pavan Sukhdev**

No subject today is perhaps so rich and deep and complex in its reality, and yet so poor and narrow and simplistic in its common portrayal, as is our food.

The challenges of our food and agricultural systems are still widely discussed, in media and even in policy and business, using narrow and simplistic metrics such as calories per person or tonnes per hectare. The main challenge of agriculture is still being widely discussed in terms of land availability to feed nine or ten billion by 2050. Such characterizations are both misleading and demeaning. They are in fact part of the problem of an inadequately understood and largely mis-managed eco-agri-food systems complex that is at the heart of all of the most important dimensions of our life on this planet's surface, be it nutrition, health, culture, employment, development, equity or the environment.

Eating Planet – Food and sustainability: building our future, by the Barilla Center for Food and Nutrition, is a very timely and important book which provides us the full picture of food and its importance to all of the above dimensions of our existence. It looks at food and agriculture not from a restricted lens of production alone, but from the perspective of equity and distribution ("Food for All"), from the perspective of environmental and ecological sustainability ("Food for Sustainable Growth"), from the perspective of health and diets ("Food for Health") and from the world of cultural values, richness and diversity ("Food for Culture").

As *Eating Planet* so well describes, we are challenged today with the need to achieve a very substantial and widespread transformation of the so-called "eco-agri-food systems complex": a collective term for the vast and interacting complex of ecosystems, agricultural lands, pastures, fisheries, labour, infrastructure, technology, policies, culture, traditions, and institutions including markets that are variously involved in growing, processing, distributing and consuming our food.

This multi-dimensional challenge is also the ultimate systems challenge. It involves transforming not one or two but indeed all the systems that enable us to produce, process, distribute and consume food and permeate every management framework, including political systems, global trade and markets. These systems involve forest and watershed management, agriculture, animal husbandry and fisheries, utilities such as freshwater and energy, and industries from mining and chemicals for fertilizers and pesticides, to food and beverage for processing, packaging, transportation, storage, distribution and retail, to the hospitality business, and last but not least, waste management, medicine and healthcare. And food and agriculture systems involve not just small or large farming business but also local communities everywhere, from urban residential and hobby farming neighbourhoods in the western world to tribal communities in Africa, Asia and elsewhere. Such is the complexity of the challenge on hand.

In his introduction to *Eating Planet*, Guido Barilla describes three important "para-

doxes" which are central to the challenges of our food system today, and which are the *raison d'être* of the Barilla Center for Food & Nutrition (BCFN). The first of these paradoxes is that almost 800 million people are still hungry or undernourished, while at the same time more than two billion are obese or significantly overweight, conditions that in turn leads to widespread suffering from diseases such as diabetes, whilst at the same time the planet already grows enough to feed nine-ten billion people today, let alone by 2050. This "paradox" is a many-faceted blow to our aspirations for solving poverty and achieving the pillars of sustainability, and it derives from a deep and complex set of failures in our food systems, including trade, distribution and political systems.

In the section "Food for All" this book investigates the errors inherent in reducing nutritional goods to the mere status of commodities, as has happened in recent times with their growing availability, and the failure of today's mechanisms of distribution to operate properly and serve people and communities facing hunger and malnutrition. The book also addresses the vital question of metrics. It points out why we are mistaken in being guided by an excessively narrow view of well-being, restricted to its economic dimension. By presenting an alternative (the "BCFN Index of Well-being") it builds another strong plank in the case for including a vast array of real facts that help define and describe the state of the social, politic, economic, and environmental conditions in which people live.

The section of the book entitled "Food for Health" deals with the need for balanced diets with low content of sugars, fats, and salt and with a high content of fruit, vegetables, and cereal grains. The book describes how and why this tends to reduce to a significant degree the negative factors that cause diet-driven disease and infirmities.

An important failing of today's food systems is in the design of diets and education around diets. There is at present too little policy support in most nations for nutritional models designed to take into account sustainability and health. Adequate public education is a common shortfall, leading to poor levels of public knowledge about what constitutes a healthy diet. Public interest campaigns targeted at changing damaging dietary habits are too few, and are rarely funded by governments. Herein lies an opportunity for businesses and governments: using the "double food pyramid" (explained in the section on "Food for Sustainable Growth" which recommends lower quantities of foods that are damaging to the environment and to human health) as an educational tool. It could go a long way in promoting healthy food for people, and sustainable food for the environment.

Such design and educational aspects are taking shape in some developed nations, in an attempt to face up to a health-care emergency linked to the rapid spread of metabolic, cardio-circulatory, and tumoral diseases and illnesses that derive from improper ways of eating.

However, as trends in diets in fast-developing nations follow trends in wealth, turning people further towards meats, the problems of design and education may not disappear, instead, they might just migrate to even larger populations in the fast-developing world. This situation is also a key driver of the "second paradox" mentioned in Guido

Barilla's introduction: the livestock challenge. There are over three billion heads of livestock. A third of food produced is to feed these animals, and half of agricultural GHG emissions are due to livestock. And there is a psychological tendency for communities coming out of poverty and into wealth to respond by including more meat in their diets, thus exacerbating these problems.
The search for solutions based on approaches that use reduced energy consumption and better knowledge will become one of the decisive aspects of sustainability in the eco-agri-food systems space. The fossil energy intensity of conventional agriculture is significant, and the use of agriculture for energy is the third "paradox" in the introduction to *Eating Planet,* viz, the increasing competition for land between energy and food, due to the increasing popularity of biofuel crops. The idea of using agricultural land for putting fuel in cars rather than food in hungry mouths seems to go against the grain of equity, ethics, sustainability and common sense.

The book's final section—"Food for Culture"—is a heart-warming tribute to food as a cultural and social activity, delivering value beyond nutrition. This is the dimension of food and agriculture that is perhaps being most deeply damaged by the global market-driven simplification and universalization of food. To stem this tide, it will be necessary to revive fundamental aspects of eating that are most focused on the bond between food, the individual, and her community. At the environmental and ecological level, it will be about protecting local crop varieties, preserving biological diversity. At the social level, this will be about transferring the culinary expertise and know-how about the preparation and serving of foods in unique and culturally enriching ways, returning to a healthy relationship with the land, and with the raw material by focusing on the excellence in quality of the ingredients, recovering age-old flavors, perhaps even making contemporary variants, and thus leading to the preservation of the best of the local culinary tradition.
The economic environment in which farmers and agricultural policy-makers operate today is distorted by significant externalities, both negative and positive. Indeed, many of the largest impacts on the health of humans, ecosystems, agricultural lands, waters, and seas arising from various different types of agricultural and food systems, are economically invisible, and do not get the attention they deserve from decision-makers in policy and business. There is therefore a need to evaluate all significant externalities of eco-agri-food systems, to better inform decision-makers in governments, businesses and farms. Furthermore, there is a need to evaluate the eco-agri-food systems complex as a whole, and not as a set of silos. *Eating Planet* is a significant step in the right direction to enlighten policy-makers, business, and society at large about the many dimensions of our eco-agri-food systems, the problems, and their solutions. Together with economic analysis of these challenges and solutions (being proposed by TEEB[1] and others) this book will be amongst the important works that contribute to a much

1 TEEB (*The Economics of Ecosystems and Biodiversity,* www.teebweb.org), a G8+5 initiative hosted by the United Nations, has just launched a global study on the size and scale of externalities along the value chain in different types of eco-agri-food systems.

better and holistic understanding of our food challenge. It will help create better and lasting food solutions for all—for the poor, for development, for the planet and for society and culture, for generations to come.

** UNEP Global Ambassador and, on behalf of this UN Agency, has led the project on* The Economics of Ecosystems and Biodiversity *(TEEB) commissioned to the United Nations by the European Commission and the German government. He is founder-CEO of GIST Advisory, an environmental consulting firm helping governments and corporations manage their impact on natural and human capital. He worked at the Deutsche Bank, on behalf of which he founded and chaired the Global Market Centre of Mumbai. He was special adviser and leader of the Green Economy Initiative for UNEP. He is the author of the essay* Corporation 2020 *(Island Press, Washington DC 2012)*

AGRICULTURE AND SUSTAINABILITY: OUR FUTURE IN THE ERA OF HUMANS

*Gianfranco Bologna**

Today, the world before our very eyes has changed dramatically compared to just 50-60 years ago and we are increasingly aware that many changes are occurring at an unprecedented rate. In just two generations, human activities have put extraordinary pressure on our planet's natural systems, which led us to outpace the Earth's ability to sustain our societies in a stable manner. In particular, starting from what the Global Change scientists define as "The Great Acceleration"[1] of human activities, which began in the 1950s, we have witnessed a colossal development of industry and agriculture, to the point where the world as we know it has come under threat. Today, human-caused impacts on a large scale, involving both local and global levels in an interconnected way (climate change, air pollution, human-induced pollution from chemicals, soil and water reserves degradation, massive loss of ecosystems and species, etc.) made human pressure become such a significant agent of transformation to be considered a true geological force on the planet, just as those that have shaped and changed the Earth over its 4.6 billion years. This is why the international scientific community believes that we have originated a new geological era, the Anthropocene, a blink of an eye in our planet's long history.[2]

As Johan Rockström clearly put it in his latest volume:[3] "We have gone from being a small world on a large planet to a big world on a small planet. This is a radical change. Our home is different and our future depends on what we will do." The unexpected is to be expected. More and more so today, and certainly in the future, change is the only constant. Surprises will be the new normality. We must change our mentality that has determined our cultural attitudes based on continuous and infinite growth, which, up until now, has underpinned the exploitation of natural systems in a planet clearly bound by its biophysical limits. It has now become imperative that we reconnect with nature and that societies reconnect with nature and all humankind with Earth, as it has also been brilliantly stated in Pope Francis' encyclical *Laudato si'*.

The great challenge to achieving sustainability in our development in the near future is to manage to understand what the optimal population numbers are and the relevant lifestyle necessary to respect the regenerative and carrying capacity of the natural systems supporting us. So far, the accumulated knowledge in the Earth System Sciences'

---

1 Steffen W., *et al.*, "The trajectory of the Anthropocene: The Great Acceleration", *The Anthropocene Review*, 2, 81-98, 2015.

2 The scientific literature on the Anthropocene is endless. Three peer-reviewed scientific magazines on the Anthropocene have been available for a few years now. Please consult the following websites: www.futureearth.org and www.anthropocene.info.

3 Rockström J., M. Klum, *Big World, Small Planet*, Max Ström Publishing, Stockholm 2015.

articulated fields[4] clearly informs us that it is not possible to pursue the sustainability of human development if we are unable to learn to live within the now obvious biophysical limits of our supporting systems.

The international scientific community dealing with Global Change highlights how much the continuation of the functioning of the Earth System, which over the recent centuries has supported human wellbeing and the proliferation of human civilization, is now at risk. Scientific research is thus working hard to try and identify "thresholds"[5] and global and regional planetary boundaries,[6] which, once crossed, can generate unmanageable social and environmental changes by human society. The great distress we caused with our growing pressure to the planet's natural systems could thus activate a planetary "ticking time bomb" and profound changes could occur in feedback mechanisms, which from negative would become positive, so what used to cushion before, then produces an acceleration of the effects instead.

In short, the new Anthropocene epoch shows us that human activities have the potential to make the Earth system pass to states that can be irreversible and inadequate to support human life and that of other living species. Therefore, we must learn to live, with the greatest creativity and innovation, within a safe operating space for humanity, we have to live within a One Planet Perspective.[7]

The complexity of how to tackle the challenges of the future is clear to everyone. The latest UN data on human population growth were published in July 2015,[8] highlighting that today there are 7.3 billion people, almost 9 times the 800 million people thought to have lived in 1750, at the dawn of the Industrial Revolution. The population, still growing at a rate of 83 million a year, should reach, according to the medium variant (the most reliable one), 9.7 billion inhabitants by 2050. Even assuming that the fertility rate will continue to decline, global population should reach 8.5 billion in 2030, then 9.7 billion in 2050 and 11.2 billion in 2100, compared to the forecasts according to the medium variant. A population growth until 2050 is virtually unavoidable, even if the fertility rate should accelerate.

Agriculture represents humankind's most widespread use of the global dry land surface (40% of Earth's surface is used for agriculture and animal farming) and the human activity that causes the highest consumption of fresh water (globally, 70% of fresh water is used for irrigating crops) besides being the first cause of biodiversity loss and one of

---

4 Please consult Future Earth report, the extensive international programme on global research and sustainability analysing global changes in the Earth system (www.futureearth.org).

5 Lenton T. M., *et al.*, "Tipping elements in the Earth's climate system", *PNAS*, USA, 105; 1786-1793, 2008; Scheffer M., *Critical transitions in nature and society*, Princeton University Press, Princeton, New Jersey, USA, 2009; Barnosky A. D., "Approaching a state shift in Earth's biosphere", *Nature*, 486; 52-58, 2012.

6 Rockström J., *et al.*, "A safe operating space for humanity", *Nature*, 461; 472-475, 2009; Steffen W., *et al.*, "Planetary boundaries: Guiding human development on a changing planet", *Science*, 347, 6223, 2015.

7 WWF, *Living Planet Report 2014. Species and spaces, people and places*, 2014.

8 United Nations Population Division, *World Population Prospects: the 2015 Revision*, 2015 (http://esa.un.org/unpd/wpp).

the major sources of greenhouse gas emissions (about 30% of global greenhouse gas emissions are due to agricultural activities, half of which is due to deforestation and the other half to farming).

The current situation offers an overall difficult picture:[9] crop production has almost reached a plateau, climate change, especially through the intensification of extreme weather phenomena, worsens annual yields, water crisis, the overexploitation of aquifers, including fossil ones, fertile soil loss, relentless transformation and destruction of natural systems, desertification, loss of biodiversity and the connected services that ecosystems provide benefitting our wellbeing and our economies (for instance, the role of pollinating species in agriculture), and the insane food waste at all levels, etc. This mix of problems has not yet been tackled and solved with the energy and determination required and unfortunately they are leading humankind towards an actual tipping point that could trigger planetary emergencies.

Many analyses have been carried out to identify the new agricultural scenarios for the near future. The authoritative International Assessment of Agricultural Knowledge, Science and Technology for Development[10] highlighted the need to abandon the conventional reductionist approach that separates agriculture from the environment and the environment from the fulfilment of human needs. The report points out that there is not just one approach for solving hunger and poverty, that the reintegration of livestock and crop production could drastically improve rural economies in the most degraded areas and that orphan crops and traditional seeds have a much better potential than previously thought. These are the innovations that will help feed humankind and the planet.

Agriculture is becoming a viable solution to mitigate climate change's effects, to reduce diet-related diseases and their connected costs and to make our cities more liveable, creating jobs in a stagnating global economy. In the rosiest future that we can imagine, and that we can absolutely create, some countries, currently plagued by food scarcity, could not only become self-sufficient but also start producing surpluses to help other nations.

These visions, to different degrees, are shared by those who study the future of food production. Today, first and foremost, we need to kick-start a sort of triple green revolution: increasing soil productivity without expanding the cultivated surface avoiding further land, air and water pollution (an engaging and winnable challenge for innovation and human ingenuity); reducing environmental impacts and sustainable management of water resources.

This challenge encourages everyone to imitate nature and its extraordinary evolution instead of going against it, creating an uninhabitable world, first of all for ourselves. The concept of the "circular economy" can work extremely well in agriculture. In many areas of the planet, eco-agriculture is already proving that it is possible to achieve good yields while safeguarding soil's organic matter and biological activities without exces-

---

9 See amongst others Brown L. R., *Full Planet, Empty Plates*, W. W. Norton & Company, New York 2012.

10 To read this assessment, visit www.agassessment.org.

sive ploughing and practicing precision agriculture with targeted use of manure and fertilizers.

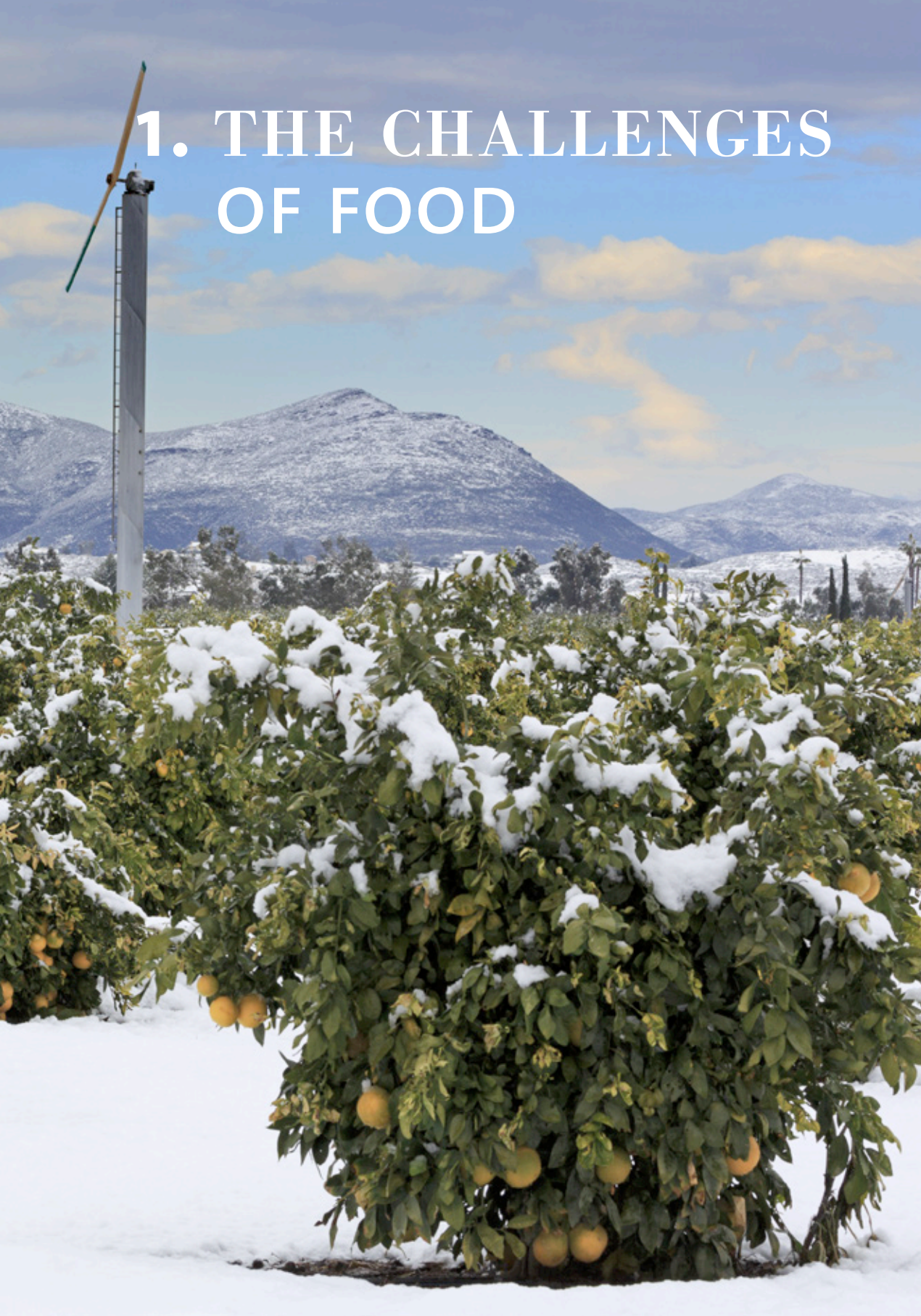
Several pieces of research, such as that of an authoritative group of experts led by Jonathan Foley,[11] points out that an important contribution to the goals of eradicating hunger, doubling food production by 2050 and reducing environmental damage caused by agriculture can come from some crucial solutions such as: stopping the expansion of farmland in tropical areas (the destruction of these ecosystems impacts heavily on biodiversity loss and CO_2 emissions deriving from deforestation), improving the productivity of soils with the lowest yields, increasing water and fertilizers use and efficiency at global level, reducing per capita meat consumption (with a vegetable-based diet we would have at our disposal an impressive amount of calories every year, 50% more compared to the current availability) and reducing waste in food chains (about 30% of all food produced at global level is thrown away, left to rot or consumed by pests).

Evidently, in order to do all this, we must change our approach and our actions and we must act soon. All the evidence at our disposal suggests that all that was good until yesterday will not be so tomorrow. Business as Usual (BAU) is no longer a valid option. To achieve tangible results, our top priority is to create meaningful partnerships amongst institutions, companies, NGOs and civil society to implement successful programmes epitomizing "the seeds for good Anthropocene" as stated by the dedicated international programme Seeds of Good Anthropocene. In this, the role of young generations is paramount because they are the ones who, first and foremost, will live through the Anthropocene. We must be aware that we can and have to move within a Safe Operating Space set by planetary boundaries that cannot be exceeded. As Johan Rockström reminds us, this space must be the central component of our lives and of our way of doing business. It must become second nature, like breathing. Once we have managed to do this, it will be much easier to lay the foundations for future generations to thrive.[12]

** Scientific Director for WWF Italy*

11 Foley J., *et al.*, "Solutions for a Cultivated Planet", *Nature*, 478; 337-342, 2011.

12 Visit Seeds of Good Anthropocene website (www.goodanthropocenes.net).



1. THE CHALLENGES OF FOOD

COP21: a good deal for climate and for growth

Barbara Buchner

BARBARA BUCHNER is the head of CPI Europe, managing both the CPI Venice and the CPI Berlin offices. She serves on the Advisory Board of the Barilla Center for Food & Nutrition (BCFN).

On 12 December 2015, representatives of 195 countries adopted a new climate deal with nationally determined contributions—national targets and actions that arise from national policies—at its core, combined with top-down elements for oversight, guidance and coordination. The agreement for the first time brings all nations into a common cause based on their historic, current and future responsibilities, and covers the important bases: common but differentiated responsibilities; the need for financing; the need to develop and disseminate technologies; the need for capacity building in many parts of the world; and the need for new institutions to help support all of this.

A strong signal steering businesses away from fossil fuels, towards sustainable growth

The objectives laid out in the Paris Agreement are visionary—but not overambitious as they build on trends already happening in reality. The agreement's guiding star is the science-based goal of limiting temperature rise to "below 2 degrees Celsius." In combination with the mention of 1.5 degrees Celsius, this goal sends a clear signal, giving governments and businesses an incentive to escalate efforts to decarbonise their economies, supply chains and business models. Even more importantly for business, this deal has teeth. It includes a mechanism to ramp up action every five years, starting in 2018, and importantly, does not allow backsliding.

While the deal itself is a big step forward, the larger leap has been the recognition, all over the world, that action on climate change and economic growth can (and should) go hand-in-hand. The Paris Agreement has recognized that the substantial gaps between the costs of clean and fossil energy have collapsed, and that returns increase when we produce food by using less land better. The spread of market driven activities consistent with these realizations will provide the foundations on which the Paris commitments will deepen.

The Agreement builds the case for both public and private actors to explore low-carbon and climate-resilient options. For developing countries, emerging economies and their partners, the clear message is that growth without sustainability is off the table, whereas sustainable growth is a win for climate and development. For business and investors

around the world, the Agreement means the direction of travel is clear and with appropriate support it is time to seize the opportunities on offer.

Many actors are already on board

With the world's population and middle class increasing each year, nations and investors have focused first and foremost on economic growth. But counter to the conventional thinking of the past, this focus on growth is no longer a constraint on action on climate change. To the contrary, it is a source of more productive uses of capital that can lift us from the weak economies of recent years through resource saving investment.

Private and public investments in the low-carbon economy are delivering profits, reducing emissions, and building resilience to energy and climate shocks. CPI's Global Landscape for Climate Finance[1] estimated US$391 billion in primary investment flows in 2014, up 18% from the previous year. Private investment surged 26% from 2013, reaching 62% of total global investment in climate action driven largely by falling renewable technology costs, supported by government measures.

The deal in Paris would in fact not have been possible if nations and businesses weren't already moving in this direction. In fact, one major change between past, failed negotiations, and Paris is that the lead-up to Paris was "bottom-up," instead of "top-down," with nations outlining their plans for climate action in advance. And while the sum total of the plans don't seem be enough to limit warming from dangerous levels,[2] they still show that there is significant momentum.

Businesses, in fact, stepped up this year. High-worth individuals, family offices, and foundations committed[3] to financial support to help move new clean energy solutions to viability, and heads of large companies, including Richard Branson and Paul Polman, called for zero emissions by 2050.[4]

Governments and businesses are recognizing the opportunities offered by low-carbon, climate-resilient growth, and the actions at Paris, and far beyond, demonstrate this momentous shift. The Paris Agreement means that these investors and project developers who have already started transitioning their business models can now have the confidence to continue shifting their assets, in order to avoid stranding their own portfolios.

Building confidence for the next five years through enhanced transparency

Developed countries must continue to take the lead in implementing the world's first universal binding climate agreement. Building confidence that commitments outlined in the agreement are being met is key, and transparency is critical to this goal. Transparency on progress toward the commitment to continue to mobilize at least US$100 billion per year from 2020 onwards is a case in point, and here work remains to be done. A OECD Report done in collaboration with CPI on progress toward the US$100 billion was the first serious attempt to estimate public and private finance mobilized by developed countries' interventions in developing countries by applying a transparent accounting framework.[5] The Paris Agreement puts efforts to increase consensus and transparency on this and other climate finance issues at the centre of its work plan going forward, which is an important step towards a more comprehensive picture of

climate finance. Such transparency can help ensure confidence that finance is flowing from north to south, and to the right technologies, and that private investors are being mobilised in line with country interests.

From ambition to action: the critical role of national policy

However, right now the bulk of climate investment (74%) originates and is spent in the same place, whether in developed or developing countries. This indicates there is still work to do to scale up finance that crosses borders, and our research indicates that policy frameworks and enabling environments are the first prerequisite. As governments turn their commitments into national policy, action will follow that allows to move from negotiation to implementation.

The Paris Agreement provides an important new foundation for meaningful progress on climate change and represents a dramatic departure from the past 20 years of international climate negotiations. It will be up to nations to implement these commitments, but the strength of the commitment is in its bottom-up natures—each country is volunteering to sign up, and this in turn sets a strong incentive to realize the opportunities that will keep temperature rise well below 2 degrees Celsius.

---

1 Buchner B., *et al.*, "Global Landscape of Climate Finance 2015", CPI (http://climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2015/).

2 United Nations Framework Convention on Climate Change, "Synthesis report on the aggregate effect of the intended nationally determined contributions" (http://unfccc.int/resource/docs/2015/cop21/eng/07.pdf).

3 Davenport C., "Bill Gates Expected to Create Billion-Dollar Fund for Clean Energy", *The New York Times* (www.nytimes.com/2015/11/28/us/politics/bill-gates-expected-to-create-billion-dollar-fund-for-clean-energy.html?_r=2).

4 Timperley J., "Business leaders call for net-zero emissions by 2050", businessGreen (www.businessgreen.com/bg/news/2434592/business-leaders-call-for-net-zero-emissions-by-2050).

5 Buchner B., "Climate Finance in 2013-14 and the USD 100 Billion Goal", CPI (http://climatepolicyinitiative.org/publication/climate-finance-in-2013-14-and-the-usd-100-billion-goal/).

FOOD AT THE CORE OF GLOBAL CHALLENGES

"We are the first generation to feel the impact of climate change and the last generation that can do something about it."

Barack Obama

We are at a historical turning point. We need to go back to the Eighteenth century to find a vision, in physiocrats' theories, putting agriculture at the core of economic and social affairs, as well as of the political debate. In the following centuries, the idea that value was created elsewhere was only consolidated and this led to current aberrations pointing to an economy that is excessively based on finance. Determination of the economic value is today widely disconnected from "tangible" data, from food and what is needed to produce it.

However, in the last few years and in the last few months in particular, several factors have converged and triggered a process based on which the agrifood sector has been newly placed at the core of debate, in numerous different areas.

January 2015: the panel guided by the Stockholm Resilience Center scientists Will Steffen and Johan Rockström unveiled the update of an important study conducted on planetary boundaries, titled "Planetary boundaries: Guiding Human Development on a Changing Planet." Phenomena that resulted as exceeding the boundary of "safe operating space for humanity" in the first version of said study are complemented by another one: soil use.

Changes in soil use have indeed created uncertainties in this process, that is factors contributing to increasing the risk of permanent changes to the balance ensuring life on the planet as we know it. And the main defendant for this new declared crisis is deforestation, which is closely related to trends concerning agriculture and the agri-food system, therefore food, even though not alone. The study conducted on *planetary boundaries* however includes an element that is often partly neglected, but which is the actual cornerstone of the issue: considering indicators separately—biodiversity loss or nitrogen cycle, climate change or sea and ocean acidification, etc.—leads to losing sight of the fact that said phenomena interact, mutually strengthening each other and making forecasting even more uncertain. Designing solutions aimed at acting on said elements without considering that they interact with other concurrent factors is not the appropriate solution.

Evidence identified by scientists only strengthen the approach, arguments and recommendations issued and disseminated by the Barilla Center for Food & Nutrition since its creation.

Identifying the three "food system" paradoxes, mentioned in the preface of this book (competing uses of the same resources, coexistence of malnutrition and obesity, food

waste) are the core of research and initiatives aimed at raising awareness, conducted by BCFN since 2009, using a multidisciplinary approach consisting in the following macro-areas of analysis: "Food for all," "Food for sustainable growth," "Food for health," "Food for culture." This thorough approach has included and has been enriched by intense and high-profile meetings and debates organized every year by BCFN Forums on Food & Nutrition. Said approach has led to important initiatives, including the *Milan Protocol,* a draft policy document set out in the appendix of this book and *BCFN Yes! – Young Earth Solutions,* a contest on food and sustainability involving young researchers. These actions have impacted, as we will see, far beyond the scope of this organization that, in the meantime, has become the Barilla Center for Food & Nutrition.

After the publication of the *Planetary Boundaries* update, other factors have contributed to reiterating the central role played by agriculture and food as key areas for future development of human beings.

Not long before the opening of Expo 2015, the *Milan Charter* was presented, a document discussed in the previous months originating, as we have already seen, from the Protocol issued by BCFN since 2014, involving the thorough expertise gathered by the Center since its creation. So many people have participated in this event that it has appeared clear that food, nutrition and sustainability of the agrifood sector attract far more interest than expected and that a new trend is emerging.

This Charter aims at becoming the actual bequest of the universal exhibition, which will take place in the six following months. Its text includes almost all challenges identified by the Protocol: fight against undernourishment and malnutrition, fair access to natural resources, sustainable management of production processes, but also recognition of women's role, fight against waste, fight against deforestation and excessive exploitation of sea resources, respect of local populations' needs, promotion of virtuous behaviors also in food consumption, promotion of food education and enhancement of traditional knowledge and much more. It is a call to awareness and action.

And 1st May 2015 was the first day of Expo 2015, "Feeding the Planet – Energy for Life," an event that has undoubtedly focused everybody's attention on sustainability of the agrifood system and food consumption.

Those who have decided to participate in it, have had the opportunity to think about what and how we eat, with a powerful representation of the relationship of our societies and economies with food resources. Last but not least, institutions have newly dealt with these issues, largely and constantly involved in debates and meetings organized within and around Expo.

24th May 2015: the document was disclosed, which it would be a euphemism to define as a "turning point." Pope Francis's *Laudato si'* encyclical letter is a clearer and more impacting statement than several years of disappointing or elusive final documents of international negotiations or summits. The masterful synopsis of issues linked to our relationship with the planet resources and the relevant environmental, social and cultural impact makes it a benchmark the importance of which will be proven in

time. The idea of integral ecology that the Pope dates back to San Francis, claims that concern for nature, justice for the poor, social commitment and inner peace are inseparable: "An ecology which respects our unique place as human beings in this world and our relationship to our surroundings." The interaction of the different crisis factors mentioned previously is fully highlighted in analyses suggested in said encyclical letter and the central role played by food issues clearly emerges, involving consumption trends, distribution inequalities, food waste and unequal access to resources, market distortions, the impact of unsustainable practices in agriculture and exploitation of fisheries.

The strength of statements contained in the encyclical letter are strongly consistent with the message given by US President Barack Obama on climate change last September: "Climate change is already disrupting our agriculture and ecosystems, our water and food supplies, our energy, our infrastructure, human health, human safety. Now. Today. And climate change is a trend that affects all trends: economic trends, security trends. Everything will be impacted. And it becomes more dramatic with each passing year. If we were not to abandon our course of action," President Obama added, "we would condemn our children to a planet that is beyond their capacity to repair." In a recent speech, President has used even stronger words, defining as mad those who, due to personal interest or ignorance, continue to oppose the adoption of effective policies to fight against environmental crises.

Still in September, another extremely important event occurred. In 2000, the 193 UN Member States underwrote the Millennium Development Goals, to be achieved by 2015. Ensuring environmental sustainability was only one of said eight goals. On 25th September, during the UN Summit on Sustainable Development, a set of 17 new goals explicitly focusing on sustainability was adopted. They were indeed named Sustainable Development Goals and they are the agenda for countries by 2030. A paradigm shift, involving all key strategies that countries of the world will have to implement to achieve an important general goal: a sustainable development pattern. This document, as well, reiterates the pivotal role played by agrifood systems. Goal 2 reads "End hunger, achieve food security and improved nutrition and promote sustainable agriculture," but also the other goals place food and the ways it is produced, distributed and consumed at the core.

And the launch of the *Youth Manifesto*, still within Expo, promoted by the BCFN Foundation in collaboration with *BCFN Yes!* young researchers of all the world is part of this very scenario. "We are future politicians, farmers and teachers. We are future journalists, activists, businessmen and researchers": The manifesto is the contribution given by youngsters to the *Milan Charter* and a new approach in food sustainability for a healthier planet and healthier human beings.

And on 16th October 2015, just before the end of Expo, the *Milan Charter*, calling to action a million and a half stakeholders, including institutions, governments, associations and citizens who have underwritten it, was delivered into the hands of Ban Ki-moon, the UN Secretary General.

On the previous day, the mayors of 111 towns of the world, representing 300 million

citizens, had signed the *Milan Urban Food Policy Pact*, confirming the commitment made by these towns to proactively fostering policies for the right to healthy and safe food for all, water as a common heritage, fight against waste and paradoxes of our century.
The most important heritage of Expo also includes the Milan Center for Food Law and Policy, a center gathering and classifying public administrations provisions and acts on the right to food.
Paris COP21 rendezvous has therefore taken place at the end of an extraordinarily rich year of happenings, debates and meetings of institutions, companies and economic sectors. Guidelines, strong statements, appeals and proposals made in the months before the round of negotiations on climate, mentioned in the previous pages, have significantly contributed to creating a positive scenario to achieve global agreement on climate, which could no longer be postponed. At long last, on 12th December 2015 an agreement amongst 195 countries was reached characterized by strong political legitimacy, pointing to ambitious objectives to achieve. It highlights the sectors where it is necessary to act as a matter of urgency, to keep average global temperature increase "well below 2 °C compared to pre-industrial levels and to do our utmost to limit temperature rising to 1.5 °C."
The outcomes of COP21 has a decisive importance, but it is worth to reiterate the quality leap that has been achieved in the last few years in collective perception, knowledge and involvement in important social, environmental and economic issues involved in climate negotiations.

Obviously, all this stems from long-standing awareness raised by several analyses, practical and theoretical studies. The urgency to adopt a different development pattern than the one used in the last two centuries strongly emerged in the work of great thinkers, who laid the foundations for the paradigm shift needed to trigger the change toward sustainability. All this before 1992, when Rio de Janeiro Earth Summit appeared to put on top of global political agendas the issues of environmental defense, fair development and the relevant economic feasibility.
Agriculture has been dealt with in studies and surveys leading to inception of environmental groups. Environmentally disruptive farming practices were at the basis of the silent spring reported by Rachel Carson in 1962. The relationship of agriculture, environment and society was the crucial link identified by Lester Brown in the Sixties and triggering reflections that led to devise the concept of sustainable development.
Today, visibility of the "food" issue has achieved unprecedented levels, but much remains to be done to raise awareness on its complexity and relevance for the planet balance.
This is why BCFN's commitment will be even more impacting in the future, to more rapidly raise awareness in people on the need to make sustainable food decisions, to promote individuals and the planet's health, respecting food farmers and producers and to increase focus on the planet natural resources and appropriate enhancement of food nourishing us. This effort will focus on the contribution given by youngsters, who will inherit the planet.

The first step is the Policy Workshop organized by BCFN and taking place at the European Parliament, in Brussels, on 2nd December 2015. This event has given BCFN Alumni the opportunity to present their *Youth Manifesto* and to deal with NGOs, policymakers, media and stakeholders of the agribusiness sector about possibilities to implement actions proposed at a European level.

The following recommendations, a synopsis of the results of the multiannual research conducted by BCFN, aim at becoming guidelines for action for the numerous stakeholder of the "food system": citizens, institutions and companies. Only by combining several different projects it will be possible to achieve knowledge, expertise and good practice sharing, which is essential for food to remain at the core of the debate on large and crucial global issues.

2. FOOD FOR ALL

Agribusiness sustainability and the new global goods movement

Paolo De Castro

PAOLO DE CASTRO is an Italian politician, economist and agronomist. He was Minister for Agricultural Food and Forestry Policies and an MEP. Chair of the EC's Committee on Agriculture and Rural Development, he is currently full professor of Agricultural Economics at the Faculty of Veterinary Medicine at Bologna University. He authored over 100 scientific publications, many of which on the analysis and prospects of European policies.

At the dawn of the 20th century, in London, for breakfast a worker could eat bread made with American wheat, butter produced in Ireland and jam made in Spain. He could sip Indian tea, sweetened with sugar from Caribbean plantations. The meat for the Sunday roast would come from Argentina or Australia and beer was produced with Canadian barley. At the beginning of the 21st century, in order to eat ingredients from all over the world, there is no need for a menu; a simple chocolate bar is enough.

Food is an increasingly global *affair*.

For an economically substantial market share, its production depends on global value chains,[1] namely the complex trading network, the geographical distribution, division and functions of labour underpinning goods manufacturing and service supply in the era of globalization.

Consumption is also globalized. Going back to our example, if in the past our menu was a prerogative of a consumer of the Empire's capital that dominated trade in the late 19th century, today global food products are theoretically accessible to the four corners of the planet. It depends on the consumer's income and culture, but also on the opportunities and obstacles foodstuff encounters in order to reach various markets.

Partly, this scenario stems from the multilateral agreements signed by the World Trade Organization (WTO) members, which came into force in 1995 during the so-called "Uruguay Round." As for agriculture, those agreements bound States to eliminate the protectionist measures at the borders such as customs duties, thus opening tariff quotas for third countries' export, as well as reducing domestic support to agriculture. Trade liberalization triggered a process whereby the wellbeing and food demand growth in the countries of the South of the world (including the emerging economies of South East Asia) is at the same time cause and effect of global trade intensification.

The trade boom, new technologies and the increasing establishment of new global value chains revolutionized the world trading system, including food, with pros and cons. The all-encompassing trade agreements have systemic effects and a positive or negative

judgement depends on their contents, but also on how domestic policies harmonized their effects within national boundaries, trying to maximise the benefits while limiting disadvantages.

Twenty years on from the Uruguay Round, we are now faced with a very delicate phase for trade policies, where the sustainability of food production processes is crucial. A phase that suddenly makes the old approach—interesting in principle but overestimated for too long—of the impact of transport and the food production processes on the environment (Food Miles) obsolete.

Over the last few years, "food development," intended as a harmonious economic, environmental and social growth, has become part and parcel of the new-generation trade agreements. Such definition covers agreements not only on mere economic and commercial aspects, but also environmental, social standard and cultural values' protection. Turning such verbal commitment into deeds is the greatest challenge that trade policies have ever faced.

Before 1995, a world protectionist's tool-bag was essentially based on economic values and on the reciprocity of some measures. A compromise could be achieved on quantifiable and neutral parameters, essentially based on economic calculations and on a sort of "mutual disarmament," where weapons were duties and taxes. On the one hand, the Uruguay Round demolished this logic, on the other hand, it caused new problems involving aspects such as sustainability of production processes and social and cultural values. These issues often present high conflict levels and are difficult to manage within national boundaries, let alone in international treaties.

As for agribusiness, the new trade treaties will have to tackle the concept of food security that after the 2007-2012 price crises has spread into two different directions. One concerns the process and the other the product. From the process point of view, food security embraces environmental and social sustainability of production processes; from the product perspective, the access to food has become a question regarding not only the nutritional quality but also the quantity of calories intake. These two "expansions" coincide with just as many planetary challenges. Because, as for sustainability, all countries are literally "developing countries" and because it is difficult to define quality according to universal parameters. The ability to guarantee sufficient, healthy, nutritious food while producing it sustainably represents "the other inconvenient truth" of our century, the main challenge for humankind together with that of climate change.[2] And new-generation trade agreements are one of the fields where these new crucial issues will be shaped in coming years.

Especially with food, trade limits are currently imposed through non-tariff barriers. In other words, with rules and regulations concerning environmental or health security standards that can become a hindrance to the free movement of goods when an exporter has to comply with specific rules of the importing country, stricter than international standards. There are mainly two types of measures: Sanitary and Phytosanitary Measures (SPM) aimed at the protection of human, animal or plant life or health from certain risks; and Technical Barriers to Trade (TBT), for instance compulsory certification, labelling, packaging characteristics that make entering a market more difficult for exporters or entail unaffordable compliance costs.

Sometimes, rules, regulations and standards are mere pretexts to protect the market. Other times, they are just an expression of beliefs deeply rooted in a culture, regardless of a country's trade policies. To understand how delicate this subject is and how difficult it is to separate these two aspects, suffice it to think of the emotions stirred up by the current negotiations between the EU and the United States for a transatlantic trade agreement, known as TTIP.

When we talk about quality in the agribusiness sector, especially in Mediterranean Europe, we prefer to talk about uniqueness and excellence rather than rules and standards. But the future food challenge depends on standards able to combine the value component and the economic aspect offered by trade. In other words, it must be technically efficient and politically "sensitive."

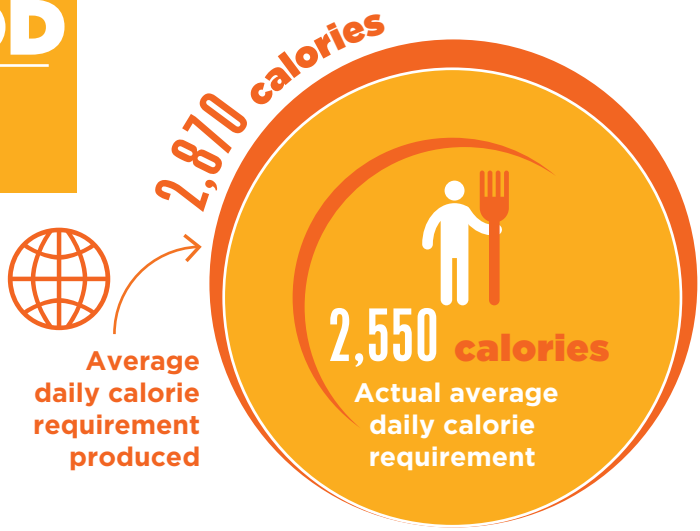
---

1 OECD, *Mapping Global Value Chains*, 2012.

2 De Castro P., *Cibo – La sfida globale*, Donzelli, Rome 2015. The definition of "other inconvenient truth" is taken from Jonathan Foley. A synthesis of these conceptual elaborations can be found in the second of the 17 Sustainable Development Goals adopted by the UN in September 2015, aiming at ending world hunger and malnutrition by 2030 while guaranteeing high levels of productivity, food quality and biodiversity protection.

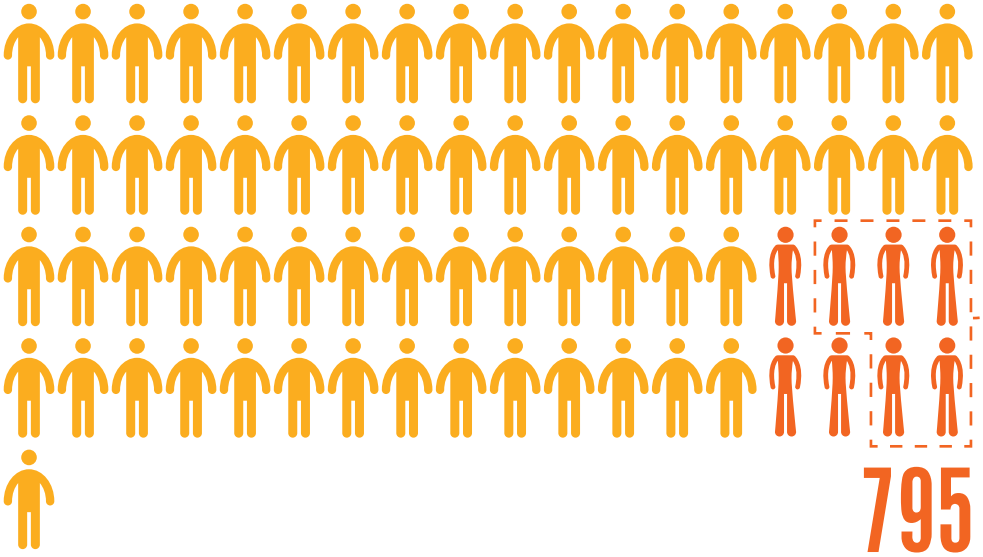
2. FOOD FOR ALL

WORLD FOOD SYSTEM



The world food system is capable of producing today a little less than 2,870 calories per person per day, compared with an actual average per capita calorie requirement for an adult individual of 2,550 calories

WORLD POPULATION **7.3** billion people

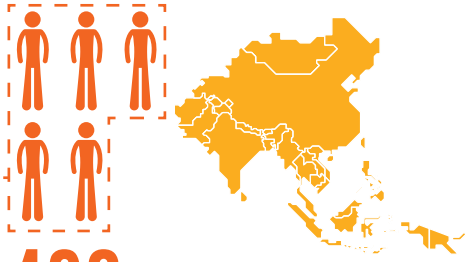


795 million people undernourished

6.3 million deaths of children < 5 years of age in 2013

About 45% of these deaths linked to malnutrition

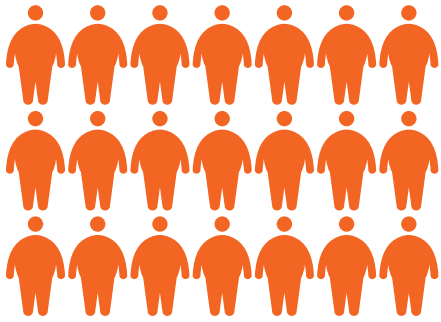
HUNGER VS. OBESITY



490 million hungry people live in Asia

23% of the Sub-Saharan population is undernourished

62% of the world's hungry live in Asia, a region where there is also an increase in the number of overweight or obese people. In Sub-Saharan Africa, the percentage of undernourished people in the total population is the highest in the world (23%). Although there has been a decline in the percentage of undernourished people compared to 1990-1992, the absolute number of people continues to increase due to population growth



2.1 billion obese or overweight in 2015

In 2013, 45 million children < 5 years of age were obese or overweight

33 million deaths annually from diseases linked to excess food

ACCESS TO FOOD: PRESENT AND FUTURE CHALLENGES

Access to food is one of the first and most fundamental of all human rights. Where food is lacking it is impossible to live with dignity, and the right to a healthy life and peaceful coexistence are undermined.
The world is now experiencing a silent tragedy caused by humanity's inability to produce and distribute sufficient quantities of food. This tragedy takes an array of different forms, starvation being the first and most tragic. There is also a range of secondary impacts on human health and welfare, and they too can be devastating. They stem from the chronic or acute conditions of undernourishment and malnutrition that plague many poor and developing countries.
Undernourishment and malnutrition have serious harmful effects on the human immune system. They increase susceptibility to diseases and augment the gravity and duration of the ensuing illnesses. This relationship is reinforced by a broader system of allied conditions that are typically associated with situations of inadequate nutrition, such as poor hygiene, inadequate health care, and lack of access to plentiful drinking water and basic pharmaceuticals.
It is important to emphasize, however, that access to food is not a problem that exclusively concerns the developing nations; it affects the industrialized world as well, where the number of undernourished people has reached 15 million, increasing by 54% just between 2007-2010.[1] As a result of the recent economic crisis, there has also been a perceptible change in dietary choices toward foods that cost less and are less nutritious.[2]

Moreover, poor economic and social conditions also tend to exacerbate the link between malnutrition and disease, making potential workers unsuited to employment and further marginalizing the unwell in social and economic terms. In many cases, lack of basic knowledge about nutrition prevents mothers from taking adequate care of their children. However, throughout the world, the lack of food is also behind many major forms of conflict over the availability of food and natural resources:

- social tensions bound up with the issues of access to and control of agricultural resources;
- mass migrations triggered by sharp deteriorations in living conditions (malnutrition and lack of water), in some cases aggravated by the effects of climate change;
- situations of political and social instability and misgovernment and their effects on the response to the growing needs of populations;

---

1 FAOSTAT, *Food security indicators*, 2015.

2 IFAD, "Statement by the IFAD President to the joint AU and ECA conference: Implications of the global financial and economic crisis for Africa's long-term development", 2009 (www.ifad.org/events/op/2009/cairo.htm).

- pressures on international governance bound up with growing imbalances between developed countries and developing countries.

There are significant risks that a worsening of the viability and security of agricultural and food production will lead to a noticeable increase in the amount of social conflict, already aggravated by climate change. This would occur mainly in developing areas, where food and water issues exacerbate unresolved ethnic religious and economic tensions.

2.1 FOOD SECURITY AND PROBLEMS OF ACCESS

The most widespread and commonly accepted definition of food security[3] identifies it as a condition in which all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life.[4] The concept of food security thus includes four components: the availability of sufficient quantities of food of good quality (*availability*); adequate means of access to such food (*access*); the maintenance of appropriate hygiene and sanitary conditions to allow the safe consumption of food to satisfy basic physiological needs (*utilization*); and the stable, consistent availability of food over time (*stability*).[5] Each of these components can be addressed at the individual, community, local, and global levels. Action on food security is one of the primary concerns of the United Nations' Agenda 2030 for Sustainable Development, which aims to establish a framework for the elimination of poverty and pursuit of sustainable development by 2030.

The gravity of the problem of global food security is immediately evident from a quick look at the relevant data. The number of malnourished people around the world today—that is, those who are unable to consume enough food to maintain an active and healthy life—has reached approximately 800 million, or around one out of every nine people (see figure 2.1). The majority of the malnourished live in developing countries, though the last ten years have witnessed a notable degree of progress on this front (167 million fewer people than a decade ago). Some 62% of the world's hungry live in Asia (490 million people), which manifests itself in malnutrition across all age groups of the population and in arrested development among children under five years of age. At the same time, the region also hosts an increasing number of people who qualify as overweight or clinically obese. In Sub-Saharan Africa, the percentage of undernourished people relative to the entire population is the highest in the world (23%). Although the region experienced a decline in the percentage of malnourished people compared to 1990-1992, the absolute number continues to increase as a result of demographic growth.

---

3 For a more detailed exploration of the different approaches to the concept of food security, see Burchi F., P. De Muro, "From food availability to nutritional capabilities: Advancing food security analysis", *Food Policy*, 1 May 2015 (www.sciencedirect.com/science/article/pii/ S0306919215000354).

4 FAO, Rome Declaration on World Food Security and World Food Summit Plan of Action, 1996.

5 FAO, *Food Security*, Policy brief, 2006.

Rapid progress has been made in Latin America (from 13.9% down to 5%), Southeast Asia (from 30.6% to 9.6%), Central and Eastern Asia (from 23.2% to 9.6%), and in certain parts of West and North Africa.[6] However, the developing countries that have reached their millennium goal of cutting the overall number of hungry citizens by half between 1990 and 2015 is only 72 out of 129.

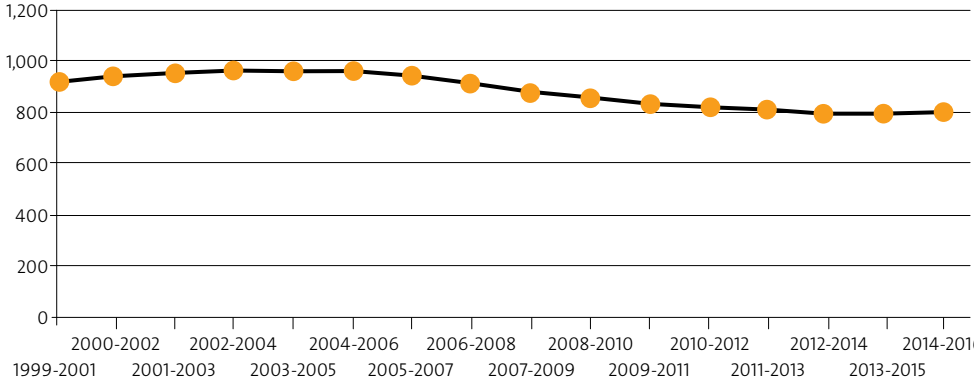


FIGURE 2.1

Undernourished people on Earth (millions of people)
Source: FAOSTAT, Food Security Indicators, *2015.*

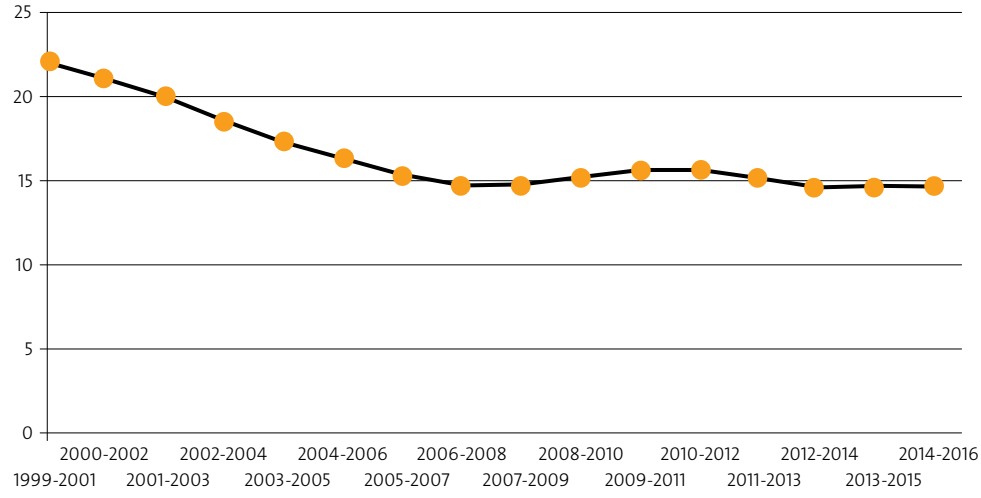


FIGURE 2.2

Undernourished people in developed nations (millions of people)
Source: FAOSTAT, Food Security Indicators, *2015.*

6 FAO, *The State of Food Insecurity in the World 2015*, 2015 (www.fao.org/hunger/en/).

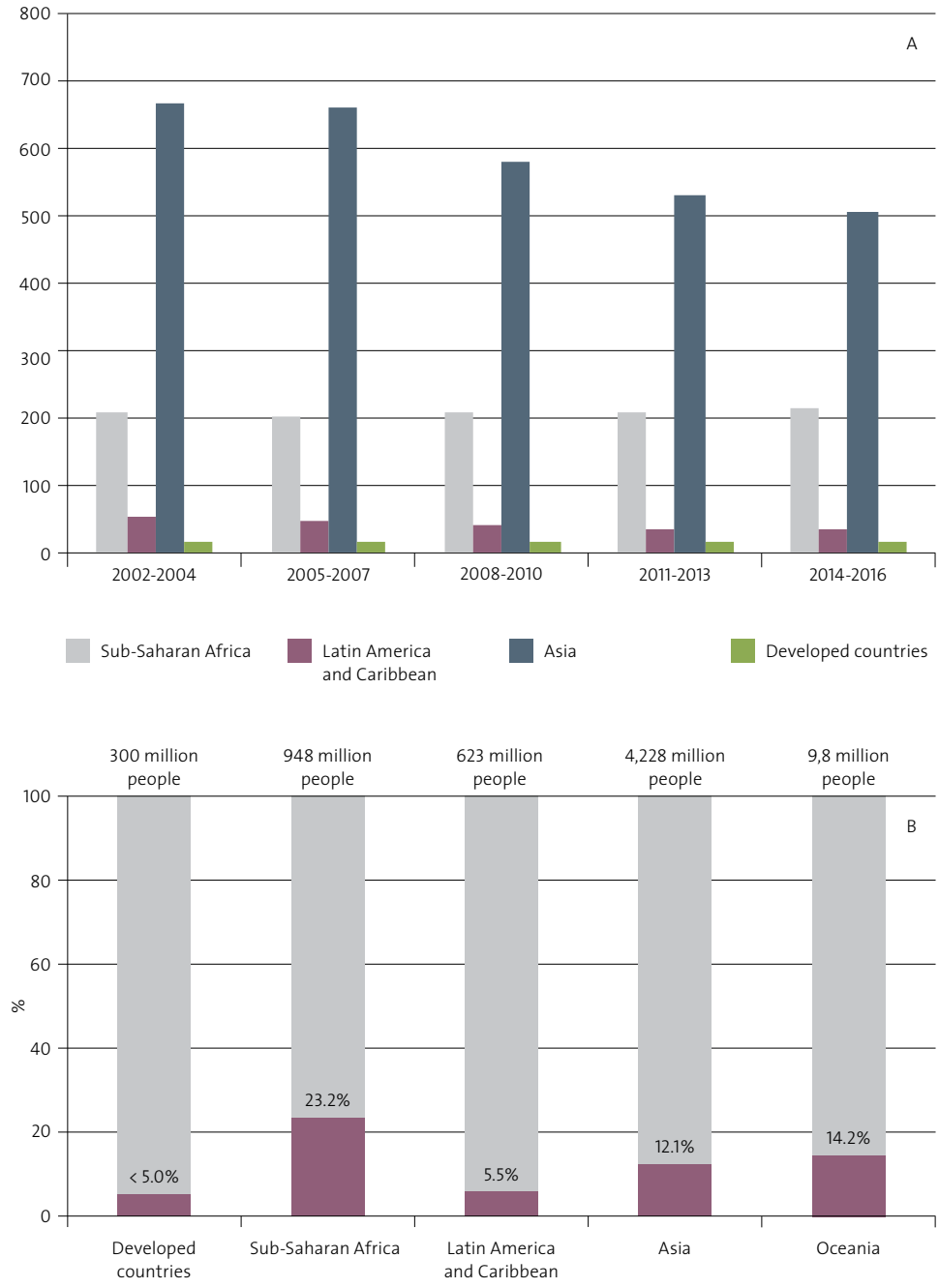


FIGURE 2.3

Worldwide undernourishment situation (2014-2016 values are estimated)
A: Undernourished people in selected regions of the world
B: Percentage of undernourished people on the total population of each region of the world (2014-2016)
Source: FAOSTAT, Food Security Indicators, *2015.*

2.2 THE "FOOD PARADOX": UNDERLYING CAUSES

While the current productive capacity for foodstuffs is sufficient to feed the world's entire population, this has done nothing to alter the persistence and expansion of enormous imbalances in terms of access to food. Evidence of these imbalances can be found in the fact that, during the last two years, almost 800 million undernourished people continue to live alongside and among 2.1 billion people defined as obese or overweight.[7] The gap described by this "paradox" has progressively and visibly widened over the last few decades. Since 1980 (when fewer than one in ten people in the world were labeled obese), this figure has doubled if not tripled in many OECD nations, where the epidemic of obesity currently affects one of every two people, producing considerable economic and social effects.[8] Although recent research has revealed that rates of growth in this area have stabilized in some countries (Italy, the United States, Great Britain), and increased only modestly in others (Canada, Korea, Spain), we must continue to pay close attention to this issue.[9]

This paradox (the existence of a vast segment of chronically malnourished people in the face of sufficient agricultural production) highlights the limits of the classical view,[10] in which the problem of food security is a purely agricultural issue, resolvable through an increase in output.

The FAO has also shown that the question is not whether production will continue to increase at the global level, as it has recently, but whether certain particularly impoverished regions, like Sub-Saharan Africa, will be able to lift themselves out of the stagnation of the last few years. From a long or extremely long range view, the growth rate of the human population will begin to slow down, reaching its peak and beginning to decline by 2050 in many large population centers (Japan, China, Europe, Brazil), while other regions will succeed in producing an adequate supply of calories per person within that timeframe. The need for increasing production on a global scale will thus eventually lessen, but the problem of hunger will remain for countries with a scarcity of land suitable for farming, insufficient yields, or structural problems regarding food access.

The problem is thus not one of food production, but of the potential opportunities (or *entitlements*) to access. The idea of increasing agricultural output that primarily engages family farming and the most impoverished producers can be effective in the short term, as shown by the FAO (among others) in its 2014 report,[11] but it runs the risk of focusing exclusively on the agricultural question, and thus adopting an overly narrow perspective. Economic diversification in the developing countries can guarantee that

---

7 WHO, *Obesity and overweight*, *Fact sheets 311,* 2015 (www.who.int/mediacentre/factsheets/fs311/en/).

8 OECD, *Obesity and the economics of prevention: Fit not fat*, 2010 (www.oecd.org/els/healthsystems/obesity-and-the-economics-of-prevention-9789264084865-en.htm).

9 OECD, *Obesity Update*, 2014 (www.oecd.org/health/Obesity-Update-2014.pdf).

10 De Muro P., "Agricoltura e riduzione della povertà e dell'insicurezza alimentare", 2010 (http://agriregionieuropa.univpm.it/content/article/31/22/agricoltura-e-riduzione-della-poverta-e-dellinsicurezza-alimentare).

11 FAO, *The State of Food and Agriculture 2014*, 2014 (www.fao.org/3/a-i4040e.pdf).

they possess more stable access to food through the reduction of family poverty and greater economic development over the long term.[12] Finally, it must be remembered that food insecurity is not an isolated phenomenon, but rather goes hand in hand with a lack of educational opportunities, medical care, and/or other factors that help determine an individual's Well-Being; thus, a greater understanding of this phenomenon can only be achieved by adopting a more panoramic perspective regarding the overall development of a nation and its livelihood.[13]

Structural factors. Several major structural issues underlie global imbalances in food access. The primary cause of malnourishment is poverty. The critical targets in the battle against inadequate nutrition should thus be an increase in wealth and a more equitable distribution of that wealth. It is important to keep in mind that economic growth through agriculture represents one of the best economic tools with which to address the problem, given the fact that the majority of those who lack the resources to maintain adequate access to food are small farmers living in rural areas.

An increase of just one percentage point in the gross domestic product generated by the agricultural sector is twice as effective in terms of reducing poverty as equivalent growth in other sectors, as several studies have shown. The importance of the agricultural sector in the fight against poverty derives from two principal factors: the high incidence of poverty in developing countries, where farming represents the primary source of income and employment, and the fact that rural populations typically possess lower levels of education and less access to alternative sources of income (like manufacturing or services). This means that the agricultural sector constitutes a key element in the development of strategies aimed at improving the living conditions of rural populations.

For the developing countries, however, it is not enough to invest in increasing productivity; rather, what is needed above all is a more equal distribution of wealth through the creation of income opportunities for the poorest segments of the population. Without a wider distribution of wealth, farming in many poor and developing nations is destined to remain purely at subsistence level.

In the same way, it is critically important to establish basic infrastructure and local markets that will create the conditions for an agricultural sector that is at least in part "market-based."

Among the other structural factors that significantly influence ease of access to food, there is an increasing level of competition for agricultural land and water resources, which frequently translates into the acquisition of large tracts of land by foreign investors, often in partnership with local actors, and their reconversion from traditional uses by the local community to commercial uses (so-called land grabbing); the existence of national subsidies for agriculture; and the great global challenges presented by energy, in particular the production of biofuels, which have encouraged the development of cultivation for purposes other than the feeding of people.

---

12 Sen A. K., *Development as Freedom*, Oxford University Press, New York 1999.

13 Burchi F., P. De Muro, "From food availability to nutritional capabilities: Advancing food security analysis", *Food Policy*, 1 May 2015 (www.sciencedirect.com/science/article/pii/ S0306919215000354).

Then there is the subject of political decision-making. In policy areas of such complexity, which necessarily summon the interaction of a broad range of actors, political choices are in fact decisive both domestically (in terms of political economy) and internationally (especially on topics of trade). In the current climate of international political and economic instability, food security is frequently downgraded to a position of secondary importance, or redirected toward the issue of food aid, and the distribution of food assistance.

Concomitant factors. In addition to these structural elements, recent years have witnessed the addition a number of other concomitant factors. The difficulty of forecasting the future of markets for agricultural products and foodstuffs is influenced by a complex set of phenomena on a global scale: these include worldwide demand and new opportunities in the agro-food market (energy, green chemistry, etc.); the effects of climate change; economic and demographic growth; uncertain environmental conditions; and the financialization of agricultural commodities.[14] With respect to climate change, the answer is a two-pronged strategy: mitigation and adaptation. The more effective efforts are in combating climate change through broad, shared consensus, the more agricultural strategies will be able to address mitigation, primarily through adaptation. Agriculture can become an essential part of the solution to the problem of climate change through "climate-smart" approaches, which seek to expand agricultural output in a sustainable manner and increase resilience to environmental pressures, reducing greenhouse gas emissions and encouraging farmers to adopt new practices to adapt to this new reality.[15]

The current situation testifies not only to the lack of adequate joint and multilateral economic, social, environmental, and commercial action (including structural measures) aimed to regulate food access in order to address the inequalities we see today, but also and especially the failure of pure free-market mechanisms to work when it comes to food. The decline in public and private investment in agriculture over the last twenty years and the corresponding lack of political interest (save for the adoption of frequently protectionist and otherwise distorting agricultural and trade policies) finds one possible explanation in the productivity gains achieved in the last three decades by technological advances and the spread of farming know-how (the so-called Green Revolution); these gains have allowed a gradual but consistent increase in output and a corresponding decrease in prices in real terms. This has made investment in agriculture less attractive (with the exception of the biofuels sector) and has created the illusion that it can be managed with a lighter hand.

The profound changes underway today require a rethinking of our management of natural resources. The pressure placed on our natural resources is increasing, as are concerns regarding their more efficient use, their conservation, and the containment of the

---

14 Visciaveo M., F. Rosa, "Volatilità dei prezzi agricoli: un confronto fra prodotti e paesi dell'Ue", *Agriregionieuropa*, 8, 31, 2012.

15 For more on these ideas see the BCFN report *Sustainable Agriculture and Climate Change*, 2011 (www.barillacfn.com/wp-content/uploads/2012/11/pp_agricoltura_sostenibile_cambiamento_climatico_eng.pdf).

negative effects of economic development. The dynamics of competition, in the form of exploitation and hoarding of scarce and unequally distributed natural resources, often degenerates into conflict, violence, and despoiling of our common natural capital. These dynamics may well be aggravated by the changing farming conditions brought on by climate change, extreme meteorological events, or water scarcity.

New Challenges for World Food Security. One major initial challenge in the battle for global food security comes from population growth, which is estimated to surpass 9 billion by 2050 and approach 11 billion in 2100.[16] This jump will bring with it a growing demand for food worldwide. Changing diets and the increasing demand for animal proteins, which correlates positively with increasing incomes, represents a second challenge for food security in the future, as it risks further "enlarging" our "environmental footprint." According to the World Health Organization, the annual consumption of meat will increase from 36 kg per person per year in 1997-1999 to 45 kg by 2030.[17] In this context, the promotion of sustainable diets (those that are both healthy and respectful of the environment) will represent a fundamental priority.

The production of biofuels constitutes a third challenge, in that it creates additional competition for land and water, both fundamental inputs for the production of foodstuffs. By 2035, global energy demand will increase by one-third with respect to its 2011 levels.[18] The production of biofuels competes with food production not only in terms of land use, but also in terms of hydraulic resources, since the production of biomass requires a substantial volume of water.[19]

It is also important to note that the growing competition for agricultural land and water resources necessary for the production of agricultural goods, together with the need to respond to growing demands for food and energy, has played a fundamental role in the emergence over the first decade of the new century of investment in the acquisition of large parcels of agricultural land (> 200 hectares) by means of concessions, sales, or leases (generally between 55 and 99 years), on the part of different kinds of investors, whether public, private, or in partnership. The expression "land grabbing" is used to denounce cases in which these investments take place without the free and informed approval of the local populace, either in non-transparent conditions or in violation of human rights.[20] Currently, this phenomenon describes nearly 60 million hectares of land and more than 1,000 investments around the world, according to data from the independent monitoring group Land Matrix.[21]

---

16 United Nations Department of Economic and Social Affairs, *World Population Prospects: The 2012 Revision, Highlights and Advance Tables*, United Nations, New York 2013.

17 World Health Organization, *Global and regional food consumption patterns and trends, (Nutrition Health Topics)*, 2013.

18 International Energy Agency, *World Energy Outlook 2013. Executive Summary*, OECD/IEA, 2013.

19 Gerbens-Leenes P. W., *et al.*, "Biofuel scenarios in a global perspective: The global blue and green water footprint", *Global Environmental Change*, 22, 764-775, 2012.

20 International Land Coalition, Tirana Declaration, 2011.

21 Figures from the Land Matrix online database (www.landmatrix.org/en/).

ENVIRONMENTAL FOOTPRINTS

The Ecological Footprint: Measures the amount of biologically productive land (or sea) necessary to provide resources and absorb emissions related to a production chain; it is measured in square meters or global hectares. The concept was developed by Rees and Wackernagel in the 1990s.[1]

The Carbon Footprint: Represents the emissions of greenhouse gasses responsible for climate change, measured in equivalent mass of CO_2.

The Water Footprint: Is a multi-dimensional indicator of water consumed to produce a good or service that expresses the volume of water used and its original source. The concept was devised by Arjen Hoekstra in 2003.[2]

1 Rees W. E., M. Wackernagel, "Ecological Footprints and appropriated carrying capacity: measuring the natural capital requirements of the human economy", in Jannson A., *et al.*, (eds.), *Investing in Natural Capital: The Ecological Economics Approach to Sustainability*, Island Press, Washington 1994.

2 Hoekstra A. Y., (eds.), "Virtual water trade: Proceedings of the International Expert Meeting on Virtual Water Trade", Value of Water Research Report Series, 12, UNESCO-IHE, Delft 2003.

The availability of large parcels of land at low cost in areas characterized by abundant water resources, atmospheric conditions favorable for farming, cheap labor, and geographic proximity to markets for export have decisively shaped the geographic distribution and concentration of such investment.[22] These investments began to emerge between 2004 and 2005, intensified in relation to increasing food prices on international markets and the contraction of the global economy in 2007-2008, and reached their peak in 2009 before finally leveling off in 2010.[23] Recent studies have shown that the scarcity of water resources and suitable farmland are the determining factors driving these acquisitions (as in the case of Middle Eastern investors, for instance), as well as the need to cultivate crops destined for use in biofuels. This is the case in many European-led investments, not only in developing nations but also on the European continent itself.[24] Currently, the countries most frequently subject to large-scale land acquisition are South Sudan, Papua New Guinea, Indonesia, and the Democratic Republic of Congo, as well as other nations on the African continent. These investments have originated primarily from the United States, Malaysia, Singapore, the United Arab Emirates, the United Kingdom, Canada, India, Saudi Arabia, Russia, and China.[25]

22 De Schutter O., "Large-scale land acquisitions and leases: A set core of principles and measures to address the human rights challenge", 2009.

23 Anseeuw W., *et al.*, *Transnational Land Deals for Agriculture in the Global South. Analytical Report based on the Land Matrix Dataset*, 1, CDE/CIRAD/GIGA, Bern/Montpellier/Hamburg, 2012.

24 Antonelli M., *et al.*, "Global investments in agricultural land and the role of the EU: drivers, scope and potential impacts", *Land Use Policy*, 47, 98-111, 2015.

25 As measured by number of hectares of agricultural land per investment. Figures from the Land Matrix online database (www.landmatrix.org/en/).

2.3 POSSIBLE AREAS FOR ACTION

There are six principal areas for action in this global context:

- strengthen global governance of the world food system and guarantee access to food through agricultural, agro-industrial, and commercial policy;
- rethink the use of natural resources, particularly in the first phase of the agro-food chain (cultivation);
- intervention in the production chain and management of price volatility to encourage more equitable conditions to incentivize investment, compensate growers for their production, and increase opportunities for access to food;
- reduce waste all along the agro-food chain;
- invest in education for rural populations in developing countries. A 100% increase in access to primary school education can create a reduction of 20-25% in food insecurity.[26]

Reinforce the mechanisms of global governance and ensure access to food in adequate quantities, of appropriate quality, and at reasonable cost. There are two primary spheres of action to combat the problems related to food insecurity, and particularly food access: rethinking the approach to food security, and formulating coherent farm and trade policies with the goal of fighting undernourishment and malnutrition.

First, the particular nature of food products—which cannot be simplistically reduced to the status of a commodity—and the failure of distribution mechanisms makes it necessary to move beyond a paradigm of the market as a self-regulating system, through the coordination of global policies and the reduction over time of unilateral protectionist policies. It is essential to return food to a central role of primary importance on the international political and economic agenda. This means that the entire food production chain must be structured and regulated more transparently toward the goals of accessibility, sustainability, and nutritional quality. To that end, shared spaces for dialogue and analysis must be created on themes tied to food security, with a multilateral and cross-sectoral approach that involves all public and private actors directly or indirectly associated with the agro-food sector.

Second, to combat the problems tied to food access in the developing world, particularly in the short term, it is additionally important to ensure the availability of foodstuffs of sufficient quantity, quality, and cost through a combination of agricultural, agro-industrial, and trade policy, and reform of the labor market to encourage a more equal distribution of profits and greater stability in levels of employment. In the long term, it is essential to modify the productive structure of countries to diversify their economic base, including non-agricultural sectors as well, in order to encourage higher wages and better living conditions (for more see the contribution by Pasquale De Muro below).

---

26 Burchi F., P. De Muro, *Education for Rural People: A Neglected Key To Food Security*, 2007 (www.die-gdi.de/uploads/media/wp78romatre.pdf).

Food security belongs to the larger sphere of a society's Well-Being and overall development, and not just its agricultural sector.[27]

Encourage more efficient use of natural resources in the production chain. It is time to promote the transition toward sustainable agriculture not only in developing countries, but in the industrialized world as well. The three objectives that must be pursued in defining this path are: protection of the environment, economic profitability, and socio-economic equity. In this pursuit, it is important to create and support genuine paths to sustainable development in those sectors that are essential to economic growth through innovation and the adoption of agricultural and productive models that maintain high standards of quality and productivity but, at the same time, produce fewer environmental impacts (so-called sustainable intensification). Scientific and technological research in these areas, including through public investment, will be decisive in this respect.
It is also necessary to promote actions to support developing countries through the transfer of scientific knowledge and agricultural best practices, with *ad hoc* programs designed to fill the gap in know-how that exists today.
Finally, it is important to use appropriate policy instruments and incentivization/disincentivization measures to encourage the development and maintenance of localized production-distribution-consumption chains for agro-food products, preserving quality of production and attention to bio-sustainability associated with more rationalized land use. Fiscal and trade policy that distorts global agro-food markets must also be vigorously contested, particularly those that harm the developing world.

Intervene in the food chain and manage price volatility. The agro-food sector, which is always subject to constant price volatility, must possess better technical solutions to optimally manage this new reality.
To combat and prevent future food crises, it appears necessary:

- to institute a process of evaluation and selection of best practices on a local, national, and international level for the creation of stockpiles of foodstuffs and raw materials, defining costs, schedules, and roles for a similar process of global "insurance";
- define a new system of rules for food commodities markets, to privilege the not-exclusively economic role of the products they exchange, including—for example—active vigilance by an independent authority or the imposition of position limits to ensure that the sums invested do not assume an excessively speculative nature, making complete transparency of all financial operations (volume and price of exchange) fully obligatory;
- coordinate trade policies at the international level, encouraging access to markets and the qualitative growth of production from developing countries.

Promoting Sustainable Diets. In 2010 the FAO and Bioversity International collaborated on the publication of a report titled *Sustainable Diets and Biodiversity*, which

27 Burchi F., P. De Muro, "From food availability to nutritional capabilities: Advancing food security analysis", *Food Policy*, 1 May 2015 (www.sciencedirect.com/science/article/pii/ S0306919215000354).

SUSTAINABLE INTENSIFICATION

Sustainable intensification has been defined as a form of agriculture in which production is increased without adverse environmental impacts, and without increasing the amount of farmland used.[1] The term emerged in reference to agriculture in Africa, which has been characterized by low productivity and very large environmental impacts, but it gained traction beginning in 2009 with the publication of a report by the Royal Society of the United Kingdom. Sustainable intensification does not represent an existing model of production but rather is a goal to be pursued through the application of a mixture of various solutions depending on the bio-physical, social, cultural, and economic characteristics of the area under consideration.[2]

1 The Royal Society, "Reaping the benefits: science and the sustainable intensification of global agriculture", London 2009.

2 For a more detailed exploration of sustainable intensification concept, see Garnett T., C. J. Godfray, "Sustainable intensification in agriculture", 2012 (www.fcrn.org.uk/sites/default/files/SI_report_final.pdf).

defined the concept of a sustainable diet and explored its relationship with food access, nutrition, and the environment. Despite the progress achieved in the agricultural sector over the last few decades in terms of productivity, it is clear today that the transition toward a low-carbon society, or more generally a society that does not destroy but rather conserves those precious environmental resources upon which all human activities are based, cannot be achieved without a radical change in dietary habits.

The international community has in the meantime acknowledged the need to define the concept of sustainable diet in a way that privileges its multidimensionality: "Sustainable Diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources."[28]

This definition implies, first, intervening in consumption patterns so that they do not conflict with natural ecosystems; this can represent a considerable challenge for policymakers, who, by adopting measures to change food consumption, may be acting against the wishes of their constituent citizens.[29] Among examples of sustainable diets, the FAO specifically cited the so-called Mediterranean diet, not only from a nutritional perspective but also for its emphasis on social interaction and bio-cultural diversity. In 2010, the Mediterranean diet was declared by UNESCO to be part of the Intangible Cultural Heritage of Humanity.

Tim Lang argues that the promotion of consumption habits that are more sustainable for ecosystems and individual health constitutes a political priority for all countries around the world, because dietary Westernization (the increase in consumption of ani-

28 FAO, Bioversity International, *Sustainable Diets and Biodiversity*, 2010.

29 Lang T., "Sustainable Diets: Hairshirts or a better food future?", *Development*, 57(2), 240-256, 2014.

mal products and processed foods rich in fats) has now become a global phenomenon, and deserves the same attention as other activities in terms of food production.[30]
The BCFN Foundation has taken up the challenge of promoting sustainable diets through its research coordinated by the Observatory for Sustainable Diets, launched in May 2015.

THE INSTABILITY OF FOOD PRICES

In 2011, the BCFN Foundation studied the phenomenon of rising food prices and their volatility, following the rapid jump in market prices for agricultural commodities in 2010. In the period from July 2010 to February 2011, in fact, the FAO Food Price Index skyrocketed by 38%, reaching a peak higher than that recorded during the 2008 food crisis. In the last three years the value of this index, which includes various food commodities, has slowly declined thanks to a series of excellent yields on a global level, but the lesson of the last few years makes clear that we must remain vigilant in monitoring the price of food and its sudden and unpredictable variation.
A similar trend has been witnessed with regard to price volatility, which if too great can generate market uncertainty. From 2006 to 2011, the standard deviation (the measure of volatility) has more than doubled compared to the preceding fifteen years (29.3% as opposed to 13.5%), which has led to the development of early warning mechanisms (such as the Excessive Food Price Variability Early Warning system from the International Food Policy Research Institute, or IPFRI) and closer monitoring of reserves. After the record cereals production of last year, which allowed an increase in global stockpiles, the FAO has predicted that 2015 will produce just enough to cover worldwide demand, but without any turbulence in prices. This forecast may be reinforced by the stabilization of production levels in biofuels, another important factor in food prices on the international market.

2.4 THE BCFN EVALUATION MODEL

The Barilla Center for Food and Nutrition has developed a study designed to identify the variables that directly influence the prices of food commodities, and to assess the effects of increasing prices for these goods on families' food security (particularly that of low-income families) as well as on countries' economic and political stability (especially within the developing world). The BCFN evaluation model attempts to display the many elements that combine to define trends in food commodity prices. Above all it highlights the factors that can be traced to the demand side (inventory levels of product, demographic factors, economic growth of emerging countries, food choices) and to the supply side (agricultural production, scarcity of natural resources, produc-

30 *Ibid.*

THE ISSUE OF FOOD ACCESS

*Pasquale De Muro**

Access to food is the most important element of food security. Unlike the concept of food availability or supply, which is considered on an aggregate level (local, regional, national, global), food access must be examined at the family and individual level.

In essence, it concerns the opportunities that a family or individual may possess to obtain a quantity and quality of food sufficient to meet their basic wants and needs. These opportunities normally depend either upon the purchasing power of the family or individual—presupposing the availability of food on the market—or on the type and quantity of food the family is capable of producing for its own consumption.

Obviously, in our age, the vast majority of the world's population, even in rural areas, obtains food from the marketplace. This is equally true of a great many farming families that do not produce food crops or do not produce the full quantity and variety of food that they need.

As a result, families that depend primarily on self-production for their food needs represent a very small part of the world's population. For this reason, given that the availability of food on a global level has for a very long time now been more than sufficient to feed the entire population, access to food for the vast majority of families depends on their purchasing power, and in particular on two variables: their income and the relative price of food—that is, the terms of trade between food and other goods.

Thus, in the short term, the two fundamental factors to analyze in order to understand the lack of access to food are family income—particularly among the most impoverished—and the terms of trade for food. While income depends on several variables, for the poorest families it depends largely on employment, wages, and the family's productive opportunities and abilities (economic resources, education...).

For salaried workers—of which there are many in agriculture as well—income is determined by general trends in the economy as well as the state of the labor market and other institutions that determine wage levels. For all these families, access to food depends more on structural and macro-economic conditions than on trends in the agricultural sector.

For the self-employed (farmers, artisans, small business owners...), meanwhile, income depends on their own productive abilities and capacity (assets, knowledge, technology, access to markets upstream and downstream), but also and especially on trends in the prices of the goods and the services they produce.

For both wage earners and the self-employed, the smooth functioning and stability of local and global markets—and thus their regulation—are a crucial element in food access.

For those who cannot work (children, the elderly, the sick or disabled...), access to food depends on their family's income, as well as the existence of social safety nets that can guarantee them a minimum level of necessary support.

From this portrait it clearly emerges that access to food is not strictly an agro-industrial question, in that it does not depend primarily upon the functioning, efficiency, productivity, and competitiveness of the agro-food system and its chains—including farming. Access to food instead depends largely upon economic growth, income distribution, employment levels, and the labor market, not to mention trends in the relative price of food items.

Naturally, agricultural and agro-industry policies also have an undisputed role, and can encourage access to good quality food at low cost, but they alone cannot determine purchasing power for the vast majority of families. The principal role of agricultural and agro-industrial policy—not to mention trade policy—is instead to make available sufficient foodstuffs, in terms of quantity, quality, and cost. As for access to food, these policies can only contribute to increasing family incomes for poor farming families, supporting their production and/or relative prices.

For all other poor families, both urban and ru-

* Associate Professors of Management Business Ethics at Università degli Studi Roma Tre.

ral, action should primarily be directed toward: 1) increasing employment, whether wage-earning or self-employment; 2) improving market conditions, especially on the labor market, and particularly with respect to wage levels; and 3) creating or reinforcing social safety nets.

The majority of the encapsulated recommendations provided thus far generally concern the short term, and are thus designed to avoid the gravest consequences of a lack of food access—that is, hunger, malnourishment, and their immediate effects.

But the long term poses additional problems. The most important of these concerns the economic and productive structure of many countries. In fact, those countries with the greatest problems in terms of food access are, paradoxically, those that still have a significant agricultural sector both in terms of employment and in terms of revenue, which also happen to be the same countries with the lowest per capita incomes and the greatest incidence of poverty. These are countries that, for various reasons, have not yet managed to diversify their economies and to develop significant non-agricultural economic activities (or at any rate those not related to natural resources). Only through diversification of their economic base can these countries create employment outside of agriculture and thus absorb a large segment of underemployed agricultural workers, who have a significant impact on their economies, while at the same time improving overall income levels. From this perspective, the development of opportunities upstream and downstream from agriculture (food industries, for instance) can be a more convenient and practical path for some of these nations.

Other long term problems, which we can only note briefly, include: the complex question of malnutrition, which is not simply a matter of food access but also of diet, and thus of nutritional education and the quality of food consumed; and the question of sustainability, which involves agriculture, the agro-food system, and consumption.

"FEEDING THE CITIES"

For some time now the talk has been all about "smart cities": that is, urban spaces where all economic activities, mobility, environmental resources, interpersonal relations, residential policies, and the means of administration are in some way "intelligent" and responsive to citizens' values. Among the many objectives of such smart cities, food must occupy a position of primary importance. Many cities, like New York and Toronto—but also European cities like London and Paris—have developed their own food policies, policy instruments designed to make a city more sustainable starting with their food system, which are intertwined with all of a city's other areas of competency. These policies are generally orchestrated in accordance with local civil society and economic stakeholders.

Urban food policies address global issues, like problems associated with access to food, the reduction of waste, food education, and sustainable farming, all with a local approach. The city of Belo Horizonte in Brazil, for example, manages more than 20 initiatives to ensure access to healthy food for the most impoverished segments of the population; while in Toronto, the parents of school-age children can attend cooking classes organized by the city free of charge, to bring home the principles behind healthy eating.

Food waste is another hot topic: from London to Bologna, Berlin to New York, there are a growing number of initiatives to recapture unsold but still perfectly edible food products from supermarkets that can then be re-distributed through charitable organizations to people in need.

There are also many widespread initiatives to support urban farming: community spaces where it is possible to grow fruits and vegetables, which in addition to contributing to food security also reinforces a broader sense of social solidarity. Here are some of the best practices in terms of urban farming:

Paris, Green Hand Charter (Charte Main Verte): a city initiative that allows any resident to create an urban garden on city land in collaboration with the local authorities. To date, more than 130 such gardens have been established.[1]

London, Capital Growth: an initiative by the NGO Sustain, which provides technical assistance (gardening courses, for instance) and financing to citizen groups interested in creating or maintaining an urban garden.[2]

Sao Paolo: the NGO Cidades sem Fome teaches residents to create small urban gardens in unconventional spaces, anywhere from school courtyards to the favelas.[3]

Rome, Orto della Caffarella: within the Appia Antica Regional Park (*Parco Regionale Appia Antica*) an urban garden has been established as part of a project of naturalistic restoration of the valley. The garden is primarily used by school groups. Older residents of the area and families take part in Saturday afternoon classes in horticulture.[4]

In several cases, cities have joined forces in veritable movements or international organizations: one such example is C40, a network that aims to combat climate change; another is the Sustainable Food Cities Network, which brings together 40 cities from around the United Kingdom linked by their desire to create a new sustainable food paradigm. The city of Milan has also initiated several programs at the local and international level. In July 2014, the city launched a project with an ambitious goal: to reform the metropolitan food system toward greater sustainability over the next five years. Public consultation has allowed residents to make their voices heard on the issues they believed to be most important, among them an interest in more community markets, food education, and agricultural districts within the metropolitan city limits.

On October 5th 2015, Milan City Council approved the "Guidelines for Milan Food Policy 2015-2020," namely the plan of action for improving the local food system. The city today has established its place as a laboratory for changing dietary habits, because it has been able to make strides simultaneously on a city-wide food policy as well as engage citizens directly through the financing of practical initiatives on the ground (as in school cafeterias, for example). On the international level Milan is at the head of the line with respect to the European project Food Smart Cities for Development, which involves twelve cities over three continents engaged in coordinating their food policies, and has also promoted the Milan Urban Food Policy Pact. This agreement on sustainable urban food policies, proposed by Mayor Giuliano Pisapia, has received the active support and participation of 116 cities from around the world, from New York to London, Melbourne to Dakar. It was formally signed in Milan on October 16, 2015.

1 Paris.Fr, "Les jardins partagés parisiens" (www.paris.fr/services-et-infos-pratiques/environnement-et-espaces-verts/nature-et-espaces-verts/les-jardins-partages-203#les-jardins-partages-parisiens_1).

2 www.capitalgrowth.org/.

3 http://cidadessemfome.org/en/.

4 Parco regionale dell'Appia Antica, "L'orto didattico della Caffarella" (www.parcoappiaantica.it/it/testi.asp?l1=3&l2=4&l3=3&l4=0).

tion of biofuels, impact of climate change). These are called endogenous factors. Some indirect, exogenous factors that affect price levels directly or indirectly can be added to these. The evaluation model takes into account financial and exchange markets, the price of oil and energy, international trade policies, and geopolitical dynamics.

The need to prepare an easily understood graphic representation required placing different factors on the demand side, on the supply side, or among the indirect factors. In reality, however, many of these factors interact in a complex way in the demand-supply

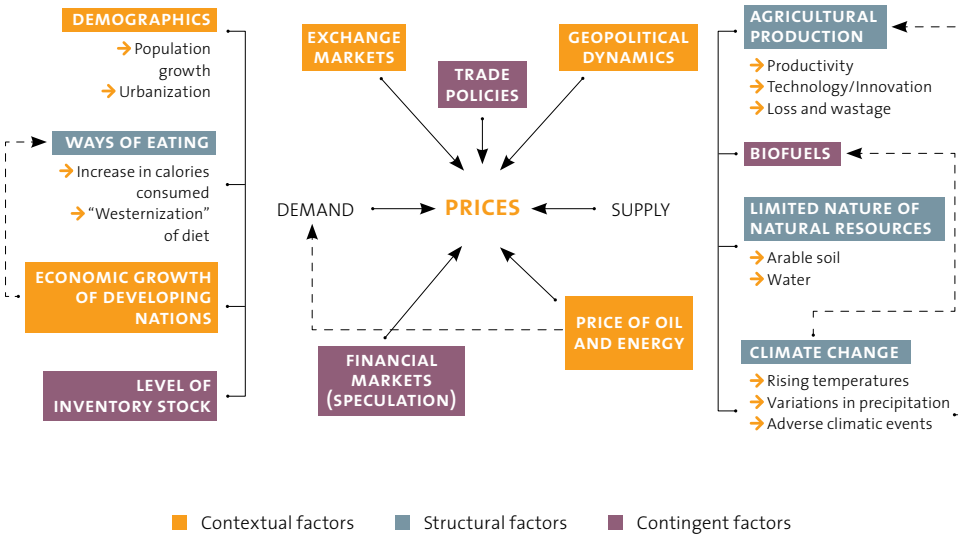


FIGURE 2.4

Interpretative model of food price volatility
Source: BCFN, 2011.

relationship. Moreover, there are many interconnections among the factors themselves, shown by the dotted lines in figure 2.4.
All the elements identified and shown in the evaluation model above can also be subdivided by the type of effect they have on prices and their relative reference timeframe. That is, the increase in price volatility can be short-term or long-term.

These evaluations also show that the effects of some factors can be changed only over the middle to long term and that answers may be found as the system adapts to changed structural conditions in supply and demand. For example, the demographic and economic growth of emerging countries is creating a significant increase in the demand for food, in urbanization, in the rise in temperatures caused by climate change, and in the progressive worsening of the scarcity of natural resources.
The imbalance between supply and demand is at the origin of the changes in price levels. In equilibrium, prices do not have a tendency to increase and volatility peaks are less likely.
By way of example: consider a situation containing factors such as present and forecast global demographic growth, heated economic development in emerging countries, drought, conflagration, or flood in key world agriculture areas. The outcome can only be a powerful shaking up of the markets. If the policy responses are protectionist, the global result will be a sudden increase in prices and greater uncertainty.

2.5 VARIABLES OF THE BCFN MODEL

To understand in depth the reasons for price increases and their extreme volatility, we must analyze the different variables at work, their movement, and their points of interaction.

Structural factors. These include, on one hand, demographic and economic growth, and on the other hand, insufficient supply globally and high levels of waste and losses. As a result of the increase in population and per capita income in the developing countries, the consumption of agricultural goods is constantly growing. The increase in the rate of urbanization and changes in food habits are bringing about a radical—and resource-intensive—increase in demand for foods such as meat, which directly affects the consumption of agricultural products and has a heavy impact on the consumption of resources to support animal husbandry. To try to limit this phenomenon, scientists are studying alternative ways to favor the consumption of vegetables with high protein content and to stimulate replacements for the consumption of meat.

The risks associated with global food production. The future growth of farming productivity is seriously threatened by a scarcity of natural resources due principally to growth in urbanization, soil degradation and changes in crop usage (particularly regarding the production of biofuels), water scarcity, and levels of waste and losses along the food chain (losses upstream in the developing countries, and waste downstream in the developed world). Alongside these structural factors, there are other, short-term conditions that could exacerbate or mitigate the effect of the former by impacting price instability and volatility.

Meteorological phenomena caused by climate change. According to the IPCC (Intergovernmental Panel on Climate Change)—the foremost international authority on the impact of climate change, established in 1988 by the World Meteorological Organization (WMO) and the United Nations Development Programme (UNEP)—it is very likely (in IPCC terminology, "very likely" indicates a probability of between 90-100%) that more than half of global warming is the result of human activity. Rising temperatures, the changing frequency and overall amount of rainfall, and above all the intensification of extreme events, produce a considerable impact on agricultural production, because they limit the ability to maximize yields and total agricultural production, thus implying a risk for food availability, one of the essential components of food security. This can also result in rising food prices in the medium to long term.

Trade policy. Decisions about international economic policy (trade policy) by individual States have always played a fundamental role in determining price levels on a global scale. During the crisis in 2008, at least 30 countries implemented restrictive export policies in an effort to safeguard internal food security, which distorted the international market.
On a global level, export restrictions can aggravate instability and cause prices to in-

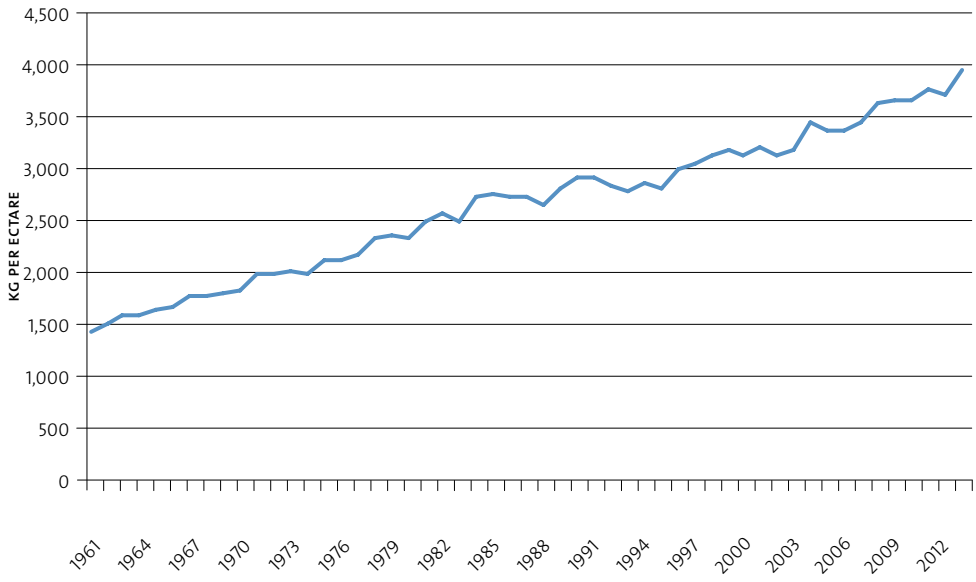


FIGURE 2.5

The global yield of cereals (1961-2012)
Source: http://data.worldbank.org/indicator/AG.YLD.CREL.KG.

crease. These restrictions prevent achieving equilibrium between demand and supply and send uncertainty signals to the markets, which can lead to aggressive buying policies intended to protect against trends and future availability.

Oil prices. There is a very tight connection between the energy sector and the food sector. Indeed, overall, the latter accounts for 10-15% of the energy in the industrialized countries, in the production of inorganic fertilizers, the consumption of fuel for transportation, production activities (irrigation, harvesting, animal husbandry), and in the final phases of the value-added chain (processing the harvest, freezing, and storage). Moreover, crops are increasingly going for the production of biofuels, which reduces the food supply. The two-way bond between food and energy makes the price of oil a determining factor in food production and distribution.

Macroeconomic factors. Inflation, exchange, and interest rates are also very important in determining agricultural policy. The relationship between food prices and the value of the dollar is a universally recognized phenomenon. Since the United States is the primary exporter of agricultural commodities and many prices are accordingly determined in US dollars, the depreciation (or appreciation) of American currency carries with it an increase (or decrease) in the buying power of importing countries, with a consequent increase (or decrease) in demand for imports, contributing to the imbalance between international supply and demand.

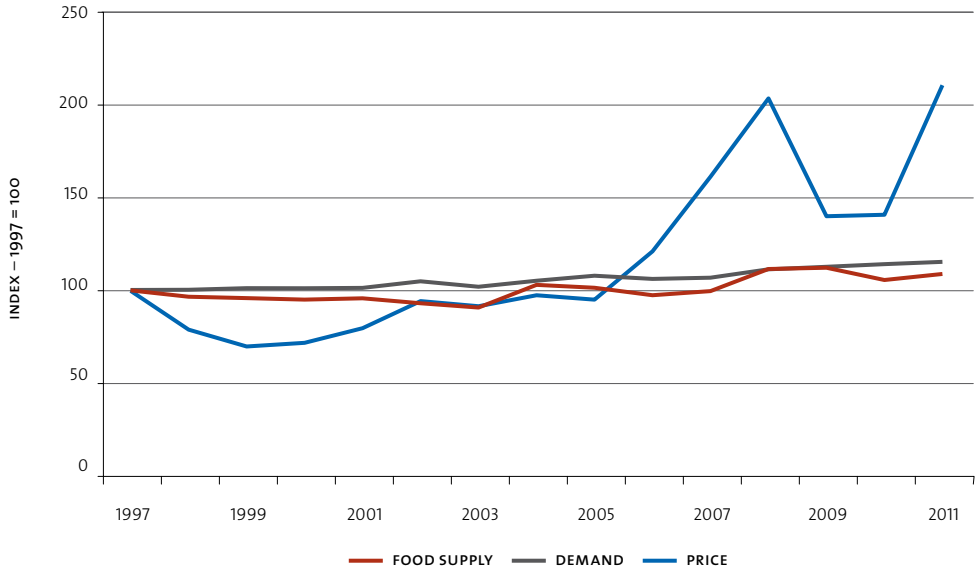


FIGURE 2.6

Correlation between oil prices and food prices (January 1997 – April 2011).
Source: BCFN on FAO and IMF data, 2011.

Speculation on financial markets. What of financial speculation as a short-term factor? Today, the financial derivatives markets for agricultural products offer various instruments to limit risk, such as futures, options, and swaps. These assets allow cash to flow in the markets and send powerful signals about prices, to which supply reacts in the medium term. Looking at the crisis of 2008, one wonders about the role of derivatives on the agricultural markets, and how they could influence the volatility of prices and threaten access to food. According to many observers, the flow of significant amounts of foreign money for real economic purposes (hedging operational risk) on the agricultural markets helped to aggravate the overall instability.

Inventory levels. Finally, when inventory levels are low in the absence of a "cushioning" mechanism, the response to a supply shock is a direct increase in price levels. For example, between 1972 and 1973, when international inventories were low, a reduction of less than 2% in the output of grain caused the price to double. World inventory levels are difficult to estimate, as they are recorded as annual aggregates on individual markets and therefore can only be guessed.

2.6 STRATEGIES FOR CONTROLLING VOLATILITY

The picture that emerges from this analysis is extremely complex. It must be interpreted systematically, taking into consideration the many elements contributing to the current unbalanced situation. This lack of equilibrium translates into a powerful

volatility in short-term prices and the risk of a constant increase over the middle to long term.
How can we act on such a complex system, in order to guide development along a sustainable path? In terms of possible leverage, it will be fundamental to sort the factors examined according to the concrete possibility of being able to affect them, either to reduce volatility or to stabilize prices at levels that are compatible with global food security objectives and development of the industrial agricultural sector. It is essential to consider the timeline for taking this action.
In our opinion, there are seven principal areas for action.

Stimulate the overall growth of agriculture, by defining optimal production models and agricultural patterns for various geographic contexts. The challenge will be to promote innovation, guiding the sector to update production models and agricultural patterns for greater productivity, higher quality, and less environmental impact.
To do this, there must be support for the transfer of knowledge and know-how toward the developing countries and greater engagement with new issues deriving from technological evolution, as well as promoting the transition toward sustainable agriculture to produce healthy, high-quality food; creating openings in global trade networks; remaining "in balance" with the natural environment; and evolving in harmony with societies that must contribute to support development.
Scientific and technical research on these subjects, supported by significant amounts of public investment, will be decisive.
Sufficient measures must also be taken to combat potential disruptive trade policies and promote the protection of local productive systems. In general, work must be focused on limiting the instability of global markets for food commodities.

Come to grips with the scarcity of natural resources for agricultural production. The limits of available natural resources, especially water and arable land, represent a very important barrier to the growth of global agricultural production capacity.
In response, action is needed to reduce the use of water in cultivation. Water usage in agriculture accounts for 70% of worldwide water use, and there is considerable room for improvement, both by reducing waste and by using technologies that make water usage more productive ("more crop per drop").

- We must introduce incentives for investment in existing technologies to obtain greater savings in the volume of water used in productive processes.
- With respect to agricultural uses—which account for 70% of water usage worldwide—it is vital to improve productivity of so-called green water (rainwater or snow run-off that falls to earth without being absorbed into aquifers, lakes, rivers or glaciers)[31] and encourage the adoption of advanced techniques for the collection of rainwater to be used for irrigation.

---

31 Antonelli M., F. Greco, "Non tutte le gocce d'acqua sono uguali", in *L'acqua che mangiamo*, Edizioni Ambiente, Milan 2013.

- Change cultivation to reflect the amount of water available and the surrounding context, favoring dry farming.

Act to reduce, delay, and mitigate the effects of climate change. According to the most reputable studies, without radical intervention climate change is very likely to reduce future global agricultural productivity. Moreover, climate change could disproportionately affect particular geographic areas and their ability to ensure adequate production levels, mainly because of the increase in temperature and greater difficulty gaining access to water resources, with the most severe impacts possibly occurring in equatorial areas, the Mediterranean, Australia, etc. An additional threat is that climate change intensifies adverse weather (drought, floods, heat waves, heavy downpours), which can cause significant crop losses and troublesome increases in food prices over the medium and long term.

- Incentives are needed for various actions to reduce the impact of climate change, including managing cropland and pasture better, increasing carbon reserves in the soil, restoring cultivated peat soils and degraded land, improving production techniques for growing rice and raising livestock, managing fertilizer use to reduce methane (CH_4) emissions, improving techniques for applying nitrogen-based fertilizers to reduce emissions of nitrogen dioxide (NO_2), and improving energy efficiency.
- It is also necessary to support actions to adapt to climate change in order to sustain agriculture production, including the diversification of crops.

Reduce barriers to imports, subsidies to exports, and various forms of trade restriction. Trade barriers and subsidies distort the dynamics between demand and supply on the international food commodities market.

One of the major challenges facing the international community today is the need to build a transparent, responsible system of international trade based on multilateral rules that can guarantee greater access to food at the global level. In general, one would hope for a reduction in the use of import barriers, export subsidies, and other trade restrictions. In particular, it appears necessary to:

- eliminate export restrictions and reduce subsidies with an eye to creating equitable conditions on the international market, thus increasing its efficiency;
- it would also be helpful to reduce the use of mechanisms to support internal demand, because these create distortions especially when employed by the more developed countries;
- finally, it is critical to significantly improve market transparency while maintaining appropriate systems to protect developing countries, in order to improve those countries' efficiency and competitiveness and reinforce their integration into international markets.

Create a multilateral system for food reserves and improve the transparency of flows and inventories. In recent years, different factors have made it necessary to draw on inventories accumulated over the years to satisfy the growing demand for food (growing more rapidly than supplies) and to stabilize domestic prices. Analyses conducted dur-

ing this research study show a strong connection between changes in inventories and the price trends for food commodities. In particular, we noted that, over a sufficiently long time span, a reduction in the stock-to-use ratio of cereals tends to correspond to an increase in the price level; on the other hand, with an increase in the stock-to-use ratio, the price tends to go down.

Various measures could be taken to mitigate this effect.

- Augment the multilateral, regional, and transnational food reserve system to increase the elasticity of the global food supply. It is thus essential to encourage the coordination of storage policies at the international level.
- Improve market transparency in terms of sharing information on supply, demand, reserves, and import-export dynamics. The elaboration of a more precise statistical foundation would help diminish speculation and attenuate widespread price volatility. Of particular importance is the collection of data related to reserve levels and dissemination of estimates of supply and demand by forecasting the size of yields in order to support the decision-making of national governments.

Avoid competition between biofuel production and food in growing crops. At the international level, the price of food correlates strongly to the price of oil. Increases in the price of oil make biofuels more attractive and increases the demand for them internationally. Because most first-generation biofuels are produced with the same inputs used for food and livestock (cereals, sugarcane, vegetable oil, etc.), this creates competition between the energy sector and the food sector for the use of agricultural raw materials. Thus, changes in the price of oil and biofuel subsidy policies cause strong volatility and price increases on food markets.

- One helpful response would be for governments (particularly in Europe and the United States) to significantly reduce support for production and consumption of first-generation biofuels. These products use food crops as raw materials and thus compete directly with food products and livestock for these raw materials.
- If the incentives are not removed, governments should develop emergency plans to regulate policies (at least in the short term) that stimulate the production and consumption of biofuels when world markets are under pressure and food supplies are reduced.
- At the same time, second-generation biofuels should be supported, beginning with crops that do not compete with food for the use of land. Incentives should be provided for research into new technologies to produce biofuels to respond to the growing worldwide demand for energy and to reduce its impact on agricultural raw materials markets.
- In addition to limiting subsidies, it is also important to facilitate the opening of international markets, so that biofuels can be produced where conditions are economically advantageous.

Regulate financial speculation in food commodities. Futures markets are an integral part of the food commodities market, performing two important functions: transferring price risk and helping to determine the price itself. However, the recent global

financial crisis has led "non-commercial" investors (index funds, which hold long positions, and hedge funds, which operate aggressively over the short term) to increase their investments in agricultural commodity derivatives in order to diversify their portfolios. The increase in the share of contracts held by non-commercial investors may have brought about speculation of the sort typical of stock markets. How significant a role this speculation may be playing in the increase in the prices of agricultural assets is still widely debated. We can state with relative certainty, however, that financial speculation in the agricultural commodities markets could have aggravated short-term volatility.
Without demonizing the work of the financial intermediaries or interfering with their legitimate activity, we can suggest some actions that could be taken to facilitate greater transparency, order, and equilibrium on the markets.

- On one hand, to enable regulators to identify possible anomalies in financial trends and to prevent possible excessive speculative behavior, the flow of information and the transparency of over-the-counter operations could be improved. This could be done by monitoring the activity of all operators (through a transaction/positions reporting system and by requiring operator registration) and possibly by imposing caps on their activity. For example, mechanisms could be introduced to distinguish between sector operators and non-commercial operators, so that limits could be placed on speculative operators to prevent excessive betting on the movement of prices, leaving the real market free to operate.
- On the other hand, it also appears desirable to introduce rules to define the perimeter of action for financial intermediaries on the agricultural commodities market, in order to progressively harmonize trades on these markets.

NEW TOOLS TO MEASURE AND PROMOTE WELL-BEING

In recent decades there has been a growing sense of a gap between improvements in key macroeconomic variables and how well off people perceive themselves to be. In particular, economic growth does not seem to be capable by itself of ensuring higher levels of overall Well-Being across society. This happens in part because there are costs associated with growth that, while hard to quantify, have nevertheless had a strong impact on people's lives, including the excessive exploitation of environmental resources or the wide array of negative externalities associated with economic activity; in addition, the primary economic indicators that measure growth inherently overlook social and environmental aspects that are of vital importance to Well-Being and prosperity.
The emergence of a greater awareness in this area has recently nourished a lively debate on the efficacy of the principal indicators that governments have used to make major economic and political choices. The gross domestic product (GDP) is the principal focus of this debate.

2.7 GROSS DOMESTIC PRODUCT VERSUS INDICATORS OF WELL-BEING

GDP is a quantitative measure of macroeconomic activity. It reflects the volume of economic activity of a country (except for activity carried out on the black market and not captured in the formal accounts). GDP growth is traditionally taken to approximate the ability of an economic system to generate wealth and therefore the level of economic Well-Being of its citizens.

However, over time the indicator has become a key index of overall social and economic development, assuming a role for which it was not designed. It needs to be supplemented by other measurements of a wide range of phenomena that influence living conditions, such as social inclusion, inequality, and the state of the environment. This was stated publicly as far back as 1968, when Robert Kennedy, in a famous speech at the University of Kansas, said: "We will find neither national purpose nor personal satisfaction in a mere continuation of economic progress, in an endless amassing of worldly goods. We cannot measure national spirit by the Dow Jones Average, nor national achievement by the Gross National Product. For the Gross National Product includes air pollution and advertising for cigarettes, and ambulances to clear our highway carnage. It counts special locks for our doors and the jails for the people who break them. It counts the television programs which glorify violence in order to sell toys to our children. It grows with the production of napalm and missiles and nuclear warheads and research on spreading bubonic plague [*sic*] and armored cars for the police to fight the riots in our cities, which will only grow when the slums are rebuilt over their ashes [*sic*]. Yet the Gross National Product does not allow for the health of our children, the quality of their education, or the joy of their play. It does not include the beauty of our poetry or the strength of our marriages, the intelligence of our public debate or the integrity of our public officials. It does not count the justice in our courts or the equity of our relationships [*sic*]. It measures neither our wit nor our courage, neither our wisdom nor our learning, neither our compassion nor our devotion to our country. It measures everything, in short, except that which makes life worthwhile. And it can tell us everything about America except why we are proud that we are Americans." Back in 1934, the inventor of the GDP, economist Simon Kuznets, testified before the Congress of the United States that Well-Being and the GDP are two different things: "The Well-Being of a nation [...] cannot be easily deduced from an index of national income."

How to measure Well-Being. The purpose here is not to criticize an instrument that has shown its reliability over time, albeit with well-known limitations. The point is that it is simply not possible to characterize Well-Being in one dimension. Well-Being touches on economic, social, environmental, and political factors, personal elements, and health issues, as well as the lifestyles of individuals and societies. Therefore, even a detailed list of the factors that could affect any single dimension of individual Well-Being, no matter how sophisticated, would be incomplete. However, it is worthwhile to consider as many factors as possible, to construct summary indicators that possess great statistical and methodological rigor.

Along this line, many multidimensional descriptive indicators have been developed with

the intent of measuring Well-Being and quality of life for a particular nation, region, city, or territory. This type of measurement combines several indicators focusing on crucial aspects that directly or indirectly influence quality of life, including education and training, employment, environment, energy, health, human rights, disposable income, infrastructure, public and private safety, and recreational and cultural activities.

The first effort on a global scale to measure the Well-Being of a country by taking these aspects into consideration can be traced back to the creation of the Human Development Index (HDI) by the United Nations in 1990. But it has only been in the last ten years that efforts in this direction have truly multiplied. In 2007, the European Commission, European Parliament, Club of Rome, WWF, and the OECD organized a conference titled "Beyond GDP," and in 2008 then French President Nicolas Sarkozy convened a commission of approximately thirty world-renowned economists—led over by Nobel Prize winners Joseph Stiglitz and Amartya Sen, and coordinated by the French economist Jean-Paul Fitoussi—charged with studying and proposing alternative measurements for economic Well-Being. The final report of the Commission on the Measurement of Economic Performance and Social Progress was published in September 2009, and now constitutes obligatory reading for those who have subsequently sought to develop new indicators of prosperity.

The process begun in France continued in other countries (the earliest were Germany, the United Kingdom, the United States, Australia, Ireland, Mexico, Switzerland, and the Netherlands). For example, in Great Britain, Prime Minister David Cameron charged the National Statistical Institute with identifying new measurements for support the evaluation of economic policies.

In Italy, the two institutions traditionally charged with measuring economic data in the country, ISTAT (National Statistics Institute) and CNEL (National Council on Economy and Labor), which reports to Parliament on economic subjects, recently established a Working Group to Measure Progress in Italian Society that consists of representatives of social and public agencies, which in 2013 published its initial report on the state of the nation's health, which includes indicators of social Well-Being—a report that has subsequently been updated and expanded annually.[32]

2.8 SUBJECTIVE VERSUS OBJECTIVE APPROACHES: DIFFERENT OUTLOOKS IN TERMS OF MEASURING WELL-BEING

In order to put the phenomenon of Well-Being into context—in terms of a methodological approach for its measurement—we should first and foremost define the standpoint for the investigation. We should choose, in fact, to adopt the individual as a point of reference—according to what is ultimately a fundamental problem, linked to the points of view of the choice, measurement, and evaluation of the various factors that contribute to any definition of individual Well-Being. There exist, in fact, when the outlook is that of the individual person, as many objective factors as there

32 ISTAT, *Rapporto Bes 2014: il benessere equo e sostenibile in Italia*, 2014 (www.istat.it/it/archivio/126613).

are subjective factors of Well-Being. On the one hand the approach is that of the measurement of the factual elements of a person's existence, gathered and evaluated in an objective manner because they are thus unbound from any partial and personal evaluation. On the other hand, the logic is that of the evaluation that individuals give of their own lives, of the interpretation of the objective phenomena that each person formulates subjectively. With the first option (objective measurement) we give up the possibility of directly consulting the perceptions of individual persons, through forms of opinion surveys, thus limiting the investigation to a certain number of objectively measured indices. For instance, we might decide that good-health life expectancy in a country constitutes, on average, a factor capable of having a positive effect on the lives of all the people who live in that country, without exceptions. According to the second approach (subjective measurement), the level of wellbeing becomes the subject of an evaluation expressed by each individual contacted, with all the challenges and difficulties that ensue when one is attempting to carry out comparisons over time and space, since the evaluation of wellbeing depends upon perceptual and emotional factors.
One way to create a bridge between objective measurements and subjective perceptions is to develop indicators that include both. This makes the measurement of individual Well-Being more complete and consistent with the real assessment of people's quality of life. An approach of this kind has been used since 2010 by the OECD, which has released three indicators for the measurement of subjective Well-Being comparing the number of positive experiences/sensations enjoyed during the course of the prior year to those negative experiences/sensations endured over the same period of time, and to the number of people who state they enjoy an elevated level of Well-Being in their own lives.
The alternative is to remain within the context of objective measurements, expanding the spectrum of phenomena that are considered co-determinant with Well-Being, thus seeking a definition of Well-Being that is closer to the objective assessment, and continuing to add measures that concern many different aspects of life. This second approach is also not without its critics. First, the techniques of statistical measurement are inevitably associated with broad simplifications and an obligatory set of conventions. Second, choosing to limit oneself to a small number of observable variables and estimates intrinsically focuses and limits the potential distortions that can result from the very act of measurement. On the other hand, the choice of a limited number of variables pays the price of an elevated level of approximation in terms of the description of reality, generating the risk of a failure to consider a set of elements that can together play a decisive role.
We should take into account, when we discuss the various options, that today the national statistical systems of the various nations are not yet structured in such a manner as to collect all the necessary information to effectuate adequate measurements and that, in the current state of the art in the field, every decision brings with it an elevated and necessary level of approximation.

2.9 THE BCFN INDICES OF WELL-BEING AND SUSTAINABILITY OF WELL-BEING

The Barilla Center for Food & Nutrition has tried to contribute to the subject of Well-Being as it relates to our principal area of research and analysis: careful considera-

tion of nutrition and its impact on the quality of life. We have avoided definitions that emphasized one element or one particular aspect at the expense of others, in order to take into account the greatest number of factors that have an impact on Well-Being. We have also considered it fundamental to pay special attention to the impact of nutrition and lifestyles on the Well-Being of individuals in social groups. It is obvious that food and nutrition directly or indirectly affect Well-Being. Consider first the effect that food choices have on the health of children and adults, both negatively (direct causes or risk factors for serious disease), and positively (protection against certain diseases). However, the impact that food and nutrition have on the environment around us is also significant, because they are responsible for consuming and degrading natural resources (from soil depletion and water use and pollution, not to mention greenhouse gas emissions and other pollutants). It is also important not to forget that there are aspects of food that closely involve the social sphere and interpersonal relationships (conviviality, socializing, time spent preparing food, meals, etc.).

The two indices. The outcome of our work is two multidimensional summary indices for the quantitative measurement of national Well-Being:
- the BCFN Index of Current Well-Being, to measure the present Well-Being of individuals (what people feel and live today, an "inventory of Well-Being");
- the BCFN Index of Well-Being Sustainability, to measure the dynamics and future trends of the current level of Well-Being.

While it is undoubtedly important to measure Well-Being today, at the same time we must evaluate its future trajectory. For example, it is possible to achieve very high levels of Well-Being in the short term, by consuming environmental resources in excess, thus compromising the Well-Being of future generations. Only an integrated reading of both indicators allows us to understand Well-Being in depth.
To bring maximum consistency and scientific quality to the methodology, the starting point was the work of Stiglitz, Sen, and Fitoussi noted above, which suggested analyzing a wide range of different variables (for example, income, health, education, strength of social networks, democracy, etc.) in order to evaluate multiple aspects and dimensions of Well-Being at the same time.

For an international comparison, 10 benchmark nations were chosen:
- three European countries from the Mediterranean: Italy, Spain, and Greece;
- two Continental European countries: France and Germany;
- two Scandinavian countries: Denmark and Sweden;
- the United Kingdom;
- the United States;
- Japan.

The performance of each nation was measured in seven dimensions (psychophysical and behavioral Well-Being, subjective Well-Being, material Well-Being, environmental Well-Being, educational Well-Being, social Well-Being, and political Well-Being)

SOCIAL WELL-BEING ACCORDING TO THE SEN-STIGLITZ-FITOUSSI COMMISSION

The Sen-Stiglitz-Fitoussi Commission[1] did not produce a new comprehensive indicator, but rather released a series of recommendations that capture social Well-Being in all of its many dimensions.

- Material Well-Being should be evaluated at the level of the family unit, taking into consideration income and consumption, rather than production. More emphasis should be placed on income distribution, consumption, and wealth; an increase in average income does not mean that everyone got a raise.
- Data collection and statistics need to be developed for non-market activities, because Well-Being also depends on activities that do not trigger market trades, such as direct services between parties (for example, healthcare and care for the elderly provided within the family).
- Measuring the multidimensionality of Well-Being needs to be considered. Well-Being is shaped not only by economic conditions, but also by education, health, democratic participation, social networks, the environment, and basic safety.
- Attention must be paid to environmental sustainability, in order to measure growth that does not include the destruction of resources and associated risks of climate change.
- Government-provided services should be measured not on cost, as occurs with GDP, but on their impact on the Well-Being of constituents.

In terms of the non-material dimension of Well-Being, we must also remember the importance of time for leisure and the need to measure social relationships, political participation, and the safety or vulnerability of the individual.
Finally, and more generally, both objective and subjective measurements should be taken into consideration. It is important to include indices for the sustainability of Well-Being over time, which can take account of problems connected with environmental issues.

1 Professor Joseph E. Stiglitz (Chair, Columbia University), Professor Amartya Sen (Chair Adviser, Harvard University), Professor Jean-Paul Fitoussi (Coordinator of the Commission, Institut d'Études Politiques de Paris), *Report by the Commission on the Measurement of Economic Performance and Social Progress.*

using both the BCFN Index of Current Well-Being and the BCFN Index of Well-Being Sustainability, through specific key performance indicators (KPI).
The 27 performance indicators utilized, aggregated by category in Table 2.1, were selected with the specific goal of measuring one or more areas of interest for each of the nations under consideration. Among these variables are, for example, family income, life expectancy, and the average time devoted to meals, as well as the percentage of people with a positive assessment of their lives at the time of reporting. In some cases, where it was not possible to establish punctual reporting of a given phenomenon because of scant data or the very nature of the phenomenon itself, an approximate variable or proxy was used in order to obtain a reliable measurement.
Consistent with the premises of the study, a very high relative weight was assigned to lifestyles and personal relationships, in the conviction that these were at least as important as economic factors in defining the state of Well-Being of individuals.
Assigning a relative weight to each KPI, to each dimension of Well-Being, and to each of the three sub-indices made it possible to use a simple weighted average to calculate partial indicators for each of the seven dimensions of Well-Being, the three sub-indices

under consideration, and the two final summary indicators mentioned above (which aggregate the results of the three sub-indices). The three sub-indices—the lifestyle sub-index, the wealth and environmental sub-index, and the social and interpersonal sub-index—are compiled from 27 performance indicators that measure the seven identified dimensions of Well-Being.

2.10 PRINCIPAL RESULTS OF THE 2012 BCFN INDEX

The BCFN Index of Current Well-Being is a multidimensional measurement of individual Well-Being from a static point of view, that is, the Index represents a snapshot of the Well-Being of a population at a specific instant. The classification of nations according to the BCFN Index of Current Well-Being was obtained by adding together the point totals for the ten nations in all three sub-indices. The list was led by Sweden, with 6.9 points, followed closely by another Scandinavian country, Denmark, with a total of 6.5 points. The United Kingdom came in third with 6.1 points.
After them came France (5.5), and a trio of countries with a substantially similar score that includes (in order) the United States (5.3), Japan (5.2), and Germany (5.1). Italy maintained the same position and point total as the previous BCFN Index (4.9).
Spain and Greece brought up the rear, with 4.3 and 3.5 points out of ten, respectively.
The BCFN Index of Well-Being Sustainability represents a multi-dimensional measurement of the future sustainability of the Well-Being of individuals, from a dynamic point of view. It is also an aggregate index, consisting of 25 performance indicators to measure the seven dimensions of Well-Being in three sub-indices: the lifestyle sub-index, the wealth and environmental sub-index, and the social and interpersonal sub-index. Using a simple weighted average to aggregate the scores of the 10 countries into the three sub-indices, we obtain the BCFN Index of Well-Being Sustainability.
The classification for the BCFN Index of Well-Being Sustainability was led by Denmark, with 7.4 points, followed closely behind by Sweden, with 7.3 points. Third place belonged to France (6.3) and fourth to Germany (6.1). Sitting between 5.9 and 5.3 points, in descending order, are Spain, Japan, the United Kingdom, and the United States, while Italy finds itself in the penultimate spot with 5.1 points (although the distance between Italy and Germany is only one full point). Greece once again came in last, with 4 points, displaying a substantial gap behind the other countries in the comparison.
As in the preceding edition, we have included a detailed list of the 25 indicators used for the Index of Well-Being Sustainability, grouped by category (Table 2.2). As one can see, this version privileges those measures among the objective indicators used that express changes already observed over time that possess a significant predictive capacity; variations in education levels today impact the overall value of human capital tomorrow, for instance, just as the reduction in the number of cases of various diseases correlates positively with hopes for a healthy life. In the same way, the level of current economic investment helps condition the future competitiveness of the economy.
For the subjective indicators, we have used existing measurements designed to gather assessments of future scenarios.

THE OECD BETTER LIFE INDEX

The shifting of attention from GDP as an indicator of a nation's prosperity toward broader measures that include quality of life, the environment, and national political participation has led other organizations to develop instruments similar in philosophy and scope to the BCFN Index. Among these, we would like to point out the Better Life Index, launched by the OECD in 2011 (www.oecdbetterlifeindex.org), a multidimensional index that looks at 11 dimensions of people's lives from across the different spheres of human activity that contribute to an individual's Well-Being.

These dimensions include: the cost and quality of housing; income level and the Well-Being of the natural environment; working conditions, safety, and wage levels; the quality of the social support network; levels of education; the quality of the lived environment; civic engagement; personal health; individual satisfaction with their living conditions (happiness); safety; and work-life balance. Unfortunately, Italy received positive marks in only a few of the indicators studied: health and individual work-life balance, with similar results to those shown in the BCFN Index. In seven areas, however—civic engagement, housing, subjective Well-Being, environmental health, employment and wages, and education and skills—Italy came in below the average. OECD data reveals, for example, that the quality of Italian water resources is lower than the European average, the concentration of polluting PM_{10} particles in the atmosphere of the country's metropolitan areas is higher than the European average, and, perhaps most concerning, the Italians themselves are less satisfied with their lives than the OECD average.

By consulting the online Better Life Index it is possible not only to have access to all the results divided by country for each of the various indicators, but is also possible to calculate one's own individual Well-Being.

With the launch of the Better Life Index, visitors are encouraged to create and share on the site their own index of a happy life. To date, the OECD has received more than 80,000 indices from roughly 180 countries and territories. It is important to note that, since anyone in any country in the world can create their own index, the results obtained do not represent a statistically relevant sample.

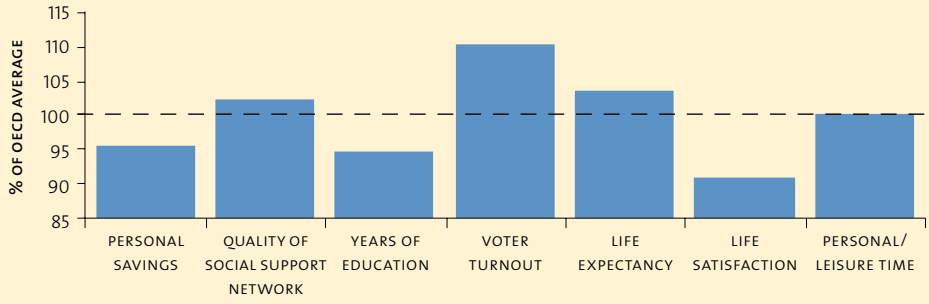


FIGURE 2.7

An Unhappy Nation?

Italy's standing in comparison to the OECD average can be better understood by analyzing the individual indicators used in the creation of the Better Life Index. For example, Italy's high life expectancy is reflected in the points it receives for the general health of the population, while its above average voter turnout is not enough to guarantee an elevated position in the classification of civic engagement. The indicators that are furthest from the median, however, are years of education (roughly a whole year below the OECD average), personal earnings (1,600 euro under the median) and, especially, the index of overall satisfaction (6, some 10% lower than average).

Source: OECD, Better Life Index 2015 Edition.

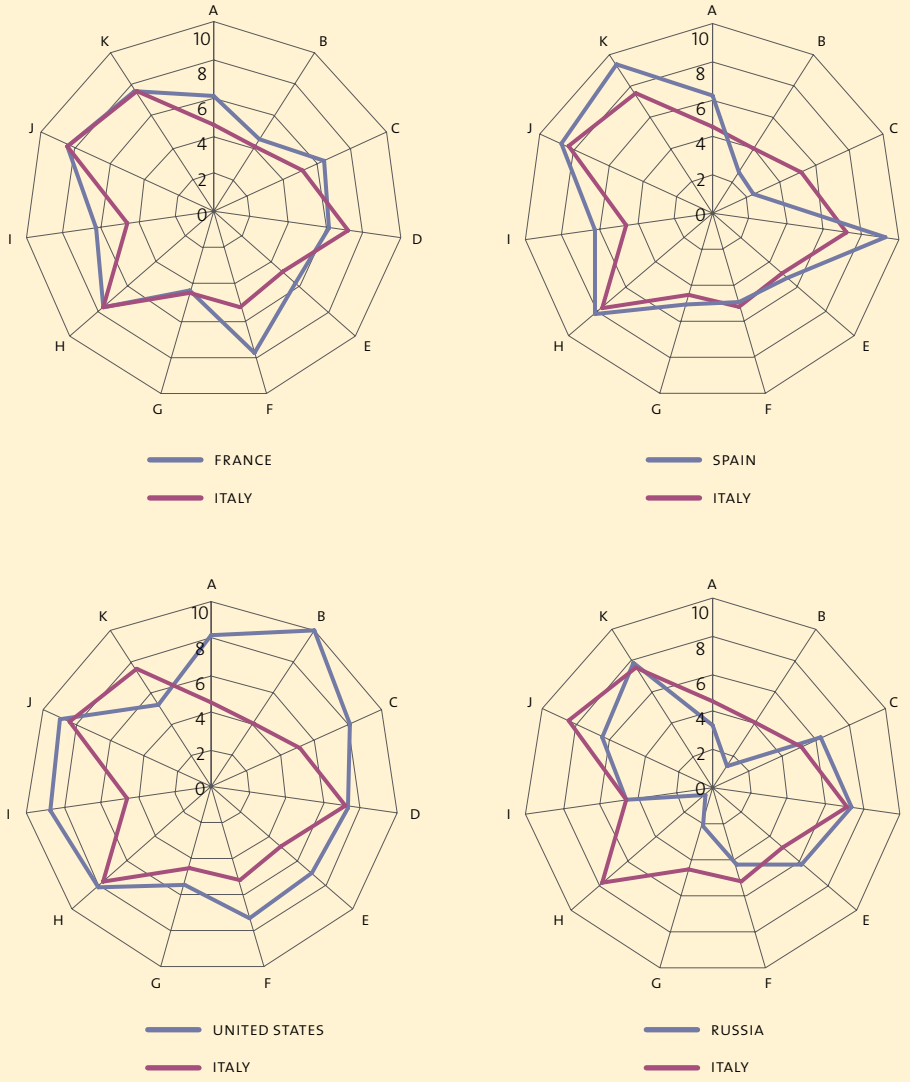


FIGURE 2.8

Italy's Well-Being: a comparison with other countries

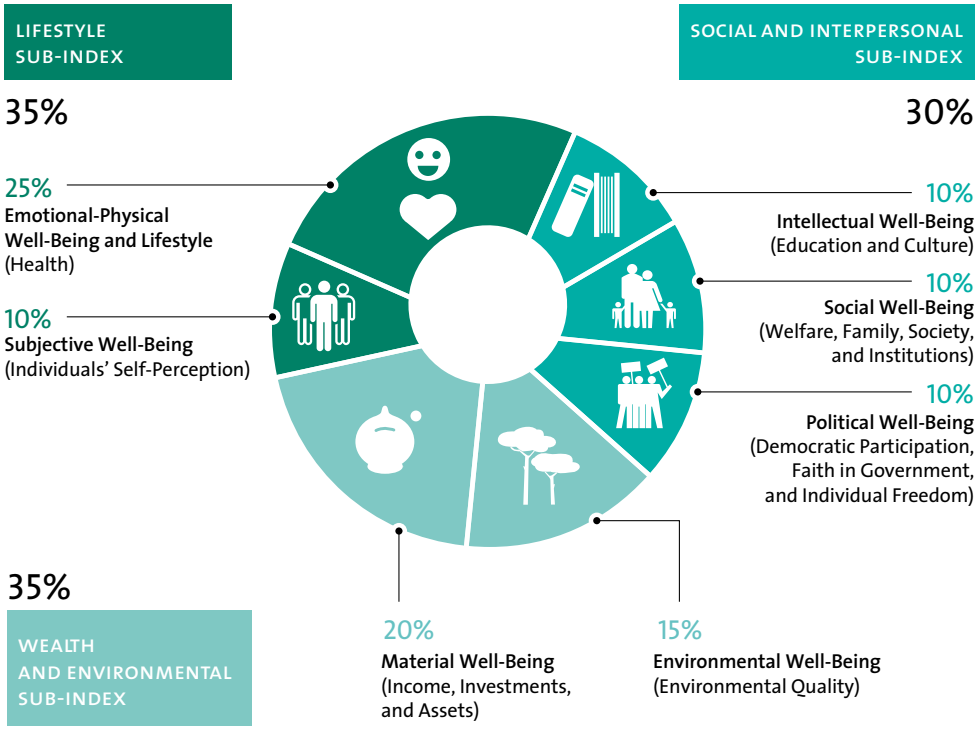
The diagrams represent the comparison between Italy and the other four countries. Equal weight was given to all the factors taken into consideration. The countries' position in the classification: United States, 7th; France, 18th; Spain, 19th; Italy, 23rd; Russia, 32nd.

A: Housing – B: Income – C: Jobs – D: Community – E: Education – F: Environment – G: Civic Engagement – H: Health – I: Life Satisfaction – J: Safety – K: Work-Life Balance

Source: OECD, Better Life Index 2015 Edition.

MEASURING WELL-BEING: ITS CURRENT STATE AND FUTURE PROSPECTS

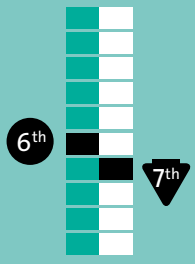
THE DIMENSIONS OF WELL-BEING AND THEIR WEIGHT IN THE INDEX



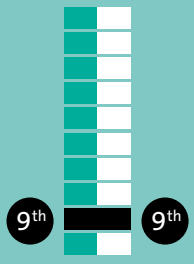
THE ITALIAN EXAMPLE

BCFN Index of Current Well-Being
BCFN Index of Well-Being Sustainability

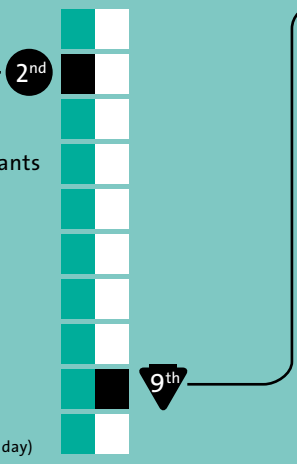
WEALTH AND ENVIRONMENTAL SUB INDEX



SOCIAL AND INTERPERSONAL SUB-INDEX



LIFESTYLE SUB-INDEX

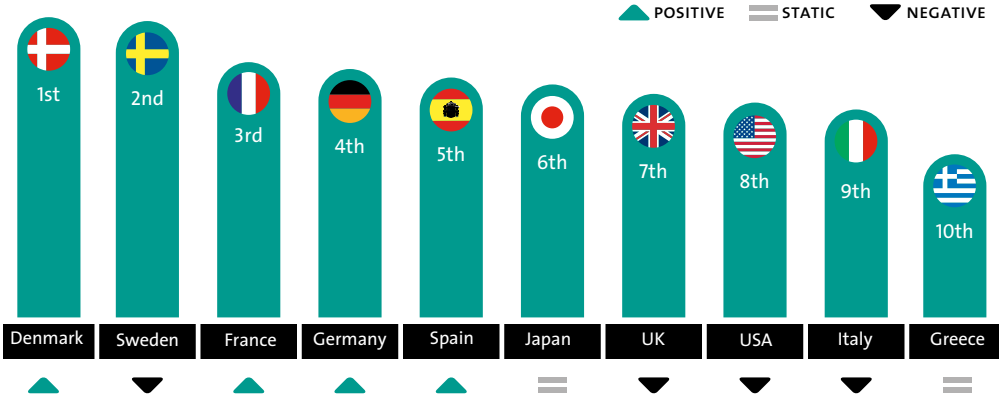


- Low use of anti-depressants
- Low rate of suicide
- High life expectancy
- Low rates of obesity
- Time spent at the table (almost 2 hours a day)

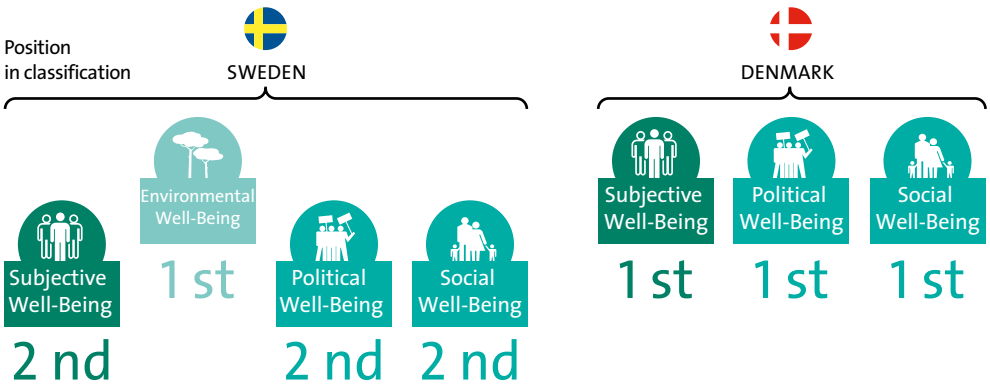
BCFN Index of Well-Being Sustainability

TREND IN THE WELL-BEING SUSTAINABILITY

POSITIVE STATIC NEGATIVE



THE DIMENSIONS CONTRIBUTING TO THE PRIMACY OF SWEDEN AND DENMARK

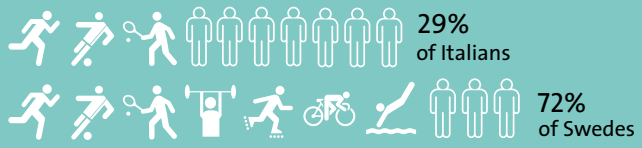


Italy on the wrong path with a worsening lifestyle

Comparison between Italian figure and that of the country ranked first

SCANT EXERCISE

Taking part in regular physical activity



OVERWEIGHT OR OBESE POPULATION

Youth (11-15)

HIGH CALORIC INTAKE

Calories consumed per day

TABLE 2.1 – **PERFORMANCE INDICATORS USED IN COMPILING THE BCFN INDEX OF CURRENT WELL-BEING**

PSYCHOPHYSICAL AND BEHAVIORAL WELL-BEING	RELATIVE WEIGHT
1 LIFE EXPECTANCY IN GOOD HEALTH	30%
2 AVERAGE TIME SPENT ON MEALS	10%
3 OBESE AND OVERWEIGHT POPULATION (ADULT)	20%
4 DEATH RATE FROM SUICIDES	30%
5 CONSUMPTION OF ANTIDEPRESSANTS AND MOOD STABILIZERS	10%
SUBJECTIVE WELL-BEING	
6 OECD POSITIVE EXPERIENCE INDEX	25%
7 OECD NEGATIVE EXPERIENCE INDEX	25%
8 PEOPLE REPORTING HIGH EVALUATION OF THEIR LIFE AS A WHOLE (PRESENT TIME)	50%
MATERIAL WELL-BEING	
9 DISPOSABLE INCOME	70%
10 NET FAMILY ASSETS	30%
ENVIRONMENTAL WELL-BEING	
11 PM_{10} LEVELS (PARTICULATES)	40%
12 URBAN WASTE	20%
13 INTENSITY OF FREIGHT AND PASSENGER TRAFFIC ON THE STREET	40%
EDUCATIONAL WELL-BEING	
14 PISA (PROGRAMME FOR INTERNATIONAL STUDENT ASSESSMENT) SCORE*	25%
15 AVERAGE ANNUAL NUMBER OF COLLEGE GRADUATES	35%
16 FOREIGN STUDENTS ENROLLED IN THE UNIVERSITY SYSTEM	15%
17 NUMBER OF NEWSPAPERS SOLD	10%
18 UNEMPLOYMENT RATE AMONG GRADUATES	15%
SOCIAL WELL-BEING	
19 NUMBER OF HOURS DEDICATED TO THE CARE OF CHILDREN	25%
20 INACTIVITY RATE AMONG YOUNG PEOPLE	25%
21 UNEMPLOYMENT RATE	10%
22 ANNUAL VACATION DAYS	15%
23 DIFFUSION OF BROADBAND INTERNET CONNECTIONS	15%
24 INTERPERSONAL TRUST INDEX	5%
25 NATIONAL INSTITUTION INDEX	5%
POLITICAL WELL-BEING	
26 THE ECONOMIST INTELLIGENCE UNIT'S INDEX OF DEMOCRACY	50%
27 CORRUPTION PERCEPTION INDEX	50%

* The Program for International Student Assessment (PISA) is an international survey sponsored by the OECD designed to evaluate every three years the level of education of adolescents in the leading industrialized nations.

Source: BCFN, 2011.

TABLE 2.2 – **PERFORMANCE INDICATORS USED IN COMPILING THE BCFN INDEX OF WELL-BEING SUSTAINABILITY**

PSYCHOPHYSICAL AND BEHAVIORAL WELL-BEING	RELATIVE WEIGHT
1 VARIATION IN MORTALITY FROM CARDIOVASCULAR PATHOLOGIES	15%
2 VARIATION IN MORTALITY FROM TUMORS	15%
3 VARIATION IN MORTALITY FROM DIABETES	15%
4 POPULATION AGES 11 TO 15 OBESE AND OVERWEIGHT	10%
5 PERCENTAGE OF SMOKERS	15%
6 CONSUMPTION OF ALCOHOL	5%
7 PHYSICAL ACTIVITY	10%
8 SPENDING ON THE CONSUMPTION OF FRUIT AND VEGETABLES	10%
9 DAILY AVERAGE INDIVIDUAL CONSUMPTION OF CALORIES	5%
SUBJECTIVE WELL-BEING	
10 PEOPLE REPORTING HIGH EVALUATION OF THEIR LIFE AS A WHOLE (FUTURE TIME)	100%
MATERIAL WELL-BEING	
11 VARIATION OF DISPOSABLE INCOME	40%
12 PER CAPITA GROSS LEVEL OF INVESTMENT	60%
ENVIRONMENTAL WELL-BEING	
13 ADJUSTED NET SAVING	30%
14 CONTRIBUTION OF RENEWABLE SOURCES TO ENERGY SUPPLY	25%
15 WATER FOOTPRINT	25%
16 TOTAL EMISSIONS (CO_2/NO_x/SO_x)	20%
EDUCATIONAL WELL-BEING	
17 VARIATION OF ENROLLMENT IN THE TERTIARY EDUCATIONAL SYSTEM	60%
18 RATE OF PARTICIPATION IN ONGOING EDUCATION AND TRAINING ACTIVITIES	40%
SOCIAL WELL-BEING	
19 PERSONS AT RISK OF POVERTY	25%
20 RATE OF DEPENDENCY AMONG THE ELDERLY	25%
21 VARIATION FROM THE NATIONAL INSTITUTION INDEX	10%
22 INEQUALITY IN INCOME DISTRIBUTION	20%
23 DIFFERENTIAL BETWEEN THE RATE OF YOUTHFUL UNEMPLOYMENT AND THE OVERALL UNEMPLOYMENT RATE	20%
POLITICAL WELL-BEING	
24 VARIATION FROM THE ECONOMIST INTELLIGENCE UNIT'S INDEX OF DEMOCRACY	50%
25 VARIATION FROM THE CORRUPTION PERCEPTIONS INDEX	50%

Source: BCFN, 2011.

CONTRIBUTIONS

Cultivating a better food system

Danielle Nierenberg

DANIELLE NIERENBERG is Advisory Member of BCFN Foundation. Expert on sustainable agriculture and food issue, she has written extensively on gender and population, the spread of factory farming in the developing world, and innovations in sustainable agriculture. She contributed with *The New York Times*, *The Wall Street Journal*, *The Washington Post*, *BBC*, *The Guardian* and *Reuters*.

In Chipata, Zambia a revolution is taking place. The organization Zasaka is helping farmers get access to corn grinders, nut shellers, solar lights, and water pumps. And while they might not seem like revolutionary, these technologies are helping farmers increase their incomes, prevent food loss, and reduce backbreaking manual labor. And these are the kinds of practices that not only help farmers make more money, but they can be help ensure that young people see farming as an opportunity, something they want to, not something they feel forced to do.

And they are part of the recipe for sustainable agriculture. A recipe that is constantly changing and evolving.

Farmers, eaters, businesses, funders, policymakers, and scientists are continually learning about the best ways to increase nutrition, protect natural resources, and raise incomes. But there are some basic ingredients for the recipe for sustainable agriculture. And this is a recipe that was developed in fields and kitchens, in board rooms, and in laboratories by farmers, researchers, government leaders, NGOs, journalists, and others in sub-Saharan Africa, Asia, and Latin America over the last several years. They're finding ways to first-hand, to overcome hunger and poverty and other problems—while also protecting the environment—in their countries.

And ironically their recommendations are not that different from farmers in the United States and Canada. Despite all the differences, there is a shared belief that the first world's response to hunger isn't working now, and that policymakers and donors need to start following their lead rather than insist they follow ours.

In Ethiopia, for example, farmers are using a low cost rainwater harvesting and erosion control projects to battle drought and poverty, increasing yields and incomes. In India, women entrepreneurs are providing low cost, high quality food to the urban poor. In the Gambia, fisher folk are finding ways to protect marine resources and preserve fish harvests. And farmers from all over the world are encouraging more investment in smallholder agriculture and to let policymakers know that farmers deserve to be recognized for the ecosystem services they provide that benefit us all.

And there are countless others who are showing the components of what a sustainable, global food system could look like. They know that the way things are isn't the way they have to be.

They understand that we can help build a food system that combats poverty and alleviates hunger not by treating the natural environment as an obstacle to sustainable growth, but by understanding it's a precondition for it. A food system where our sci-

ence is our servant—not our master—and where it's understood that costly, complicated technology often isn't the most appropriate technology. And a food system that honors our values; where women, workers, and consumers all have a seat at the table and none are left on the outside looking.

We have a real opportunity to build that kind of system, and we don't have a minute to waste.

There are lots of different ingredients for the recipe for sustainable agriculture, but there are a few that deserve more attention including preserving what may be agriculture's most important, but overlooked input—soil; finding ways to prevent food loss and food waste; growing food in cities; improving diversity in our diets; and last, but not least, recognizing the important role of women in the food system worldwide.

Let's start with the ground beneath our feet. The United Nations General Assembly declared 2015 the International Year of Soils (IYS) to increase awareness and understanding of the many important roles of soil. Soil is more than just dirt. It is the foundation of a healthy food system, storing and filtering water, providing resilience to drought, and sequestering carbon. And the loss of topsoil could be one of the biggest threats to our food supply.

Unfortunately, this vital ingredient is being degraded and eroded at unprecedented rates across the world. According to the U.N. Food and Agriculture Organization (FAO), 25% of the planet's land is highly degraded and only 10% is improving. Half of the topsoil on the planet has been lost in the last 150 years. And just over the past 40 years, 30% of the world's arable land has become unproductive. Deforestation, for example, is causing China's Loess Plateau to erode rapidly. Overgrazing of grassland in the Western United States is reducing soil depth and creating desertification. In India, overcutting trees and crops is reducing soil fertility and threatening wild medicinal plants. And industrial agriculture practices around the world expose topsoil and increases erosion. Brazil alone loses 55 million tons of topsoil every year because of soybean production.

Wes Jackson, an agronomist and founder of the Land Institute, says we're plowing through our soil bank account and sending those riches downstream to the ocean.

But there are solutions. Growing a diversity of crops, rather than relying on just one crop like corn or soybeans can help restore soil nutrients and help farmers, both large and small, get more nutrients per hectare. In western Africa, farmers are raising cattle and using the manure to fertilize crops and promote earthworm production. This not only restores nutrients to soils and helps protect soil microbiota—the little critters who live in soil by the millions—but also help farmers save money by eliminating the need to buy fertilizer out of a bag.

Jerry Glover, an agronomist at the U. S. Agency for International Development, also calls for more research into perennial crops—unlike annuals, these crops survive from season to season and have deep root structures that can stabilize soils and hold water. Perennials such as sorghum, peas, and beans are also very nutritious, providing an extra source of food to families in the developing world. According to Glover, more than half the world's population depends on marginal landscapes unsuited for

producing annual crops. But perennial crops can be sustainably produced on those lands and improve farmers yields. And farmers all over the world are revitalizing soils by incorporating cover crops such as winter wheat, rye, and clover. Cover crops can provide an extra source of calories and nutrients, while preventing erosion and improving yields.

The second part of the recipe is finding ways to minimize food loss and waste. You don't have to be religious to recognize that it's a sin that, today, roughly 40% of the global harvest never reaches people's stomachs. In the United States, roughly one-third of food is thrown away as a result of over-buying and misinterpretation of expiration and sell by dates. In Sub-Saharan Africa and other parts of the developing world, an equal amount of food is lost because of poor infrastructure and pests and disease. As a result, all the hard work that farmers do to fertilize and irrigate crops goes to waste, putting them further into poverty.

Food waste tends to be insidious—a little bit is lost in the field; a little bit is lost in storage; a little is lost in transport; and then finally, a few percent is lost at home.

And while wasting food presents an obvious moral conundrum, it also presents environmental challenges. Food releases methane gas as it decomposes in landfills. Methane is a greenhouse gas that is 20 times more potent than carbon dioxide. And according to the U. S. Environmental Protection Agency, landfills are the third-largest source of human-related methane emissions in the United States. The good news is that preventing food waste can be both simple and inexpensive. And some of the most interesting innovations are taking place in the developing world.

In the Gambia and India I've visited with farmers who are drying papayas and mangos helps makes sure that families have access to vitamin A and extra income from the sale of dried fruit throughout the year.

In Eastern Africa, the organization One Acre Fund is helping farmers learn to not only store their crops better, but also how to keep track of what they're growing and how much is lost. Through the use of simple tracking sheets to see how much they grow and how much is saved from one season to the farmers are now using better storage bags that prevent pests from infecting crops.

Of course, on the consumer side, the solutions to limiting food waste are very simple and effective. Don't buy more than what you can eat. Store your produce properly. Take leftovers home. Don't throw food away that hasn't gone bad—and trust your senses, not expiration dates, to tell you whether food is safe to eat.

Many activist groups like Love Food, Hate Waste and FareShare, are educating consumers by offering tips for food storage and recipes to make use of leftovers or food that is close to its expiration date. They've also developed a portion size calculator that shows how much spaghetti or meat to cook per person.

Organizations like City Harvest, based in New York City, has pioneered in collecting food that otherwise would have been wasted to distribute to homeless shelters and low income families. In a similar vein, the Food Recovery Network is mobilizing hundreds of college and university students to collect perishable food from their campuses and communities to distribute to those in need. But action on the consumer side doesn't absolve manufacturers and food retailers of their responsibilities. Intermarché, a gro-

cery chain in France is marketing ugly vegetables to their consumers and other countries are following suit, including Loblaw Companies, Ltd., the largest food retailer in Canada.

The next component of a sustainable food system is farming the cities. Urbanization rates are expected to increase to 70% by 2050, And, if we're going to feed those families, we'll need to make cities and towns into centers of food production as well as consumption. Worldwide, there are nearly a billion urban farmers and many are having the greatest impact in communities where hunger and poverty are most acute. For example, Kibera Slum in Kenya is believed to be the largest slum in Sub-Saharan Africa with anywhere from between 700,000 to 1 million people. In Kibera, urban farmers have developed what they call vertical gardens: they grow vegetables, like kale or spinach, in tall empty rice and maize sacks. What they do is grow different crops on different levels of the bag. At harvest time they sell their produce to their neighbors and keep part of what they grow for themselves. The value of these sacks shouldn't be underestimated. During the riots that occurred in Nairobi in 2007 and 2008—when no food could come in to Kibera—the urban farmers who used these sacks are credited with helping to keep thousands of women, men, and children from dying.

And the role of urban farmers in saving lives in Kibera is likely only a precursor of things to come. In much of the less developed world, food purchases can take up as much as 80% of family income. In countries where wars and instability can send the cost of food skyrocketing overnight, urban agriculture will be fundamental to helping prevent food riots and wide-scale hunger. In that respect, promoting urban agriculture isn't only morally right, or environmentally smart, but necessary for regional stability.

The fourth ingredient is improving the variety of food people have access to and can afford. One consequence of the Green Revolution is that, over the last 50 years, agricultural production in Africa, Asia, Latin America, and Europe and the United States has become more narrowed on the production of raw commodities, including corn, soy, wheat, and other crops, and less on more nutritious foods, such as millet, sorghum, perennial grains, and vegetables.

While it's true that the poor in developing nations get most of their calories from starchy crops, there's been very little funding for research into what makes those starchy staples palatable. In fact, funding for research on cereals and grains is now roughly 13 times the amount spent on fruit and vegetable research. And that lack of investment comes at a high price.

Dyno Keatinge, the former Director General of AVRDC—The World Vegetable Center in Taiwan, says that the catastrophic impact the lack of vegetables in children's diet has on childhood malnutrition and mortality. Very simply put, the more countries have access to vegetables, the fewer children die before the age of 5. And obviously, if children aren't getting access to vegetables they're at greater risk of malnutrition and stunting—curbing not only their personal and educational development, but also preventing economic development.

If that wasn't enough, the lack of focus on more nutritious crop is a principal factor

in the obesity and overweight epidemic of overweight and obesity—a crisis facing 2.1 billion people in industrial countries and the developing world alike. In the United States, over 30% of Americans are considered obese or overweight. Yet, at the same time, Mexico has a 70% obesity rate. Even in India, the poster child of world hunger, 17% of adults are obese. One upshot in the growth in obesity has been a surge cardio-vascular, respiratory diseases, and type 2 diabetes: diseases will cost $30 trillion globally between now and 2030.

But shifting from the food system's emphasis from starchy staples to vegetables isn't only essential to promoting nutrition and public health, but also environment protection and reducing poverty.

For example, in Uganda, Developing Innovations in School Cultivation, or Project DISC, is helping young people view agriculture as a career. Its founder, Edie Mukiibi, who is the Vice President of Slow Food Internatioanl, is working with more than two dozen schools to teach kids from pre-schoolers to teens how to grow and cultivate—and market—indigenous fruits and vegetables. One spin off of Project DISC's work is that it's restoring a demand for tradition food that had been for long forgotten.

Promoting and meeting the demand for traditional, locally grown is one reason why it's surged from 4% of the food Africa consumed, to 12%.

The final ingredient for a more sustainable food system is cultivating more equality. It's more than a little absurd that women make up more than half the world's population and they make up nearly half of the world's farmers. But their contributions as farmers go unnoticed and are almost universally ignored.

Women make up at least 43% of the global agricultural labor force, but in some parts of Sub-Saharan Africa they make up as many as 80% of all farmers. This invisible sisterhood is the world's food producers. And yet these working women are denied access to education, refused by banking and financial institutions, and ignored by extension agents and research organizations. They are still routinely discriminated against just because they're women.

But women around the world are feeding families, improving nutrient, and fighting climate change every day. They're tending dairy cows in Ghana, weeding vegetable gardens for school canteens in the Ivory Coast, picking tomatoes in Florida, growing flowers in Kenya, raising rabbits in Italy, harvesting tea in India and coffee in Ecuador, and drying fish in Japan.

But these innovative and hard-working women are not victims. They are businesswomen. They are stewards of the land. Many have other careers, in addition to farming to put food on the table. These women are caretakers of rich cultural traditions, actively preserving indigenous crops and biodiversity. And all of this occurs in the service of producing food that people actually eat. Men typically produce cash commodity crops that need to be processed into something else, while women grow the vegetables, fruits and raise small livestock that actually nourish families. Women farmers work hard. They cook and they clean. They take care of children and sick elders. They fetch water and fuel. And yet their work as food producers continue to be ignored.

It doesn't matter how much local, organic food we buy or how much money foundations pour into agricultural development unless we listen to what these women want and need and then work with to find ways to provide it.

The importance of talking to women and learning about their needs hit home for me a few years ago when I was sitting in a circle with about 50 women farmers in India. These women knew that I had spent a lot of time traveling and talking to farmers, and so after I had finished interrogating them about their farming practices and their lives, they asked what women farmers in Africa were doing to combat drought.

I shared what I knew. And since then I've been trying to share as many stories as possible and highlighting what's working on the ground to alleviate hunger and poverty and protect the environment. For example, in Niger, a group of 50 women farmers women have partnered with the International Center for Research in the Semi-Arid Tropics to establish a communal garden using solar drip irrigation to grow vegetables, fruit trees, and other crops. Before they started the garden, they earned about $300 a year, or less than a dollar a day. Today, they're making about $1,500 a year. Imagine what it would be like if you could earn five times more next year than you did last year. But it's more than money these women have gained. They've innovated their way to a sustainable life.

In Ghana, a group of women dairy farmers are working with Heifer International and they started a small dairy cooperative to make yogurt to sell to local schools and stores. At first their husbands were angry that the women dared to start the group without their permission. But as they saw their family incomes grow and saw how the women were using the money—to pay for healthcare for their children and to send them to school—their anger turned to respect.

These women are changing the food system and making it more sustainable. Sustainability in agriculture is not just a fad or a catch phrase. Sustainability is what happens when techniques for surviving drought years are shared with people who need them. Sustainability is what happens when women who earned 90 cents a day can raise their pay to $5 a day by using agroecological practices and can provide a better life for themselves and their families.

How do we go forward from here? There is not a clear path, but I can tell you the way will be led by coordination and conversation with real women farmers. We'll need listen to the real things these women and want and need and we'll listen to you. Your input is important, too, because in the big cycle of food, many of us are producers but all of us are eaters. As we make headway, we'll be able to see progress, because as goes the fate of women, so goes the fate of the world. That's one thing I have seen over and over again in my travels and in my work. And the data support this idea. According to the U.N. Food and Agriculture Organization, if women farmers had the same access to resources—land, credit, education, extension services—these workers could increase food production by 20 to 30% and lift as many as 150 million people out of hunger and food insecurity.

Against that backdrop, sustainable agriculture isn't an option, it's a necessity. Right now food production accounts for 70% of fresh water use. It's leading to 80% of deforestation around the globe. And it's contributing an estimated 25 to 30% of global

greenhouse gas emissions. It's the human endeavor most impacted by higher temperatures, flooding, extreme weather events, and other impacts of climate change.
It's no exaggeration to say that today's food system is like the *Titanic*.
Immense.
Complex.
A marvel of engineering.
Thought to be invincible.
But racing to its destruction.
The difference though it that, unlike the captain, the crew, and the passengers on the *Titanic* we know the disaster that awaits us if we don't change course—and do it fast.
The amazing thing about growing food is that when it is done sustainably it can help mitigate climate change while, at the very same time, strengthen food security in developing and industrialized countries alike.
In Kenya farmers who are working with the World Agroforestry Center are growing nitrogen fixing trees that provide a natural source of fertilizer for crops, and, at the same time, eliminating the need for farmers to buy expensive fertilizer out of a bag. Using these methods can increase production by up to 300%.
In Cambodia, farmers are using System of Rice Intensification method helping family farmers conserve water resources, building soil health, and increasing yields by up to 150%.
In Indonesia, organic farmers are producing 60,000 tons of rice per year by using organic methods, and, simultaneously slashing their production costs by 40% by using organic methods. In Rwanda, farmers are working with Heifer International, created the necessary to support milk production and distribution. Farmers' cooperatives in the countryside now have access to cooling centers for their dairy products, allowing them to sell milk in urban areas they normally wouldn't have been able to get to.
Growing indigenous and traditional crops improves both incomes and nutrition while also offering farmers a source of insurance against crop failure and disease. These practices can often be replicated, adapted, scaled up and used application on both small and large farms to improve water availability, increase crop diversity, improve soil quality, and mitigate climate change. How do we promote sustainable agriculture? We already know the ingredients.
We need government and NGOs to:

- invest in the research and technical support;
- introduce nutritious diets;
- foster the use of environmentally friendly practices and appropriate technologies;
- and provide training in management skills.

But that's only part of the equation. We also need to stand with men and women who understand, as I think all of us do, that sustainable agriculture can generate wealth, but it takes democratic institutions—in particular—collective bargaining to guarantee shared prosperity.
From Africa to Latin America to Asia, farmers are on the leading edge of the greatest transformation of agriculture in our time. They're not scientists. Most never even fin-

ished school. They're not only separated by geography, but by faiths and traditions that go back generations long before any of us were born.

But, together, they share a common vision. A vision of a world where no one's future is determined in corporate boardrooms 5,000 miles away. A vision of communities where everyone understands that you don't need to destroy the environment to feed your family. A vision of a food system that's built to last, and an economy that leaves no one behind. A vision grounded in the conviction that the way things are isn't the way things have to be. Today, let's send them a message that it's our vision, too.

INTERVIEWS

In access the key factor is diversity

Paul Roberts

PAUL ROBERTS is an American journalist and writer, the author of three nonfiction books: *The End of Oil* (2004), *The End of Food* (2008) and *The Impulse Society* (2014). He writes about politics and energy issues, and regularly appears on national and international television and radio broadcasts. He is a contributor to the *Los Angeles Times*, the *Washington Post*, the *Guardian* and *Rolling Stone*.

What are the main reasons the global food system, on a global perspective, is not working properly? What are the key reasons for the unbalances we observe?

I would point to several factors that are destabilizing the global food system. Most obvious are the risks associated with the key agricultural "inputs," such as energy, fertilizers, and water—risks that are only likely to grow as the system strives to feed a population of 10 billion by mid-century.

Right now, the biggest input risks relate to energy. Keep in mind that our global food system was designed when oil cost less than $30 a barrel—around a quarter of the current price—which encouraged a business model in which low-cost production, not distance, was the dominating factor. Even if oil is currently sold at less than $50, in the past and even in recent times it reached more than double this value. These fluctuations put the system under enormous pressure, with producers and manufactures, unable to easily shrink their market scale, struggling, not always successfully, to reduce costs without compromising quality or safety. Of course, researchers are working hard to find alternatives for oil. Unfortunately, the most successful current alternative—biofuels—may simply be adding pressure to prices. And, of course, transportation isn't the only high-energy part of food production. Farming, processing, and packaging are all very energy intensive.

And, of course, after the risk of energy there is the risk of water. In many areas, soaring crop yields have only been possible through rapid growth in irrigation, a practice that has gradually depleted some regional water sources to dangerous levels in both developing and advanced economies. According to a report by the National Academy of Sciences, roughly one sixth of China's population is now being fed with irrigation that cannot be sustained.

And we cannot forget the largest input—climate. Already, the effects of global warming are wreaking havoc in Sub-Saharan Africa, where repeated droughts have pushed many millions of citizens into chronic food insecurity. But Africa isn't the only climate victim. The United States, Europe, and Asia are expected to face dramatic changes in rainfall, temperature, and frequency of "extreme weather" events, such as severe drought and storms, which will significantly reduce crop yields. Add to this the risks as tropical pests migrate into temperate zones in Europe and North America, and climate change could seriously hamper global food output even as population is rising.

In particular, do you think that the modern and industrialized agricultural approach to food, as a collection of interrelated mutually dependent parts, can effectively contribute to fighting hunger and malnutrition in the least developed and developing countries? If not, why?

This is a very important question. The industrialization of agriculture was instrumental in allowing us to dramatically raise output and lower prices in the last century, and the developing world has unquestionably benefited from these advances. But too often, the developing world benefited as a recipient, not as a participant. Many developing countries lack the capital, infrastructure, and political stability to take part in large-scale industrial production, and thus cannot compete with the developed world on price. As a result, these countries have failed to develop vital domestic food systems and must import a large share of their food, which only further drains their treasuries of the capital needed for economic development—a vicious cycle.

If we want the industrial model to work in the least developed and developing countries, we need to re-design that model, in terms of scale and technology requirements, to fit the realities on the ground. Personally, I am optimistic that such a re-design is possible. But I also know it will require a lot of new thinking and strong political will, both within the developing world and elsewhere.

What kind of agricultural models should be promoted and subsidized, and what should the role of R&D in agrifood systems be in order to make them more sustainable?

The key point here is diversity: as we've seen in the developing world, we need to be promoting a whole spectrum of agricultural models. Consider the question of scale. Today, there are basically just two sizes in food production—the very large-scale model, which can be quite low cost, but also has many "external" costs, such as pollution and high-energy and water use; and the very small-scale, which can be better suited to high-quality, or specialty products, or "authentic" foods, but is often inefficient and costly. What is missing, and what we need to support, is a "middle-ground"—that is, a mid-size model that can produce food sustainably but also affordably, and which may be better suited to less developed economies.

The need for diversity goes beyond scale. We need models for "polyculture"—that is, farms which grow not just one or two crops, but four or five or ten crops, all deployed in ways that help restore soil fertility or control pests naturally, with less need for synthetic inputs. Of course, we need low-capital, low-tech models of agriculture, which are appropriate for Africa and other parts of the developing world. But I think we also need a new model of agricultural production for another "undeveloped" part of the world—urban areas. Today, urban horticulture is hugely popular in the media, but in reality, it is still practiced mainly in the margins, as a specialty or a novelty. We need models that can bring urban horticulture to the urban mainstream, into schools and rest-homes and hospitals, municipal buildings and grocery story rooftops, but also backyards and parks—in other words, a human-scale model for human-scale food production.

So, as you can see, the future role for R&D is large indeed. Beyond developing these new models of agriculture, we will new elements for those models. Among these are:

food crops that require far less water or fertilizers; more efficient irrigation systems; and a more sustainable model for aquaculture (in part because conventional livestock production consumes so much acreage and energy). And we must find ways to affordably produce food, and especially fresh produce, which are less vulnerable to food-borne pathogens.

In my opinion, R&D is the most critical piece of the future agriculture "puzzle." Yet, paradoxically, it is the piece most at risk, because spending on agricultural R&D has been declining—part of a larger trend in all sectors, and one that must be reversed if we're going to solve the food challenge of the next forty years.

From a market perspective, considering the high level of volatility of the last few years, how do you see the future of access to food?

Volatility is quite worrying. As we've seen, prices for food, and for the energy necessary for food production, are now hugely unstable, with major repercussions for producers and consumers alike. In the developing world, food price spikes can be lethal. But even among well-off producers, volatility makes it impossible to correctly anticipate demand or plan production, resulting in over—or under—supply. Volatility also makes investors wary about putting capital—another key "input"—into farms or, importantly, into research, which will have devastating long-term effects.

Of course, the causes of volatility are still debated. In one theory, high demand in emerging economies, especially Asia, coupled with biofuels production, has tightened world food markets, making them more prone to price swings and, thus, more attractive to speculators, whose bets can then exacerbates price trends. No doubt there are other factors, and one hesitates to blame a single culprit. But this very complexity undermines a hope for a simple solution, such as a ban on "short-selling." I don't agree, as some suggest, that we must simply learn to live with higher volatility, and all the uncertainty that comes with it. But I do think volatility will pose one of the greatest challenges.

ACTION PLAN

FACILITATE THE ECONOMIC DEVELOPMENT OF THE POOREST COUNTRIES

Hunger is a direct consequence of poverty. To alleviate poverty, we need to develop and maintain clear and reliable pathways for sustainable development and to define and disseminate solutions and tools for developing countries in the key sectors of economic growth. Agriculture is the sector that makes the greatest contribution to income growth among the weakest populations in developing countries. It is often the most important sector and the one toward which investment should be targeted to help build regulatory frameworks and good incentive systems.

REINFORCE WORLDWIDE GOVERNANCE MECHANISMS

The special nature of food (which cannot be reduced to a commodity despite its abundance in recent decades) and the failure of distribution mechanisms make it necessary to get past the paradigm of a self-regulating market. Global policies must be coordinated and unilateral protectionist policies must be reduced over time. This requires at least four actions:

- building a transparent, "responsible" trading system based on multilateral rules that can assure greater access to food worldwide. In general, one would hope for a reduction in the use of import barriers, export subsidies, and other trade restrictions;
- avoiding competition between biofuels and food in growing crops;
- regulating financial speculation on food commodities. Despite the ongoing debate about the role speculation may play in the increase in agricultural prices, we can state with relative certainty that such speculation could have amplified short-term volatility;
- creating a multilateral system for food reserves and improving the transparency of flows and inventories. There is a strong connection between changes in inventories and the price trends for food commodities. In particular, over a sufficiently long time span, a reduction in the stock-to-use ratio of cereals tends to correspond to an increase in prices, while prices tend to decline with increases in the stock-to-use ratio.

FACILITATE NEW APPROACHES AND TOOLS FOR MEASURING AND PROMOTING WELL-BEING

Policy must reflect the fact that well-being encompasses far more than one simple economic dimension and depends on the status of many economic, social, political, and environmental factors that influence people's lives. Policy must also acknowledge that present choices can have profound consequences for future well-being. The creation of the BCFN dual indices is a small step in that direction. In the end, however, better indicators are not enough; they are simply one means to improve the quality of public decision making.

MANAGE FOOD CONSUMPTION STYLES

Government action and efforts to guide nutritional patterns according to the demands of sustainability are becoming crucial variables in economic policy. This is taking firm shape in some developed countries, which are facing a health crisis from the spread of metabolic, cardiovascular, and tumor-related diseases caused by harmful eating habits. This initiative will also become crucial in developing countries, mainly because of the impact it will have on global production equilibrium in agriculture.

3. FOOD FOR SUSTAINABLE GROWTH

Paying what's fair

Carlo Petrini

CARLO PETRINI is the president of the international association Slow Food. In the 1980s, he founded Arcigola, which in 1989 became the international association, Slow Food. Out of his ideas sprang the first University of Gastronomic Sciences and Terra Madre ("Mother Earth"), a network of more than 2,000 food communities that brings together farmers and producers of food from around the world.

Sustainability is a concept bound up with an age-old idea: time. It's a concept that tells us "just how long something can last." It's a fine word, and "sustainability" has a fine etymology: it originates with reference to one of the pedals of a piano, known in English as the *sustain* pedal. That pedal is pressed when the piano player wishes to prolong a note, to make it endure. In fact, it's significant that the French term is *durabilité*, capacity to endure.

The clear understanding that the things we plan to do (personal and private actions as well as public or business projects) must be able to last over time and on a number of different levels (social, economic, and environmental) is one of the crucial factors in the future of all human pursuits. Today sustainability is a very widely used term; we're all thinking a little more about the future. Many of us think about it constantly, because the very idea of sustainability contains a germ of the understanding that the future doesn't really belong to us, any more than natural resources do. The future and natural resources are both shared patrimonies, and our generation has the duty of preserving them for the generations still to come. We have certain responsibilities toward those generations. And that is yet another factor: the idea of responsibility toward those who are not yet among us. We have a responsibility to those who will one day come into this world with the same rights that we enjoy: the rights to enjoy flavors, climates, panoramas, health, and quality of life.

But that's not all.

We also know that if we wish to protect everything we enjoy ourselves and hope to pass on to future generations, then a single level of action will not suffice. What we need are certain high-level strategic approaches on the part of the governments of the world, along with international treaties and national laws. Along with those factors, it is crucial to be able to rely upon daily acts, individual choices, and the yes-and-no decisions that each of us can make, reordering the priorities of our everyday lives and business. This means that we must put emphasis not only on saving time and making money, or vice versa, making time and saving money. Instead, we should consider the time

we spend choosing the food we will eat as time invested in the care of our health and the state of the environment at large. We must also consider the money we spend on that food as an indicator of our involvement in a profession, the profession of farming. Farmers should be repaid for the many services that they perform for society and for the Earth, not just for the products that they put on the market. This money pays for certain values, not just for the price of a product.

In the general context of sustainability, food is a crucial factor. In terms of sustainability and food, the private level, where the actions of individuals take place, is certainly the forum for the most active and conscious decision making. In contrast, the level of politics remains particularly vague and distracted; in many cases, it is even genuinely ignorant. Agriculture is frequently thought of by politicians as a stand-alone sector, a mere producer of goods, of commodities. To politicians, those commodities have only one metric of value, which is the prices they fetch, or else the prices that are influenced by various corrective supports and regulations imposed from above. (Even worse, those prices can be influenced by financial speculations.) All too often, we think of agriculture as a productive sector devoid of the other values that actually do accrue to it. And those factors, as it happens (and this is no accident), are profoundly bound up with the very idea of sustainability.

For instance, consider the care of soil and farmland. That care involves a number of skills and bodies of knowledge: how to keep soil alive by the very act of farming, the care taken of a vital biodiversity that can be seen at a glance by observing the plants (whether or not they are cultivated) and the animals (wild or bred), a care that is also concealed in the countless array of microorganisms, the micro-life that makes farmlands fertile and productive, that keeps them rich and abundant for the future, that makes them last.

Unfortunately intensive monocultures that are planted and harvested for many years without interruption permanently undermine both farmland and biodiversity. The failure to properly rotate crops and the misuse of fertilizers and pesticides only make matters worse. Often these practices are justified by saying that they are necessary if we wish to increase production. But production for the mere sake of production is not a sustainable activity and, as we shall see, it's not even necessary. Equally unnecessary and unsustainable is the unbridled spread of concrete over the landscape, which cannot be compatible with the conservation of increasingly endangered natural and agricultural systems. A landscape that is covered with cement can never become fertile again. It is lost forever, and we can never hope to restore it for the use of future generations.

Fertile soil and biodiversity, moreover, are prerequisites for abundant and healthful food supplies. Those supplies should be characterized by diversity in accordance with the climates and the crops, thus ensuring that they are sustainable foods. The heroic determination shown by some in the defense of small local agricultural economies, especially those at risk of complete extinction, is much more than a mere exercise in weak-minded nostalgia or the epicurean activity of people who like to consume rare, high-quality foods. Actually that defense is a sustainable action that is valid for all kinds of food production. It is a defense of biodiversity, of communities that are perfectly in harmony with the environment, and all the various factors that go along with that.

By this, we are referring to the diversity of flavors and therefore of cultures: further guarantees of sustainability for the future progress of human life on this planet of ours. Because if there's no diversity there's no identity; if there's no exchange, there's no reciprocal enrichment; if serial standardization triumphs, then we become poor and defenseless, hesitant in the face of the future, with no confidence in our own "durability." These are only some of the leading values that we ought to pay for—both as individual citizens when we do our grocery shopping, and as a society, a collective, when we levy taxes. And we should value good agriculture that respects the natural setting in which it operates. It should be done through serious and carefully monitored parameters. It should further mean including multifunctionality in our evaluation of the work done by farms. This should go well beyond lip service: it should take the form of actual strict regulations. And here's why: multifunctionality—all these values—almost always translates into a more beautiful landscape, panoramas which positive anthropization (the transformation or adaptation of the environment to meet the needs of humans, or by human activity) has rendered even more pleasant and charming. Places where it is unmistakable that someone is taking care of them. Care for a territory is just one more prerequisite of sustainability, and it is a product of the love that we feel for the things among which we live, the things that we use, the things that we transform with respect and which can therefore be perpetuated.

Such care and all the other values are almost automatically translated into beauty but also into goodness. They result in the capacity to take the greatest possible benefit from a product, building upon its basic characteristics through agricultural techniques and techniques of transformation, and making its unique and distinctive flavor known far and wide. Beauty and goodness are therefore integral parts of the concept of sustainability. It is time for us to be done, once and for all, with the idea that ethics and aesthetics are two separate fields, two distinct ideas, two incompatible philosophies of life. Ethics and aesthetics, in the context of sustainability, are so complementary that they ultimately become the same thing, a single lighthouse, a guiding beacon.

Out of this thinking we can draw up a list of commandments: don't pollute, don't overuse chemicals, don't do harm in the name of mere profit to our resources, to the land, and to farmers. Don't destroy fertile farmland. Defend biodiversity. Stimulate local economies, traditional crops and products, and small-to-medium-sized farming operations in challenging, isolated, or underfed areas. Establish stronger and closer ties between city-dwellers and farmers and agriculture. Encourage young people to go back to the land.

These, then, are a few of the commandments that should be observed in the name of sustainability, a few actions that can be carried out on its behalf at all the levels mentioned above. Actions that, moreover, go hand-in-hand with the beautiful and the good, in a world that actually produces too much food (the total quantity of food produced on Earth is more than enough to feed all the inhabitants of this planet) but wastes nearly as much as it produces. After all, official figures on food waste are absolutely intolerable, not to mention how offensive they are in light of the billion or so people who struggle every day with outright starvation and malnutrition.

Here are a few more commandments: produce a little less food, produce better quality

food, distribute intelligently, rooting production and consumption as far as possible in the various different territories, acting first and foremost at the local level.

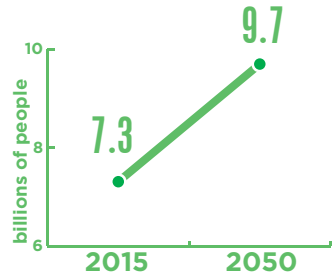
To come back to individual city dwellers, the fact that beauty and goodness are at the same time consequences and prerequisites of sustainability can only encourage us to change our routines, beginning with our food choices and our everyday grocery shopping. Very soon, we will discover—if we haven't already—that eating can be as pleasurable and healthful an activity as it is a sustainable one. Moreover, we can do our part easily without making great sacrifices. Indeed, doing our part can add small but significant portions of happiness to our lives. We can do so by learning to pay what's fair: the right price, taken together with values.

"Eating is an agricultural act," wrote the farmer-poet Wendell Berry. We can add to that thought that eating is an ecological act, an act that affects the landscape, an act of profound respect for the diversity of cultures, and a political act. It must also become a sustainable act, because eating is the act that is most directly and intimately linked with everything that surrounds us. Those links are both evident and hidden because they remain impenetrable at the current level of scientific understanding. But the food we eat is surely bound up with the vast and complex system that is the planet in which we live, the biosphere. In other words, the planet is our home, but we are not just its tenants. We are an integral part of it, because we are part of that system. For too long now we have pretended that we are somehow an extraneous entity on that planet. We are guests housed here, and everything on the planet is at our disposal, until we run out of it—which has been our reason for failing to act in a sustainable manner. But to do so, to harm our Earth and act so as to keep it from "lasting," also harms us humans. And so even the selfish considerations that have always characterized us as a species demand that we change so many of our choices, beginning precisely with those choices that really have become insignificant for many of us—far too many of us—just because they are everyday decisions. Among them is the decision of what to eat each day. But that is actually a decision that has the power to change the world.

3. FOOD
FOR SUSTAINABLE GROWTH

+3
billion thirsty people in the world in 2025

2015–2050 +34%



9.7 billion inhabitants on Earth in 2050

IMPACT OF FARMING

70% freshwater consumption

26% global greenhouse gas production

-8/20% arable land

By 2050 arable land will be reduced due to climate change

-43% of tropical and temperate forests have been converted for crop growing

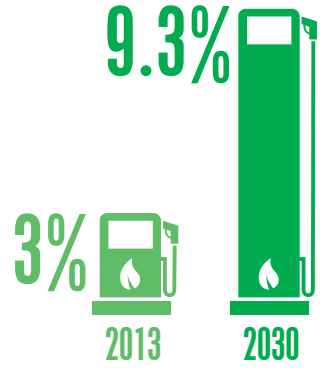
LAND USE FOR ANIMAL FARMING

40% for grazing

33% for production of animal feed

32%
fishing stocks overexploited or depleted

FORECAST FOR USE OF BIOFUEL



-30% CO_2 emissions in agriculture through proper use of agronomics

THE MEDITERRANEAN DIET SAVES OVER 2,000 LITRES OF WATER A DAY PER PERSON

MEDITERRANEAN DIET

WESTERN DIET

+75%
water use for food production

THE DOUBLE PYRAMID: HEALTHY FOOD FOR PEOPLE, AND SUSTAINABLE FOOD FOR THE ENVIRONMENT

It's impossible to get a grip on the topic of development unless we put into the foreground all the pieces that make up the food system from farms to tables. The reason is simple: it is from this "agri-food" sector that many of the problems—and a great many of the solutions—of sustainability first arise. Further, the sustainability of the agri-food chain of production depends not only on the commitment of the farmers, the producers, and the distributors, but also—and perhaps even more so—on the individual choices and families, who have such a powerful effect on the entire market and the environment in which we live with the daily choices and decisions they make.

The purpose of the important new concept of the Double Pyramid model, presented in 2009 by the BCFN (its latest version is shown here), is to demonstrate the close relationship that exists between the nutritional aspects of food and the environmental impact it generates during production and consumption. In particular, by adopting a dietary pattern recommended by nutritionists, the Mediterranean diet for example, health can be reconciled with the environment without any negative impact on the economy. Moreover, as argued by expert Timothy Lang, professor of food policy, public health objectives and ecosystem constraints converge. Eating without excess, reducing the consumption of meat and dairy products, and increasing that of fruit and vegetables not only brings benefits to the people, but also the environment in which we live.

The Double Pyramid concept is a response to the need to communicate the environmental impact of food choices effectively. Since the first studies by the Barilla Center for Food & Nutrition, published in 2010, it has become clear that the foods with less environmental impact are the very same ones nutritionists recommend we consume more of, while those with a more marked environmental footprint should be eaten in moderation. Based on this important discovery, the BCFN has set itself the goal of illustrating to organizations and consumers that healthy eating has positive effects both on health and the environment and, to this end, has developed a diagram in which a new upside down "environmental" pyramid has been added to the classic food pyramid (such as that of the Mediterranean diet), in which foods are classified according to their ecological footprint.

3.1 THE FOOD PYRAMID AS AN EDUCATIONAL TOOL

In recent years, there has been a striking increase in the number of people who can freely choose what, and how much, they eat. These people, however, are at great risk of adopting imbalanced diets because they lack an adequate food culture or widespread nutritional guidelines that are clearly understood and easy to apply. One unmistakable indicator of this fact is the recent galloping spread of pathologies caused by excessive

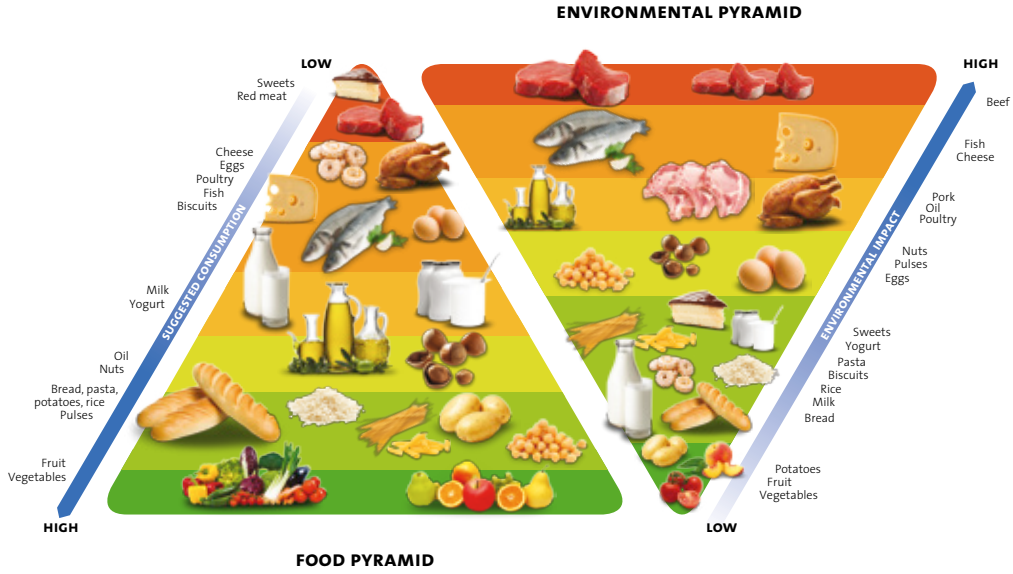


FIGURE 3.1

The food and environment Double Pyramid Model
Source: BCFN Foundation, 2015.

consumption of the wrong kinds of food (as well as a concomitant decline in physical activity among all age groups).

The American physiologist Ancel Keys, who published the best-seller *Eat Well and Stay Well* in 1958, was one of the first to explain to a worldwide audience why people were longer-lived in certain regions. The secret of longevity lies in the balanced consumption of all natural foods, with an emphasis, in terms of frequency and quantity, on fruit, vegetable, and grain products. At the same time, it is important to reduce the consumption of foods rich in saturated fats, meats, and sweets. In particular, Keys discovered that it was due to this diet (which he dubbed the "Mediterranean diet") that rates of death from heart disease in the countries of southern Europe and North Africa were much lower than the rates found in English-speaking and other northern countries, where the diet tended to be rich in saturated fat. Unfortunately, since then the Mediterranean diet, in Italy and elsewhere, has been challenged by competition from global food models (first and foremost, American fast food).

We hope to help reverse this sad trend with the Double Pyramid, which has two strengths: it is an excellent synthesis of the principal knowledge developed by medicine and by food studies, and it is a powerful educational tool for changing patterns of consumption, thanks to its simple and intuitive graphic nature.

The base of the pyramid. Let's take a more detailed look at the food pyramid. The general pattern is obvious: at the base we find plant-based foods, typical of the dietary habits of the Mediterranean region, that are rich in nutrients (vitamins, mineral salts,

water) and protective compounds (fibers and plantbased bioactive compounds). As we move upward, we find foods with progressively greater energy density (very much present in the American diet), which ought to be consumed in smaller quantities.
The first level contains fruits and vegetables, which are foods with limited caloric content that provide the body with water, carbohydrates, vitamins, minerals, and fiber. Protein and fat content is very low. The carbohydrates found in fruit and vegetables consist for the most part of simple sugars, which can be easily utilized by the body, and small amounts of starch. Plant-based foods are also the chief source of fiber, which helps regulate intestinal function and makes us feel full, which contributes to lower consumption of high-energy foods.
Continuing upward, we find pasta, rice, potatoes, bread, and legumes. Pasta is rich in starch, with a substantial protein content and a negligible lipid ratio. Rice, like all cereal grains, has high starch content, low protein content, and even lower fat content. Rice also contains small quantities of minerals and B vitamins. Potatoes have very low fat and protein content, while they are rich in starch and carbohydrates. They are also a very significant source of potassium, phosphorus, and calcium. Bread is a staple, because it contains the necessary level of carbohydrates to provide the human body with the ideal fuel. Last of all, legumes are the highest-protein plant-based foods known (proteins of excellent quality) and also contain lots of fiber. Legume proteins are rich in essential amino acids and are easily digested. Legumes are also an excellent source of B vitamins (especially B1, niacin, and B12) and such minerals as iron and zinc. They are a good alternative to meat.
One level farther up we find extra-virgin olive oil, which is composed of triglycerides (rich in monounsaturated fatty acids), essential fatty acids, vitamin E, polyphenols, and phytosterols. Just beyond that we come to milk and yogurt. Milk is almost 90% water, with trace contents of high-quality proteins, mostly easily digested short-chain saturated fats (many of which are also rich in animal fats that encourage the rise of plasma cholesterol levels and should therefore be consumed in moderation) and sugars (chiefly lactose, which is made up of galactose and glucose). The vitamins found in the largest quantities in milk are A, B1, B2, B12, and pantothenic acid. Milk is also the chief source of calcium in the human diet. Yogurt, like milk, is a food with high nutritional value. It may be more easily digested than milk by people who suffer from lactose intolerance.

The second part of the pyramid. At the next higher level, we find a vast assortment of diverse products, such as cheeses, white meats, fish, eggs, and cookies. Cheeses contain proteins and fats, but practically no carbohydrates at all. Cheeses also contain significant amounts of calcium in a form that is well absorbed into the bloodstream. B vitamins are present in small quantities and there is a good quantity of vitamin A. Then come fish and eggs; fish contain proteins with an elevated metabolic value and variable quantities of fats up to 10% of the weight of the food. Fish fats contain polyunsaturated fatty acids, which belong to the category of essential fatty acids; the family of the omega-3 fatty acids, in particular, is considered to be beneficial in the prevention of cardio-circulatory diseases. Eggs contain proteins with such a high metabolic value that for years the protein composition of eggs was the benchmark used

to evaluate the proteins of other foods. Cookies are composed of a wide variety of ingredients with different nutrient and energy content. In general terms, there is a significant content of simple sugars, while the fat content is quite variable, on average between 9% and 25%.

The consumption of meat, especially lean meat, is important because it helps to provide high quality proteins, which are crucial to children's growth and to the formation of muscles. About half of the proteins in meat consist of amino acids that are essential to the human organism. We also find B vitamins (in particular, B12), selenium, copper, and zinc. Fat content is variable. It can range from virtually zero to almost 30%, depending on the kind of meat. The fats are mainly saturated and monounsaturated, with a small proportion of polyunsaturated fats. White meats are therefore recommended and the consumption of red meat should be reduced. This is evident in the many versions of the food pyramid developed by national and international institutes that place red meat at the very top of the pyramid, along with sweets (which are rich in fats and simple sugars) and should be consumed in moderation.

3.2 SOME STUDIES OF THE MEDITERRANEAN DIET

The correct nutritional balance of the Mediterranean diet was scientifically proven in the Seventies by Keys' *Seven Countries Study*, which compared the diets of different populations to assess benefits and critical points. The analysis highlighted for the first time the strong correlation between type of diet and the risk of developing chronic diseases, especially cardiovascular ones.

Since that first study, many others have examined the association between diet and health, confirming that a Mediterranean-type diet is related to a low mortality rate, a lower incidence of cardiovascular disease, metabolic dysfunctions and certain types of tumors. Moreover, according to recent studies, the Mediterranean diet seems to ensure longevity, being linked to longer telomeres—small pieces of DNA found at the ends of the chromosomes—a fact linked to the aging process. This uniqueness was also recognized by UNESCO, which in 2010 declared the diet Intangible Heritage of Humanity.

In 1992, the US Department of Agriculture published the first edition of the food pyramid to inform and educate on nutrition, drawing inspiration from the Mediterranean diet. This was republished without any modifications by the FAO in a simple but effective document in 1997 which explained how to follow a balanced diet.

Over the years, various institutions and research centers—such as the WHO (World Health Organization), the CIISCAM (Interuniversity Centre for International Studies on Mediterranean Food Cultures) and the Harvard School of Public Health—have developed communication systems based on the image of the food pyramid. The basic concept is that foods are presented on different levels and that, as they climb to the top of the pyramid, the relative frequency of consumption decreases, without excluding any category, so that variety remains one of the key principles of proper nutrition.

Several versions of the food pyramid have been published over the years. Starting from a common scientific basis, each pyramid adapts the original model to the specific audience that is targeted, for example, by distinguishing different age groups, lifestyle,

THE EVOLUTION OF

FOOD PYRAMID

FROM 1992 TO DATE

Mediterranean diet and other nutritional models around the world

USDA
1992

WHO
2000

MY PYRAMID
2005

OLDWAYS
2008

HSPH
2008

OTHER NUTRITIONAL MODELS

Temel Besin Grupla
Turkey

The Pagoda
Cina

Choose My Plate
USA

Guide to Healthy Eating
Australia

BCFN 2009

"The mediterranean diet represents a combination of skills, know-how, practices and traditions ranging from landscape to food, through cultivation, harvesting, fishing, preserving, processing, cooking and, particularly, consuming food."

CIISCAM 2009

UNESCO 2010

The Food Circle
Sweden

Food Bicycle
Korea

Food Spinning Top
Japan

The Food Rainbow
Canada

the specific time or nutritional habits. Moreover, in almost all the most recent versions of the pyramid, the scheme includes further recommendations for a correct lifestyle (the amount of water to drink, the time to be spent on physical activity, etc.).
Even the food pyramid contained in the Double Pyramid, which comes from making common factors of different international nutritional guidelines, can easily be traced back to the traditional Mediterranean diet. The message conveyed is that nutrition must be based on ingredients and foods of plant origin, rich in vitamins, minerals, fiber and complex carbohydrates, vegetable protein and water, all typical of Mediterranean eating habits. Instead, foods placed towards the top of the pyramid should be eaten in moderation because they are rich in fat and simple sugars.

From the pyramid to the dinner plate. A major international effort is under way to make the arguments of the food pyramid and the Mediterranean diet increasingly accessible to ordinary people. One example is what the United States Department of Agriculture is doing in America with the USDA food plate, a different visual translation of the contents of the Food Pyramid (figure 3.2).
However a healthy diet is depicted, it is clear that a large share of the most respected scientific research on the relationship between diet and chronic diseases shows, beyond any reasonable doubt, that the Mediterranean dietary model must be taken as a point of reference for proper nutrition and that "healthy" lifestyles should be associated with that diet. Figure 3.3 shows the guidelines for the prevention of cardiovascular diseases, diabetes, and tumors.

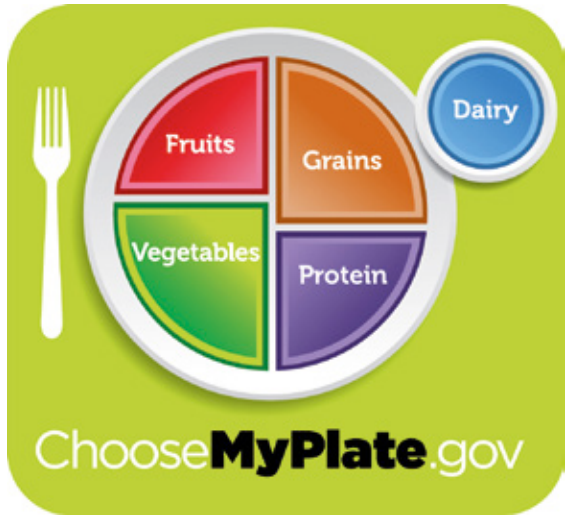


FIGURE 3.2

The graphic representation of food advice issued by the USDA
Source: USDA, 2011.

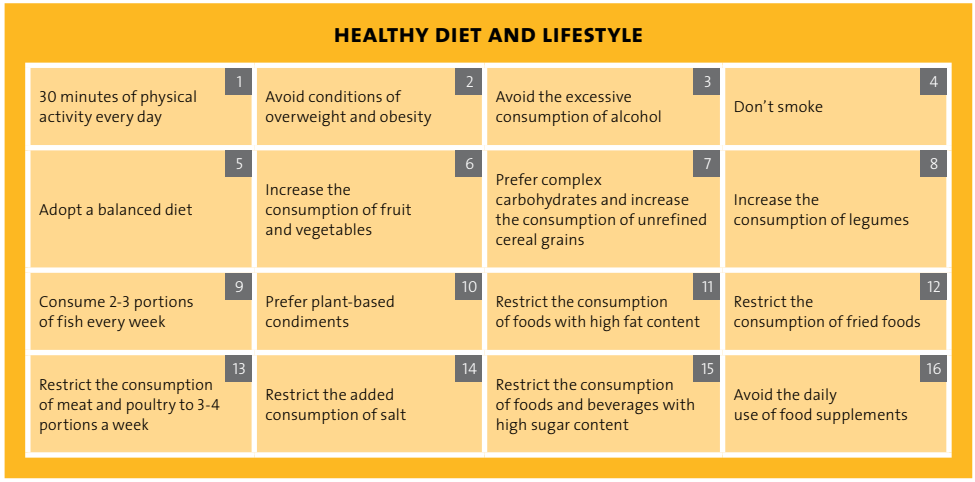


FIGURE 3.3

Scheme of medical guidelines
Source: BCFN, 2009.

3.3 THE ENVIRONMENTAL PYRAMID

The food pyramid based on the Mediterranean diet is clearly considered as one of the healthiest dietary approaches available. But what about its impacts on the health of the environment? The BCFN Environmental Pyramid is an effort to illustrate those impacts. It was constructed from research tracing the environmental effects of various food types using the life-cycle assessment (LCA) method. LCA analysis follows a product or service throughout its entire life in order to evaluate the energy and environmental loads imposed by its production. LCA begins with the initial cultivation or extraction of raw materials, and follows them through processing, fabrication, assembly, transport, distribution, use, reuse, recycling, and final disposal. The LCA approach offers the most objective and complete evaluation possible of the system (figure 3.4).

Environmental indicators. A close look at the agri-food production reveals that the chief environmental loads are represented by three factors: the emission of greenhouse gases (which help drive climate change), the utilization of water resources, and the capacity to regenerate the territorial resources that are utilized in producing food.

- The Carbon Footprint identifies greenhouse gas emissions responsible for climate change, and is measured as mass of CO_{2eq} (figure 3.5);
- Along the different stages of the supply chain the Water Footprint calculates the volume of fresh water used to produce food. It not only considers the amount and type of water source used or polluted, but also the place from which it was removed (figure 3.6);
- The Ecological Footprint estimates the amount of biologically productive land (or sea) needed to provide resources and absorb the emissions associated with a production system: it is measured in square meters or global hectares (figure 3.7).

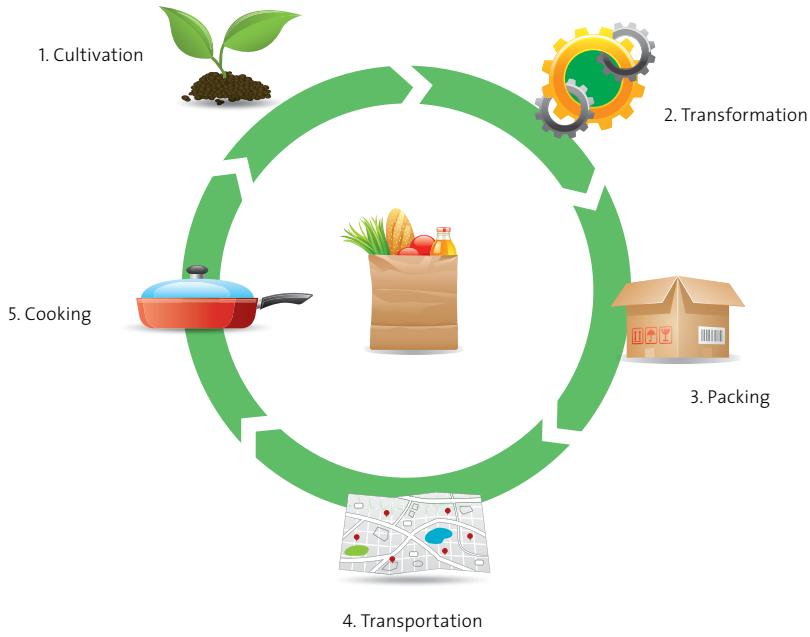


FIGURE 3.4

The LCA method of analysis is regulated by the international standards ISO 14040 and 14044
Source: BCFN, 2011.

It is important to note that these indicators are not the only impacts generated by the food chain, but they are certainly the most significant in terms of real impact on the environment.
BCFN chose to construct the environmental pyramid using only the ecological footprint. We include the descriptions of the carbon and water footprints to make it clear that a truly complete accounting of the environmental impacts of food would require using multiple "lenses."

The influence of food choices. Figure 3.8 gives an idea of the degree to which individual food choices can affect the ecological footprint by comparing two different daily menus. Both menus are balanced in nutritional terms, both for caloric content and nutrients (proteins, fats, and carbohydrates). In the first menu, however, the proteins are from plants ("vegetarian menu"), while in the second menu the proteins are mostly of animal origin ("meat menu").

The meat menu has a three-fold greater environmental impact than the vegetarian menu. Imagine how great a reduction of environmental impact an individual could bring about by merely modifying a person's eating habits! Let's take a sample week's diet, and imagine three different dietary regimens, with varying frequencies of a vegetarian menu as opposed to a meat menu. If we limit the consumption of animal

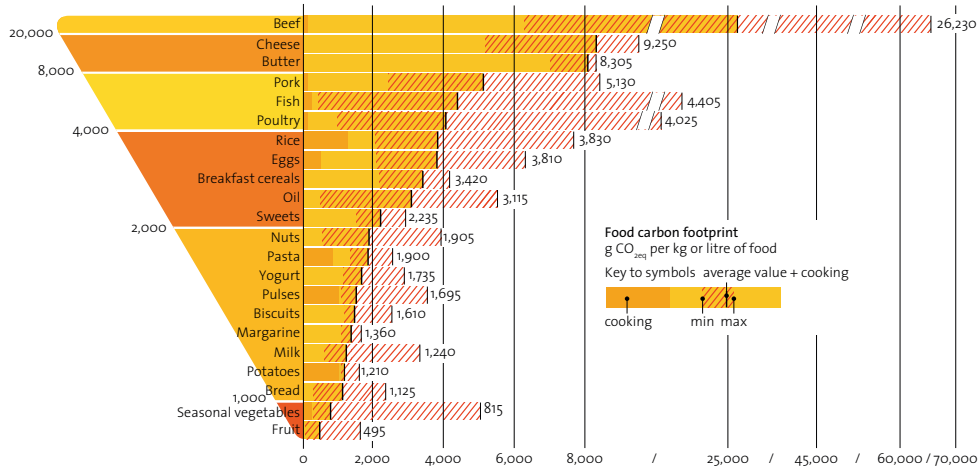


FIGURE 3.5

Carbon footprint of foods (g CO_{2eq} per kg or liter of food)
Source: BCFN Foundation, 2015.

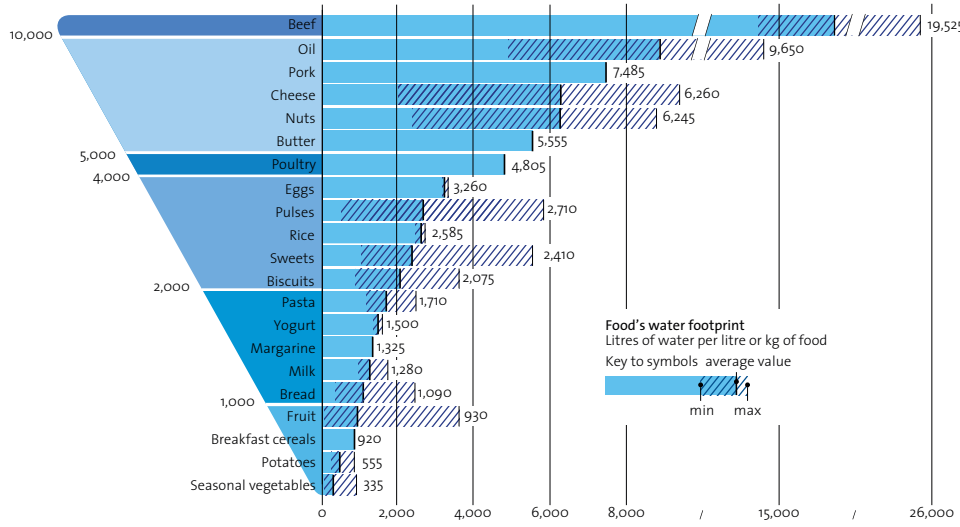


FIGURE 3.6

Water footprint of foods (liters of water per liter or kg of food)
Source: BCFN Foundation, 2015.

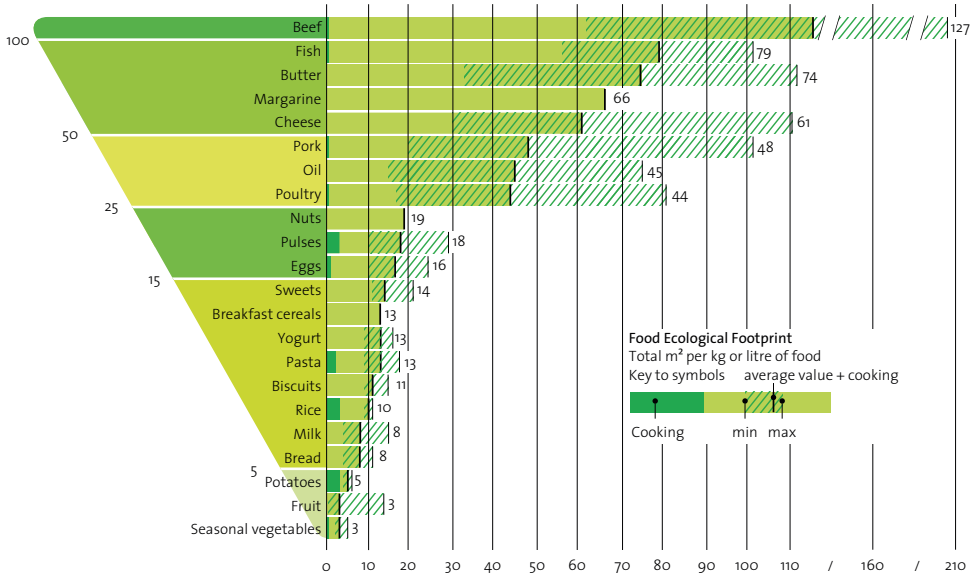


FIGURE 3.7

The ecological footprint of foods (global square meter per kg or liter of food)
Source: BCFN Foundation, 2015.

proteins to just twice a week, as recommended by nutritionists, we can "save" up to 2,300 grams of CO_{2eq} per day compared to a menu that includes daily consumption of meat.

3.4 THE DOUBLE PYRAMID FOR GROWING CHILDREN

The generic Double Pyramid is aimed primarily at adults, so we also explored the concept of the Double Pyramid for growing children and adolescents.
There are three critical factors that should be avoided during adolescence to lower the risk of chronic disease during adulthood:

- developing bad eating habits, consuming alcohol and tobacco, or gaining excessive weight;
- adopting a sedentary lifestyle, such as spending one's free time watching TV, playing videogames, or in front of the computer instead of engaging in physical activity;
- neglecting prevention or ignoring risk factors, such as by failing to monitoring the adolescent's weight or scheduling checkups with a pediatrician.

In combination these three factors can rapidly produce obesity, insulin resistance, dyslipidaemia, and arterial hypertension. They can also generate longterm effects, such as an acceleration of the processes that lead to diabetes and to cardiovascular diseases in adulthood.

FIGURE 3.8

Footprint & food choices
Source: BCFN, 2015.

VEGETARIAN MENU IMPACT

17.3 global m²
2,549 g CO_{2eq}
2,793 litres

VEGETARIAN MENU

2,016 total kcal

PROTEINS	FATS	CARBOHYDRATES
14%	32%	55%

Breakfast	Snack	Lunch	Snack	Dinner
1 Glass of milk 5 Slices of rusks Jam	1 Fruit 1 Pack of crackers	1 Portion of pasta (Casarecce Siciliane type) with fennel and pumpkin and leek flan 1 Portion of raw vegetables Oil Bread	1 Fruit	1 Portion of chickpea soup 1 Portion of steamed French beans and potatoes with parmesan shavings 1 Fruit
2.2 global m² 338 g CO_{2eq} 348 litres	0.7 global m² 108 g CO_{2eq} 172 litres	4.2 global m² 766 g CO_{2eq} 668 litres	0.5 global m² 74 g CO_{2eq} 140 litres	9.7 global m² 1,262 g CO_{2eq} 1,466 litres

MEAT MENU IMPACT

30.9 global m²
5,803 g CO_{2eq}
4,672 litres

MEAT MENU

2,031 total kcal

PROTEINS	FATS	CARBOHYDRATES
15%	27%	58%

Breakfast	Snack	Lunch	Snack	Dinner
1 Glass of milk 5 Slices of rusks Jam	1 Fruit	1 Pizza with tomato and mozzarella 1 Portion of raw vegetables Oil	1 Fruit	1 Fillet steak Oil 1 Portion of rocket and tomato salad 1 Fruit Bread
2.2 global m² 338 g CO_{2eq} 348 litres	0.5 global m² 74 g CO_{2eq} 140 litres	6.6 global m² 1,129 g CO_{2eq} 697 litres	0.5 global m² 74 g CO_{2eq} 140 litres	21 global m² 4,187 g CO_{2eq} 3,349 litres

Poor nutrition and chronic diseases. But even considering diet alone, it has been clearly shown that there is a strong link between poor nutrition, excessive body weight, and increased risk of contracting chronic diseases. While the public is fairly well aware of this correlation in the case of adults, the crucial importance of diet in the prevention of many diseases in children and young people is less widely understood.
Figures 3.9 and 3.10 illustrate the daily allocation of calories and the makeup of an optimal weekly diet, based on nutritionists' and pediatricians' understanding of the nutrients needed for proper development in various phases of growth.
A proper diet will contain a lot of day-to-day variety: a mixture of foods that includes plant-based foodstuffs (fruit, vegetables, legumes, cereal grains, seeds, etc.) and animal-based foods (meat, cheese, dairy products, ham, etc.).

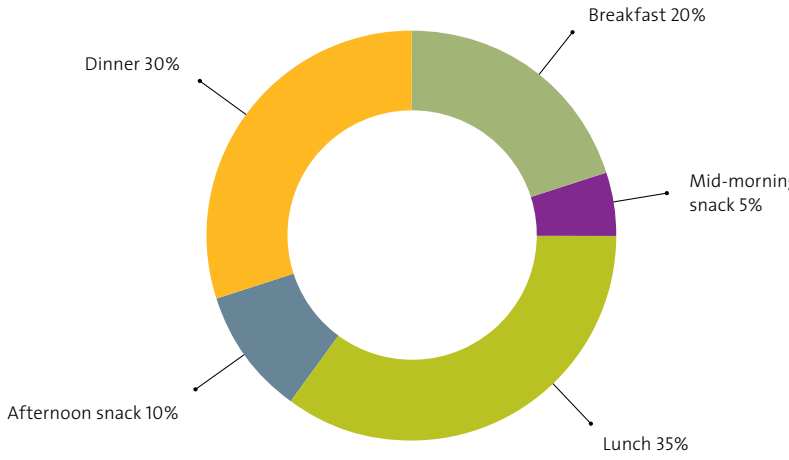


FIGURE 3.9

The recommended breakdown of daily caloric intake for children and adolescents
Source: BCFN, 2011

Despite these recommendations, numerous international studies show that poor eating habits are widespread among children aged 6 to 10 and that those habits tend to undermine proper growth and predispose them to weight gain. Only 1% of all children consume portions and varieties of food that are nutritionally optimal. The same studies also show that the daily caloric intake observed for most school-aged children is not only greater than their needs, but is also principally oriented toward the consumption of fats and sugars, instead of fruits and vegetables. This is especially true of children with a tendency toward obesity.
Based on the information we've described in these pages, the BCFN has constructed a nutritional pyramid that is used in the development of the Double Pyramid applicable to children (particularly from the age of two) and adolescents (figure 3.11).

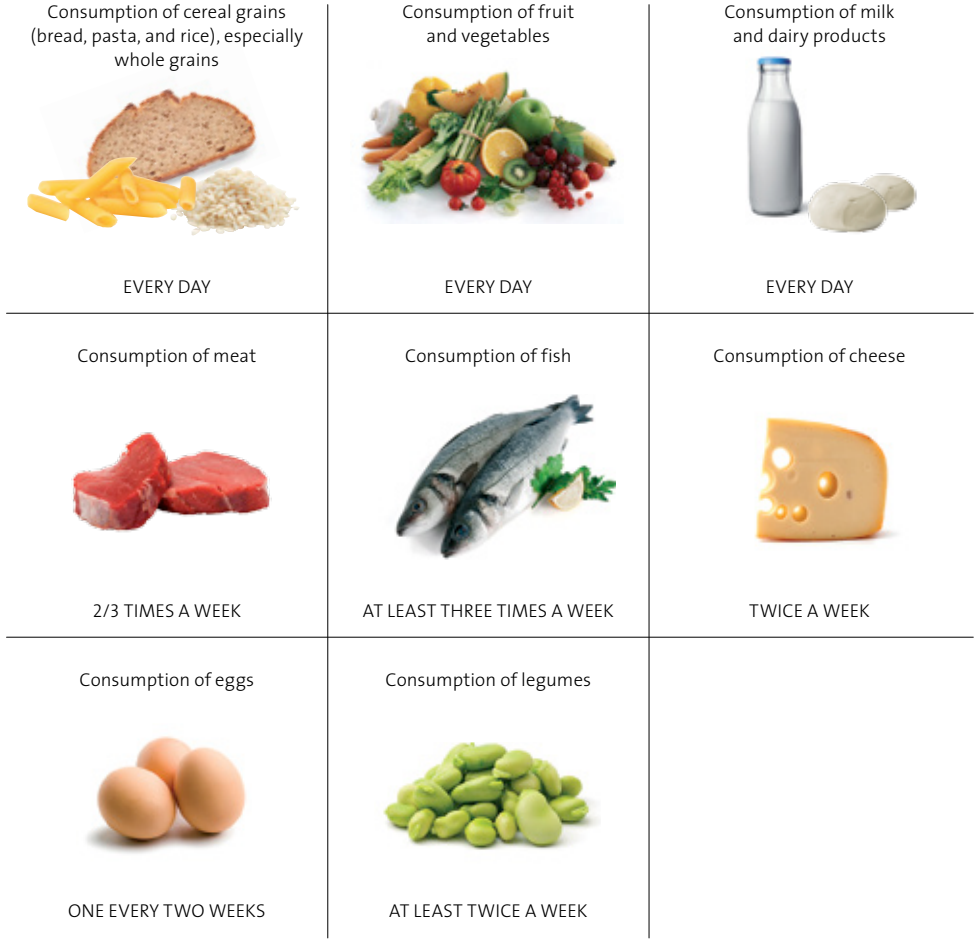


FIGURE 3.10

The optimal weekly breakdown of food intake for children and adolescents
Source: BCFN, 2011.

(The needs of youth are comparable in terms of frequency of consumption to those of adults.)
As with adults, the diet for children and adolescents ought to be based prevalently on plants, and in particular the various cereal grains, especially whole and unrefined grains, as well as fruits and vegetables. These are very important because of their fiber content and the presence of nutrients that protect against disease.
Moving up the pyramid, we find milk and dairy products (preferably in low-fat versions), as well as meats and fish, until we finally come to products with higher fat and sugar content. For these products, a relatively low frequency of consumption is recommended. The need for unsaturated fats should be met with fish and dried fruit, preferably utilizing plant oils as a condiment.

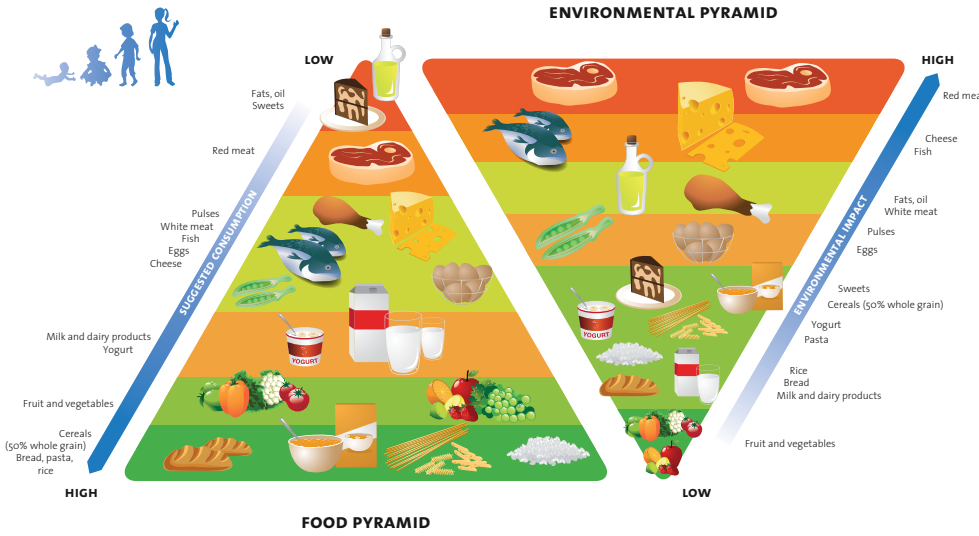


FIGURE 3.11

The double pyramid for growing children and adolescents
Source: BCFN, 2015.

To incorporate the principles and facilitate adoption of the Mediterranean diet by other populations living in Italy, in 2015 the Italian Society of Pediatrics launched the cross-cultural food pyramid for younger children. As shown in figure 3.12 next to foods typical of the Italian diet, are other equally healthy foods from different parts of the world.

3.5 IS HEALTHY EATING MORE EXPENSIVE?

As we have seen sustainability demands a lasting balance over time on many fronts; for this reason, the BCFN decided to address this issue in an articulate way, integrating environmental and nutritional variables with the economic aspects. In particular, it tried to understand how healthy diets for people and sustainable for the environment are also affordable as well. According to many scholars, in fact, price (real or perceived) is one of the main elements influencing food purchases: if you want to promote healthy and sustainable nutrition you cannot avoid considering the cost.

An analysis of various studies carried out on the subject, particularly in Europe and the United States, despite some conflicting data, has shown that you can eat healthily regardless of income level: the "healthiest" and most sustainable diets do not necessarily imply higher costs, quite the opposite in fact. It is necessary, however, to change eating habits, choosing the most nutritious, economical and environmentally friendly foods.

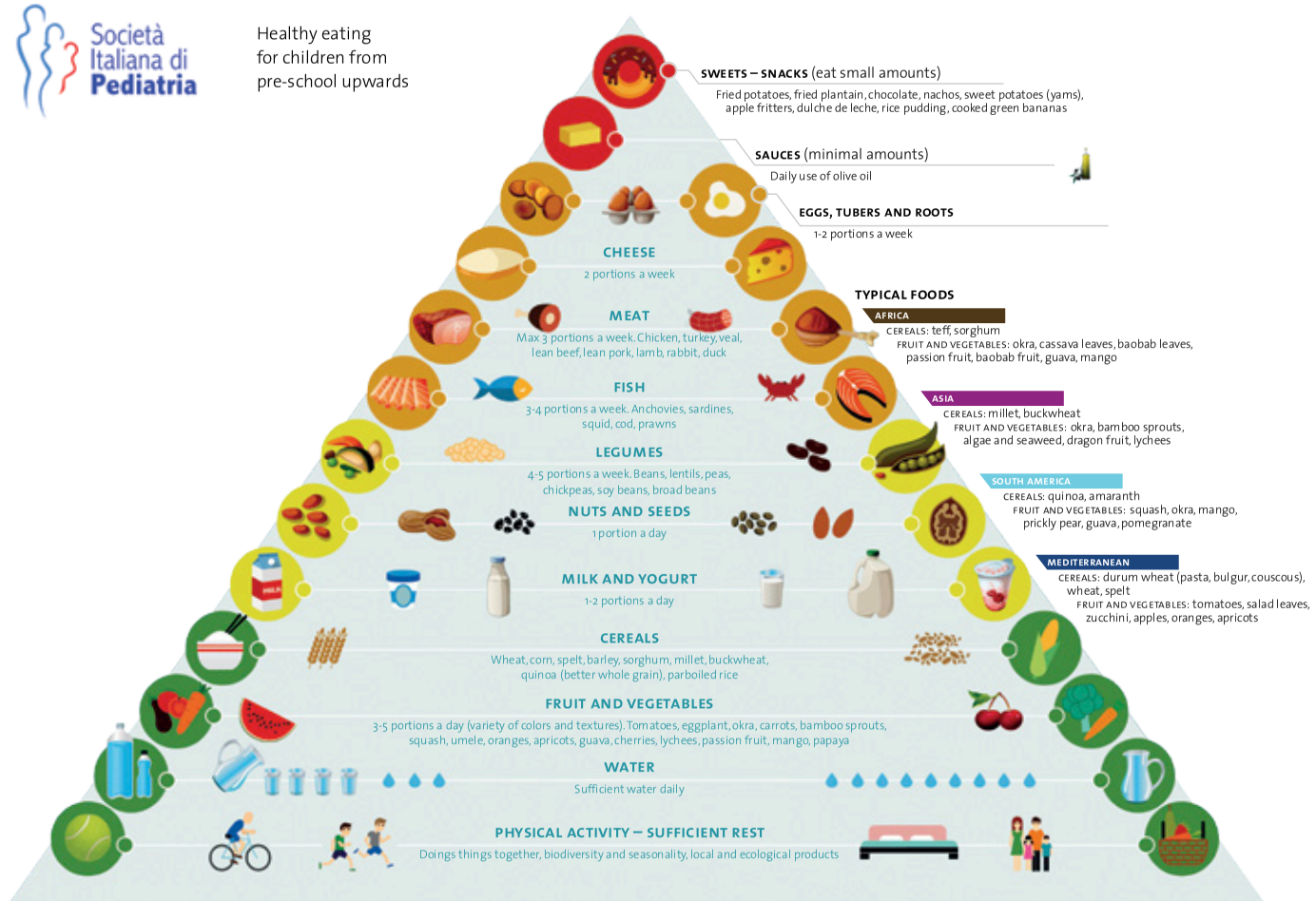


FIGURE 3.12

Cross-cultural food pyramid

Source: SIP, 2015.

EATING HABITS AND CLIMATE CHANGE

It is well established that the greenhouse gas emissions resulting from human activities are at the root of the climate change we are witnessing: rising temperatures, melting glaciers and extreme weather episodes are becoming more and more frequent.

The climate of our planet is changing at a rate never previously recorded. Since the early nineties international treaties have been signed, such as the 1992 the United Nations Convention on Climate Change (UNFCCC), with the aim of reducing the impact of rising temperatures. Since then every year the signatories have met at the Conference of the Parties (COP) to assess the progress made.

The best known outcome of these meetings is the Kyoto Protocol, which established binding commitments for the reduction of greenhouse gases.

On December 12th 2015, in Paris, COP21 came to an end with an agreement signed by 195 countries to keep global warming temperatures "well below 2 °C" compared to pre-industrial levels. Such a result was achieved at a particularly delicate moment for our planet and its balance. According to FAO estimates, in fact, it will be necessary to increase agricultural production (increasing efficiency and using land now uncultivated) by 70% to have enough food for a world population that in 2050 will be about 9 and a half billion. Without any further action, this will result in an 80% increase in emissions with increasing pressure on natural resources and their already precarious balance.[1]

For this reason, many countries have developed or are developing strategies to reduce their emissions, including those of the agri-food sector. This represents about a third of total emissions and is the main cause of deforestation, loss of biodiversity and soil degradation.[2] It is therefore essential for the food industry to be involved in the process of fighting climate change. Among some notable initiatives is the European Union's *Roadmap to 2050*, which aims to reduce the carbon dioxide emissions of member states by 80%. To achieve this, the importance of improving the agro-food systems is stressed, but also the need to change our eating habits. A reduction in the consumption of animal protein is recommended in favor of other proteins with less environmental impact. The fundamental role of food choices in the face of climate change is also recognized by the Policy Department for Energy and Climate Change (DECC) of the United Kingdom. In their report *Prosperous living for the world in 2050: Insights from the Global Calculator* various scenarios were presented that demonstrate how you can still keep a high quality of life even with food choices that reduce greenhouse gas emissions.[3] It has been suggested that if in 2050 the entire world population consumed about 2,100 kcal per day of which only 160 were derived from meat (the consumption level suggested by the WHO), this would result in a reduction of approximately 15 gigatons of carbon dioxide equivalent, a saving of one third of global emissions of greenhouse gases in 2011.[4] Recently, the Intergovernmental Panel on Climate Change (IPCC) has also assessed the importance of food consumption in reducing climate change and concluded that the type of diet plays a key role in this context.[5]

Generally speaking we are all aware of the effect that transport, heating and electricity usage have on the environment, while there is less awareness about the impact of our food choices. In the West, 30% of emissions come from food consumption, making it one of the main causes of climate change. According to research in 2006,[6] which takes into account eight different indicators of environmental pressure and 12 economic sectors, the food and beverages sector accounts for roughly 30% of the total impact, while the heating of buildings and transport sectors represent respectively 35% and 15% of the total. If we consider only the emissions of greenhouse gases, it is food that makes the greatest contribution to climate change, with 31% of the total, surpassing heating (about 24%) and transportation (about 18%). Particularly relevant is meat consumption, accounting for 12% of total emissions, while dairy products account for about 5%. Our food choices therefore play a crucial role in the preservation of our planet, which is why we must become aware and choose accordingly.

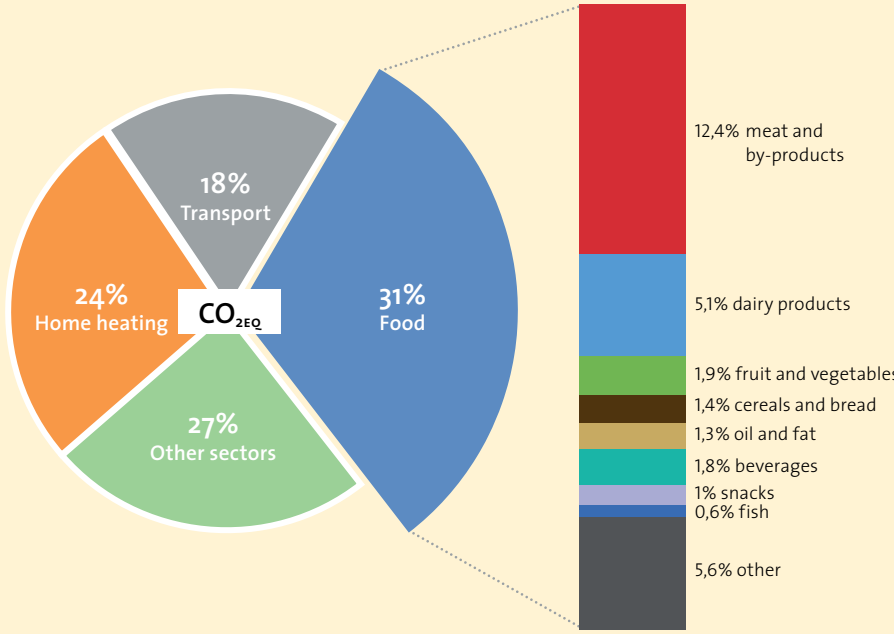


FIGURE 3.13

Factors determining the greenhouse gas emissions of European households
Source: BCFN elaboration from Tukker A., B. Jansen, "Environmental Impacts of Products", Journal of Industrial Ecology, *10, 3, 2006.*

1 Bajzelj B., K. Richards, J. Allwood, P. Smith, J. Dennis, E. Curmi, C. Gilligan C., "Importance of food-demand management for climate mitigation", *Nature Climate Change*, 4, 924-929, 2014.
2 Garnett T., "The food sustainability challenge", Food Climate Research Network, 2014.
3 Department for Energy and Climate Change, Climate-KIC and International Energy Agency, "Prosperous living for the world in 2050: insights from the Global Calculator".
4 *Ibid.*
5 Porter J. R., L. Xie, A. J. Challinor, K. Cochrane, S. M. Howden, M. M. Iqbal, D. B. Lobell, M. I. Travasso, "Food security and food production systems", *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects, Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2014.
6 Tukker A., B. Jansen, "Environmental Impacts of Products", Journal of Industrial Ecology, 10, 3, 2006.

A key factor in this is education, which is why the authorities need to remove both physical and educational obstacles that could compromise access to healthy food by the weaker sections of the population.[1]

1 For more information on the cost of diets, see our BCFN *Double Pyramid, 2015* (www.barillacfn.com/position-paper/pp-doppia-piramide-2015-le-raccomandazioniunalimentazione-sostenibile/).

TOWARD SUSTAINABLE AGRICULTURE

The field of sustainable agriculture has reached a point at which the debate is focused increasingly on agro-alimentary biotechnologies. In that context, BCFN has developed its own vision of agricultural sustainability and has used it as a reference point in examining the critical issues and opportunities in various forms of agricultural innovation. In this section we will evaluate the chief characteristics of agricultural production paradigms with respect to their sustainability.

Agriculture is a complex activity and its sustainability depends on many factors. In addition to the agro-alimentary production system in the narrowest sense (the actual productive chain), we must consider energy issues (the production and use of energy and, in particular, of fossil fuels), soil quality (soil loss and soil depletion), and the availability and use of water resources.

There is also the population variable (now and in the future) and the growing significance of migration (especially in the most critical socioeconomic contexts) as well as the impact of the various agricultural models on food security and human health (epidemics, undernutrition, malnutrition). And of course any evaluation of the world's agricultural systems must address two additional underlying themes: dietary habits (current and future, Western and otherwise) and the consequences of climate change (increase of average temperatures, changes in precipitation, extreme weather phenomena, etc.).

These variables, in their reciprocal influence and interaction, work together to describe the complex reality of world agriculture (figure 3.14). Given the possibility of energy shocks that could undermine one or more of that reality's constituent factors, it is urgent that new forms of equilibrium be found in order to make the structure sustainable over the long term.

Sustainable agriculture can be defined, briefly, as "food production that makes the best use of nature's goods and services while not damaging these assets."[2] As the UN Food and Agriculture Organization (FAO) reminds us, it: "Conserves land, water, plant and genetic resources, is environmentally non-degrading, technologically appropriate, economically viable and socially acceptable."[3]

The various models of sustainable agriculture share certain traits in their interactions with the ecosystem: they seek to protect the soil against erosion; optimize the consumption and use of water; minimize the application of plant protection products (such as herbicides, fungicides, and pesticides), synthetic fertilizers, and fossil fuel-based energy; and encourage biodiversity (which reinforces the resiliency of ecosystems and their ability to self-regulate). These measures ensure both that farmers and producers receive adequate income and that the land is protected and safeguarded.

---

2 "Food production that makes the best use of nature's goods and services while not damaging these assets" (Pretty J. N., *et al.*, "Resource-Conserving Agriculture Increases Yields in Developing Countries", *Environmental Science Technology*, 40 [4], 1114-1119, 2006).

3 FAO, 2008.

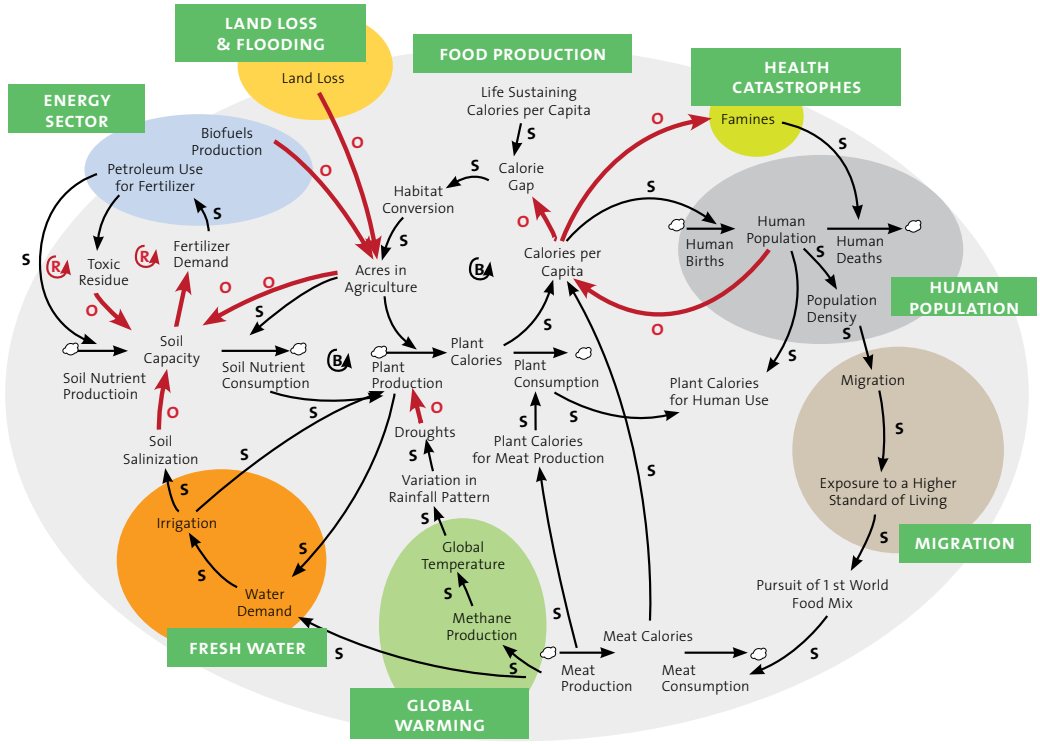


FIGURE 3.14

The model developed by the IAASTD for representing the complex system of agriculture
S: same; O: opposite; R: reinforcing; B: balancing
Source: IAASTD, 2011.

The reasons for the growing interest in forms of more sustainable agriculture reside primarily in the increased awareness of the environmental impact of farming. We need to think about a new way of approaching agriculture, since the results of the Green Revolution (the use of High-Yielding Varieties—HYV, the practice of monoculture, widespread mechanization, the contribution of agrochemicals) have on the one hand resulted in high productivity and on the other led to the often irreversible depletion of natural resources: soil erosion, water contamination, pollution of the hydrogeological basins, deforestation, loss of biodiversity.

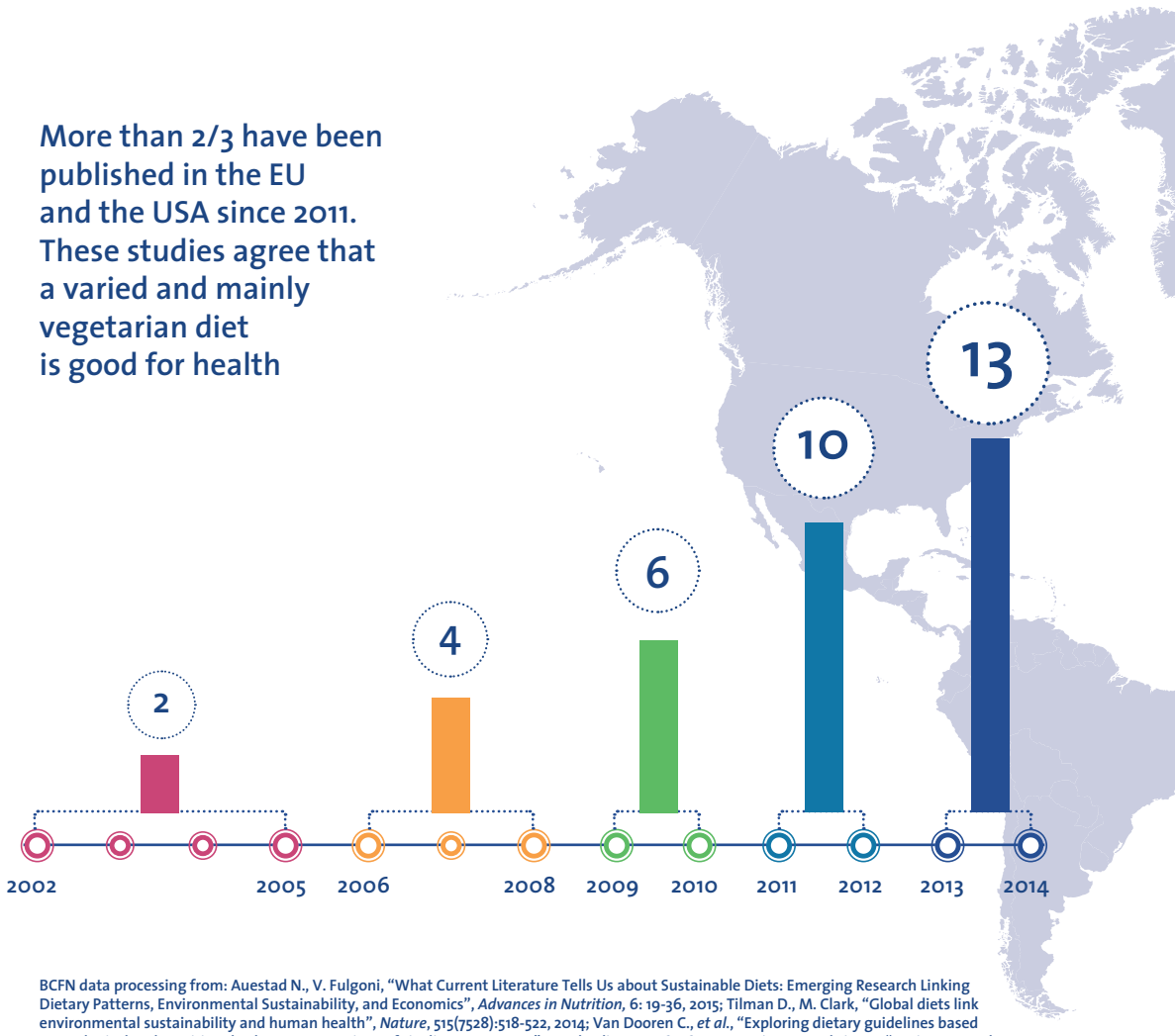
Moreover, in the last decade, the trend of growth in agricultural productivity has significantly declined, to the point that it has reached a stage of "yield stagnation" (figure 3.15). This means that the development that had characterized the first thirty years since the introduction of the intensive mono-cultural model has gradually been losing momentum.

Many studies have indicated the need to double the world's agricultural production by 2050 to meet the needs of the future population, in particular by increasing crop yields. Four core crops have been identified: corn, rice, wheat and soybeans (which

DIETS' ENVIRONMENTAL IMPACT

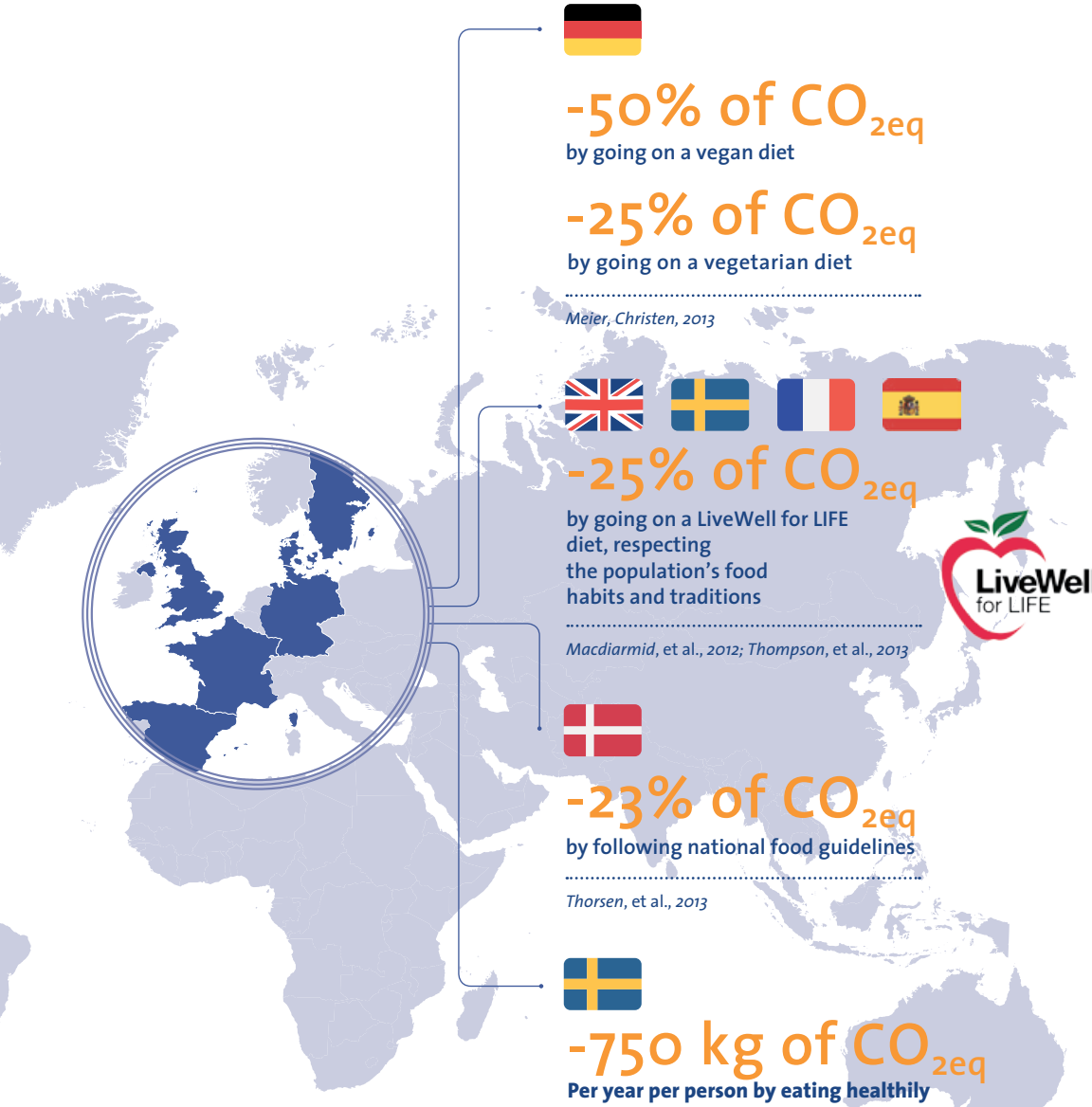
35 SCIENTIFIC STUDIES PUBLISHED IN THE LAST 12 YEARS

More than 2/3 have been published in the EU and the USA since 2011. These studies agree that a varied and mainly vegetarian diet is good for health



BCFN data processing from: Auestad N., V. Fulgoni, "What Current Literature Tells Us about Sustainable Diets: Emerging Research Linking Dietary Patterns, Environmental Sustainability, and Economics", *Advances in Nutrition*, 6: 19-36, 2015; Tilman D., M. Clark, "Global diets link environmental sustainability and human health", *Nature*, 515(7528):518-522, 2014; Van Dooren C., *et al.*, "Exploring dietary guidelines based on ecological and nutritional values: a comparison of six dietary patterns", *Food Policy*, 44: 36-46, 2014; Meier T., O. Christen, "Environmental impacts of dietary recommendations and dietary styles: Germany as an example", *Environmental Science & Technology*, 15;47(2):877-88, 2013; Macdiarmid J., *et al.*, *Livewell: a balance of healthy and sustainable food choices*, Surrey, WWF-UK 2011; Thompson S., *et al.*, *A balance of healthy and sustainable food choices for France, Spain and Sweden*, Surrey, WWF-UK 2013.

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



-50% of CO_{2eq}
by going on a vegan diet

-25% of CO_{2eq}
by going on a vegetarian diet

Meier, Christen, 2013

-25% of CO_{2eq}
by going on a LiveWell for LIFE diet, respecting the population's food habits and traditions

LiveWell for LIFE

Macdiarmid, et al., *2012; Thompson*, et al., *2013*

-23% of CO_{2eq}
by following national food guidelines

Thorsen, et al., *2013*

-750 kg of CO_{2eq}
Per year per person by eating healthily
Namely, a 5,600 km trip on a medium car, i.e. one Milan-Moscow round trip

BCFN data processing from Jordbruksverket, 2013

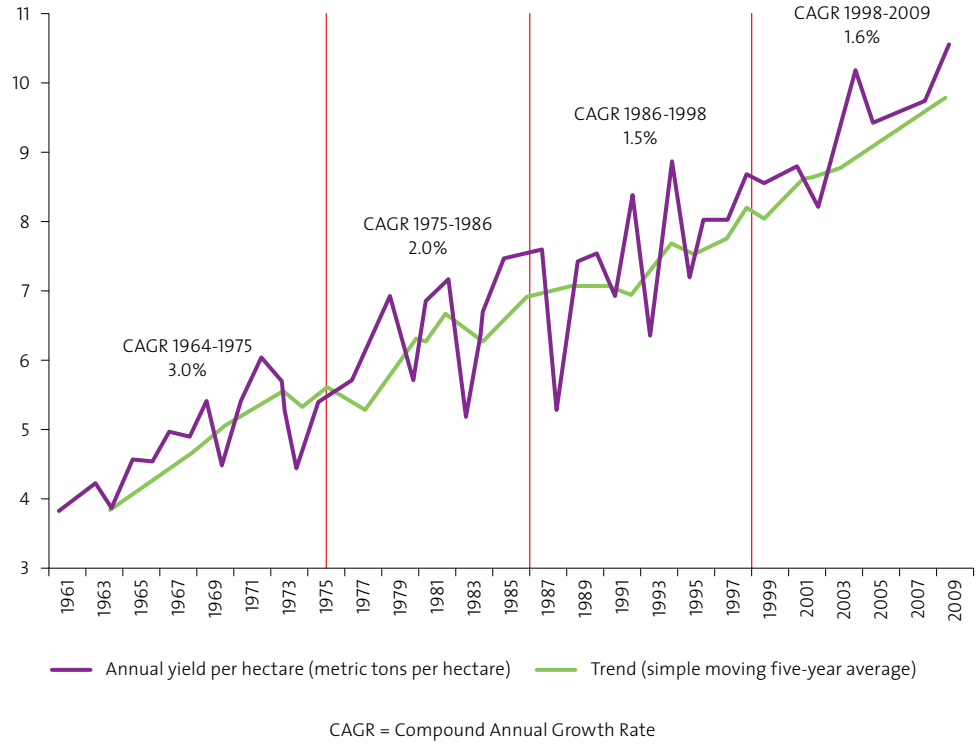


FIGURE 3.15

The trend of corn yield per hectare, USA (metric tons per hectare, 1961-2009)
Yield per hectare has been calculated as the relationship between the level of production and the area harvested, for every single year considered; the trend was identified by using a moving five-year average
Source: Elaboration of data from United States Department of Agriculture Database, 2011.

currently represent almost two-thirds of the world's agricultural production), and for these it is estimated that the growth rates of their crops correspond to 1.6%, 1.0%, 0.9% and 1.3% per year, well below the 2.4% required to double production by 2050.[4] Approaches more in line with overall sustainability are therefore being experimented, although as yet there is no clear vision of how to successfully combine production volumes, product quality and environmental, economic and social sustainability.
This is why the debate on the process of radically rethinking the models and the prevailing logic is now more open than ever.
It is essential in the first place to identify the basic requirements of the possible agricultural models, in the light of the need for sustainability.

4 Ray D. K., *et al.*, "Yield Trends Are Insufficient to Double Global Crop Production by 2050", *PLoS ONE*, 8(6), 2013.

WORLD AGRICULTURE TOWARDS 2030/2050

According to current data from the United Nations, the world population could grow by more than two billion compared to today, thus reaching 9.15 billion in 2050, and income will grow even faster. FAO estimates that agricultural production will have to grow by 60% between 2005/2007 and 2050, a lower estimate than that provided in 2009, which accounted for 70%.

This modified estimate is the result of new data on demographic and economic growth, combined with other information about the style of consumption, availability of arable land and productivity of crops.

Among all these, the factor that has contributed most to the change in the above estimate is actual global food production from the starting year on which the estimates are based: in 2005/2007 this was in fact much higher than previously estimated, especially in developing countries. On the other hand, estimates of production levels in 2050 remain unchanged.

According to the FAO this process should be based on five fundamental principles:[5]

1. Improving the efficiency of the use of natural resources

The agricultural intensification of the twentieth century—otherwise known as the Green Revolution—has led to a large increase in production without taking care of efficient use of other resources, such as land and water. In future the solutions to poor productivity will need to take into account the wide diversity of conditions and needs. It will also be essential to connect services and research at local, national and international level, so as to promote the application of techniques and farming practices that promote the efficient use of resources.

2. Conserve, protect and improve natural resources

Degradation of ecosystems has a direct impact on the amount of food available and on the income of the poorest sectors of the population, thereby increasing their vulnerability and fueling a vicious cycle of poverty, degradation and hunger. The policies should therefore take this into account, by providing incentives and reforms which address the importance of natural resources and their social value.

3. Propose a type of agriculture that protects and enhances fairness and quality of social welfare in rural areas

The lives of many people living in rural areas depend on their possibility to access natural resources and use them for food production, both for themselves and as a source of income. This is especially true for women, who represent the majority of the population who suffer from hunger and discrimination. It is therefore essential to increase the entrepreneurial capacity of small producers, so as to allow them to become an active part of the local, regional and international market. Higher local incomes

5 FAO, *Building a common vision for sustainable food and agriculture*, 2014 (www.fao.org/3/ai3940e.pdf).

increase demand for local products and services, which in turn generate employment and economic revenue, thereby reducing poverty.

4. Focus attention on the resilience, of the people, of the communities and of the ecosystems

Resilience is defined as the ability of a system to anticipate, absorb or recover from the effects of an external event, restoring its essential functions efficiently and quickly. In the context of food production this refers to the ability of the agri-food industry to maintain its level of productivity preventing and mitigating risks, adapting to change and recovering from the shock suffered (climate instability, extreme weather events, variability of market prices or the political context, etc.). Resilience can be increased by policies including strategies for risk management or insurance and a social safety net.

5. Implementing a policy that is responsible and effective in order to ensure the sustainability of the agri-food system

A good governance structure will be crucial to ensure social justice, fairness and a long term perspective regarding the protection of natural resources. A series of wide-ranging consultations, accompanied by a transparent discussion will be required to build consensus on the objectives of sustainability.

Implementing a clear agenda for sustainable agricultural development will lay the foundations for formulating policies that support the implementation of appropriate local measures. A combination of scientific evidence and traditional knowledge is essential in defining the legitimacy of the policies. Many countries will also have to increase their participation in international government mechanisms, and give feedback of their progress on shared objectives.

It is also suggested that these five principles should be applied by: establishing scientific evidence; involving all the stakeholders in a constructive dialogue to ensure a common approach; developing innovative solutions and approaches; and formulating ways of fostering change in the agri-food sector. These actions need not take place necessarily in that order but will vary depending on the location and scale in question. Coordination is essential. Since sustainability has multiple objectives, it is important to adopt an approach that will facilitate dialogue between key stakeholders from local to global level, in order to highlight the fundamental differences on the different scales and taking into account all the bio-physical and socio-economic factors.

An example of an integrated approach useful to keeping account of the different challenges regarding food security and climate change is what is known as Climate Smart Agriculture (CSA): this aims to improve economic sustainability—providing support to the development of economic revenue in the agricultural sector, social—developing resilience of the food system to the different effects of climate change, and environmental—reducing or eliminating greenhouse gas emissions.[6]

6 FAO, *Climate-Smart Agriculture: A call for action*, 2015 (www.fao.org/3/a-i4904e.pdf).

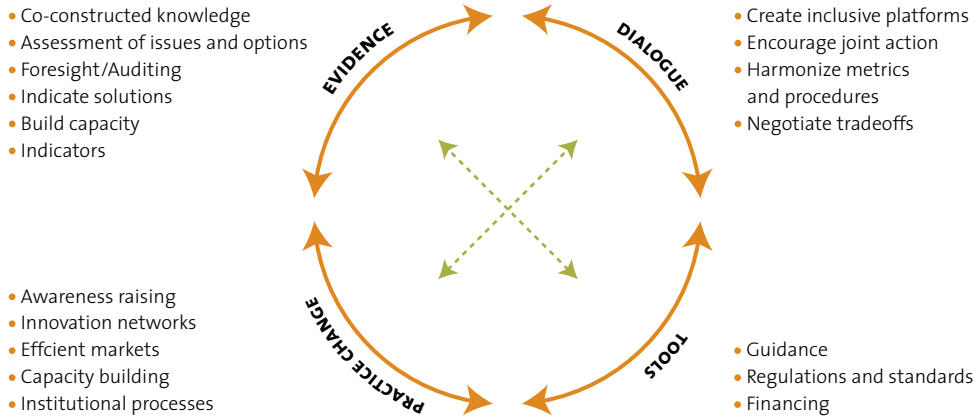


FIGURE 3.16

Operating sustainability: four broad areas of action
Source: FAO, 2014.

Other examples of programs supported by the FAO to promote sustainable agriculture are Sustainable Land Management, a multi-sector approach to land management that aims to improve productivity through better organization and planning. Another example is the program "Energy Smart Food for People and Climate," which caters to the food-water-energy nexus in the context of climate change. This aims to improve access to renewable and other forms of energy, so as to develop systems that will help both reduce greenhouse gas emissions and increase the resilience of rural communities most affected by climate change.[7]

3.6 SUSTAINABLE FOOD VALUE CHAIN

Value chains (VC) have been established in the past decade as one of the main concepts in development projects. Much of the literature produced focuses on specific aspects of this concept and its implementation, but is dedicated to a limited audience. The FAO has instead decided to focus its attention on the Sustainable Food Value Chain—SFVC, developing practical guidance on how to implement this concept.
A Sustainable Food Value Chain includes all farms and companies and their subsequent activities to transform raw materials into food products sold and disposed of in a manner that is profitable in every area of society and that does not permanently destroy natural resources. This concept emphasizes the importance of three elements simultaneously: firstly it recognizes that value chains are a dynamic process, market-driven, and that a consistent policy is of fundamental importance at all levels. Secondly, the concept is applied broadly, usually so as to comprise all the steps of a

7 FAO, *Building a common vision for sustainable food and agriculture*, 2014 (www.fao.org/3/ai3940e.pdf).

specific sector at national level (corn, salmon, etc.). Finally, added value and sustainability are considered as measures of performance and are valued at a more highly aggregated level.
The development of a chain of this type is based on the premise that a lack of food security is the first symptom of poverty, therefore added value needs to be created in five areas 1) wages for workers; 2) profit for entrepreneurs; 3) adequate taxes for the government; 4) better food choice for consumers and 5) impact on the environment.
This type of supply chain alone is not enough to solve all the problems of the agri-food system, which is why government programs supporting the SFVC are needed. However, these are often financed with the taxes from the SFVC, so they will have to be at the center of any strategy aimed at eliminating long-term hunger and poverty.

3.7 THE SUSTAINABILITY OF THE SYSTEMS USED TO GROW DURUM WHEAT: THE CASE OF BARILLA

In continuity with the positions held in this chapter, the Barilla case is shown below.
For several years, Barilla has been pursuing a series of experimental activities and data collection aimed at identifying critical points and spreading information and tools for improving economic and environmental efficiency of durum wheat in Italy.
Its most significant findings and conclusions are shown here.
Among the various studies available today it has been demonstrated how the agricultural phase is one of the most relevant to the environmental impact of pasta production (figure 3.17).

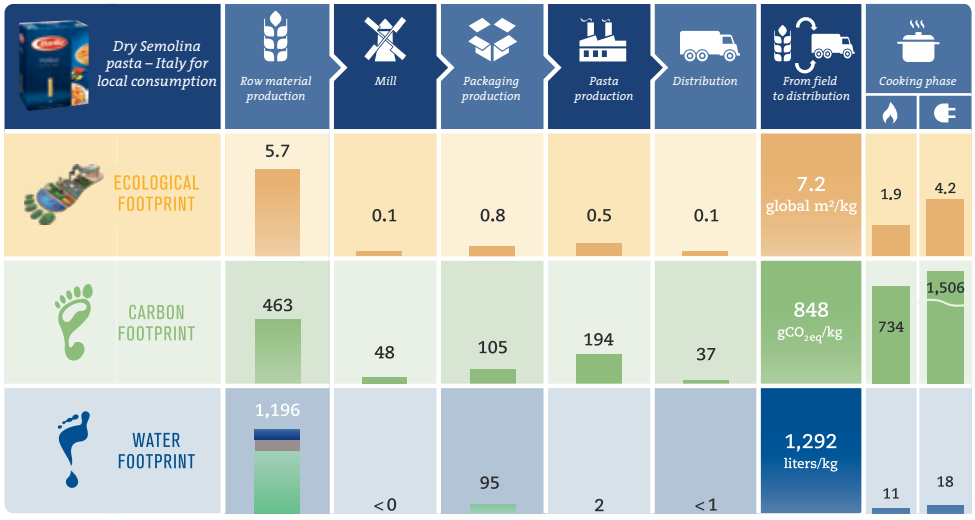


FIGURE 3.17

Environmental impact of pasta production
Source: www.environdec.com.

Lombard-venetian plain				
Cultivation of Corn	corn	durum wheat	corn	corn
Industrial	soy	durum wheat	rapeseed	corn

Emilia-Romagna				
Cultivation of Cereal Grains	corn	durum wheat	sorghum	common wheat
Industrial	soy	durum wheat	corn	common wheat
Cultivation of Vegetables	tomatoes	durum wheat	corn	common wheat

Central Italy				
Cultivation of Cereal Grains	durum wheat	durum wheat	sorghum	durum wheat
Protein	garden peas	durum wheat	garden peas	durum wheat
Pasturage	alfalfa	alfalfa	alfalfa	durum wheat
Industrial	sunflower	durum wheat	rapeseed	durum wheat

Southern Italy and islands				
Cultivation of Cereal Grains	durum wheat	durum wheat	durum wheat	durum wheat
Pasturage	pasturage	durum wheat	pasturage	durum wheat
Protein	chickpeas	durum wheat	chickpeas	durum wheat
Industrial	tomatoes	durum wheat	durum wheat	durum wheat

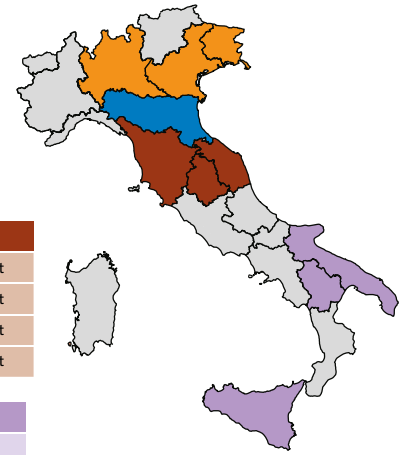


FIGURE 3.18

Crop rotations studied in the four macro-areas of Italy
Source: Filiera Grano Duro News, *18, 2011.*

In the light of this evidence, Barilla commissioned a study to analyze and compare different models of agriculture for growing durum wheat, with the aim of identifying more efficient and "sustainable" agricultural systems to be applied in different national production areas, improving both the quality and profitability of the wheat produced in this way.

From the point of view of technique four main areas were examined: the Lombardy and Veneto plain, Emilia-Romagna, central Italy (Tuscany, Umbria and Marche) and Southern Italy and islands (Puglia, Basilicata and Sicily) (figure 3.18). For all these macro-areas cultivation alternation and the most common methods used to grow durum wheat were identified.

Agronomic and economic studies were supported by environmental assessments conducted using the Life Cycle Assessment (LCA) methodology summed up with three indicators: Water Footprint, Carbon Footprint and Ecological Footprint.

The study showed how in many cases Italian growers, using the correct crop rotation, can reduce the emission of CO_2 (up to 40%, i.e. 400 kg of CO_{2eq} per ton of durum wheat in the case of central and southern Italy) and other environmental impacts while improving profitability (first of all, cost optimization) and product quality. For example, figure 3.19 (A, B, C) shows some of the results of the study on Carbon Footprint and gross income generated.

By analyzing the many results collected to date, it is clear how with proper crop rotation and optimization of all other practices (tillage, fertilization, etc.) environ-

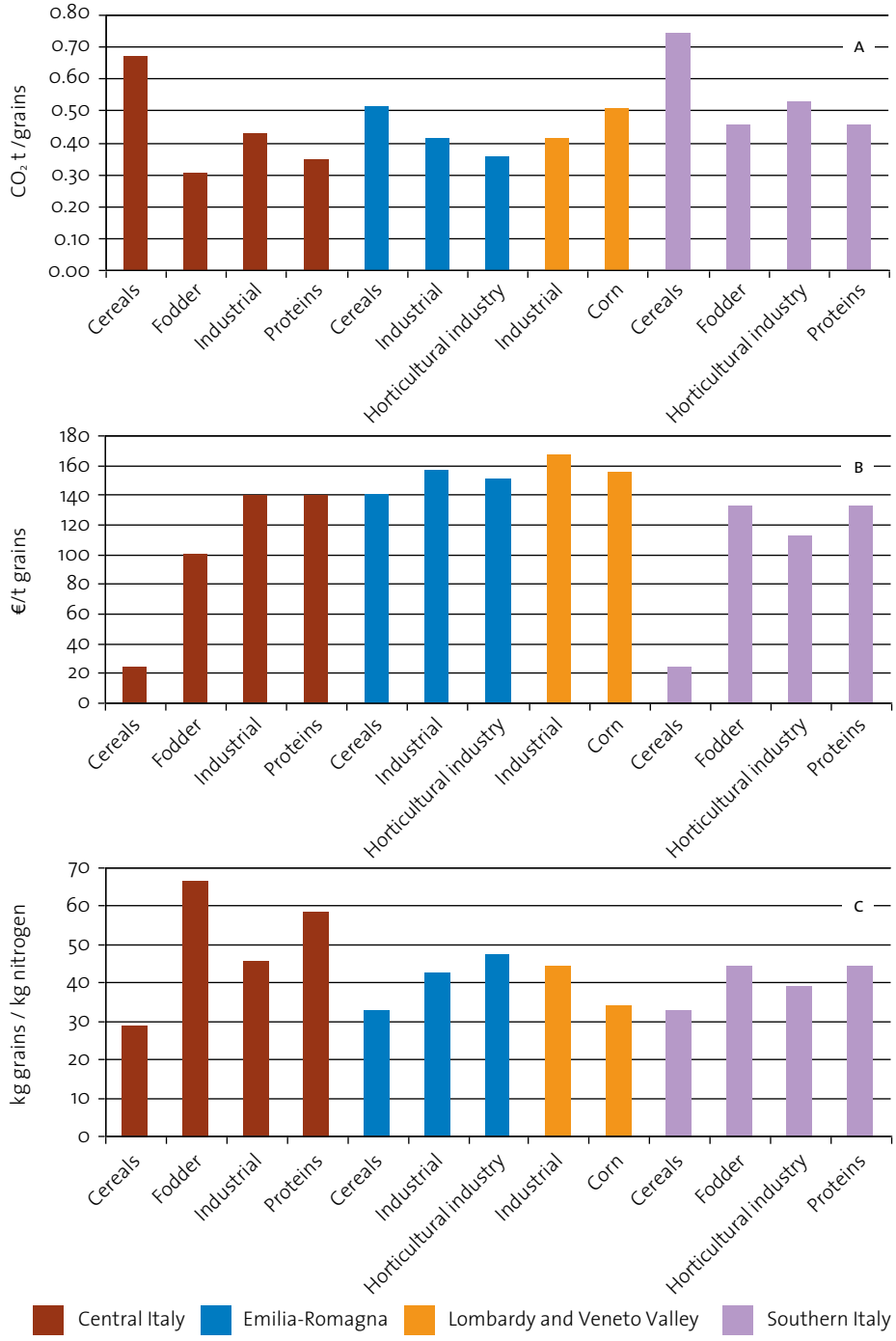


FIGURE 3.19

Agricultural systems' effects on: A – Carbon Footprint (t CO_2/t grains); B – gross income (€/t); C – nitrogen's use effectiveness (kg grains/kg nitrogen)
Source: Filiera Grano Duro News, *18, 2011.*

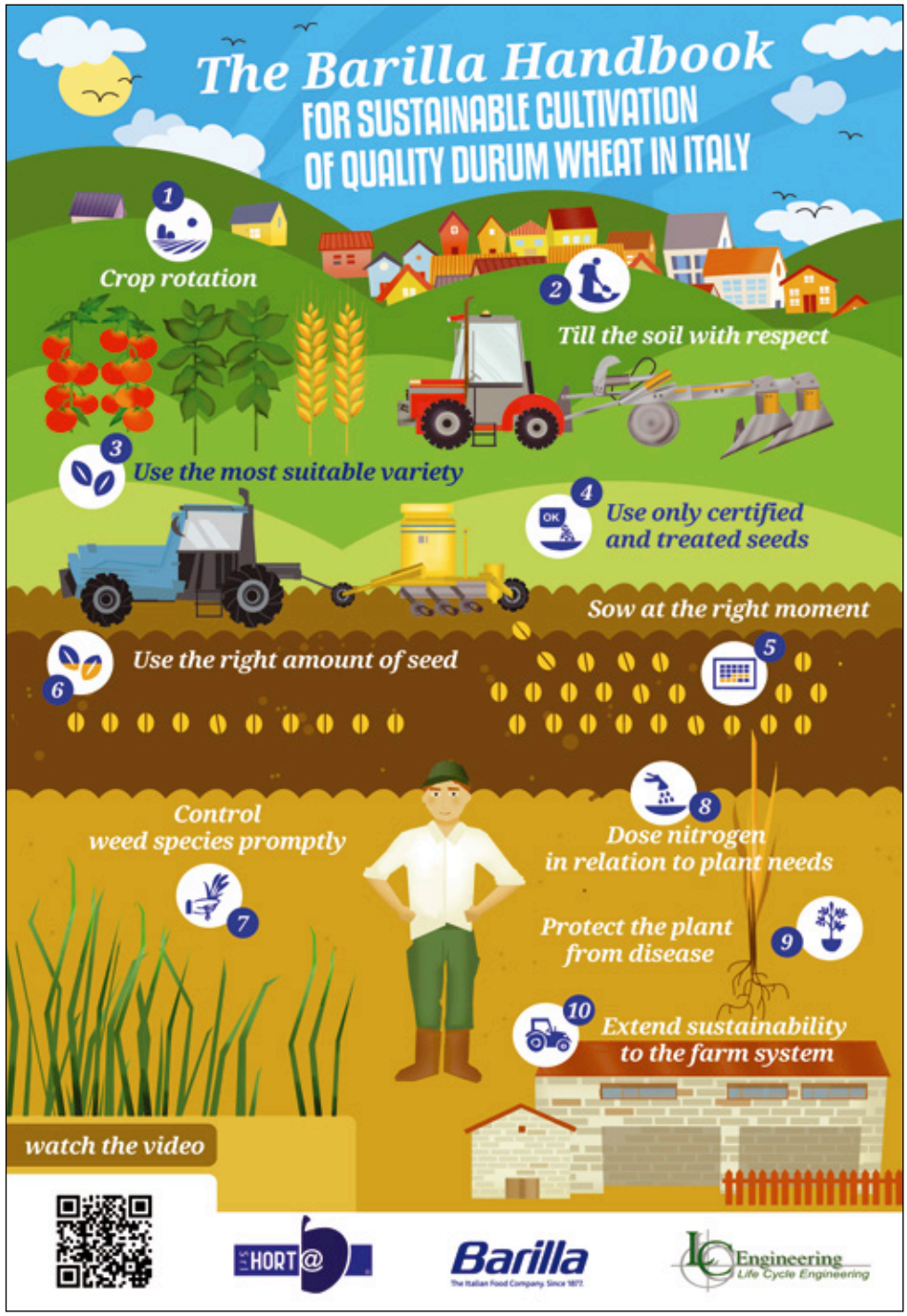


FIGURE 3.20

The Barilla Handbook for Sustainable Cultivation of Quality Durum Wheat
Source: BCFN.

mental impact can be drastically reduced, with better returns for the farmer: it is therefore not only more sustainable from the environmental point of view but also economically.
The Barilla Handbook for Sustainable Cultivation of Quality Durum Wheat was produced to consolidate these results. A similar study was started on other cereals (e.g. wheat) and in other countries (such as Greece and Turkey).

The Barilla Handbook for Sustainable Cultivation of Quality Durum Wheat contains some basic rules and tips:
1. Crop rotation;
2. Till the soil with respect;
3. Use the most suitable variety;
4. Use only certified and treated seeds;
5. Sow at the right moment;
6. Use the right amount of seed;
7. Control weed species promptly;
8. Dose nitrogen in relation to plant needs;
9. Protect the plants from disease;
10. Extend sustainability to the farm system.

An online Decision Support System (DSS) was also set up for farmers, called granoduro.net.
Granoduro.net assists and suggests in real-time which practices to adopt, making use of meteorological data, soil characteristics, mathematical models and field observations.

Barilla has for many years made agreements with farmers' associations for the production of durum wheat. For several years Barilla has also been promoting sustainable cultivation of durum wheat by using the farming techniques in the *Handbook for Sustainable Cultivation of Quality Durum Wheat* and thanks to Decision Support Systems (DSS) with less environmental impact and which ensure greater economic sustainability for farmers. As the *Handbook* suggests, Barilla encourages the rotation of durum wheat with other plants to improve soil fertility, reduce the incidence of fungal diseases and the spread of weeds, thus promoting biodiversity.
Besides its integrated supply chain on durum wheat, Barilla also promotes joint activities and synergies with other crop chains developing horizontal collaboration with other reliable players in the Italian agri-food sector who have embarked on a similar path of environmental, economic and social sustainability.
In this way farmers are supported in the development of a system of multi-annual sustainable cultivation, ensuring commercial outlets to all the crops in rotation.
Barilla, therefore, intends to extend the program to as many sectors, crops and partners possible, creating a competitive advantage for the Italian agro-food system.

By the end of 2014, Italy produced more than 85,000 tons of wheat under BSF condi-

FIGURE 3.21

Net profits in €/ha. Comparison between Common farming and BSF (Barilla Sustainable Farming)
Source: BCFN 2015

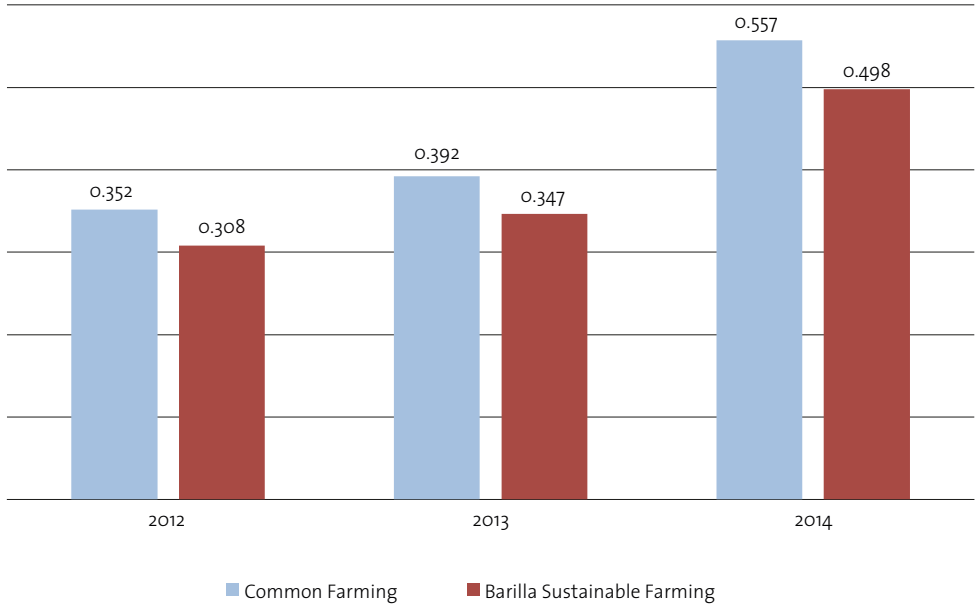


FIGURE 3.22

Carbon footprint in t CO_{2eq}/t. Comparison between Common farming and BSF (Barilla Sustainable Farming)
Source: BCFN 2015

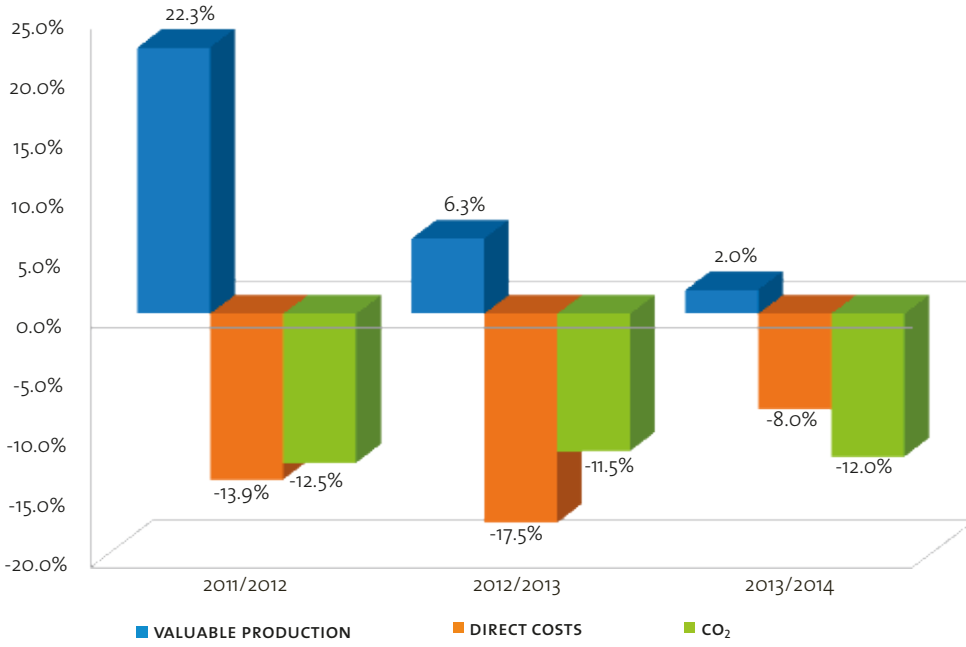


FIGURE 3.23

Value of production per hectare, of direct costs and CO_2 emissions, or carbon footprint
Production value per hectare has been calculated multiplying production in t/ha by its price in €/t, adding a further price in €/t for protein contents higher than 13.5%. For direct costs, production value is the sum of all costs for cultivating durum wheat, measured in €/ha.
Source: BCFN 2015

tions while in 2015 over 125,000 tons were produced. Between 2012 and 2014, using the BSF method net gain per hectare has always been greater than with the traditional method. For example, in 2014 it was almost €970, compared to the gain of €850 per hectare of the traditional method.

A three-year comparison of the aggregate results obtained between traditional agricultural methods and the BSF method shows that all the indicators confirm the positive benefits with an increase in gross production, reduction of direct costs and reduction of CO_{2eq}.
The chart in the figure 3.23 shows the value of production per hectare (calculated by multiplying production in t/ha by its price in €/t, and adding an additional price in €/t for a protein content of over 13.5%), direct costs (i.e. the sum of all the costs of durum wheat cultivation, measured in €/ha) and carbon dioxide emissions, or carbon footprint (representing the total emissions of greenhouse gases generated by the entire production chain, measured in tons of carbon dioxide equivalent).

THE WATER ECONOMY AND THE EMERGENCY IT CONFRONTS

The water economy is the science that studies the way in which water resources, which are limited by nature, must be managed in order satisfy the growing needs of man without creating social inequalities and unsustainable environmental impacts.
That water is precious is something we realize only when it begins to run short. Until now, water scarcity might have appeared to be restricted to less fortunate countries, but matters might quickly change because "quality water"– fresh, unpolluted water – constitutes only a minimal percentage of our water reserves. And we are constantly using increasing quantities of it, both because the world population is rising and because the growing prosperity of many countries leads people to consume (and waste) more and more water. That consumption should be considered not only in real terms (that is, by calculating the quantities used for personal care, for cooking, and for cleaning house), but also in the virtual terms of the water footprint (all the water that has been used throughout the life cycle) of any product or service we consume. As we noted earlier, one of the best ways to reduce one's virtual water footprint is to change to a diet rich in fruit, vegetables, and cereal grains, while limiting the quantity of animal proteins.
If demand grows and resources dwindle—in part because of both pollution and climate change—then clearly the economic value of water will grow and the inequitable gap between those who have plenty of water and those who do not will provoke new frictions and conflicts. We know full well the nature of the interests and the dire litigious tensions that revolve around the control of petroleum deposits. Conflicts over water might well be far more serious. After all, in the end one can survive without oil.
What is therefore necessary is a concerted effort to adopt a more rational use of water, especially in agriculture (which consumes 70% of total freshwater) and on a personal level (for instance, with water-saving diets). We also need to formulate a new set of regulations that really will ensure the right to water while defining the boundaries of privatization. While privatization may entail certain advantages in terms of greater efficiency in the management of water sources, it must be closely controlled to avoid unfair price increases and limited accessibility for the more vulnerable members of the population at large.

3.8 THE AVAILABILITY OF WATER: FROM ABUNDANCE TO SCARCITY

To understand the current scenario in terms of water resources, we must consider the availability of water and its various uses, present and future, in agriculture, industry, and in our homes. That means, in turn, taking into account the global factors that will affect water consumption (demographic increase, rising prosperity of the population with a resulting modification of lifestyles and eating habits, urbanization and expansion of economic activities, and the production of biofuels) and the reduction of the available water reserves (climate change and pollution in particular) (figure 3.24).

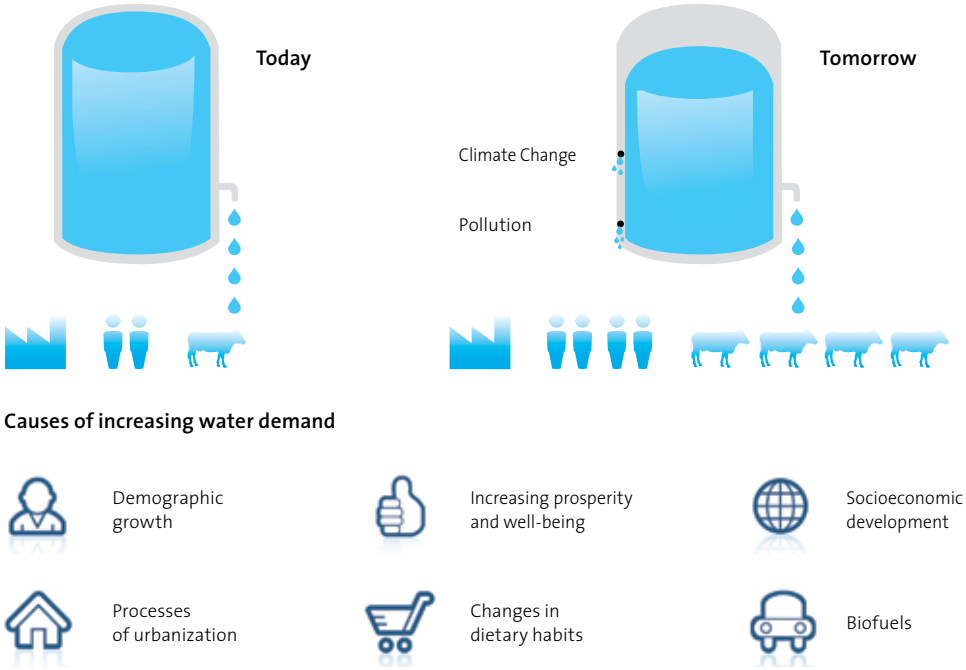


FIGURE 3.24

The current and future scenario of water resources
Source: BCFN, 2011.

How much water do we have? Overall, our planet possesses some 1.4 billion cubic kilometers of water. It is estimated, however, that less than 45,000 cubic kilometers of water (0.003% of the total) are theoretically usable and only 9,000 to 14,000 cubic kilometers of water (approximately 0.001% of the total) is actually available for use by human beings, because it is of adequate quality and is accessible at an acceptable cost. Freshwater resources are also distributed very unequally among the regions of the globe: 64.4% of all world water resources are found in just 13 countries. A growing number of countries, on the other hand, find themselves gravely short of water, with annual per capita availability of less than 1,000 cubic meters.

How we use water: farming, industry, and families. The agriculture sector accounts for 70% of global freshwater consumption, while 22% goes to industry and the remaining 8% to domestic uses. The share allocated to agriculture is even greater in countries with a low to medium incomes (in some developing countries it reaches 95%), while in developed countries the share given to industry is by far predominant (59%). Regarding domestic use of water, over one in six people in the world does not reach the minimum standards set out by the UN of 20-50 liters of fresh water per person per day, necessary to ensure the basic needs of hygiene. These figures do not

take into account the "invisible" water contained in our food, and which in Italy contributes 89% of our daily water footprint. On average a person consumes two liters of water a day for drinking, while unknowingly using up 5,000 for food. This "invisible" content comes from virtual water, i.e. the amount of water used to produce a given food. The total amount of water contained in food depends on many factors, including the food system and geographic location. For example, the meat produced in intensive farming requires five times more water than livestock grazing.

The scarsity of water, now and in the future. Demand for water is already quite high and, absent serious action, will only grow in the future and lead to a progressive scarcity, especially in certain areas of the planet. From an environmental point of view, water is considered to be "scarce" when more than 75% of the fluvial and subterranean water resources are drawn upon for use in agriculture, in industry, and for domestic use. In such cases the exploitation is coming close to (or may have even exceeded) the limit of sustainability. The scenario foreseen for 2025 in terms of the scarcity of water appears starkly worse than the current scenario. Areas using a large share of available resources (greater than 20%) will increase substantially, expanding to the entire territory of the United States, continental Europe, and southern Asia, and worsening significantly in terms of percentage values in ample areas of Africa and the Indian peninsula.

Why demand for water is increasing. Among the factors that will influence the growth of world demand for water, an especially significant role will be played by population dynamics and the growing rate of urbanization. Estimates indicate that global population will rise to more than 8,5 billion people in 2030 and reach almost 10 billion in 2050. Freshwater directly usable by ecosystems and by man is less than 1% of all water resources on the planet. Numerous populations in the world live under conditions of water scarcity, or have access to less than 1,700 m^3 of water per capita per year. This value, which denotes the threshold below which water stress is present, is called the Falkenmark indicator. Moreover we should consider that feeding the nearly ten billion people expected to populate the Earth in 2050 will require an increase in water consumption of at least 20%, compared with a greater demand for food (which will reach approximately +50% in 2030 and +70% in 2050). The growing world population and spending power in developing countries will be accompanied by a change in eating habits and increased calorie consumption (for example, in the last twenty years meat consumption in China has more than doubled and by 2030 will have doubled again). This results in an increase in water consumption, given that, as we will see shortly, the production of meat, milk, sugar and vegetable oils requires on average a larger amount of water than the production of cereals.
Meanwhile, the process of urbanization is accelerating sharply. In 2007, for the first time in history, the world's urban population outstripped its rural population, with clear and direct consequences in terms of infrastructure for access to water. The investments needed to ensure distribution of water to the growing number of city dwellers are rising, as are those for the corresponding treatment and purification of waste water from domestic and industrial use.

Economic development is also a key driver of the future rise in demand for water. Improvements in economic and living conditions in developing countries, as well as the general expansion of economic activities (ranging from industrial production to the service industry and tourism), exert growing pressures on available water resources and on natural ecosystems. Above all, the rising global demand for energy puts massive pressure on water resources. Specifically, the energy demand in 2035 will have

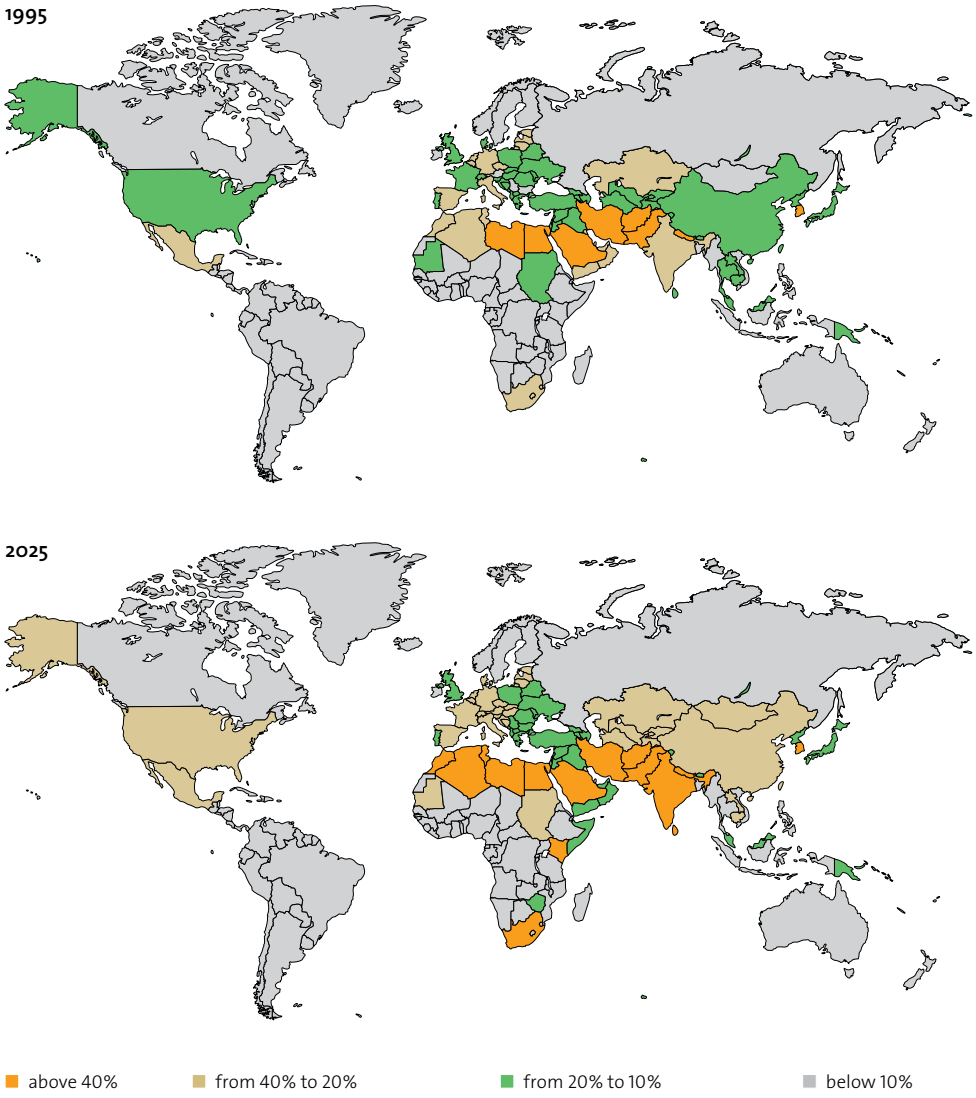


FIGURE 3.25

Amount of water used compared with available resources. Two scenarios compared: 1995 and 2025
Source: WBCSD, Business in the World of Water. WBCSD Water Scenarios 2025, *2006.*

increased by a third compared to 2011 (in particular in China and India, but also in the Middle East and South East Asia). On the one hand the use of hydroelectric power will have increased by 60% in 2030 compared to 2004, on the other the production of biofuels, which today already occupies about 3% of the world's agricultural land, will be 10 times higher in 2030 than in 2005.
Finally, we need to bear in mind that climate change will alter precipitations, evaporation, temperature and the number of extreme events such as droughts and floods. It has been estimated that an increase of just 2 °C in current temperatures will lead to a 40% increase in the number of people living in conditions of absolute water scarcity.

Why water availability is declining. Among the chief causes of reduced water availability is pollution, which threatens water quality. In particular, economic development and access to market economies by large numbers of people who had long been excluded from mass consumption are generating serious problems, especially in terms of waste management. Certain statistics throw a harsh light on the scale of the problem: it is estimated that every day 2 million metric tons of waste generated by human activity are dumped into watercourses. The food sector accounts for 40% of organic pollutants in water supplies in developed countries and 54% in developing countries. In developing countries, 70% of industrial waste is dumped into rivers and streams without any purifying treatment whatever, which results in the pollution of a substantial part of available freshwater resources.
Another major factor that will affect the future availability of water resources is climate change. By now there is a broad consensus about the effects of climate change on water and its availability: a sharp decline in the area of the Earth's surface and oceans that is covered with ice, a substantial increase in average sea level, a gradual shift toward the poles of non-tropical storms (with resulting significant effects on winds, precipitation, and temperatures), as well as a significant increase in the frequency of "extreme" weather phenomena, such as intense precipitation or strong heat waves.
Furthermore, in some countries the main problem is not scarcity, but poor management of water resources: water as a resource is often undervalued by governments, who waste and exploit it.
The future that looms before us therefore appears especially challenging. It demands immediate choices that must be both wise and courageous, and capable of altering current trends. There is no mistaking the necessity for indepth reflection that is directed toward identifying a truly sustainable model of growth that can ensure access to food for a growing world population in the face of increasingly scarce water resources.

3.9 THE RIGHT OF ACCESS TO WATER: REALITY AND PROSPECTS

Today, at least 30,000 people die every day from lack of water. To these are to be added the 2.2 million deaths from diseases related to water contamination. According to data from UNICEF in 2015, 748 million people worldwide still lack access to safe drinking water. On average, about 1,000 children die every day from diseases related to unsafe water, lack of sanitation and poor hygiene.

The "right to water"—recognized for the first time in history, and only recently, as a fundamental and essential human right through a UN resolution dated 29 July 2010 – takes the concrete form of the right of each individual, without discrimination, to enjoy physical and economic access to an adequate and secure supply of water. Making drinking water accessible in sufficient quantity and quality to meet the primary needs of every person was Target 7.C of the Millennium Development Goals (MDG), which aimed to "halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation."

The actions designed to improve water supply and basic sanitation in a community cannot be adopted in isolation. They must be framed within the context of an overall cross-sector development strategy that takes into account infrastructure, education, and high standards of governance. In fact, to attain effective and sustainable operation of structures over time has required periodic maintenance activities, as well as the training and creation of an adequate professional staff. Moreover, the distribution of information about how to collect and store water resources in homes is a critical factor in preserving the taste and smell of fresh water and in preventing the creation of potential environments for disease-bearing parasites. To achieve the goals set by the United Nations has required the coordinated involvement of all actors, both on a local scale and internationally, whether they are public agencies or private organizations.

3.10 CHOICES AND BEHAVIORS FOR SUSTAINABLE WATER CONSUMPTION

As clearly stated in the book *L'acqua che mangiamo*:[8] "The water footprint of an individual, a community or a business is defined as the total volume of water used to produce goods and services consumed by that individual, community or business. Water consumption is measured as the sum of the water volumes used and/or polluted in the production phases of any given good or service." The term "virtual" refers to the fact that most of this water is not contained physically in the product, but has to do with the direct and indirect consumption necessary for its production.

A comparison of the water footprint (expressed in cubic meters per metric ton) of certain agricultural products in a number of countries around the world reveals substantial differences, both when you compare different products with one another, and when you take into consideration the place of production. In particular, livestock and dairy products (meat, eggs, milk, and derivatives) present a greater water footprint than cultivated products, because livestock consumes a significant quantity of cultivated products as food, in some cases for many years before being transformed into food products. Moreover, the water footprint of a single product can vary considerably from one place to another, depending on such factors as climate, the agricultural techniques employed, the yield of crops, etc.

It is important to emphasize how the impact on water systems is not caused simply by the amount of water used but by other variables, such as the context from which it is

8 Antonelli M., F. Greco, (eds.), *L'acqua che mangiamo*, Edizioni Ambiente, Milan 2013.

NOT ALL WATER IS BLUE

When talking of water and its consumption, experts divide water resources into three categories.

- Blue water: contained in lakes, rivers or underground aquifers. It can come from renewable sources, which are recharged by rainfall or snowmelt, or from non-renewable sources, as in the case of water extracted from fossil aquifers.[1]
- Green water: rain water or snow that falls to the ground but that does not become blue because it evaporates or is transpired through plants. It represents 84% of the water used in agriculture[2] and its use has a less invasive impact on environmental balance.[3] Green water cannot be transported and has no uses other than for agriculture.
- Grey water: is an indicator of water pollution due to a manufacturing process. It is measured as the amount of water needed to dilute the contaminants of the production process so that the standards of water quality of the place where the production process takes place are guaranteed. Grey water is not therefore a source of additional water for human use.

1 Antonelli M., F. Greco, (eds.), *L'acqua che mangiamo*, Edizioni Ambiente, Milan 2013.
2 Fader M., D. Gerten, M. Thammer, J. Heinke, H. Lotze-Campen, W. Lucht, W. Cramer, "Internal and external green-blue agricultural water footprints of nations, and related water and land savings through trade", *Hydrology and Earth System Science*, 15, 1641-1660, 2011.
3 Aldaya M. M., J. A. Allan, A. Y. Hoekstra, "Strategic importance of green water in international crop trade", *Ecological Economics* 69, 887-894, 2010.

removed (where water may be scarce rather than abundant) and the type of water used (green or blue).

Figure 3.26 shows the quantities of virtual water linked to certain kinds of easily identified mass market products and finished industrial products. The water footprint of some of them may appear surprising.
As we have seen, our consumption and behavior, particularly our eating habits, imply higher or lower water consumption.
On average a person drinks between two and five liters of water a day, while virtual water consumption for food varies from about 1,500-2,600 liters for a vegetarian diet to about 4,000-5,400 for a diet where meat is plentiful. If the world population adopted a "western" style diet, with high meat consumption, an extra 75% of water currently used to produce food would be needed. A Mediterranean diet, on the other hand, would save over 2,000 liters of water per day per person.
As we described in section 3.1, the Barilla Center for Food & Nutrition has developed the Double Pyramid to describe both the principles of a sound diet and the impacts that diet has on the environment. In the environmental pyramid on the right, the foods with the greatest environmental impact are at the top and the foods with the lowest impact are at the bottom. Figure 3.27 shows the food pyramid adjoining the environmental pyramid of water, in which the different food categories are arranged in hierarchical order, depending on their environmental impact in terms of the water footprint.

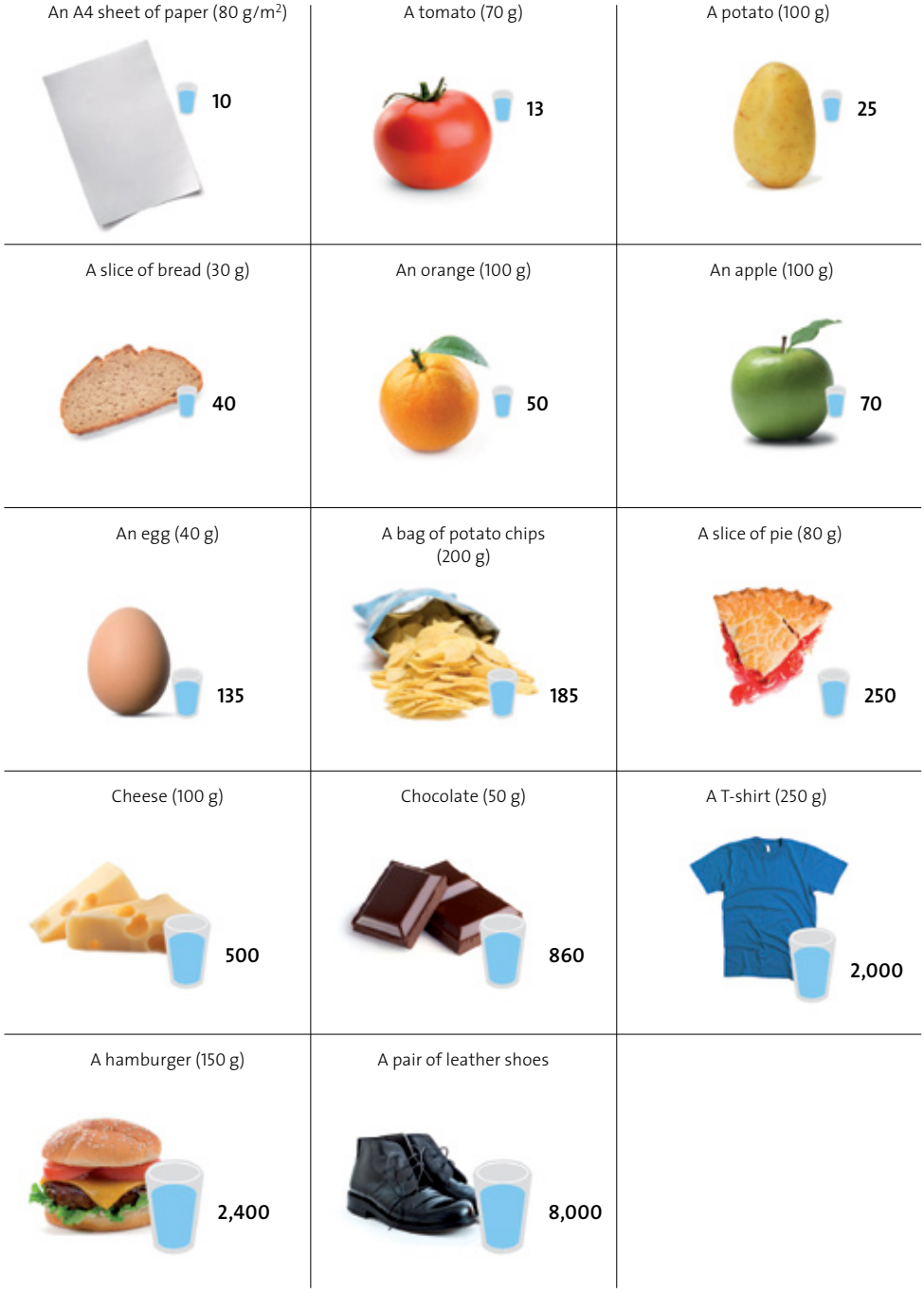


FIGURE 3.26

Average global water footprint of certain commonly used product typologies
Source: BCFN, 2011.

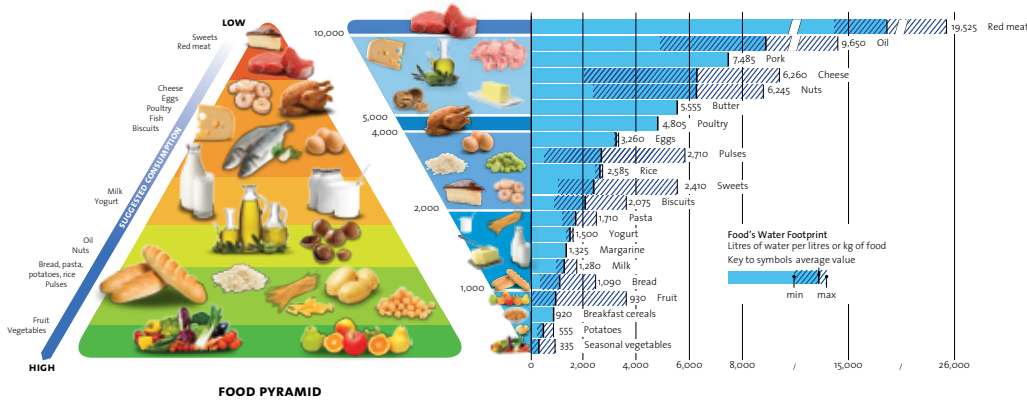


FIGURE 3.27

Water footprint of the food pyramid (liters of water per kg or liter of food)
Source: BCFN Foundation, 2015.

There can be no doubt that most of the foods recommended for relatively higher consumption are also those that present a smaller water footprint. And vice versa: most of the foods recommended for low consumption are those that also impose a larger water footprint.
By analyzing the water footprint of the most widespread and commonly consumed beverages, it is possible to build another pyramid, which shows the water consumption required in order to produce each of those beverages (figure 3.28).
Eating habits, therefore, entail substantial environmental fallout as well as nutritional effects. To illustrate the differences we have drawn up two daily menus, both balanced in nutritional terms, and then we have calculated their impacts in terms of water consumption (figure 3.29). The first daily menu calls for a diet that is rich in plant-based proteins and with few animal fats; the second is based on the consumption (actually rather limited consumption), of red meat. If we compare the water footprints of the two menus, it is clear that including dairy and livestock products such as milk and meat, however minimal, results in approximately three times the consumption of water resources.

This is simply because of the considerable quantities of agricultural products fed to the livestock in order to bring them to market as food. A menu heavy on animal-based food products is decidedly less sustainable as a result.
It is clear that individual eating habits, especially multiplied across whole societies, can have a very substantial impact on the availability of water resources. If everyone on the planet were to adopt the average, high meat-consumption dietary regimen of the Western nations, the amount of water used in food production would soar by an estimated 75%. Given the strain water supplies are already under, this would clearly be unsustainable. Instead, adopting a Mediterranean-type diet can save more than 2,000 gallons of water per day per person.

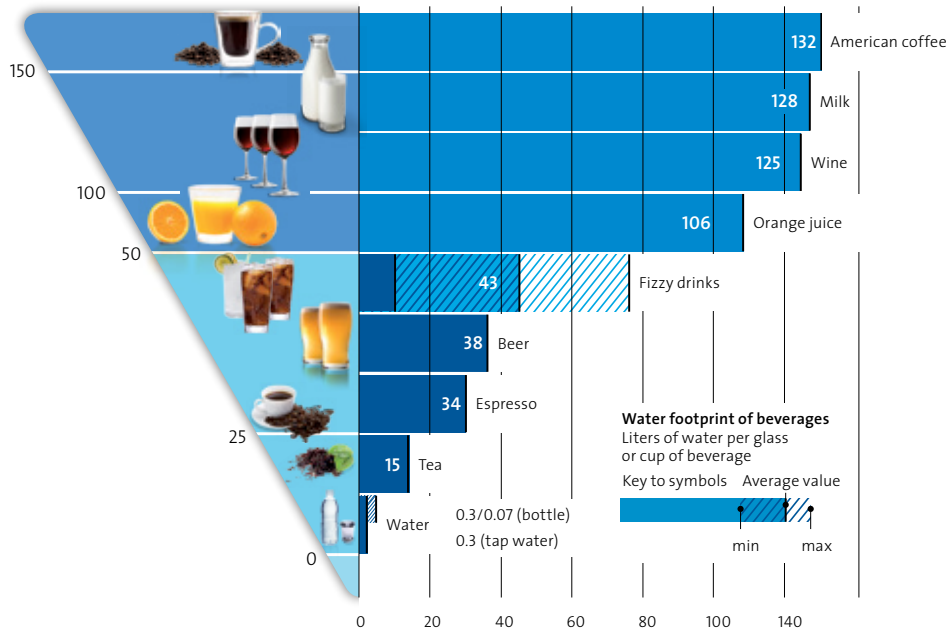


FIGURE 3.28

Water footprint of beverages (liters of water per glass, 125 ml, or cup, 30 ml, of beverage)
Fonte: BCFN, 2015.

3.11 NATIONAL WATER FOOTPRINTS AND THE TRADE IN VIRTUAL WATER

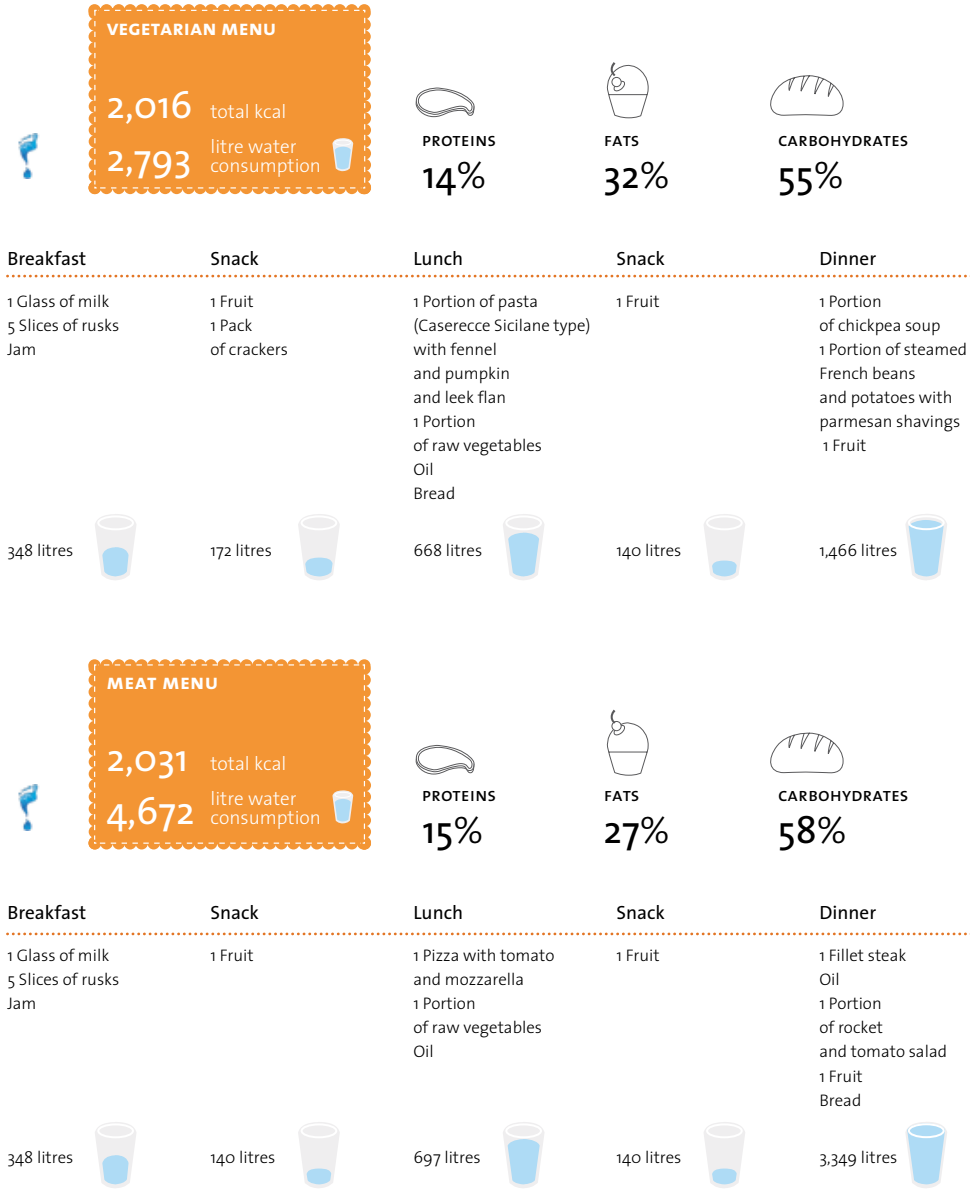
We've seen how water footprints can be calculated for each product or activity. They can also be calculated for each well-defined group of consumers (an individual, a family, the inhabitants of a city, an entire nation) or producers (private companies, public organizations, economic sectors).

The global water footprint, for instance, amounts to 7,452 trillion cubic meters of fresh water a year, or 1,243 cubic meters per person per year—twice the annual outflow of the Mississippi River. In absolute terms, the country that consumes the largest volume of water is India (987 billion cubic meters per year), followed by China (883) and the United States (696). In terms of per capita consumption, however, the citizens of the United States top the list with an average water footprint of 2,483 cubic meters per person per year, followed by the Italians (2,232), and the Thais (2,223) (figure 3.30).

The differences between countries depend on several factors, including volume of consumption (generally correlated to the wealth of the country), the model of consumption (especially where eating habits are concerned, as noted above, as well as the utilization of industrial goods), the climate (which especially affects the level of precipitation, plant transpiration, and the quantity of water necessary for farming), and the agricultural practices adopted (especially how efficiently water is used).

FIGURE 3.29

Virtual water consumption and eating habits: two menus compared
Source: BCFN Foundation, 2015.



Today agricultural products are traded all over the world. That trade pays no attention whatsoever to the water component included in the exchange. Yet "virtual water" trading goes on in huge volumes as crops requiring large amounts of water to cultivate are shipped far and wide—and not always with sensible results. Of the top 10 wheat

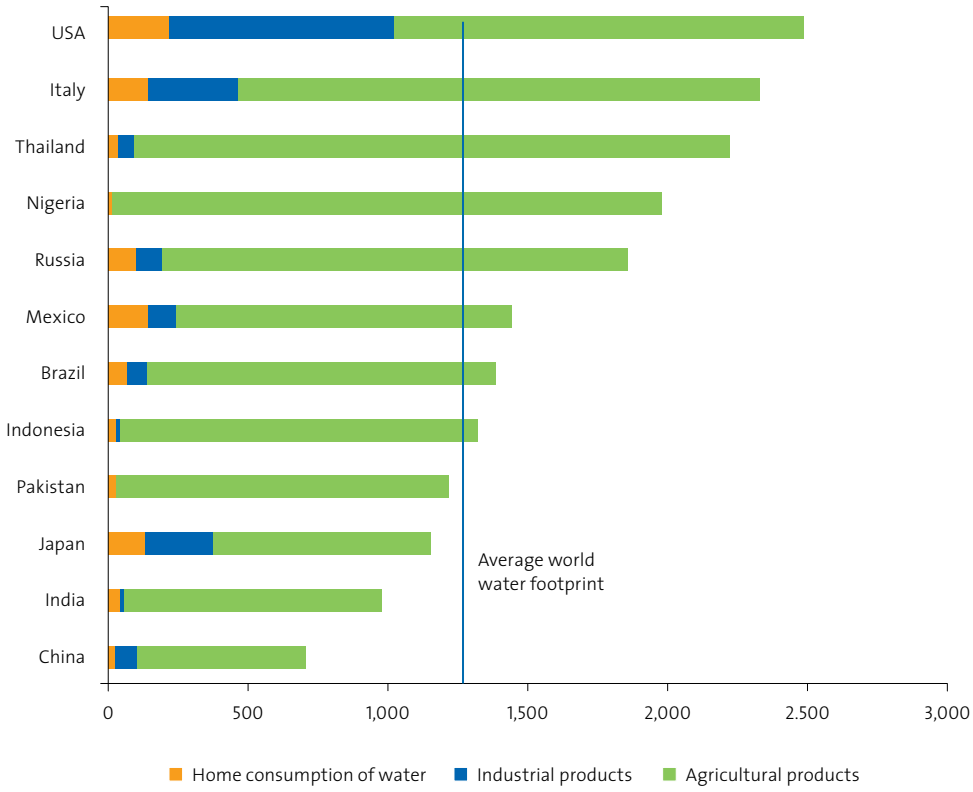


FIGURE 3.30

Contribution of the leading consumers to the global water footprint (m^3 per capita/year)
Source: BCFN, 2011.

exporters, for example, three are seriously short of water, while of the top 10 wheat importers, three are blessed with an overabundance of it. The level of interdependence among countries in the virtual exchange of water resources is, however, critical and is also destined to grow in the future, given the ongoing deregulation of international trade. Figure 3.31 gives some sense of the patterns and volumes of the global trade in virtual water embodied in agricultural products; net importers are shaded in red and next exporters in green.

The globalization of the use of water seems to entail both opportunities and risks. One of the chief opportunities lies in the fact that virtual water can be considered as an alternative water source, allowing local water resources to be preserved when high water footprint products are imported instead of directly produced. Moreover, because of the option of trade, it is possible to achieve a net savings in the volume of water consumed when a product is marketed by a country with high water productivity for that product, to a country with low water productivity.

The greatest risks, on the other hand, lie in the possibility of excessive dependence on other nations' water, and in the possibility of "water colonialism." In this process, importing

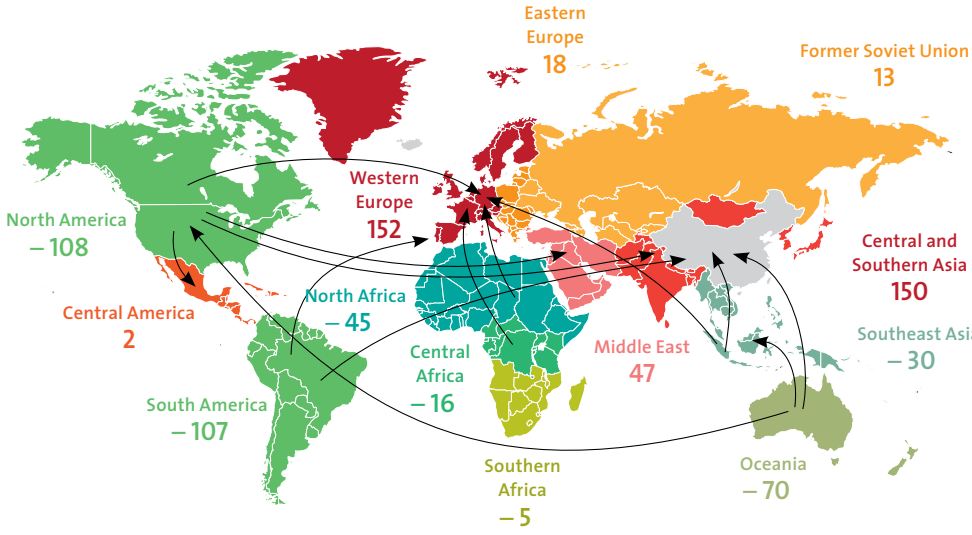


FIGURE 3.31

Virtual water flows between countries linked to trade in agricultural products (net virtual water importers – Gm^3/year)
Source: Hoekstra A. Y., Water Neutral: Reducing and Offsetting the Impacts of Water Footprints, *UNESCO, 2008.*

nations benefit from the products made using lots of water while leaving the exporting nations, which made the products using their own water resources, to suffer the problems of overconsumption. Water colonialism can be seen as a form of domination of poor countries by rich ones—even if no physical occupation takes place. Water as a strategic objective is increasingly at the root of conflicts within and between countries, triggered by competition among the various uses of water (domestic, industrial, or agricultural) within a single country, or else by the use of a body of water that extends over borders. The potential for increasing conflict of this sort is reflected in the fact that water basins shared by multiple countries cover almost half the world's surface and link 145 nations.

3.12 WATER PRIVATIZATION AND ITS IMPLICATIONS

The expression "water privatization" can refer to three different contexts. The first is the context of the rights of private property for water resources, allowing the free purchase and sale of water. This context can be found in some parts of the United States and in some developing countries but is quite foreign to the European experience, where water is firmly in the hands of the collective. The European institutional system has in fact always been based not on the regulation of the use of water as a commonly owned resource which cannot be sold. The user, therefore, does not buy the water, but rather acquires the right to use it. The second context is the involvement of the private sector in the management of water services. Any of three different business models may apply:

- lifelong territorial monopoly, privatized and regulated, as applied in the United Kingdom; this model in effect transfers ownership of the entire infrastructure and control of the water to the private operators;
- public ownership with temporary awarding to private operators through bid competitions, which is what happens in France;
- public ownership and operation, as in Italy and Germany, with the acquisition from the market of the resources necessary in order to provide the service. The third context is the involvement of the private sector in financing infrastructure and services, when the traditional means of public finance are no longer sufficient to do so in a timely and satisfactory manner.

The privatization of water brings with it risks and benefits. Among the chief potential benefits is the presumed greater efficiency of the private sector in optimizing the management of water distribution, controlling costs, and reducing user costs and pricing. Entrusting these contracts to private operations also makes it possible to share the costs of infrastructure maintenance in exchange for profits. Among the risks are price hikes, which can be substantial at times, and the failure of private operators to meet their obligations to contribute to the development of the water system, especially where poorer neighborhoods are concerned.

Given these risks, if water is a good that belongs to everyone then only an effective system of democratic control can adequately guarantee against the waste and abuses deriving from ineffective management of water resources, whether public or privatized.

THE POTENTIAL AREAS OF INTERVENTION NEEDED TO TAKE ON THE CHALLENGE OF THE WATER ECONOMY

It's clear that this sobering litany of challenges surrounding the world's water resources needs focused and ongoing attention. Among the objectives of the Barilla Center for Food & Nutrition is to increase that attention and awareness, with a focus on the most critical aspects of water use. We have also provided a series of recommendations on how best to deal with the various emerging challenges of the water economy. In our view, there are eight priority areas for intervention:

1. **THE POLICIES, MODELS, AND TOOLS THAT CAN BE USED TO ENCOURAGE A GENUINE INTEGRATED MANAGEMENT OF WATER.**

2. **THE PRACTICES, KNOW-HOW, AND TECHNOLOGY FOR INCREASING THE PRODUCTIVITY OF WATER (MORE CROP PER DROP) AND REDUCING WASTE.** The existing correlation, nowadays very strong, between economic development, demographic growth, and corresponding increases in the levels of water consumption, must be broken.

3. **THE WATER FOOTPRINT AS AN OBJECTIVE INDICATOR, SIMPLE AND EASY TO COMMUNICATE.** The water footprint is an invaluable tool for assessing the environmental impacts of individuals, companies (of production and distribution, within each sector), and countries.

4. **WAYS OF EATING AND CONSUMPTION REQUIRING A LOWER WATER CONTENT.** We must begin shifting individual behavior and models of consumption toward lifestyles that entail more careful use of water.

5. **THE EFFICIENT LOCALIZATION OF CROPS AND VIRTUAL WATER TRADING.** Major efficiencies in global water consumption could be achieved by rethinking the localization of cultivations requiring high water quantity in countries where water is abundant and trade them in the countries where water is scarce.

6. **SUPPORT FOR INSTITUTIONS' COMMITMENT TO THEIR RESPONSIBILITIES FOR ENSURING ACCESS TO WATER.** Disadvantaged populations rely heavily on existing institutions to ensure access to drinking water and sanitary infrastructures, to promote the necessary investments, and to remove technical and political obstacles.

7. **THE ECONOMIC EXPLOITATION OF WATER RESOURCES AND THE INTERNALIZATION OF THE COST OF WATER IN THE PRICE.** A key measure here is to reframe economic thinking about water markets through the development of economic models that allow the precise valuation of water in various uses.

8. **AN EFFECTIVE DEMOCRATIC CONTROL ON THE WATER RESOURCE MANAGEMENT EITHER THE WATER IS PRIVATIZED OR PUBLIC.** Privatization must be considered from the point of view of its effects on individuals and communities, and private companies must be required to operate ethically. A strong and effective democratic control systems must be built in order to protect users from the risks that derive from inefficient management and services of water, whether it is public or privatized.

IN THE GLOBAL SCENARIO OF WATER, THERE IS BOTH GOOD NEWS AND BAD NEWS

- There's plenty of water on Earth, but not always where it's needed.
- Water is free in nature, but the infrastructures needed to distribute it are extremely costly.
- In many areas of the planet, water is easily accessible at reasonable costs, but people take it for granted that it will always be available.
- Nature constantly recycles and purifies the water of rivers and lakes, but humanity is polluting water faster than nature can recycle it.
- There's a great amount of underground water, but mankind is using it faster than nature can replace it.
- In the world about 750 million people still have no access to drinking water
- Four and a half billion people have basic sanitation, but 2.5 billion don't.
- Millions of people are trying to escape from their condition of poverty, while the richer people on Earth use more water than necessary.
- Food production is growing to meet the rising population, and over 90% of water consumption is due to agricultural activity
- The pace of industrialization is rising, even though industry needs more fresh water.
- Industry is becoming more and more efficient in the way it uses water, even though many companies still use water in an unsustainable and inefficient way.
- There is a growing awareness of the water problem, as well as that of the enormous consumption of virtual water in food but translating that awareness into action is a slow process.
- The challenge of the water economy begins now: to win that match will take the collaboration of each and every one of us.

CONTRIBUTIONS

Feed 9 billion people respecting the 2 °C limit?

Riccardo Valentini

RICCARDO VALENTINI, member of the Advisory Board BCFN, Italy, received the 2007 Nobel Peace Price for his activities within the Intergovernmental Panel on Climate Change (IPCC). Since 2000, he is a Professor at the University of Tuscia in the Department of Science of the Forest Environment and its Resources. His research activity focuses on subjects in ecology and in agricultural-forest systems has been published multiple times in *Science* and *Nature*.

Climate change and right to food

The latest report of the Intergovernmental Panel on Climate Change (IPCC 2014) on the impact of climate change provided us new data and scenarios on future prospects for humankind.

Growing concerns about climate change, population growth, lack of sufficient resources for everybody and the increase of food requirements can constitute decisive elements for a planetary systemic crisis that could rewrite the course of our civilization, unless we all start doing something tangible now.

Since the pre-industrial era, the average global temperature has increased by about 0.8 °C and many signs of ecosystem degradation are already noticeable, such as the disappearance of several vegetable and animal species, ice melting in the Himalayas and the reduction of the Arctic ice cap.

Over the last years, climate variations caused a surge in agricultural commodities' prices, and year after year there are more and more signs of vulnerability and unpredictable market reactions due to the abnormal distribution of climate change in different regions of the planet. The magnitude of such phenomena has become so vast that it is one of the prerequisites for the right to food. A right to food for everybody that certainly depends on poverty and social conditions of the weaker classes but that today it is amplified and exacerbated by climate variability and the ensuing financial speculation.

Future scenarios, based on greenhouse gases' growing trends, point to about 8% reduction of the world's agricultural output by 2050, while food demand will rise by 56%. A combination of climate change and population growth will leave 2.5 billion people, out of the estimated 9.3 billion people worldwide, without sufficient food. Should the food consumption trends change, namely if traditionally vegetarian populations should shift towards a diet richer in animal fats and proteins (as often mentioned in reports on the link between pro capita income and meat consumption), the number of individuals with insufficient food would soar to 4.7 billion. On top of this, there is a need for cutting greenhouse gas emissions deriving from the combustion of fossil fuels and equally for those caused by tropical deforestation and agricultural intensification. Tropical deforestation, increasingly linked to the expansion of new farmland, produces about 3.6 billion tonnes of CO_2 a year, with an additional 6.2 billion tonnes of CO_{2eq} from agriculture.

Agriculture is thus the third impacting sector for greenhouse gases after energy and

transport, producing about 26% of the total human-induced GHG emissions in the atmosphere. Since 1990, greenhouse gas emissions from agriculture have soared by 20% and have doubled since 1960. In this scenario, maintaining global warming below 2 °C would be highly improbable with such a high food demand and a traditional agribusiness as we know it.

Global agribusiness

Today, the signs before our very eyes should make us stop and think about the current global agribusiness, but above all to understand if the race for food is now sustainable or if perhaps there is the possibility to use nature's resources more efficiently.

Are land grabbing's exponential growth, agricultural intensification through excessive use of pesticides and fertilizers and the introduction of genetically modified organisms the only instruments at our disposal to feed the world or is it first and foremost our duty to make the whole food supply chain, production, processing and consumption, including eating habits, more efficient and sustainable?

Looking at our global food system, we can see that we are currently facing three huge food paradoxes: despite the fact that a high number of people does not have access to food, one third of the world food production is fed to animals and an increasing share of farmland is cultivated to produce biofuels for cars. Despite the fact that nearly one billion people experience hunger or are malnourished, about 2.1 billion people suffer the consequences of overeating, which raises the risk of diabetes, cancer and cardiovascular disease.

In addition, every year, we waste one third of the global food production, enough to feed the nearly one billion people who experience hunger or are malnourished. It is clear that in the light of these paradoxes, we are in urgent need of rethinking how to reduce this waste, improve human diet and make our right to food security more secure and resilient while cutting agriculture's contribution to global warming as well as re-think the entire global agribusiness.

Engaging in solving these paradoxes will undoubtedly help us curb agriculture's contribution to global GHG emissions. But we need to go a step further.

Agriculture 5.0: A new way of thinking the future of agriculture

Recently, the German government in collaboration with the Fraunhofer Institute has presented an evocative projection of the industrial future. This new paradigm (Industry 4.0) is the result of the 4th industrial revolution, that is the transition from oil and steam as energy sources to electricity and eventually automation and digitalization of production processes. Today, Industry 4.0 means Smart Factory, decentralization of production centres, smart networks and computer-aided planning to optimize production lines.

Similarly, agriculture is faced with the need for a further step forward in the way we think about agribusiness. In the history of mankind, agriculture and the food production system have undergone critical transformations, even more substantial than those of industry, bearing in mind that the latter is in reality a recent human invention. Agriculture, from *Homo Sapiens*, first food gatherer and then hunter, to

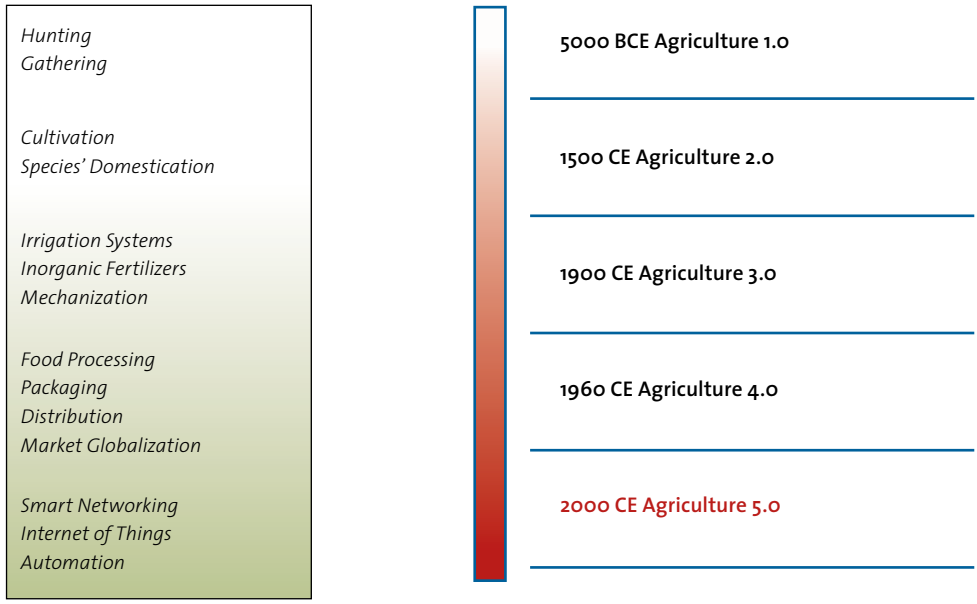


FIGURE 1

Agriculture 5.0

Homo urbanus, consumer of technologically processed products, has undergone several stages of profound changes (figure 1). Today, we can affirm that we need a new agricultural phase to tackle challenges such as exponential population growth, climate variability, right to food, new lifestyles and demand for non-traditional food. We need Agriculture 5.0 able to satisfy our needs for our human generation to make another step forward.
Agriculture 5.0, in order to satisfy our ever pressing needs, must have new characteristics.

1) **Interoperability**: In other words, food production and processing centres must be connected via the web in order to optimize both demand and supply through new web technologies such Internet of Things and Internet of Services.

2) **Decentralization**: Widespread distribution of Smart Factories, especially in peri-urban areas close to urban centres.

3) **Cooperation**: Creating interconnected production networks able to exchange and share both technological and marketing services.

4) **Innovation**: Exploiting monitoring, weather forecasting and automation technologies as well as improving resource efficiency (water, energy, fertilizers, pesticides, etc.)

in order to reduce greenhouse gas emissions while producing healthier food. This kind of agriculture will also enable young people, small businesses, isolated entrepreneurs—often the only guardians of our biodiversity and territorial typicality—to survive making a smart, light and sustainable use of new technologies that the human mind can currently offer to secure the future of our species.

INTERVIEWS

The challenging transition toward sustainable agriculture

Hans R. Herren

HANS R. HERREN is a world-renowned scientist, and since May 2005 he has been the president of the Millennium Institute. He was the director general of the International Center of Insect Physiology and Ecology in Nairobi (ICIPE), as well as one of the directors of the International Institute of Tropical Agriculture (IITA) in Benin. Today he is a board member of many organizations; he was codirector of the International Assessment of Agricultural Knowledge, Science, and Technology for Development (IAASTD); president of Biovision, a Swiss foundation with a worldwide goal of alleviating poverty and improving life for poor people while still preserving the pool of precious natural resources that support life. He has won many prizes for his research.

What are the key challenges for agriculture sustainability now and in the future? What are the problems with the current situation?

The main challenges agriculture and the food system in general are facing are:

How to eliminate the persistent nexus of hunger and poverty?

How to deal with the nutrition and health issue?

How to reduce inequities and cater for rural livelihoods?

The main problems agriculture is facing today are in the realm of adaptation to climate change; producing sufficient, diverse and quality food, feed and fiber at affordable prices while being remunerative for the producers and compatible with sustainable agricultural practices; the increasing competition from the biofuel sector; the increase of fossil energy prices and in the medium and long term also its scarcity.

Are there some agricultural production models which could help in achieving a higher level of sustainability? How is it possible to effectively manage the transition towards more sustainable production paradigms?

Farmers and scientists have devised a number of agricultural practices over the years that are in line with the requirements of a sustainable and multifunctional agriculture, as requested in the IAASTD report *Agriculture at a Crossroads*. These go by different names, ranging from organic, biodynamic, agroecological, low or zero tillage to conservation agriculture, with different levels of compliance to the sustainability and multifunctional goals. The closest models to the set goals are agroecology, and organic/bio dynamic agriculture, although even in these cases, more work is needed to meet social, environmental and economic sustainability. In principle, there is a need to develop and build into these and new systems more resilience and regenerative potential, given that the present system still uses too much water and external, often non renewable inputs.

The transition from these unsatisfactory systems requires a new approach to research and extension, which is participatory, localized and includes the stakeholder beyond production, such as consumers/users, providers of inputs and also the transformation and retail sectors. This is necessary, as production systems are shaped in part at least, by these sectors that are beyond the farm gate and research lab sectors. There is also a need to recognize that agriculture and food are the responsibility of Governments and that these areas need major funding from the public sector, rather than to be delegated to the private

sector alone. The latter still has a large role to play past the farm gate in particular, along the value chain from the farmer to the consumer. The transition will be further help and supported by introducing true pricing of the products, i.e., include the production and transformation, as well as the indirect health costs externalities into the retail price, removing all perverse subsidies and replacing them with payments for ecosystem services and rewards for sustainable practices. Managing this transition will need political will and vision beyond what is presently experienced, at all levels of governance, from global to local, new institutions to support and manage the paradigm change as well as a change in consumer and user behavior. It will also require a new systemic and holistic approach to analyzing the agriculture and food system, to identify the key leverage point and synergies to achieve the multifunctional agriculture goals while minimizing the negative feed backs. New national agricultural policies will need to cater for the internal need of food, feed and fiber production, as well as for the enabling conditions, that are just as important, as rural infrastructure, access to markets and both capital and insurances.

What kind of technology innovation and agricultural practices are required to meet the goals of sustainability in agriculture? What should be done to improve and promote agricultural best practices all over the world and further foster innovation?

The main areas of knowledge, science and technology needed to transition agriculture towards the sustainable systems required to address the above mentioned challenges are rooted in the soil, so to speak! The world is facing many challenges, in particular the fact that in the developing countries the soils have been largely mined of their nutrients, while in the developed countries, we have mostly over-fertilized, the consequence of each practice are degraded, eroded and low fertility soils, devoid of the needed soil biota to assure sustainable fertility levels that allow quality and quantity production under the new stresses of climate change. Soil fertility restoration is therefore the number one concern, to which we need to add improved and more diverse cropping systems, with more different crops in the rotation, the inclusion of animals on farm and new methods for pest and disease management that take advantage of the gifts of nature in the form of natural control mechanisms, either already built into plants through evolution or through system management practices, that go from field to landscape scale.

It has been demonstrated in the UNEP *Green Economy Report* Agriculture chapter (2011), that by implementing the basic tenets of sustainable agriculture as suggested in the IAASTD report, all key sustainability goals can be achieved, with investments that are below today's subsidy levels. The main factor being that agriculture needs to be green by design, rather than by making few changes at the margins (green washing), as suggested by most vested interest groups from the input agribusiness. Investments need also to be made in enabling conditions, such as rural infrastructure, institutions and along the value chain to assure markets for agricultural products, provide quality jobs in and around agriculture to keep the younger population in the rural areas

By making serious changes from agricultural sciences to political choices, agriculture and food systems can be made sustainable and able to deliver on the multifunctional goals, for the present and future food, feed and fiber needs of a growing and more demanding population and also for the long haul.

INTERVIEWS

Virtual water between underconsumption and poor management

Tony Allan

TONY ALLAN is one of the world's leading international experts on water. For his revolutionary virtual water concept, he was awarded the Stockholm Water Prize in 2008. His latest book (*Virtual Water*) is a textbook in the subject and one of the most original pieces of thinking in the field in recent years.

You introduced the concept of virtual water many years ago: the products we use and the foods we eat on a daily basis are produced consuming large quantities of water.
How can we promote greater awareness of the impact of the use of water on the environment and encourage the diffusion and the adoption of sustainable behaviour among citizens and enterprises?
Only with great difficulty. We humans beings don't understand the true value of water, and we are at a point in our relationships with nature's vast but limited water resources where we simply cannot afford to stay ignorant. Already, our over-consumption and mismanagement of water has had a very serious impact on our water environments and the essential services they provide.
Our ignorance is immense. Most of us don't have the slightest idea about the sheer volumes of water involved in our daily lives. To make a cup of coffee, it takes 140 litres. That's the true amount of water used in growing, producing, packaging and shipping the beans you use to make your morning coffee. A lunchtime hamburger take 2,400 litres and that favourite pair of jeans a whopping 11,000 litres. In fact, all the goods we buy—from food to clothing to computers—have a water cost in the form virtual water: the powerful new concept that reveals the hidden factors of our real global water consumption.
At the start of the twentieth century, with a global population of one billion, this ignorance simply did not matter. The ratio of water to people was so massive that it was as if our water supply was infinite. But it is not. And now, with a global population pushing seven billion, water scarcity is not just a possibility. It is already a reality for many.
Unfortunately society has evolved not to value water. We are addicted to over-consuming water, and we don't know it.

Are the main economic players conscious of the problems and challenges involved in water management?
Neo-liberal markets that operate in the food supply chain are almost totally blind to the costs of delivering water. This is especially true on the farms of the world, where most of the water needed by society is used and managed: farmers are the "de facto" water managers of the world. They manage the big water, the invisible 80-90% of all water used in the global economy, employed for the production of food. Of the eight nations states I examined in my latest book,[1] seven have seen significant improvements in their returns to water in farming. We have indeed uncovered a golden rule: the development and diversification of economies is always associated with massive increases

in the productivity of water, and these increases are delivered by farmers using big water. That is, the big volumes of water integral to food production. Sadly, the converse is also true. Developing economies, that falter or face nearly insurmountable problems in combining their land, water and capital see little or no improvement in their water productivity.
These markets are regulated by water blind accounting rules held in place by armies of accountants and lawyers that populate powerful bodies such as the Federal Accounting Standards Board [in New York] and others world-wide. As well as the big four global auditors—PwC, E&Y, KPMG and Deloitte and countless other accountants and lawyers in the transnational agribusinesses and traders and other private sector firms.

In the near future, the increase in the demand for water and the reduction in water supplies will make water more valuable and, consequently, increase economic interests in it. Is it possible that the value (and the price) of goods and services will be affected by the amount of water required to produce them?
Getting the accounting rules establishment to adopt green economics and green audit principles will be a long elemental struggle. The food supply value chain is massively distorted by public policies that introduce financial pressures that have and will overwhelm attempts to get water valued to reflect its costs of delivery and to internalise the environmental impacts of its use.
Of course, it is possible to reflect the costs and impacts in the use of water for domestic, municipal and industrial uses. But these uses only account for 10% of the water needed by society. The big volumes of water are in our food.

Just as with the "right to food," the "right to water" will require new laws on both local and international levels in order to prevent the interests of a select few from prevailing. How can we guarantee water for everyone? Do you see the risk of "water wars" in the coming years around the globe?
Nations do not go to war over water. They trade food. International trade is much cheaper and low risk compared to armed conflict. Food prices have been falling for 200 years and prices will be low again once the current price spikes are over. Although probably not as cheap as in the past when wheat and other staples were on the world market at half cost—as a consequence of the subsidies in the US and the EU. Sustainably intensifying the use of scarce water resources and using them in ways that are socially and environmentally just in these distorted conditions will challenge this generation and a number of future generations.

---

1 Allan T., *Virtual Water: Tackling the Threat to Our Planet's Most Precious Resource*, I. B. Tauris &Co Ltd., London 2011.

ACTION PLAN

ENCOURAGE NUTRITIONAL BEHAVIORS AND CHOICES THAT ARE IN KEEPING WITH THE MODEL OF THE DOUBLE PYRAMID

Following the model of the "Double Pyramid" means adopting a balanced diet both in nutritional terms and in terms of environmental impact. The model of the "Double Pyramid" (food and environment) in fact shows that with sustainable diets the two objectives can be easily attained. We should consider that healthier foods also imply lesser environmental impacts in terms of the consumption of natural resources (soil, water, etc.) and reduced emissions. With particular reference to future generations, it therefore becomes necessary to undertake a process of collective awareness of responsibility which, while it should not exclude the children themselves, ought to focus on parents and the school system in order to encourage more responsible approaches to consumption.

ENCOURAGE SUSTAINABLE AGRICULTURE THAT TAKES INTO ACCOUNT LOCAL NEEDS AND CONSIDERATIONS

The global agricultural system reveals a number of aspects of fragility, in part due to the current and future effects of climate change. In the awareness that there cannot be a single model of production that is capable of ensuring sustainability in different agricultural context, the only possible solution is that of a differentiated approach, one that takes into account the actual availability of resources and different socioeconomic and geographic settings. In this context, aside from the classic factors at play (soil quality, water availability, adaptation to atmospheric phenomena, etc.), we should also take into account other significant variables such as the local availability of energy and human expertise.

ENSURE WATER ACCESS, AND MANAGE IT IN A SUSTAINABLE MANNER ON A GLOBAL LEVEL

It is important to reinforce the commitment and responsibility of public institutions to ensure access to drinking water and adequate sanitation infrastructures to everyone. In that context, it is necessary to encourage investments that make it possible to remove technical and political obstacles. More in general, the issues of water resources must be dealt with through models and instruments of integrated management that take into account the value of virtual water (included in all products on the market) and of water productivity in agriculture (more crop per drop), in part with a view to the reduction of waste.

But it is also a good idea for the "water footprint" to be commonly used in order to assign a value to the production of goods and services, in order to better orient individuals to modify their behaviors and models of consumption in directions that entail a more careful and responsible use of water.

4. FOOD FOR HEALTH

Agriculture, food, nutrition and health

Ricardo Uauy

RICARDO UAUY is Professor of Public Health Nutrition at the Institute of Nutrition and Food Technology (INTA), Chile and at the London School of Hygiene and Tropical Medicine. Since 2008 he has been a member of the WHO/FAO expert committee on Fats and Fatty Acids in Human Nutrition, and since 2007 he has been a member of the WHO/FAO expert committee on Scientific Update on CHO 06 and on Trans Fats. He is also a member of many other scientific committees including: expert consultation on Prevention and Control of Childhood Obesity and the WHO expert panel for Scientific Update on Carbohydrates in Human Health/Disease, the Reference Group for Global Strategy Diet Nutrition and the Prevention of NCDs (non-communicable diseases), and FAO/WHO Expert Consultation on Energy Requirements in Rome.

There is no good health without good nutrition, and good nutrition depends on agriculture. Yet international and national agencies for agriculture and health interact little and often have different and sometimes contradictory agendas. Ministries of agriculture as well as international food and agriculture agencies aim for increases in food and feed production, while health ministries and the World Health Organization focus on the need for healthier food and controlling the pandemic of nutrition related chronic diseases. Yet health and nutrition objectives can only be met if *both* food and health needs are addressed with a common agenda.

A healthy diet provides sufficient energy to maintain a balance between consumption and expenditure. Based on these goals, a healthy diet is one that is high in whole grain cereals, vegetables, fruits, and legumes (supplying the necessary energy, fiber, micronutrients, and protein), while limiting the amounts of saturated and trans fats, added sugars, and salt.

A healthy diet is diversified, because consuming a variety of foods across and within different food groups is the best way to secure the intake of all essential nutrients. Because dietary patterns and foods differ across the world, recommended food groups should be established according to the prevailing agricultural practices and cultural context, utilizing the local foods available that contribute in meeting nutritional needs. Dietary diversity may be difficult to achieve under conditions of poverty, where diets are based on single energy-rich foods (wheat, corn, rice, or potatoes) with little consumption of animal products, fruits, or vegetables. In urban areas, increased consumption of packaged foods, even among the poor, may aggravate inadequate micronutrient intake.

A healthy life is conditioned not only by the food we eat but also by how much energy we spend, since we evolved under conditions of limited energy and food supply. We are equipped with a set of highly effective

systems that allow us to get virtually all the energy available in our foods, and if we eat beyond our expenditure we are very efficient in storing all forms of food energy as fat tissue. This allowed us to survive food shortages and even famine conditions. Our genes over the past several millennia were selected based on this model, thus the difficulty of preventing obesity.

In summary, the quality of the diet has been recognized from the earliest of times to play a key role as a determinant of health and wellbeing of human populations. The evolution of humans has been shaped by the nutritional quality of our diets. *Homo sapiens* is virtually identical to most primates in terms of its genetic make up. What made us different was the diet of early hominids; from being almost strict vegetarians we diversified our diets, and animal foods and fats then provided not only increased energy density but essential fatty acids and micronutrients to form a progressively larger brain and a more complex nervous system. More than hunter-gatherers, we evolved as scavengers. Now, traditional diets in most developing and transitional countries are being replaced by high-fat, high-carbohydrate, energy-dense diets with a substantial fat and sugar content. This increases palatability but also leads us into obesity and related chronic diseases. The solution to hunger and malnutrition is not achieved by providing energy in sufficient or excessive amounts; it should also be adequate in micronutrient content and in the quality of the macronutrients supplied (fats, carbohydrates and proteins). Good health requires good nutrition, and good nutrition depends on healthy foods and sustainable agricultural practices.

FOOD BASED DIETARY GUIDELINES

IN ANY DIET, WE RECOMMEND THE CONSUMPTION OF:

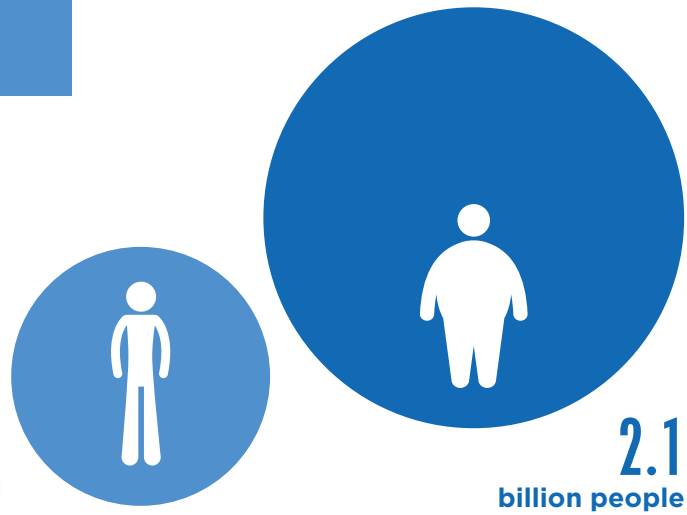
Fruits and vegetables.
Whole grains and fiber (intact plant foods not added fiber).
Tree nuts.
Fish, algae and other marine foods.
Healthy vegetable oils (olive, soy, rapeseed, sunflower).
Low saturated fat dairy and milk products.

WE RECOMMEND MODERATING THE CONSUMPTION OF:

Processed foods (high in sugar, trans fats and sodium).
Processed meats.
Sugar-sweetened beverages.
Industrial partially hydrogenated fats (trans fats).
Refined carbohydrates and free sugars.
Added sodium and salty foods.
Added sugars.

4. FOOD AND HEALTH

DYING OF HUNGER OR OBESITY?



795 million people suffer from hunger

2.1 billion people are obese or overweight

USA

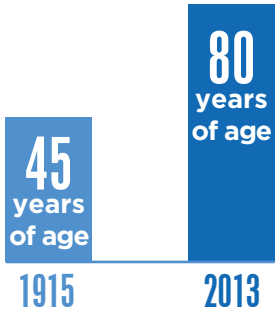
17% children and adolescents (2-19 years of age) are obese

WORLD

14% children < 5 are underweight, prevalently in the developing countries

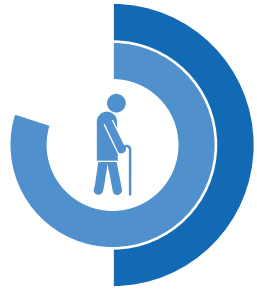
LIFE EXPECTANCY

(in Western countries)



CHRONIC DISEASES

80% > 65 has at least one chronic disease



50% > 65 has 2 or more chronic diseases

FORECAST OF DISEASE TYPE

in millions

ESTIMATE NEW DIAGNOSIS

DIABETES

592 (mln)

2035

CANCER

22 (mln)

2030

ESTIMATE DEATHS

CARDIOVASCULAR

23.6 (mln)

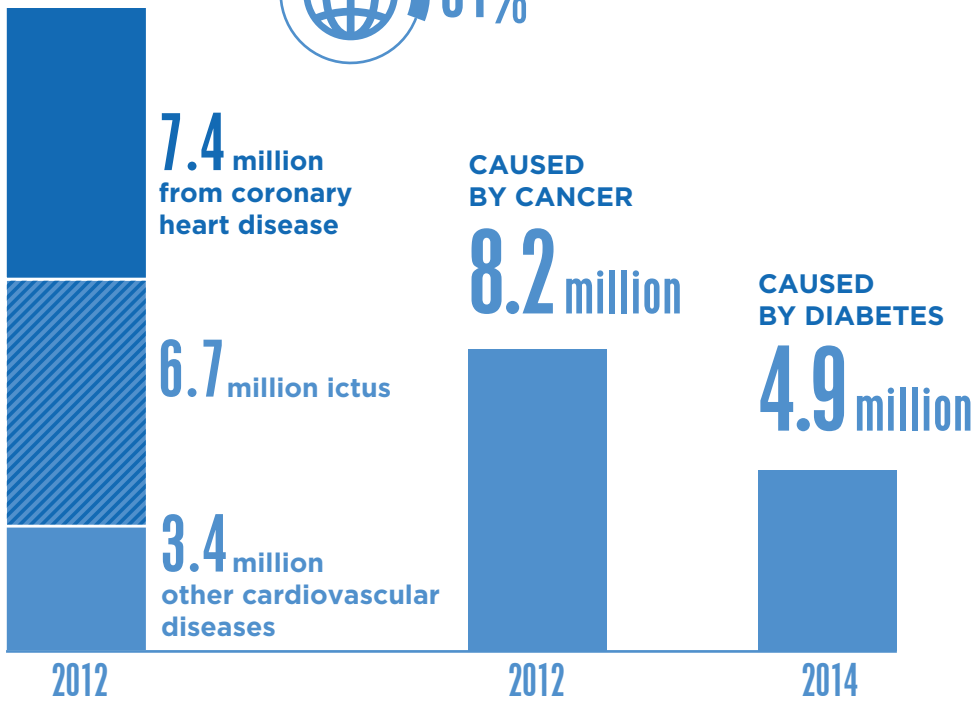
2030

MORTALITY IN THE WORLD

CAUSED BY CARDIOVASCULAR DISEASES

17.5 million

31% deaths globally



FOOD FOR A HEALTHY LIFE

Diet plays an increasingly crucial role in any attempt to enjoy a balanced lifestyle. Food, in fact, plays an essential part in the prevention of a number of pathologies, including chronic diseases. These conditions have risen continuously and to a significant degree in recent decades within populations all over the world.

The interpretative model adopted by the Barilla Center for Food & Nutrition begins with this key fact and goes on to analyze in detail the importance of various factors correlated with diet to human health.

We analyzed the trends, worldwide and in Italy alone, in main chronic non-transmissible diseases (cardiovascular diseases, diabetes/metabolic syndrome, cancers). These are the three disease groups whose onset appears to be most clearly related to diet and to overweight and obesity, an increasingly real critical factor in the overall picture of world health.

The next step was to analyze the role played by different dietary and behavioral choices in preventing the most significant chronic diseases. Then we reviewed the principal findings in the international scientific literature on the relationship between diet and cardiovascular diseases, diabetic diseases, and cancers. We looked closely at the linkages between the ingestion of a broad array of macro- and micronutrients and the likelihood of the onset of these diseases.

At this point it was necessary to translate the complex and deeply technical scientific findings into more user-friendly dietary and behavioral guidelines. We did this by reviewing the guidelines offered by the most respected international scientific societies on good nutrition, diet and lifestyles for the prevention of chronic diseases. Finally, we wrote a summary of the guidelines, noting where they agreed and overlapped. The end result was a document that distills the best current understanding of diet's role in preventing chronic diseases and promoting general good health. (Beyond their medical benefits, we have also tried to quantify the benefits of adopting sound diets in economic and financial terms.)

Building on this analysis, BCFN has developed a set of practical recommendations intended to encourage the spread of beneficial ways of eating.

While doing this work BCFN has made a few general observations. First, over the last 50 years we have seen a growing awareness of the greater efficacy and efficiency of prevention as opposed to acting only when patients have already become sick. We say greater efficacy because prevention makes it possible to attain better results overall, in part because prevention works to the benefit of it of a broader share of the population than does medical treatment. We also say greater efficiency because prevention costs less. It is this second factor that ensures that prevention will be one of the chief strategic approaches in the effort to ensure the sustainability of health systems burdened by constantly rising levels of investment and operating costs, as seems to be the case in every nation in the Western world.

At the same time, however, prevention is clearly also fundamental in emerging and developing countries, where we have seen a general move toward the westernization of diet and lifestyles, with corresponding increases in the dietary disorders and diseases linked to them. In these areas it's necessary to act before the bad habits can develop into deep-rooted practices, if we have learned anything from the experience of the last few decades in Western countries.

For all these reasons, the gradual shift we've seen over the last few decades, from treating diseases to preventing them, is welcome. Still, not enough has been done yet, especially in the face of the dramatic change in world dietary habits. BCFN is convinced that prevention is an essential and not fully explored area for the future of medicine and nutritional science. Prevention appears to be fundamental to ensuring that the younger generations do not find themselves saddled with inferior conditions of health and welfare (perhaps even radically inferior) compared with those enjoyed by preceding generations. So it is fortunate that the awareness of the links among diet, lifestyle, and health are growing. The first studies establishing those links between behavioral choices and the onset of diseases began to appear in the 1950s. Investigations followed into the nature of the underlying social, environmental, and cultural factors. One of the most important of those factors, not surprisingly, is simply information about diet and health.

By itself, however, information about diet is not enough. The problem is bigger than that. Everywhere we see a way of life emerging that involves an increase in the average quantity of calories ingested, the emergence of nutritionally unbalanced dietary models, significant reductions in time spent in physical activity, and the loss of value attributed to food as a central social and cultural element of everyday life. To prevent these trends from spreading their devastation, what is required is the rediscovery and renewed appreciation of an idea of food and lifestyle centered on "quality": a reduction of the quantity of food that we consume and a greater focus on the quality of that food, but also on the quality of the way we live and the quality of the relationship between man and food. We must rediscover and appreciate the social and cultural importance of the act of eating.

What we need, then, is an overall paradigm shift that focuses on the person and his or her behaviors, not just on their narrow dietary choices. This shift will affect not just individuals, but also medical institutions, public agencies, and the private businesses in the agroalimentary sector.

The first and perhaps the most important task will be to correct the dietary habits and ways of life among children, from pre-school age all the way up to adolescence. This phase of life is absolutely crucial to all subsequent development. The dietary habits and behaviors adopted during the first few years of life are decisive influences on one's health during childhood and adolescence and health and quality of life in later years.

However, individuals cannot by themselves change trends that have been influenced, encouraged, or not adequately disincentivized by many other forces shaping public health, including government, doctors, the mass media, and private companies and corporations. To succeed, any effort to improve the current scenario must fully and synergistically engage all the key actors in the agroalimentary world. This collaboration is not just important, but fundamental, in mounting a successful prevention effort. And we must act quickly; the rapidity and depth of the trends make time a crucial ele-

ment in all and every corrective intervention. All the data are revealing a rapid decline in average health conditions, both current and predicted, even in areas (such as Italy) normally considered the homelands of sound diets and healthy lifestyles. Unless the dietary and lifestyle trends that have emerged with such striking speed over the last few decades on a worldwide level are reversed, future generations will be inexorably condemned to live less well than the generations that preceded them. In fact, in the modern history of humanity there has never been such a marked shift in the quality of life and the average conditions of health as the one that—to judge from the data at hand—we can fairly expect to see beginning in the coming 10-30 years. Unless we begin, and immediately, to modify the lifestyles and dietary habits of the current generations, starting with young people, what will we be capable of doing once all the medical and health consequences of those habits have done their damage? BCFN has come to the firm belief—through the work that it has carried out in these years, through the analysis, the observations, the discussions with the leading international experts on the issues of diet and health—that there is no more time to waste.

4.1 A FEW KEY FIGURES: GLOBAL TRENDS IN CHRONIC DISEASES AND THEIR SOCIAL AND ECONOMIC IMPACTS

Today the main chronic diseases (cardiovascular diseases, diabetes, chronic respiratory diseases and tumors), represent the chief risk factor for human health, as well as an enormous socioeconomic burden on society as a whole.

These diseases cause some 35 million deaths every year—60% of all worldwide deaths and 80% of deaths in low and medium-income nations. The most important studies reveal that roughly 80% of all cases linked to these diseases could be prevented by eliminating such risk factors as the consumption of tobacco, unhealthy diets, physical inactivity, and the excessive consumption of alcohol. On the other hand, without adequate prevention, their impact on global health could increase by 17% in the next 10 years.

Over the last decade, in nearly all the countries on Earth, there has been an exponential increase in obesity. This trend has been so marked that it led the European Association for the Study of Diabetes (EASD) to proclaim the prevention and treatment of obesity "the most important public health problem throughout the world." Currently, 69% of all Americans are obese or overweight,[1] and we are seeing this phenomenon spread to the younger sectors of the population.

The gravity of overweight and obesity among young people is documented, to cite once again a shocking American statistic, by the tripling of cases of overweight young people from 1970 to the present day. According to a recent study by the *Journal of the American Medical Association*, more than a third of all American children and teenagers is either overweight or obese.[2]

---

1 National Center for Health Statistics, *Health, United States, 2014: With Special Feature on Adults Aged 55-64*, Hyattsville, MD., 2015.

2 Ogden C. L., *et al.*, "Prevalence of childhood and adult obesity in the United States, 2011-2012", *Journal of the American Medical Association*, 311(8):806-814, 2014.

Overweight and obesity are now fully recognized as diseases. Aside from their importance to health, they also have significant economic effects. In 2005, in the United States, for example, US$190 billion were spent on obesity-related health care—i.e. double the amount previously estimated.[3]

The impact of cardiovascular diseases. Similarly, the increase in cardiovascular diseases is strongly linked to poor diet. The World Health Organization has noted that in 2012 there were roughly 17.5 million deaths due to cardiovascular diseases worldwide, equal to 31% of all deaths. Of those deaths, 7.4 million were due to heart disease and 6.7 million were caused by stroke. It's been estimated that, by 2030, the number of deaths caused by cardiovascular diseases worldwide will grow to 23.6 million every year. This makes cardiovascular disease the number one killer on Earth. In the United States it is estimated that 80 million people are affected by one or more cardiovascular disease in any given year, and more than 860,000 die of those diseases.[4]
Throughout Europe, on the other hand, cardiovascular diseases are responsible for more than 4 million deaths every year (1.9 million within the European Union).[5] Coronary diseases are responsible for the greatest number of fatalities (1.8 million deaths in all Europe and 681,000 in the EU's member states).[6] If we assign a cash value to these data, some truly astonishing numbers emerge. The most recent estimates of the total cost of cardiovascular diseases in the United States indicate an impact of US$320 billion in 2011.[7] This value includes both direct health costs (hospital treatment and care, pharmaceuticals, home assistance, etc.), and the indirect costs calculated as a loss of working productivity caused by the sickness or premature death of the patients. In Europe, the total economic impact of cardiovascular diseases for 2009 was estimated at roughly €196 billion, which corresponds to a total average per capita cost of €212.[8] In Italy, the total costs of cardiovascular diseases have been estimated at roughly €20.8 billion per year. Of these costs, 26% (€5.3 billion) have to do with the direct costs charged to the health system, which include the costs of hospital treatment and care and the cost of pharmaceuticals. Another 74% of the total economic impact of cardiovascular diseases is due to the indirect costs related to the loss of productivity of the working-age patients due to sickness and death and the other informal costs for the care of patients,[9] for a total of roughly €15.5 billion annually.

---

3 Cawley J., C. Meyerhoefer, "The medical care costs of obesity: an instrumental variables approach", *Journal of Health Economics,* 31:219-30, 2012.

4 WHO, *Cardiovascular diseases (CVDs), Fact sheet 317*, Updated January 2015 (www.who.int/mediacentre/factsheets/fs317/en/).

5 British Heart Foundation, "European cardiovascular disease statistics 2008"; Health Promotion Research Group, Department of Public Health, University of Oxford; Health Economics Research Centre, Department of Public Health, University of Oxford, 2009.

6 European Cardiovascular Disease Statistics 2012 edition.

7 Mozaffarian D., *et al.*, *Circulation*, 2015, 131:e29-e322, American Heart Association.

8 Nichols M., *et al.*, *European Cardiovascular Disease Statistics 2012*, European Heart Network, Brussels, European Society of Cardiology, 2012.

9 *Ibid.*

The spread of cardiovascular diseases entails serious economic and social repercussions, not only in the developed countries, but also in developing nations such as China. According to recent WHO estimates,[10] the cumulative cost over 10 years of cardiac diseases, strokes, and diabetes in China will be equivalent to US$678 billion.

The impact of diabetes. With reference to diabetes (another disease strongly influenced by diet), in 2014, the global prevalence was estimated at roughly 9% for adults over 18 years of age.[11] This means that 387 million people have diabetes, a number which is projected to rise to 592 million by 2035. In 2014, diabetes caused 4.9 million deaths, namely one death every seven seconds.[12] The prevalence of diabetes will grow both in industrialized countries and in developing countries. In China, for example, it is estimated that there were approximately 98.4 million people with diabetes in 2013, equal to 7.2% of the population; in 2035 this number is expected to to rise to 142.7 million (10.5% of the population), a 50% increase. An even more worrisome growth trend is expected in India, where the current number of cases of 65.1 million (5.2% of the population) is expected to rise to 109 million (8.7% of the population) by 2035.[13] As in the case of cardiovascular diseases, the costs incurred in the treatment and care of diabetes are very high, according to the estimates of the International Diabetes Federation. In 2013, the global health care cost for treating diabetes and managing complications totalled US$548 billion, a number which is destined to top US$627 billion by 2035. A study by the American Diabetes Association has estimated the total costs of diagnosed diabetes, which rose from US$174 billion calculated in 2007 to US$245 billion in 2012. This value represents a 41% increase over a 5-year period and includes US$176 billion for direct medical expenses and US$69 billion calculated as the loss of productivity of the patients and the family members involved in their care. American diabetic patients on average bear costs of over US$13,700 annually, of which US$7,900 is attributable directly to diabetes.[14]
Another study[15] done of European diabetics estimates that, just for the direct health costs of the disease (hospitalization, clinical treatment, pharmaceuticals, etc.), an annual average cost of €2,775 per patient was incurred. Most of those costs (55%) was due to hospitalization for acute and chronic complications.

Cancers. Cancers are also tied to poor diet and nutrition. According to WHO data, in 2012 there were 8.2 million deaths worldwide that could be blamed on tumors;

---

10 WHO, *Cardiovascular diseases (CVDs), Fact sheet 317*, Updated January 2015 (www.who.int/mediacentre/factsheets/fs317/en/).

11 WHO, *Diabetes, Fact sheet 312,* Updated January 2015 (www.who.int/mediacentre/factsheets/fs312/en/).

12 International Diabetes Federation (IDF), *Diabetes Atlas, Sixth edition*, 2013.

13 *Ibid.*

14 American Diabetes Association, "Economic Costs of Diabetes in the U.S. in 2012", *Diabetes Care*, March 6, 2013.

15 International Diabetes Federation (IDF), *Diabetes Atlas*, Sixth edition, 2013.

RISK FACTORS AND LIFESTYLE

The WHO has published an in-depth study (World Health Organization, *Global health risks: mortality and burden of disease attributable to selected major risks*, 2009) of the vast array of negative factors causing millions of premature deaths. The study, conducted worldwide, shows that among the top 10 health health risks at global level, seven are linked to lifestyle and diet.

1. High blood pressure (diet and lifestyle).
2. Smoking tobacco (lifestyle).
3. Hyperglycaemia (diet and lifestyle).
4. Physical inactivity (lifestyle).
5. Overweight and obesity (nutrition and lifestyle).
6. Hypercholesterolemia (diet and lifestyle).
7. Unprotected sexual intercourse.
8. Alcohol abuse (lifestyle).
9. Underweight during childhood.
10. Smoke produced by indoor fires.

of them, about 70% occurred in low to medium-income countries. In the next two decades, new cancer cases are expected to increase by 70%, with 22 million new diagnoses. More than 60% of total worldwide annual incidence occurs in Africa, Asia and Central and South America. These regions account for 70% of cancer-related deaths in the world.[16]

In 2012, in the United States, according to the US Center for Disease Control (CDC), direct medical costs and all health care expenses related to cancer totalled US$87.5 billion. Of this amount, 43% was spent for GP and hospital medical examinations, 41% for hospital admissions, and 9% for prescribed drugs.These costs are destined to increase because of American population's growth and ageing. A recent study has estimated that 169.3 million years of healthy life were lost worldwide in 2008 because of cancer. Colorectal, lung, breast, and prostate cancers mainly contributed to Disability-adjusted life years (DALYs), while Asia and Europe mainly contributed to the loss of DALYs.[17]

The scope of the socioeconomic impact that can be traced to cardiovascular diseases, diabetes, and tumors is such that it demands an in-depth analysis of the role played by the different dietary and behavioral choices (physical activity first and foremost) in the onset of the leading chronic diseases.

4.2 GUIDELINES FOR A HEALTHY WAY OF EATING AND LIFESTYLE

The World Health Organization defines health as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity,"[18] while a healthy lifestyle is "a way of life directed toward the reduction of the risk of diseases and premature death."[19] Not all diseases can be prevented (for instance, heart attacks

16 International Agency for Research on Cancer, *World Cancer report 2014*, 2015.

17 Soerjomataram I., *et al.*, "Global burden of cancer in 2008: a systematic analysis of disability-adjusted life-years in 12 world regions", *The Lancet*, 380, 9856, 1840-1850, 24-30 November 2012.

18 World Health Organization, *Healthy Living*, 1999.

19 *Ibid.*

and cancer), but in many cases conscientious prevention can put off or reduce the risk of onset. Diet, therefore, is a fundamental component in creating a healthy lifestyle.

But what kind of diet and lifestyle? Analyzing the guidelines for preventing chronic diseases from the World Health Organization and the world's most respected international scientific societies[20] leads us to the following key actions (figure 4.1):

1. Engage in regular physical activity, for 30 to 60 minutes a day, either moderate (for instance, walking, or bicycling) or high intensity (for instance, running, swimming, or team sports), most days of the week.

2. Avoid overweight and obesity, over both the short and long term (and make sure not to regain any excess weight you might havelost).

3. Avoid the excessive consumption of alcohol (no more than one glass for women and two glasses for men aday).

4. Don't smoke.

5. Adopt a balanced diet, characterized by careful control of the total caloric intake and by a proper composition of the various macro- and micro-nutrients.

6. Increase (up to about 400 grams/day) the consumption of fruit and vegetables, focusing especially on those that are rich in food fibers, i.e., consume four to five portions of fruit and vegetables a day, which is easy to do through the elimination of snacking.

7. Choose sources of complex carbohydrates (cereal grains and legumes) and increase the consumption of unrefined cereal grains (for example, bread, pasta, and bakery products made with whole-wheat flour).

8. Increase the consumption of legumes.

9. Eat two to three portions of fish a week.

10. Choose plant-based condiments (vegetable oils) over condiments with high contents of animal fat (butter, lard).

11. Reduce the consumption of foods with high fat content (for example, processed meat, sauces, creams, cheese products, sausages), and increase the consumption of low-fat products.

12. Reduce the consumption of fried foods.

13. Moderate the consumption of meat and poultry white and red meat to three to four portions a week.

14. Limit the additional use of salt, above and beyond the levels naturally contained in foods (don't use more than 5-6 grams of added salt, roughly a teaspoonful).

15. Reduce the consumption of foods and drinks with high concentrations of sugars (for example, pastries and sugarydrinks).

16. Avoid the daily use of dietary supplements.

---

20 We considered: for cardiovascular diseases, the American Heart Association, the European Society of Cardiology, and the Società italiana di cardiologia; for diabetes, the European Association for the Study of Diabetes, the American Diabetes Association, and the Società italiana di diabetologia; for tumors, the International Agency for Research on Cancer, the American Cancer Association, and the Federation of European Cancer Societies.

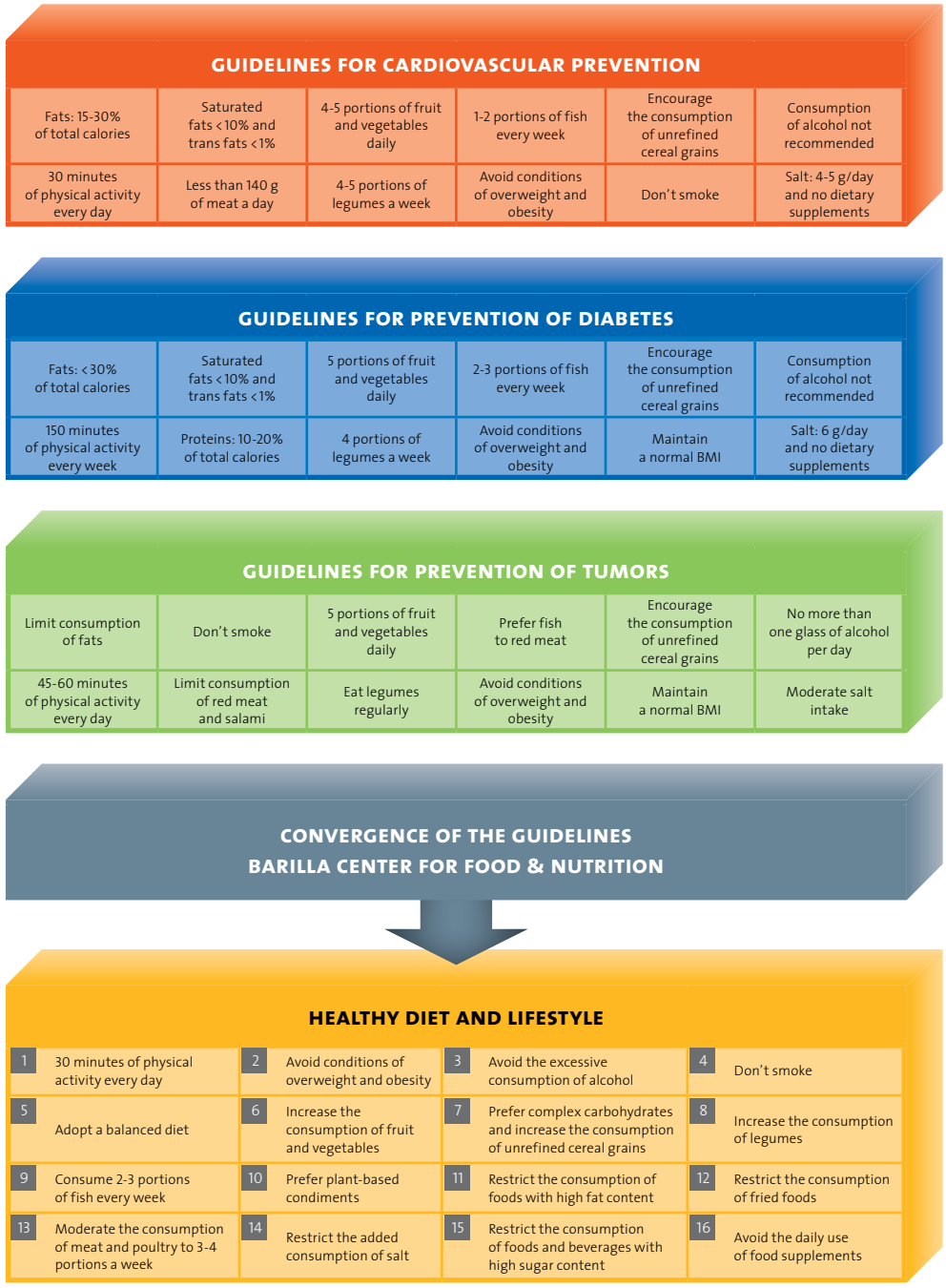


FIGURE 4.1

The methodology followed for the convergence of guidelines for healthy diet and lifestyle
Source: BCFN, 2009.

4.3 THE MOST COMMON GUIDELINES AND DIETARY MODELS

Science does not identify a single hypothetical perfect diet, capable of ensuring the greatest possible benefits in terms of health and prevention of diseases. And for good reason: every region and country on Earth has its own native agriculture, dietary traditions, and customs, making any attempt to spread an ideal meta-diet both arrogant and pointless. To ensure that a diet can improve people's state of health, actions and strategies should promote the rediscovery of regional diets and their most healthful nutritional components, which should be fully considered in light of the most recent scientific knowledge.
BCFN, through a deliberate effort at simplification, has found it possible to identify three great dietary traditions in the world, each is characterized by its own distinctive traits: the Mediterranean model, the North American model, and the Asian model (which contains a number of important traditions and cultures, ranging from the Japanese to the Vietnamese and Chinese diets).

Different dietary models. The Mediterranean dietary model, prevalent in the countries of the Mediterranean region (in particular Italy, Spain, Portugal, Greece, and France), stands out for its nutritional equilibrium. It is characterized by a high consumption of fruit, vegetables, beans, nuts, cereal grains (especially whole grain), and extra virgin olive oil. Fish, white, red and cured meat, milk, dairies, and sweets are consumed in moderation, as well as wine, which is drunk with meals only.[21]
If closely adhered to, the Mediterranean model is one of the most effective in terms of welfare and prevention of diseases.
The North American (i.e., United States and Canada) dietary model has long been at the center of attention of the scientific world. That diet has triggered concern over the exponential increase in obesity and metabolic diseases in the United States. This seems to be the result of an excessive consumption of food (about 2,600 grams as against the roughly 2,000 grams daily of the Mediterranean model and the Japanese model) and an unbalanced nutritional composition that tends toward overconsumption of red meat and sweets; respectively 11.7% and 7.1% of total daily consumption.[22]
This diet, basically, is largely rich in proteins and sugars, which are not adequately counterbalanced by a high level of fruit and vegetables. These characteristics ensure that the North American diet falls notably far from recommended guidelines and should be to some extent revised and supplemented.
The Japanese dietary model[23]—taken as an example of the dietary style prevalent in eastern Asia—favors the consumption of cereal grains, equal to no less than 24% of the total daily intake, and fish. Fish consumption averages 107 grams daily, much higher than the 45 grams of the Mediterranean diet and the 18 grams of the North American

---

21 Public Health Nutrition, *The Mediterranean diet: science and practice*, 9(1A):105-10, 2006, Willett WC1.

22 Agriculture Fact Book, *Profiling Food Consumption in America*, 2002.

23 The Japan Dietetic Association, *National Nutrition Survey*, 2001.

diet. This diet is very similar to the Mediterranean diet in both components and preparation (a relatively modest use of frying as a way of cooking food). This diet includes an abundance of mineral salts, omega-3 fatty acids, phosphorus, and polyunsaturated fats, largely derived from fish.
All of this shows that very different dietary models can coexist side-by-side, capable of adhering—in different measures and ways—to the principles sanctioned by medical science.
The nutritional value of the Mediterranean diet, in particular, was scientifically demonstrated by the well-known "Seven Countries Study"[24] directed by Ancil Keys. That study compared the diets of the populations of seven different countries to test those diets' benefits. The indicated that the best dietary regime was that of the inhabitants of Nicotera, in Calabria, who followed a Mediterranean dietary style. The populations of Nicotera, Montegiorgio (Marche), and Campania had very low blood cholesterol levels and a minimal percentage of coronary diseases. Their diet was based on olive oil, bread and pasta, garlic, red onions, aromatic herbs, vegetables, and very little meat.

Diet and chronic diseases. In general, diets close to the Mediterranean diet help protect against the most widespread chronic diseases. A number of studies[25] have shown that sticking to the Mediterranean diet produces significant reductions in overall mortality, especially from deaths caused by cardiovascular diseases and tumors. The Mediterranean diet appears capable of reducing the risk of heart attack by 72%, but is protective against all causes of mortality, including Parkinson's disease and Alzheimer's disease.[26]
Some recent studies have proved that people with high cardiovascular risk, who were following a Mediterranean diet without calories restrictions including extra-virgin olive and nuts, have shown a rough 30% reduction in the relative risk of cardiovascular events.[27]
In these studies, the concept of the Mediterranean diet has been turned into an actual regime characterized by a high intake of vegetables, pulses, fruit, nuts, olive oil, and cereals (mostly whole grain in the past); moderate consumption of fish, dairy products (especially cheese and yogurt), and wine; and a low consumption of red and white meat and saturated fatty acids.[28]

---

24 Keys A., *et al.*, *Seven Countries. A Multivariate Analysis of Death and Coronary Heart Disease*, Harvard University Press, Cambridge, MA and London, 1-381, 1980; Toshima H., Y. Koga, H. Blakburn, *Lessons for Science from the Seven Countries Study*, Springer Verlag, Tokyo 1995.

25 Trichopoulou A., *et al.*, "Adherence to a Mediterranean Diet and Survival in a Greek Population", *The New England Journal of Medicine*, 348, 26, 2003.

26 De Lorgeril M., *et al.*, "Mediterranean diet, traditional risk factors, and the rate of cardiovascular complications after myocardial infarction: final report of the Lyon Diet Heart Study", *Circulation*, 1999.

27 Estruch N., *et al.*, "Primary Prevention of Cardiovascular Disease with a Mediterranean Diet", *The New England Journal of Medicine*, 368:1279-1290, 2013.

28 Willett W.C., F. Sacks, A. Trichopoulou, "Mediterranean diet pyramid: a cultural model for healthy eating", *American Journal of Clinical Nutrition*, 1995.

4.4 RECOMMENDATIONS

In conclusion, two principal findings have emerged from BCFN's analysis up to this point. The scientific community is convinced that the linkage between lifestyle and health is direct and quite intense. In the context of individual choices, diet plays a decisive role.
Moreover—and this result is even more interesting than the first one—comparing the various guidelines issued by the most respected international scientific bodies reveals general agreement on this simple fact: there are lifestyles and ways of eating that are capable of reducing, simultaneously and in parallel, the risks of the onset of overweight, obesity, tumors, cardiocirculatory disease, diabetes, and metabolic syndrome. This is an important finding. It lays the foundations upon which it is possible to send citizens and consumers clear, unequivocal, and detailed messages concerning the preferable lifestyles and dietary choices.
The fact that it was possible to reach these conclusions by means of simultaneous studies in three different fields (cancers, diseases of the cardiocirculatory system, dysfunctions of the metabolism), shows once again how profitable it can be to examine on a systemic level knowledge that has been codified in contiguous but separate areas. The BCFN intends, therefore, as its very reason for existence, to work to generate "new knowledge" through efforts to assemble evidence, observations, and analyses that are already in part familiar, but which are rarely considered on an integrated and comprehensive basis.

FOOD AND CHILDREN: EDUCATE TODAY FOR A BETTER LIFE TOMORROW

After devoting an entire year (2009) to the analysis of the overall relationship between diet and health, the BCFN concentrated its efforts in 2010 on an investigation of the link between nutrition and healthy growth in the various phases of a child's life, from the pre-school age to adolescence.
As noted above, in Western countries, a high number of adult deaths are linked to excessive consumption of food and poor dietary and life habits. In many cases, those habits date back to a very young age. Childhood obesity, for example, is a serious risk factor for obesity in adulthood. On a more general level, lifestyles and behaviors that are acquired during an impressionable age—such as dietary preferences, the composition of one's diet, the distribution of meals through the day, portions, the way of consuming foods, the tendency to an active or sedentary lifestyle—can be important factors in creating an overall dietary behavior that is either adequate or inadequate in adulthood as well, as a result of a "memory effect" bound up with the habits acquired. It therefore appears to be fundamental to focus attention—beginning in early childhood—on the adoption of healthy daily dietary habits and proper lifestyles. Although some of the factors leading to overweight and obesity are genetic in origin and therefore resistant

to therapeutic or preventive intervention, others can respond to preventive actions aimed at modifying diets and lifestyle habits. But these interventions, if they are to be as effective and lasting as possible, must begin in the earliest phases of life.
As the pediatrician Claudio Maffeis pointed out at the Second International Forum on Food and Nutrition, "The earliest years of life are a very important window in terms of the development of the organism. [...] Eating right during the developing years is important because it not only ensures that the child will grow and develop properly, but it also guarantees a defense against diseases, metabolic and otherwise, that we might encounter in later phases."

4.5 THE SPREAD OF OBESITY AND OVERWEIGHT IN CHILDREN AND ADOLESCENTS AND THE INTERNATIONAL ECONOMIC AND SOCIAL IMPACT

All Western countries are experiencing an exponential growth of the phenomenon of childhood obesity and overweight. According to a 2012 WHO report, worldwide[29] there are 170 million obese or overweight school-age children.
The highest prevalence of childhood overweight occurs in middle and high-income countries, while low-income countries show the lowest prevalence rate. However, overweight is increasing in almost all countries and prevalence rates are rising more rapidly in middle and low-income countries.
Even though it is not an isolated case, the United States certainly exemplifies the trend of spreading obesity and overweight among the younger sections of the population (as well as among adults).[30] Some recent data show that obesity prevalence is at 17% for 7 million children and teenagers aged between 2 and 19.[31] These fractions seem to be confirmed by a more recent study done by the Trust for America's Health and the Robert Wood Johnson Foundation, which state that roughly 5% of children aged from 6 to 11 are already morbidly obese. The most recent National Health and Nutrition Examination surveys (2007-2008) indicate that about 17% of children aged between 2 and 19 are obese and a further 15% is to be considered overweight.

The rapid spread of this phenomenon has been affecting not only the United States, but all the leading advanced nations over the last 20 years.
In Europe too the problem of childhood obesity is increasingly widespread: Studies prove that childhood overweight prevalence is between 16 and 22%, while the obesity prevalence is between 4 and 6%.

---

29 World Health Organization, *Population-based approaches to childhood obesity prevention*, 2012.

30 More than 65% of all Americans are either obese or overweight and approximately 31% of the adult population (that is to say, more than 61 million people) appear to fall under the criteria identified to define conditions of obesity (an individual is defined as obese if he or she has a body-mass index, or BMI, of more than 30). The National Institutes of Health believe, moreover, that 4.7% of the American adult population falls under the criteria for what is called "extreme obesity" (with a BMI of over 40).

31 Ogden C. L., *et al.*, "Prevalence of Childhood and Adult Obesity in the United States, 2011-2012", *Journal of the American Medical Association*, 311(8):806-814, 2014.

BAD EATING HABITS IN CHILDREN

Children are often obese or overweight because of eating habits that both fail to support healthy growth and predispose those children to weight gain.
In particular, it transpires that:

- 8% of children don't have breakfast;
- 31% have inadequate breakfast;
- 52% have a too substantial morning snack;
- 25% of parents state that their children do not consume fruit or vegetables on a daily basis.

This means that overweight children are between 11.8 and 16.3 million, of which obese children represent a number between 2.9 and 4.4 million.[32]
In Italy this issue has taken on growing importance, as a result of the rise of the numbers of adolescents and children who are overweight or obese. In Italy, according to some 2014 surveys by Okkio alla salute, 20.9% of children are overweight and 9.8% are obese, including morbidly obese children who account for 2.2% alone. The highest prevalence is registered in central and southern regions.
The statistics on physical activity are anything but comforting: only one child out of six engages in sport for less than one hour per week. However, there are as many children who have not engaged in any physical activity on the day preceding the survey. Almost half of the children, moreover, have television sets in their bedrooms. Finally, the perception of the problem by the parents, seems to be inversely proportional to the statistical frequency of the excess weight. Four mothers of overweight children out of ten do not believe that their children are overweight for their height.[33]
As the reader can easily imagine, the impact of overweight and obesity in childhood and adolescence is extremely significant, both for government health-care budgets and in terms of effects on the physical and cognitive development of children and adolescents.
The European Association for the Study of Diabetes (EASD) recognizes that the prevention and treatment of obesity is "the most important public health problem throughout the world." While the health consequences of childhood obesity and overweight appear to be well documented in the literature, as of this writing the economic impacts on social and health systems have only been quantified by a small number of studies.
Particularly interesting are the findings of one recent research project[34] conducted on young Americans between the ages of 6 and 19, which revealed that the subjects who are considered obese generated higher health costs compared with normal-weight children: US$94 more for doctor's visits, US$114 more for drug prescriptions, and US$12 more for emergency services. If we extrapolate these data to the entire nation, obesity and overweight among young people appear to cause incremental costs to the

32 European Association for the Study of Obesity, 2013.

33 Okkio alla salute, *Summary of Results* 2014.

34 Trasande L., S. Chatterjee, "The Impact of Obesity on Health Service Utilization and Costs on Childhood", *Obesity*, 17, 9, 1749-1754, 2009.

American health system of US$14.1 billion dollars a year just for those three categories.[35]

4.6 NUTRIENTS IN THE DIFFERENT PHASES OF GROWTH

Growth is a continual process that begins at the moment of conception and ends with the attainment of sexual maturity. Body growth is accompanied by neurological and psychological development. This long journey can be subdivided into three time periods distinguished by the particular anatomical and physiological modifications that take place in the child: childhood, adolescence, and youth. Specific dietary needs are associated with each phase, as are the intakes of nutrients and lifestyles to be recommended for healthy development. The earliest phase, childhood, can itself be subdivided into early childhood, which runs from birth to the first two years and includes the so-called periods of newborn (the first month of life), suckling, and weaning (first teeth); second childhood or the age of play: this includes the period running from the third to the fifth year of age, and third childhood, also called "school age," which includes the period from 6 to 11 years of age. The second phase is adolescence (or puberty), and includes the period between the ages of 11 and 18 in the male, and between 11 and 16 in the female.
Youth, finally, ranges from age 18 to 25 for males and from age 16 to 20 for females. In this latter phase, the nutritional and lifestyle indications are roughly the same as foradults.

Childhood. During the period of early childhood—which is characterized by very rapid growth—it appears particularly necessary to ensure that a child is supplied with an adequate quantity of energy. The macronutrients contained in the foods that are capable of providing that energy are fats, carbohydrates, and proteins. A measure of how important the ingestion of energy is in the early years is the fact that, for every gram of macronutrients ingested and per unit of body weight, the quantity of proteins ingested by a young child is almost the same as an adult, but the carbohydrates ingested are almost twice as much and the quantity of fats is almost four times greater.
Energy is necessary for maintaining respiration, circulation, and renal and cerebral function in conditions of rest (basal metabolism). Beyond that, energy is consumed in digestion, metabolism, and warehousing nutrients (thermogenesis), during the deposit of new tissues (growth), and in physical activity. In the first year of life, the demand for energy for growth is considerable compared to the total but it rapidly decreases, from 35% in the first month to 5% at the end of the first year. After the first year and until the ages of 9 or 10, 50-60% of the energy spent daily by the child is due to basal metabolism, 30-40% to physical activity, 5-8% to thermogenesis, and only 2% to growth.
The WHO[36] points out the fact that there is substantial similarity among the various

35 *Ibid.*
36 WHO Regional Office for Europe, UNICEF, "Feeding and Nutrition of Infants and Young Children", WHO Regional Publications, European Series, 87, 2003.

recommendations concerning the quantity of energy necessary for preschool-age children. And so there is an overall range of values that can be considered reliable, derived from the product of the estimated quantity of energy necessary per kilogram of body weight and the average weight of children at different ages (table 4.1).
The chart shows average values, which can also vary considerably in terms of weight characteristics, the body makeup, and the average level of physical activity of the individual boy or girl.
When the intake of energy is to be lower than the required minimum, problems may arise, some of them quite serious, in the child's growth and ability to perform normal physical activities, especially pre-school-age children. Prolonged periods of inadequate energy intake can lead to full-blown malnutrition and/or a state of reduced protein reserves, in which tissue-deposited proteins are used for the generation of energy.
In contrast, excessive inputs of energy encourage the deposit of excess fat. Therefore, in view of the rise of obesity among children and adolescents, the WHO recommends limiting the excessive ingestion of fats and sugars from the earlier stages.

TABLE 4.1 – **THE OPTIMAL AVERAGE QUANTITATIVE AMOUNT OF ENERGY TO BE INGESTED IN ONE'S DIET (KCAL/DAILY)**

AGE OF THE CHILD	OPTIMAL AVERAGE QUANTITATIVE AMOUNT OF ENERGY
2-3	1,050-1,470
4-6	1,350-1,640
7-10	1,620-2,300

Source: LARN 2014, median Kcal/day multiplied for PAL for respective age group (www.sinu.it/html/pag/02-Fabbisogno-energetico-medio-AR-nell-intervallo-d-eta-1-17-anni.asp).

The main macronutrients. In quantitative terms, carbohydrates (starches and sugars) represent the first and most important energetic source for the organism. They provide energy to all tissues of the human body, especially the brain and red blood cells, which use only glucose as fuel for their cellular activities.
Dietary fibre[37] is represented by plants' non-digestible carbohydrates and it is responsible for beneficial physiological effects such as slower gastric emptying, a greater feeling of satiety, reduced post prandial glycaemia and the absorption of cholesterol and fatty acids.
Carbohydrates that are not absorbed inside the small intestine are then transformed into lactic and short chain fatty acids inside the colon. As well as some oligosaccharides, these metabolites stimulate appropriate bowel mucosatrophism and help maintaining it, also by exploiting the prebiotic effect they have on gut microflora.
Fats represent a source of energy and essential fatty acids for children. A daily intake has to be assured through fish, nuts, and vegetable oils, particularly olive oil. Besides, fats allow optimum absorption of liposoluble vitamins (A, D, E, K).[38]

37 Institute of Medicine of the National Academic Press, 2005.
38 *Ibid.*

Proteins are the main structural components of all body cells and can act as enzymes, membranes, carriers, and hormones. They are formed by amino acids, which are the basis for nucleic acids, hormones, vitamins and other important molecules. High-quality proteins can be obtained from optimum sources such as meat, fish, cheese, milk, eggs and vegetable products, namely soybeans, pulses and wheat derivatives.
The WHO suggests that, during the transition from weaning to the pre-school age (around age 2), some 30-40% of total energy input should derive from fats. The Nemours Foundation[39] emphasizes that fats and cholesterol play an important role in a child's growth, especially in relation to cerebral development, and they should not be reduced below certain given limits: for very young children (2-3 years), calories deriving from fats ought to account for 30-35% of total caloric intake, while from age 4 on fats should account for 25-35% of the total.

The categories of carbohydrates. There are three main types of carbohydrates in food: sugars, starches, and fibres. Sugars are a primary source of energy, but they provide no other important nutrition. In part to establish a proper long-term dietary regimen, the WHO believes that it is a mistake for the diet of school-age and pre-school-age children to be excessively rich in sugary foods and beverages. The World Health Organization recommends that the daily sugar intake for adults and children does not exceed 10% of whole energy intake. A further reduction below 5% of total energy intake could provide further health benefits.[40] In the case of a pre-schoool-age child, this translates into a daily average of no more than 25 grams of sugar. If added sugars contribute more than 30% of total energy intake, the result is higher risk of significant health problems for children, especially significant increases in the levels of glucose, insulin, and blood lipids.[41]
The WHO also suggests that a diet too rich in starches—principally found in products derived from cereal grains, and in potatoes and rice—can be unsuitable, especially at an early age, even though starches are easily digested and absorbed. Higher intake of starches is, on other hand, generally recommended as the child reaches school age, even though we should not overlook the fact that studies on the effect of diets rich in starches on pre-school-age and schoolage children are still relatively few in number.
The third main category of carbohydrates is represented by fiber, which has been shown to have numerous positive effects on a child's health from the the earliest years. Fiber appears to have a beneficial effect on the speed of intestinal transit (they make the alvus more regular), the characteristics of intestinal absorption (they slow the pace of the absorption of nutrients, in particular cholesterol and glucose), and the risk of becoming overweight (they help to make the diet less energy-dense and increase satiety).

---

39 The Nemours Foundation Center for Children's Health Media is an initiative accredited by the U.S. Department of Agriculture, U.S. National Institutes of Health, and the U.S. National Library of Medicine.

40 World Health Organization, *Sugars intake for adults and children guideline*, 2015.

41 Department of Health, United Kingdom, Dietary sugars and human disease, London, H.M. Stationery Office, 1989 (Report on Health and Social Subjects, n. 37).

In fact, foods with high fiber content are characterized by low energy density,[42] reduce the post-prandial glycemic response, and do an excellent job of satisfying hunger, thus limiting the overall ingestion of food and benefiting the digestive process.
Fruits and vegetables are strongly recommended for the diet of pre-school-age children and are, if anything, even more strongly recommended for school-age children. Fruits and vegetables, in fact, are rich in fiber, but they also contain high quantities of important micronutrients, especially those valuable during the phases of rapid growth. Fruits and vegetables, moreover, seem to have an advantage with respect to other fiber-rich foods recommended for the diets of children (such as whole cereal grains and legumes) because, unlike those food groups, they do not contain elements that can reduce the absorption of the zinc and iron ingested with the food.

The role of vitamins and minerals. Alongside the main macronutrients, vitamins and minerals are essential elements of a sound diet for school age and pre-school-age children. An adequate intake of vitamin A is necessary for the proper development of sight, in order to ensure the integrity of the epithelial tissues, and for the development and differentiation of tissues. It also plays a central role in the development of the immune system and is involved in the development of taste and hearing. The chief sources of vitamin A are liver, cheese products, eggs, fish, margarine, and certain fruits and vegetables (for example, carrots and yellow-to-orangefruit).
The B vitamins also play a fundamental role in children's growth, health, and development. B vitamins are found prevalently in whole cereal grains, legumes, peanuts, meat, leafy green vegetables, eggs, milk, and fish.
Vitamin C is fundamental in the optimal functioning of the immune system and for the synthesis of collagen. It also plays a significant support role in the process of iron absorption (especially from plant sources). Vitamin C is present mainly in fruits and vegetables, in particular in spinach, tomatoes, potatoes, broccoli, berries, and citrus fruit.
Vitamin D is essential in metabolizing calcium (by stimulating its intestinal absorption), in muscle function, in the proliferation and maturation of cells, and in the proper functioning of the immune system. The principal dietary sources of vitamin D are fatty fishes (sardines, salmon, tuna, and herrings), fish oils (especially cod liver oil), margarine, cheese products, eggs, liver, andbeef.
Alongside macronutrients and vitamins, minerals are essential elements in the diet of school-age and pre-school-age children. These include iron (both hemoglobinic, which is present in meat and fish, and non-hemoglobinic, which is present in cereal grains, legumes, beans, vegetables, and fruits), calcium (milk and milk products, nuts, beans, and fish), magnesium (pulses, nuts, raw spinach, and some varieties of green vegetables), phosphorus (milk, cheese, meat, fish, and in green-leaf vegetables), sodium (naturally found in almost all foods and in added salt), and zinc (red meat, liver, fish, milk and dairy products, wheat, and rice).

---

42 Energy quantity per unit of consumed macronutrient (in this case, Kcal/gram of fibres).

Adolescence. Adolescence is a period distinguished by intense metabolic activity.[43] In this period, in fact, there is a sharp rise in the rate of growth, in both males and females. Body growth is also accompanied by rapid psychological and behavioral development that leads the boy or girl to experience a progressively more intense need for independence and autonomy; this has a significant effect on his or her dietary behavior.

During adolescence the daily consumption of food should be sufficiently rich to satisfy the increased demand from the growth processes. At the same time, however, nutrition must meet the need to safeguard against the metabolic and degenerative diseases that are characteristic of adulthood: hypertension, diabetes, atherosclerosis (hardening of the arteries) and tumors.

Nutrition and the issues bound up with the adoption of a proper diet and lifestyle take on a fundamental importance in adolescence. In this age during which one's psychic and physical development is being completed, the foundation of proper diet and nutrition is laid, ideally to serve over time as a preventive factor against many diseases of later life.

Although the nutritional needs of adolescents is of great interest, only a few research projects have analyzed them. Often, in fact, the available data derive from extrapolations of studies done on childhood and adulthood.

In the absence of in-depth and sufficiently broad studies (both in terms of number of subjects and the time span) on the energy requirements of adolescents, it is difficult to establish the requirement for individuals who present rapid swings in growth rates from one year to the next and differ notably from one to the next and between genders. Table 4.2 shows the intervals of energy requirements in adolescents. The ranges are sharply influenced by such factors as weight, body makeup, and level of physical activity.

The energy requirement, in most cases, is efficiently satisfied through the finely calibrated and automatic regulation of the appetite by the hypothalamus. The appetite encourages the ingestion of food that satisfies the need for both energy and various nutrients. The system generally works well to ensure the ingestion of sufficient quantities of energy to satisfy metabolic needs. In contrast, the regulation of the ingestion of nutrients may prove to be less than optimal, which may result in shortages of given elements. The nutritional requirements of adolescents are influenced first of all by physical growth. Peak growth generally occurs between the ages of 11 and 15 for girls and 13 and 16 for boys. Requirements of energy and nutrients are variable from day to day, even for the same individual.

The most common nutrient deficiencies at this age are iron and calcium deficiencies. Anemia due to a lack of iron is one of the most widespread and common diseases as-

---

43 In particular, the prevalent part is anabolism or biosynthesis, that is, the part of the processes of synthesis of the more complex organic molecules out of simpler molecules of nutritious substances. In other words, during adolescence, complex molecules are produced from the of simpler molecules that are useful to the cell. These processes demand energy, and specifically anabolism is responsible for the formation of the cellular components and the body's tissues, and thus, for the growth of the individual.

TABLE 4.2 – **THE ENERGY REQUIREMENTS DURING ADOLESCENCE FOR MALES AND FEMALES**

	MEDIAN ENERGY IN KCAL/DAY PER PAL	
AGE	MALE	FEMALE
11-12	2,440-2,600	2,210-2,340
13-14	2,780-2,960	2,440-2,490
15-16	3,110-3,210	2,510
17 *	3,260	2,510

* Over 18 years, Kilocalories are calculated according to height and weight (www.sinu.it/html/pag/02-Fabbisogno-energetico-medio-AR-nell-intervallo-d-eta-1-17-anni.asp).

Source: LARN 2014.

sociated with inadequate diet.[44] Adolescents can come down with anemia as a result of the sharp increase in the tissue demand for iron, in particular in the muscular and erythrocytic mass, which involves a significant increase in the iron requirement needed to produce hemoglobin (a protein that serves to transport oxygen) and myoglobin (a globular protein contained in muscles).

The increase in lean body mass,[45] especially of muscles, is more significant in male adolescents than their female counterparts. During pre-adolescence, lean body mass is roughly equivalent in the two sexes, but when adolescence begins males accumulate more lean body mass for every additional kilogram of body weight acquired during growth, which means that they have a final value of lean body mass almost twice that of females.

Another factor that helps to increase the iron requirement is the appearance of the menstrual cycle in girls. Blood (and thus iron) loss due to menstruation requires supplementation of this fundamental trace element. Iron supplements must therefore be taken on those specific days.

Because of this higher need for iron in adolescents, they should increase their consumption of iron-rich foods such as lean meats and fish, legumes, dark green vegetables, walnuts, and cereal grains enriched with iron. Once menstruation begins, girls need to ingest a good 50% more iron than boys do. This means a daily requirement of about 18 milligrams as against the 12 milligrams daily requirement for boys.

The iron contained in foods of animal origin, also known as "heme iron," is absorbed more easily than iron from non-animal sources (also known as "non-heme iron"). Therefore, adolescents who eat a vegetarian diet are more at risk of iron shortages. The ingestion of foods that are rich in vitamin C, such as citrus fruits, encourages the absorption of iron from plant sources.

Calcium also performs an essential function in adolescents experiencing rapid growth, inasmuch as it forms part of the makeup of bones and teeth. The human skeleton con-

44 American Academy of Pediatrics, Committee on Nutrition, "Iron fortification of infant formulas", *Pediatrics*, 1999.

45 Lean body mass represents what is left of the organism after stripping of its deposited fat.

IRON-RICH FOODS

It is important that teenagers consume an adequate amount of iron-rich foods[1] such as:

- lean meat and fish;
- pulses;
- dark-green vegetables;
- nuts;
- iron-enriched cereals.

1 Wardley B. L., J. W. L. Puntis, L. S. Taitz, Handbook of Child Nutrition, 2nd Edition, Oxford University Press, Oxford, 1997; James J., "Iron deficiency in toddlers", *Maternal and Child Health*, 1991; Walter T., P. R. Dallman, F. Pizarro, L. Velozo, G. Pena, S. J. Bartholmey, E. Hertrampf, M. Olivares, A. Letelier, M. Arredondo, "Effectiveness of iron-fortified infant cereal in the prevention of iron deficiency anaemia", *Pediatrics*, 91(5):976-982, 1993.

tains some 99% of the total body reserves of calcium and the increase in the skeleton's size and weight reaches its highest point during adolescence. In fact, approximately 45% of the skeletal mass of an adult is formed during adolescence, even though the growth of the skeleton continues almost until the age of 30, and a calcium shortage during this period can damage an individual's proper growth. The greatest need for calcium comes in what is called the "first adolescence," between the ages of 10 and 14 in girls and 12 and 15 in boys. In this period the average daily retention of calcium is approximately 200 milligrams in females and 300 milligrams in males.

Because only about 30% of calcium ingested is actually absorbed, it is fundamental that an adolescent's diet provide an adequate intake of calcium in order to attain the greatest possible bone density. Only during the period of adolescence can the youth deposit the maximum possible quantity of calcium in growing bone tissue in order to attain the so-called "peak bone mass," that is, the greatest possible level of calcification. Although the maximum quantity of calcium that can be deposited in the bones is determined genetically, peak bone mass can never be attained if the individual fails to ingest an adequate quantity of calcium. This makes it clear just how important intake of calcium-rich foods is for boys and especially for girls, who will be more exposed to the risk of osteoporosis with the onset of menopause later on. A number of studies[46] confirm that attaining "peak bone mass" in adolescence is crucial to reducing the risk of osteoporosis in later years.

On the other hand, it is very common for adolescents to have diets that are lacking in a number of nutrients, because of fads or because they want to lose weight quickly and to an excessive degree. Osteoporosis represents one of the most serious and potentially irreversible consequences of anorexia nervosa and of the rapid and excessive weight losses experienced by adolescent girls, who often therefore fail to reach "peak bone mass."

For adolescents of both genders the daily consumption of 1,300 milligrams of calcium

46 Weaver C. M., "The growing years and prevention of osteoporosis in later life", *Proceedings of the Nutrition Society*, 59:303-306, 2000.

per day is recommended.[47] The principal dietary source of calcium is dairy and cheese products. Aged cheeses contain greater concentrations of calcium because they have been subjected to a process that leads to water loss. By consuming various portions of such dairy products as milk, yogurt, mozzarella, and cheese, or choosing other good sources of calcium such as mineral water, nuts, pulses and some green-leaf vegetables, it is easy to reach the recommended level of calcium.

Overweight and obesity in adolescents constitute a serious nutritional problem that is very likely to persist in adulthood; obesity in adolescence is associated with metabolic diseases in adulthood and to higher mortality rates. Addressing this problem requires not only a sound diet but also a focus on physical movement. Motor activity helps to burn calories, release tension and stress, and improve moods and psychological welfare. Regular physical activity and sports bring notable benefits to the cardiovascular and skeletal systems as well as to the metabolism. Regular motor activity encourages the maintenance of adequate body weight and an optimal body makeup; it also makes adolescents stronger and accustoms them to adopting a lifestyle that will sustain healthier lives in the years to come.

Conversely, the lack of physical activity among adolescents plays an important role in the development, progression, and persistence of a number of diseases such as obesity. Studies undertaken in Europe and in the United States. have shown that most adolescents are physically inactive or else adopt a lifestyle that does not call for adequate physical activity; they are, in other words, sedentary.

Physical inactivity is not merely one of the leading causes of overweight and obesity in adolescents, but also of the later development of such chronic diseases as heart disease, diabetes, hypertension, constipation and intestinal diverticulosis, osteoporosis, and certain forms of cancer. Sports and motor activities such as swimming, calisthenics, gymnastics, etc., or else just bicycling, skating, ball sports, dance, and weightlifting with an instructor's supervision, for about 60 minutes a day, from three to five times a week, can help to increase bone mass and density. Adequate physical condition also correlates positively with the improvement of the body's elasticity, equilibrium, agility, and coordination, and the reinforcement of the bones. On the basis of current recommendations,[48] adolescents should be physically active for at least 60 minutes a day, which includes both athletic physical activity and play.

Aside from engaging in adequate physical activity, adolescents must eat properly for health and growth. To be specific, eating properly means considering the quantity and quality of food ingested and the distribution of food consumed over the course of the day. Caloric intake should be broken down as shown in figure 4.2. Variety is also a good idea; it means a mixed diet that includes plant-based foods (fruit, vegetables, legumes, cereal grains, seeds, etc.) and foods produced by and from animals (meat, cheese, dairy products, ham, etc.), as well as alternating foods over the course of the week.

Dietary behaviors focused on a single diet and the repeated and frequent consumption

---

47 LARN 2012.

48 United States Department of Agriculture, Center for Nutrition Policy and Promotion, 2006.

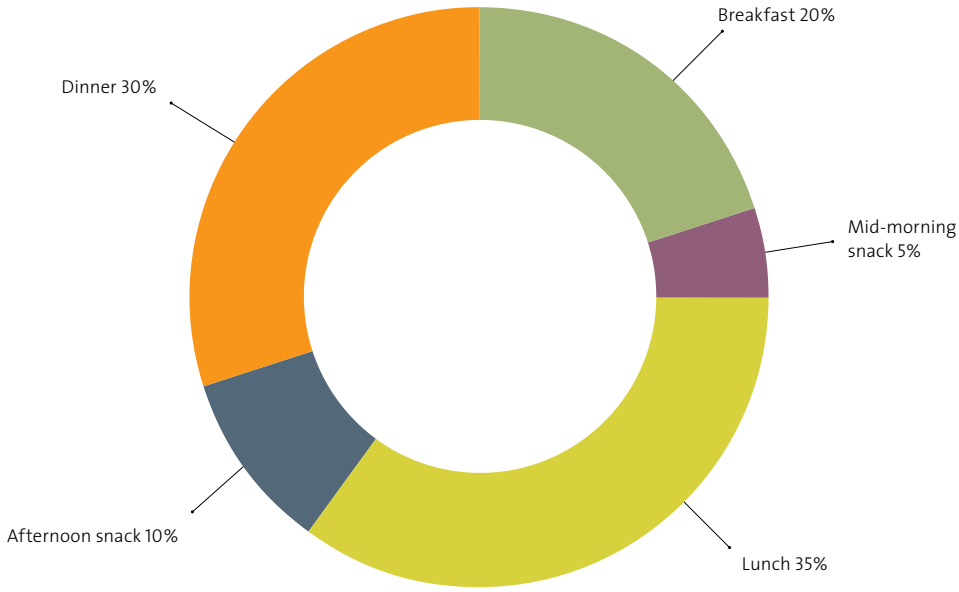


FIGURE 4.2

Breakdown of caloric intake during the day
Source: BCFN on Società italiana di nutrizione umana data, 2011.

of lunches and dinners away from home significantly increase the risk of overweight and obesity in adolescents.[49]

4.7 GUIDELINES FOR HEALTHY DIETS AND SOUND LIFESTYLES IN CHILDREN AND ADOLESCENTS

Given the importance of diet during adolescence, especially for the prevention of the main chronic diseases, governments and international organizations that are involved in health issues have formulated guidelines to establish a balanced diet in the various stages of life, with a specific focus on adolescence.[50] In general, nutritional science indicates that children should eat five times a day.
As we have noted, good nutrition is not enough; regular physical activity (especially if practiced outdoors in the fresh air) is one of the factors considered fundamental to the health of children and adolescents. It also can help reduce risks linked to common chronic diseases in later ages, up to and including adulthood.

49 Barlow S. E., "Expert Committee Recommendations Regarding the Prevention, Assessment, and Treatment of Child and Adolescent Overweight and Obesity: Summary Report", *Pediatrics*, 2007.
50 WHO, Food and Nutrition Board, Società italiana di nutrizione umana.

THE WEEKLY MENU FOR CHILDREN

A weekly balanced diet may include the following:

- cereals (bread and pasta): daily;
- fruits and vegetables: daily;
- milk and dairy products: daily;
- meat: 2-3 times a week;
- fish: at least three times a week;
- cheese: twice a week;
- eggs: once or twice a week;
- pulses: at least twice a week.

LIFESTYLE FOR ADOLESCENTS

The guidelines that should be followed in order to provide proper diet and lifestyle to foster the healthy development of an adolescent are the following.

- Adopt a healthy and balanced diet. Alternating every day among all the principal food groups will provide all the macro and micronutrients (calcium, iron, vitamins, etc.) that adolescents need.
- Avoid the excessive calories from consuming highly caloric foods or foods with elevated concentrations of fat.
- Distribute daily nutrients evenly to ensure a good equilibrium between the intake of animal and plant proteins (a ratio that should be 1:1), simple and complex sugars (through the ingestion of less sweets and more bread, potatoes, pasta, or rice), and animal and plant fats (utilizing less lard and butter and more olive oil).
- Minimize the additional intake of salt in order to reduce the risk factors for the development of hypertension, especially in adulthood.
- Distribute meals over five periods during the day: eat at breakfast, midmorning snack, lunch, afternoon snack, and dinner.
- Avoid eating at other times.
- Engage in physical activity for at least an hour every day, including both athletic activity and play.
- Stay active, and especially reduce time spent in front of video screens (televisions and computers).

4.8 RECOMMENDATIONS

Two key findings emerge from these observations and analyses. First, we can document at all levels a growing awareness of the importance of adopting proper dietary approaches in the earliest years of a person's life (up to adolescence) in order to ensure conditions of good health in adulthood as well.

Second, awareness is spreading within both the scientific community and throughout society of the importance of disease prevention and of the fundamental role dietary habits and lifestyles play in preventiong obesity and chronic diseases. Prevention is also emerging as one of main lines of future action to ensure the financial sustainability of health care systems.

However, most of the studies done to date have focused on adults; problems of methodology, economics, and organization have made it difficult to study children and adolescents in sufficient detail. Nevertheless, and although the general picture we present here is based to some degree on fragmentary evidence, the findings undeniably reveal the extreme importance of a sound approach to diet from the younger stage.

KNOWLEDGE AND INFORMATION

We consider it more necessary than ever to:

- encourage the further exploration of scientific knowledge;
- encourage cooperation among the various entities involved in feeding young people (general practitioners, pediatricians, nutrition experts, teachers and parents);
- properly structure the various interventions in accordance with the most broadly accepted international best practices; and
- encourage the diffusion of proper dietary information and promote a culture of prevention.

Above all else, ensuring that children and adolescents eat properly seems to require a concerted effort, the result of the coordination of a variety of actors (school, family, doctors, pediatricians, etc.) who provide care to children at different times of the day. The family and the school appear to be the principal focuses of effective education about proper diet aimed both at young peopleand—in the future—at the adults of tomorrow. It is in the family that a child learns to eat and internalizes dietary behaviors. On the other hand, the school—by virtue of its growing importance in shaping diets and the potential involvement of the families themselves—can and should play a truly active role in encouraging balanced ways of eating, by inviting families to understand the most appropriate dietary choices and to become allies in a joint and concerted program of intervention.

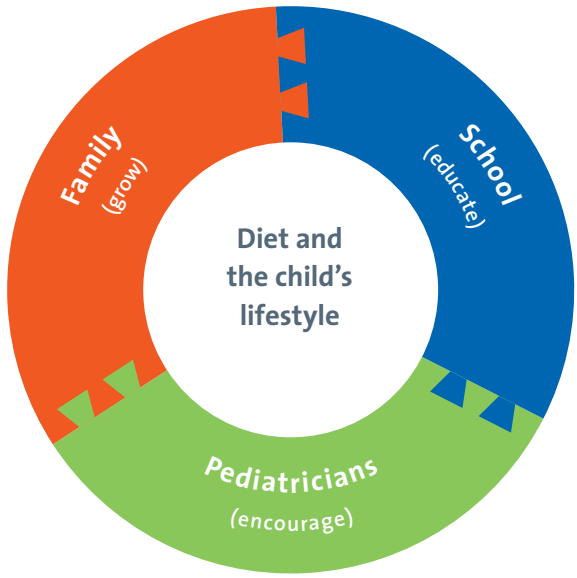


FIGURE 4.3

The various actors in food education
Source: BCFN, 2010.

Finally, physicians and nutritionists are also key actors in establishing dietary and lifestyle virtuous cycles. In particular, it is clearly fundamental that family doctors, pediatricians and nutritionists more fully become first-access "gatekeepers" to topics having to do with proper nutrition and adequate physical activity for all the members of the nuclear family, in the various phases of their lives from children through old ages.

LONGEVITY AND WELFARE: THE FUNDAMENTAL ROLE OF NUTRITION

In 2025, according to United Nations estimates, the world will have more than 8 billion inhabitants, principally as a result of the general increase in average life expectancy. In the last hundred years, life expectancy at birth has almost doubled, stretching out from 45 years at the end of the nineteenth century to approximately 80 years in 2013. The percentage of elderly people (over age 65) has also increased to an astonishing extent, for example rising in Italy from 4% in 1900 to 21.7% in 2015.[51] In 2050, in Italy, people over 65 are expected represent 34% of the population: one out of every three people will be elderly.

The same trend can be seen all over the world. In the period from 1950 to 2010, the world's elderly population grew at an average annual rate of 13%, a trend that shows no sign of slowing: it is estimated that in 2050 the over-65 population will amount to 1.9 billion people.

These demographic changes are very worrisome and could cause a general crisis in the healthcare systems of many countries, both industrialized and developing. Approximately 80% of all elderly people suffer from at least one chronic disease and approximately 50% are affected by two or more (such as cardiovascular and cerebrovascular diseases, tumors, diabetes mellitus, arterial hypertension, and chronic pulmonary diseases).[52]

Those numbers are destined to rise because of the epidemic of obesity and diabetes that is currently under way, even among the younger members of the population. Overweight and obesity (in particular abdominal obesity) are associated with an increase in the risk of developing cardiovascular diseases and tumoral conditions. Those diseases are responsible for about 70% of all deaths in many industrialized and developing countries.

In light of these demographic changes, the epidemic of obesity, and the deterioration of lifestyles (sedentary lifestyle, hypercaloric diets, cigarette smoking), it becomes fundamental to design and implement interventions that are aimed at the prevention of the chronic diseases associated with aging and to work for improvements in the quality of life, that is, a reduction of the gap between the duration of one's life (*lifespan*) and

---

51 ISTAT 2015.

52 National Vital Statistics Reports, 56 (10), 2008.

the duration of one's health (*healthspan*). It is more necessary than ever before to identify and adopt lifestyles that promote healthy and successful aging, and that ensure that individuals can remain physically and mentally healthy, happy, active, strong, independent, and socially useful for the longest possible time, ideally for their entire lives.
Unless corrective interventions are carried out in the lives of millions, the fact that those lives are growing longer might no longer imply that they are also improving in quality. We might find ourselves facing an old age characterized by a sharply reduced quality of life for a significantly longer time. We must confront squarely the problem of aging and the diseases associated with aging by implementing a preventive and integrated approach. The strategy of combating each disease only when it comes to a doctor's attention is conceptually faulty and fails to offer an adequate response to the challenge of the reduction of the gap between lifespan and health span.
Aging is caused by the progressive accumulation over time of damage to the body's DNA, its cells, and all its organs, due to a defect in the mechanisms assigned to repair the damage. The accumulated array of damages causes a progressive decline of many physiological functions and the vital structures of the organism.
Recent studies have shown that lifestyle (nutrition, physical activity, exposure to cigarette smoke, toxic and radioactive substances, and pollutants) can have major influences on the aging process. For instance, a hypercaloric diet, rich in saturated fats and poor in nutrients (vitamins, mineral salts, etc.), and a sedentary lifestyle accelerate aging as well as encourage the onset of obesity, diabetes mellitus, arterial hypertension, cardiovascular diseases, and tumoral conditions. On the other hand, countless scientific findings have shown how a moderately hypocaloric diet (low in calories) that is rich in nutrients is capable of slowing the aging processes and preventing most of the chronic diseases associated with aging.
Although we cannot prevent or reverse natural aging, we can still act decisively to affect environmental (or secondary) aging and influence the processes tied to intrinsic (or primary) aging. It is possible to slow the natural aging processes and, especially, intervene preventively on the onset of the chronic diseases associated with those processes (obesity, diabetes, metabolic syndrome, cancer, cardiovascular diseases, hypertension, and inflammatory processes). Food and lifestyle have a critical role to play in preventing the onset of those diseases, mitigating their effects and encouraging a qualitatively better form of longevity.
For example, numerous studies[53] designed to measure the impact of behavior on increased risks of mortality have made it clear that the adoption of a healthy life-

53 For an in-depth study of the topic, consider—among others—the following studies: Osler M., Schroll M., "Diet and Mortality in a Cohort of Elderly People in a North European Community," *International Journal of Epidemiology*, 26:155-9, 1997; Zubair K., *et al.*, "Life-Years Gained from Population Risk Factor Changes and Modern Cardiology Treatments in Ireland", *European Journal of Public Health*, 2006; Hamer M., *et al.*, *Dietary Patterns, Assessed from a Weighed Food Record, and Survival Among Elderly Participants from the United Kingdom*, University College London, 2010; Cai H., *et al.*, *Dietary Patterns and Their Correlates Among Middle-Aged and Elderly Chinese men: A Report from the Shanghai Men's Health Study*, Vanderbilt University, Nashville, 2007; Spencer C. A., *et al.*, *A Simple Lifestyle Score Predicts Survival in Healthy Elderly Men*, Elsevier 2005.

style—in terms of dietary regimen, alcohol consumption, smoking, and physical activity—helps prevent mortality by extending average life expectancy by 5 to 14 years per individual.

In this chapter, we have analyzed the general relationship between diet and health, paying particular attention to those diseases that by now represent full-blown contemporary epidemics (obesity, cardiovascular diseases, diabetes, and tumoral diseases). We have also explored the links between good nutrition and healthy growth in the various phases of child's lives. Now we will complete this in-depth study by examining the relationship between diet and a healthylongevity.

As mentioned, it is no longer sufficient these days to hope to live longer without also living well during the second part of your life, the years of one's maturity. Quality of life is a crucial factor that no one wishes to do without, either as individuals or as a society. It is a crucial foundation for the truly sustainable progress of nations.

4.9 DEMOGRAPHICS, LONGEVITY, AND THE ECONOMIC AND SOCIAL IMPACTS OF THE PRINCIPAL DISEASES

As a result of global economic growth, a general improvement in living conditions, and scientific progress, average worldwide life expectancy[54] has increased steadily since the turn of the century; between 2010 and 2013 it was 73.5 years for women and 68.5 years for men (figure 4.4).[55] Life expectancies are rising even in countries that still lag in terms of economic and social development. In Bangladesh, for example, men's life expectancy in 2020 will rise to 71 years, which is only three years less than men's life expectancy in Europe, even though Bangladesh is a country with only partial suffrage, inadequate health care structures, and major challenges in terms of obtaining basic pharmaceuticals.

World values are driven by the Western high-to-medium averages and by the high rates of growth in average life expectancy found in developing economies. Figure 4.5 shows the 10 nations in the Organization for Economic Cooperation and Development (OECD) with the highest life expectancies.[56]

The United States, alone among all developed countries, is beginning to witness a decline in life expectancy at birth in some states. A recent study[57] has shown that in states such as Mississippi, Arkansas, Kentucky, Tennessee, Oklahoma, Alabama, and Louisiana, life expectancies are progressively falling, especially among women, who are showing the highest rates of obesity and tobacco consumption. In Mississippi in particular, the state with the highest rate of obesity, life expectancy is just 67 years for men and 74 years for women, numbers that are much lower than in the countries shown above. As was mentioned earlier in this chapter, the global elderly population (over 65) is

54 The average number of years that a human being can hope to live.

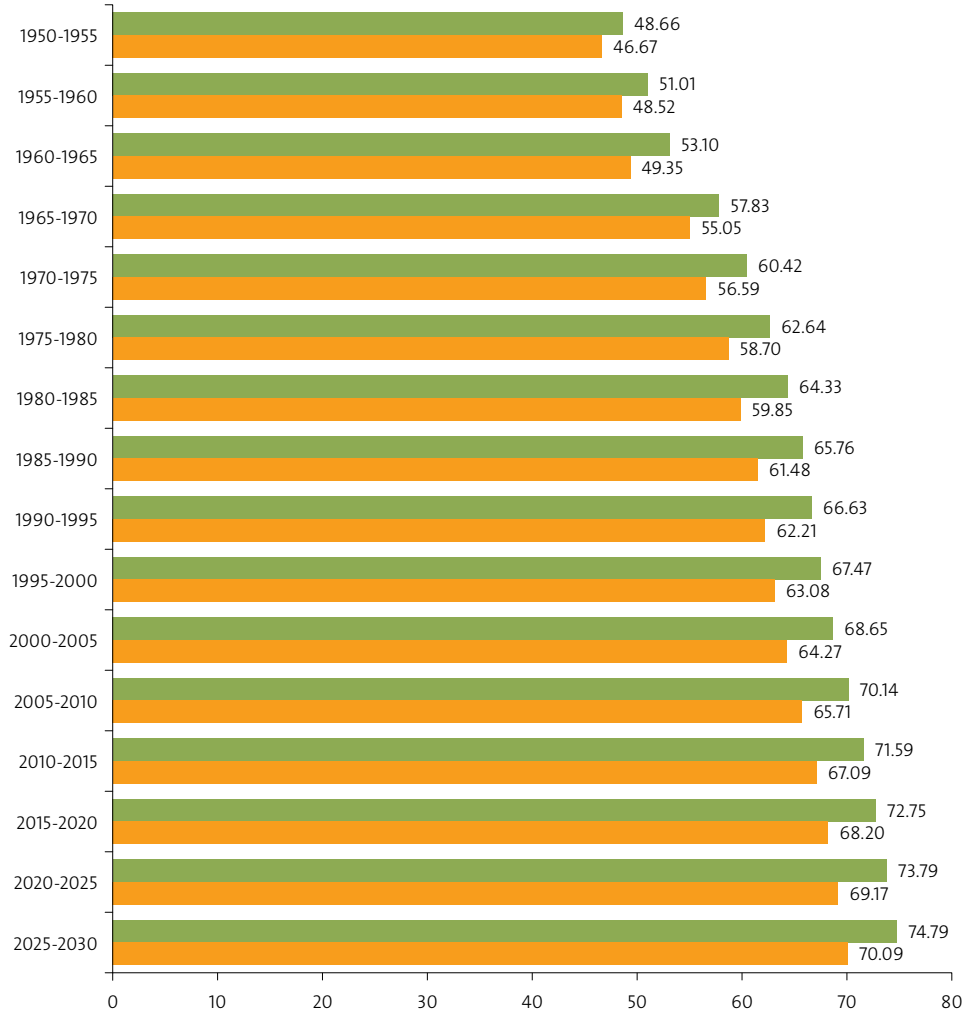
55 United Nations Department of Economic and Social Affairs, *United Nations World Population Prospects: 2012 revision*.

56 WHO, *Global Health Observatory Data Repository: Life expectancy – Data by country*, 2015.

57 Population Health Metrics, 2011.

FIGURE 4.4

World life expectancies, comparison between the male ● and the female ● population (1950-2030)
Source: UNDESA, United Nations World Population Prospects: 2012 revision.



growing continuously and will reach an estimated 1.9 billion in 2050. This means an increase in economic inactivity and dependency on the younger members of the population. Europe has the highest rate of dependency on Earth. Estimates tell us that that rate will rise until it reaches 49.4% in 2050.[58]

Worldwide, the UN predicts that the rate of elderly dependency will grow from the current 11.5% to 25.4% in 2050. Chronic diseases are already the leading cause of death in the world.

58 Eurostat 2015.

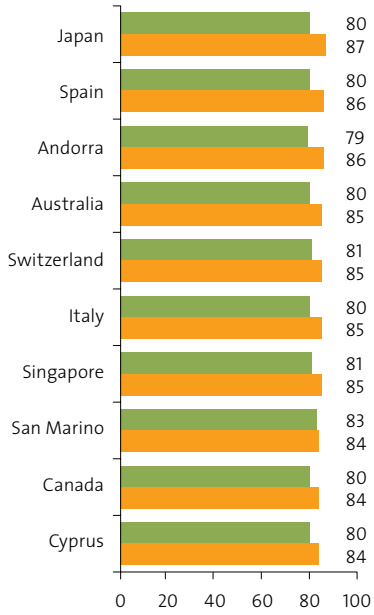


FIGURE 4.5

Life expectancy in 10 OECD countries, comparison between the male ● and the female ● population (2010)
Source: World Health Statistics 2015.

In 2008, worldwide, 36 million—i.e. 63%—out of 57 million deaths were caused by non-transmissible chronic diseases.[59]
Figure 4.6 shows the effects on healthcare costs of living longer lives but not in good health.
The chart shows the increase in the share of GDP spent on healthcare on average in the OECD nations and certain representative countries. In the United States, 17.4% of GDP (approximately US$2.5 trillion) was invested in healthcare in 2009 compared with 5% in 1960. In Italy, too, there has been growth in healthcare spending, albeit more modestly, with a shift from approximately 6% of GDP per year in the 1960s to the current level of 10% (approximately €180 billion). In China and India, major increases in healthcare spending are also predicted.
A great deal of this spending, of course, goes for the treatment and care of those suffering from the chronic diseases we have discussed in this book, diseases that result from, or are worsened by, unhealthy diets and lifestyles. In general, perhaps 80% of all cases of chronic disease could be prevented, by eliminating such risk factors as smoking tobacco, unhealthy dietary models and customs (diets), physical inactivity, and the excessive consumption of alcohol.
Older people are also more likely to be stricken by neurodegenerative conditions (dementia) and osteoporosis as they age.
It is common knowledge that ageing is the main risk factor connected with the onset of dementia. The ageing population is growing continuously in Italy and worldwide and life expectancy is constantly increasing both for men and women, even though it is tipping towards the latter especially in older generations.
The burden of ageing corroborates the estimates of many international epidemiological studies, according to which cases of dementia will exceed 48 million by 2020. This number could rise to over 81 million in the following 20 years, with the majority of cases concentrating in developing countries.
According to the most reliable estimates, it is likely that people affected by dementia will exceed 15 million in the EU countries alone in 2020, with the number of affected women expected to more than double that of men's.
Moreover, based on the evaluations of the Disability-Adjusted Life Years (DALY) scale, the burden of dementia is almost double than that caused by diseases such as diabetes in the EU countries.

59 WHO, Global Health Observatory (GHO).

In 2008, in the same countries, the estimated costs for dementia cases amounted to over €160 billion, nearly 56% of which was constituted by informal care alone. Estimates based on demographic changes in Europe lead us to expect a 43% increase of such costs by 2030.
Alzheimer disease (AD) accounts for 54% of all dementias, with a 4.4% prevalence in the over 65.
The prevalence of this disease increases with ageing and is higher in women, with val-

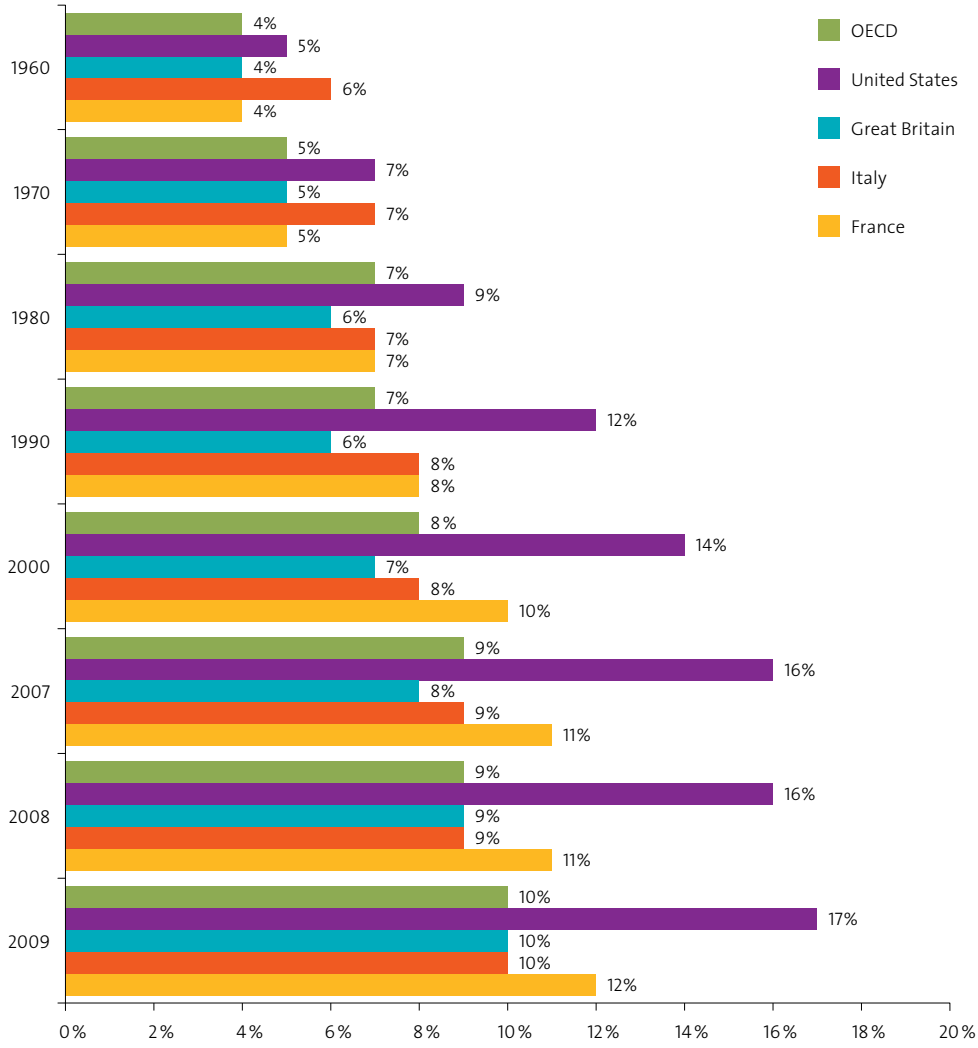


FIGURE 4.6

Share of GDP spent on total health care costs (1960-2009)
Source: BCFN on OECD data, 2009.

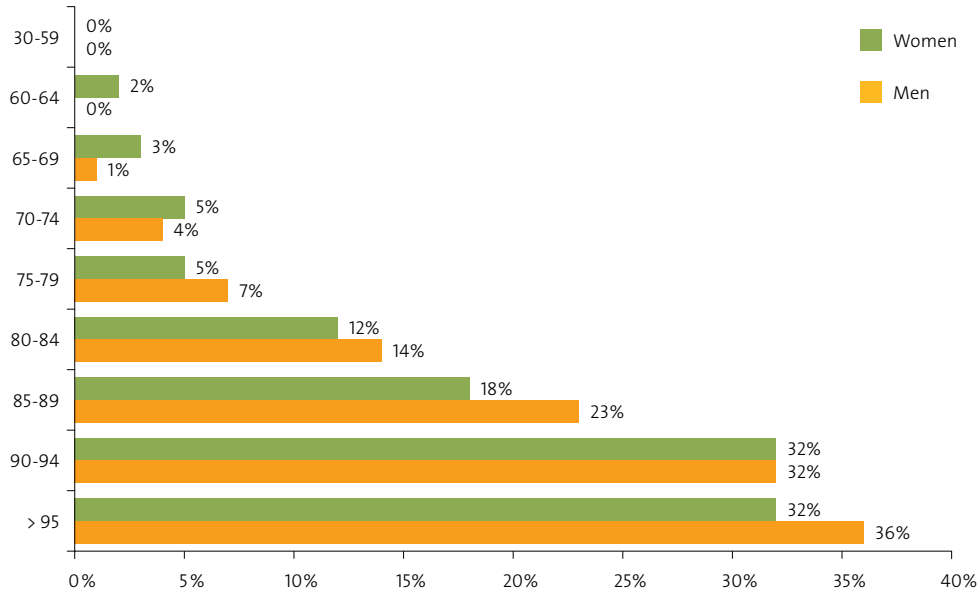


FIGURE 4.7

Prevalence of Alzheimer's by age group (2009)
Source: BCFN on EURODEM study, 2011

ues ranging from 0.7%, for women aged between 65-69, to 23.6%, for women aged over 90. On the other hand, the values for men range from 0.6 to 17.6% respectively. AD incidence rates for Europe show that male cases have increased from 0.9 per 1,000 person-years in the 65-69 age-group to 20 cases in the over 90 group. With respect to women, cases have increased by 2.2 in the 65-69 age group to 69.7 cases per 1,000 person-years in the over 90 group.[60]

Certain risk factors predispose people to both dementia and cardiovascular diseases. Patients with high levels of cardiovascular risk (hypertension, diabetes, high levels of cholesterol, and smoking) are often predisposed to contract neurodegenerative diseases as well (figure 4.7).

Osteoporosis is a disease characterized by the decline in bone mass and the deterioration of the microarchitecture of the bones. Osteoporosis is increasing worldwide and the World Health Organization has identified it as a health priority. The incidence of osteoporotic fractures is expected to increase from one every 8.1 minutes in 2001 to one every 3.7 minutes in 2021.[61]

Osteoporosis affects an estimated 150 million people around the world, 75 million of them in Europe, Japan, and the United States. Most of them have a 15% probability of suffering wrist, femur, or vertebral fractures—very close to the likelihood of suffer-

60 Italian Health Ministry, 2013.

61 World Health Organization, *Prevention and Management of Osteoporosis*, 2003.

ing coronary problems. In Europe one out of every three women and one one out of every five men older than 50 have suffered an osteoporotic fracture at least once. In the United States perhaps 10 million people suffer from osteoporosis, and an additional 34 million have such low bone mass that they are at risk of developing osteoporosis.
In Italy, too, osteoporosis is one of the most common chronic diseases associated with aging, afflicting 7%, putting it third after hypertension (16%) and arthrosis and arthritis (17.3%). There are marked differences by gender, however: in Italy the disease afflicts 3.9 million women and 840,000 men.[62] Among women, 15% between 50 and 59 are affected, compared with more than 30% in the 60-69 age range and 45% of the 70-79 age range. The economic burden of osteoporosis is comparable to that of the leading chronic diseases, but in women older than 45 osteoporosis is the cause of a greater number of hospital admittances than other diseases, including diabetes, heart attacks, and breast cancer. The number of osteoporotic fractures is expected to rise with the aging of the European population, with costs rising from €31.7 billion in 2000 to approximately €76.7 billion in 2050.

4.10 DIET AND LIFESTYLE AND THEIR EFFECTS ON LONGEVITY AND DISEASES OF AGING

As we have said, with life expectancies and the rate of main chronic diseases both rising, it is likely that humankind will soon experience, for the first time in modern history, a prolonged old age marked by the risk of fragility, disability and suboptimal health. That's why it is more necessary than ever to identify lifestyles and diets that can extend the disease-free period of life at the same time that they prolong life itself. Below is a summary of what's currently known about the relationship between longevity and certain diseases (diabetes, tumors, obesity, neurodegenerative diseases, and osteoporosis) and the role played by diet and lifestyle.

Diabetes. The nutritional approach is univerally recognized as a fundamental tool in preventing and treating Type 2 diabetes and its complications. In particular, diet is important in preventing the accumulation of excess abdominal fat, which is linked to Type 2 diabetes. Numerous studies have shown that abdominal fat is perhaps even more strongly correlated with Type 2 diabetes than a high body mass index, since it is also strongly correlated to insulin resistance, a central feature of diabetes.
Because overweight and obesity are both linked to the development of insulin resistance and the onset of diabetes, programs designed to alter lifestyles in the direction of weight reduction and higher physical activity appear to be help reduce the likelihood of contracting Type 2 diabetes. A 5-7% reduction of body weight, combined with two-and-a-half hours of regular physical activity every week and a dietary strategy that reduces the intake of calories, may reduce the risk of Type 2 diabetes by as much as 60%.

Cancers. Tumors and tumoral diseases are caused by many factors but unhealthy life-

62 ISTAT, *Annuario statistico italiano 2010*.

styles and diets certainly increase their likelihood. One of the most important non-dietary factors is smoking tobacco, a practice that increases roughly thirty-fold an individual's risk of contracting pulmonary tumors. Smoking accounts for 80% of all cases in developed countries and pulmonary tumors are the most common type of tumor worldwide. Tobacco smoke is also one of the principal risk factors for oral, laryngeal, and esophageal tumors. Smoking, therefore, is clearly linked to lower life expectancy.
Diet also affects the incidence of tumoral diseases. Some studies have estimated poor diet may account for 30% of the incidence of tumoral diseases, second only to tobacco smoke.
The International Agency for Research on Cancer has indicated that overweight and physical inactivity account for somewhere between 20% and 35% of breast, colon, kidney, and esophageal tumors. Both long standing and temporary obesity and overweight can increase the risk of various tumors, in particular colorectal tumors. Excessive alcohol consumption is the principal dietary risk factor for oral, laryngeal, and esophageal tumors. If we add tobacco to alcohol consumption, we explain the origin of more than 75% of all tumoral diseases in the mouth.

Therefore, the results show that alcohol consumption badly affects ageing, since it increases the risk of cancer.
The International Agency for Research on Cancer has recently evaluated the carcinogenity of red and processed meat consumption. Red meat has been classified as probably carcinogenic to humans (Group 2A) while processed meat has been classified as carcinogenic to humans (Group 1) based on scientific evidence associating processed meat consumption to human colorectal cancer. In order to reduce the risk of colorectal cancer, the World Cancer Research Fund International recommends that people limit the consumption of red meat (such as beef, pork and lamb) and avoid processed meat.[63]

Cardiovascular diseases. Cardiovascular diseases are also increasingly characteristic of aging populations. Although their causes include a diverse array of environmental factors, they too depend to a great degree on dietary habits, lifestyle, and behavior: smoking, alcohol abuse, sedentary lifestyle, etc.
Conversely, many studies[64] confirm that the right dietary behaviors and personal habits can help reduce the risk of cardiovascular disease, especially at an advanced age. Recommended measures include daily consumption of fruits and vegetables, the ingestion of eicosapentaenoic acid and docosahexaenoic acid (contained principally in fish), appropriate amounts of n-6 fatty acids and potassium, adequate physical activity, and low alcohol consumption. On the other hand, the available research cautions against consumption of high quantities of saturated fatty acids, high concentrations

63 World Health Organization, World Cancer Research Fund International, *Links between processed meat and colorectal cancer statement*, 29 October 2015.

64 World Health Organization, "North Karelia Project"; National Public Health Institute, "The North Karelia Project – Pioneering work to improve national public health", 2002.

of sodium in the blood, persistent overweight, and excessive consumption of alcohol. All the studies agree that, although cardiovascular diseases occur more often in middle or old age, the risk factors that cause them are largely linked to behaviors learned in childhood and youth and perpetuated into adulthood.

Neurodegenerative diseases. Dementia and neurodegenerative diseases such as Alzheimer's and Parkinson's are primary disturbances that tend to arise and worsen with aging. It is now clear that the damage is the product of an interaction between a genetic predisposition and environmental factors. Among those factors are lifestyle, diet, infectious agents, and environmental toxins.

The relationship between lack of nutrients and dementia has long been clear. A study[65] on the link between antioxidant substances consumption and Alzheimer disease onset has proved that proper intake of vitamin C and E, carotenoids, and zinc reduces oxidative stress and delays the disease onset and progression. Therefore, a diet rich in fruit and vegetables but also including meat and fish provides the suitable intake of such micronutrients.

It has been noted that patients affected by Parkinson disease have low levels of endogenous antioxidants, an increase in reactive oxygen species and dopamine oxidation, and high iron levels. Both in vitro and in vivo studies have proved that polyphenols, coenzyme Q10, and vitamins A, C, and E have protective effects and reduce effectively neuronal death caused by oxidation.[66]

There is evidence[67] that dementia is associated with an insufficiency of magnesium (contained in cereal grains, walnuts, almonds, peanuts, buckwheat, cocoa, wheat germ, lentils, green vegetables, meats, and starchy foods). A shortage could be caused either by low dietetic intake of the mineral or a limited physiological ability to absorb or maintain it.

There are factors moreover that establish a linkage between forms of dementia like Alzheimer's and other forms of vascular dementia. Hypercholesterolaemia, already known to be a risk factor for atherosclerotic diseases, can in fact be a joint causative factor in the development of dementia of the Alzheimer's type.

Studies on cholesterol levels and on the relationship between saturated and polyunsaturated fatty acids in the diet[68] suggest that neurodegenerative disease involves the metabolism of fats. It is certainly clear that a high consumption of saturated fats and cholesterol increases the risk of cardiovascular diseases, which can be associated with dementia. Diets with high fish content are linked with lower incidence of dementia in

---

65 Staehelin H. B., "Micronutrients and Alzheimer's disease", *Proceedings of the Nutrition Society*, 064 (004), 565-570, November 2005.

66 Sutachan J. J., *et al.*, "Cellular and molecular mechanisms of antioxidants in Parkinson's disease", *Nutritional Neuroscience*, 15, 3, 120-126, 2012.

67 Glick J. L., "Dementias: the role of magnesium deficiency and an hypothesis concerning the pathogenesis of Alzheimer's disease", *Medical Hypotheses*, 31:211-225, 1990.

68 Kalmijn S., *et al.*, "Dietary fat intake and the risk of incident dementia in the Rotterdam Study", *Annuals of Neurology*, 42:776-782, 1997.

general and of Alzheimer's disease in particular. A 2004 study explored the role played by fruits and vegetables in Alzheimer's disease and concluded that elderly women who ate plants rich in folates and antioxidants such as carotenoids and vitamin C (e.g., green-leaf vegetables and cruciferous vegetables such as cabbages, broccoli, cress, turnips, and radishes), showed a lower level of cognitive decline than women who had low intake of these vegetables.[69]

Finally, restricting the ingestion of calories may help prevent such neurodegenerative diseases as Alzheimer's. For instance, some populations in China and Japan ingesting only 1,600-2,000 calories a day show a lower incidence of Alzheimer's disease compared with the inhabitants of the United States or western Europe, who generally consume about 2,000 calories a day.[70]

In summary, even though the studies on the relationship between diet and neurodegenerative diseases point to fairly variable direct links between diet and neurodegenerative processes, it is worthwhile pointing out that dietetic habits can certainly contribute to the definition of an individual's risk profile.

Osteoporosis. Good nutrition, in terms of a balanced diet and adequate caloric intake, is essential for normal growth and for the development of all the tissues, including bone tissue. It appears, in fact, that one of the keys to preventing osteoporosis in old age is laying down an ample "foundation" of bone mass during the developmental phases of youth to protect against the inevitable loss of mass later. Vitamin D is among the nutrients critical to bone mass formation. Recent studies[71] have shown that the daily ingestion of vitamin D with calcium reduces the risk of fractures by up to 8%.

However, lack of vitamin D is very common in the older population, both because of reduced intake and in part because of diminished intestinal absorption, a diminished cutaneous synthesis, and reduced conversion to the more active form of the vitamin. Foods with the highest content of this vitamin are liver, fish oils (especially cod liver oil), fatty fishes such as salmon and sardines, milk and milk derivatives (especially butter), and eggs.

Calcium deficiencies cannot be exclusively blamed for osteoporosis[72] but are implicated in it. Adequate calcium intake is fundamental to the prevention of osteoporosis—which makes all the more alarming the fact that, in all age groups, the typical daily dose of calcium ingested is actually far lower than the recommended level. The risk factors we have discussed repeatedly here also contribute to the loss of calcium:

---

69 The 9th International Conference on "Alzheimer's Disease and Related Disorders" in Philadelphia, July 17-22, 2004; Kang J. H., A. Ascherio, F. Grodstein, "Fruit and Vegetable Consumption and Cognitive Decline in Aging Women", *Annals of Neurology*, 57, 5, 2005.

70 Mattson M. P., "Will Caloric Restriction and folate protect against AD and PD?", *Neurology*, 2003.

71 Abrahamsen B., "Patient level pooled analysis of 68,500 patients from seven major vitamin D fracture trials in US and Europe", Department of Internal Medicine and Endocrinology, Copenhagen University Hospital Gentofte, 2010.

72 Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, Food and Nutrition Board, Institute of Medicine, "Dietary reference intakes for calcium, phosphorus, magnesium, vitamin D, and fluoride", Washington, DC, National Academy Press, 1999.

excessive consumption of animal proteins, salt, and alcohol; tobacco smoke; and of course being overweight. In conclusion, the studies conducted to date have found a moderate but significant link between diet and the prevention of osteoporosis. There is agreement that prevention must begin at an early age, when the ingestion of calcium through diet is absorbed and is able to contribute effectively to the consolidation of bone density. And in adulthood and during old age, retarding osteoporosis must rely upon proper diet—characterized by reduced sodium, increased consumption of fruits and vegetables, daily ingestion of 800-1,000 milligrams of calcium,[73] and the elimination of alcohol—as well as a healthy lifestyle marked by moderate physical activity, stable body weight, and the elimination of smoking.

4.11 INFLAMMATORY STATES AND CALORIC RESTRICTION: POSSIBLE INTERVENTIONS TO SLOW THE AGING PROCESSES

Two new areas of research have emerged in recent years—into the role of inflammation in aging and the possible benefits against aging offered by caloric restriction—that could lead to new understanding of the possibilities of living better and longer.

Inflammatory states and longevity. Aging is caused by the progressive accumulation of damage to the DNA, the cells, and the organs of the human body due to the failure of the mechanisms responsible for repairing that damage. The cumulative effect of this damage is a decline of many physiological functions and the vital structures of the organism itself.

The potential longevity of any individual is closely tied to the proper functioning of the cells that protect against damage and repair it when it occurs. These cells can exhaust their capacity to replicate—and therefore their reparative potential—earlier or later in the course of life, depending on a number of factors. This failure to replicate and thus replace the worn-out reparative cells leads to the progressive onslaught of inflammatory and degenerative phenomena such as arteriosclerosis.

Some degenerative chronic diseases can stem from a progressive incapacity to deal with conditions of continual inflammation and the progressive failure to repair the damage. Other diseases and health conditions, such as diabetes and obesity, produce an inflammatory state in the blood and tissues that can intensify the repair processes and lead to their early exhaustion. This too can translate into a shortening of life expectancy.

Recent scientific research has studied the link between chronic disease and the state of low-level, non-painful "silent" inflammation generated by the adoption of unhealthy dietary models. Those studies make clear that the dietary model adopted can either benefit or impair the body's inflammatory responses. Long term silent inflammation accelerates consumption of the body's repair capacity and thus the onset of chronic diseases, reducing longevity and quality of life.

In this context, the telomeres (the terminal region of the chromosomes), which serve the function of preventing the loss of information during the phase in which chromo-

73 LARN 2012.

somes are duplicated in the wake of cellular reproduction—a phase that takes place during the reparative processes—are reduced in length until they are no longer able to carry out their protective function toward the chromosomes. Cells, therefore, are no longer able to reproduce correctly, and they therefore age and die.
In other words, the process takes place in the following manner: every time that a cell is duplicated, it loses a sequence of telomeres. When the cell runs out of telomere sequences, it dies.
Certain studies that have been done on telomeres show that there is a relation between the length of the telomeres and the onset of chronic diseases. Moreover, in a more direct link, it seems to emerge from some studies that cellular inflammation (even "silent" inflammation, that is to say, inflammation caused by diet) is one of the interpretative bases for the origin of a diverse array of chronic diseases. While it is known, and has been known for many years, that injuries or microbial attacks were the cause of inflammatory responses on the part of the organism, in the past few years studies have emerged that also indicate that dietary models can have a positive or negative influence on these inflammatory responses.
In summary, increasing attention to telomeres on the part of the mass readership can be detected in recent years, that is, since researchers first began associating them with the aging process.
In general terms, the studies that have been carried out on telomeres demonstrate that there is a relationship between the length of the telomeres and the onset of chronic diseases, which are in turn linked to lifestyle and diet.
In a more direct linkage, it seems to emerge from some studies that dietary models too can have positive or negative influences on the organism's inflammatory responses. The level of inflammation deriving from the adoption of improper diet would appear to be "low" level, that is, below the threshold of pain, and therefore not perceptible.
"Silent" cellular inflammation, then, becomes one of the interpretative bases for the origin of a diverse array of chronic diseases, inasmuch as these levels of inflammation, triggered by the kind of dietary model adopted, require "repair actions" by the organism, and those actions involve telomeres in a primary role. As we stated above, the greater the frequency and intensity with which the telomeres are summoned to make repairs, and the greater the speed with which they are shortened to the point of running out entirely. The diet adopted by individuals in a population becomes a determinant factor in the care and treatment of inflammatory states produced by conditions of obesity,[74] diabetes, and the presence of cardiovascular diseases.

Caloric restriction and longevity. The second area of research has to do with the effects on the body's physiology and biochemistry of reducing intake of calories while maintaining intake of the necessary nutrients. These studies have found that caloric restriction can help prolong life in conditions of optimal health. In fact, caloric restriction (without malnutrition) has proven to be a powerful intervention for slowing the

74 Sears B., C. Ricordi, "Anti-infiammatory nutrition as a Pharmacological Approach to treat Obesity", *Journal of Obesity*, 2011.

aging process and increasing life span in many species.[75] Hundreds of studies on experimental animals have shown that caloric restriction prevents or slows the onset of most of the chronic diseases associated with aging and prolongs the average and maximum life span by as much as 50%.[76] For instance, caloric restriction drastically reduces (up to a maximum of 60%) the risk of developing cancers, which are the leading cause of death in rodents.[77]

Moreover, as shown by studies done by Shimokawa,[78] approximately 28% of rodents on a regimen of caloric restriction die a natural death at an advanced age without any significant anatomopathological lesions, while only 6% of the rodents who ate as much as they wanted died without any pathology. These data suggest that, in mammals, aging is not inevitably associated with the onset of chronic diseases, and that it is possible to live a long life without getting sick. Many studies are currently under way in an attempt to understand the metabolic and molecular mechanisms that underlie this phenomenon.

The mechanisms underlying the anti-aging effect of caloric restriction are complex and not entirely clear. In general terms, during caloric reduction the organism slows the aging processes and focuses on the systems assigned to repair damage. Nature, in a sense, places itself on a "stand-by" and "protection" footing if it perceives the absence of nutrition. Does it work in humans?

A recent study of our genetic near-relatives, chimpanzees, has shown that a 30% reduction of caloric intake over 20 years in chimpanzees is capable of reducing mortality from cancer and cardiovascular diseases by 50%. These particular chimpanzees were also completely protected against obesity and diabetes. And the researchers saw a significant slowing in the atrophy of certain areas of the study chimpanzees' brains.

It is not yet known whether such a diet can slow aging in humans as well. But studies conducted on a group of volunteers who allowed themselves to be subjected to a regimen of caloric restriction with optimal nutrition for a period of roughly eight years (consuming at least 100% of the recommended levels for every nutrient) showed significant reductions of the leading factors of cardiovascular risk, inflammation, high arterial blood pressure, insulinemia, glycemia, carotid artery intima and media thickness, and certain hormones and growth factors. However, it is necessary to emphasize that excessive caloric restriction could also involve risks of serious health damage, such as osteoporosis, sarcopenia, immune deficiency, anemia, reduction of body temperature and sensitivity to cold, libido reduction, infertility, and amenorrhoea.

For the time being, research on the inflammation-diet linkage and on caloric restric-

---

75 Fontana L., *et al.*, "Extending Healthy Lifespan. From Yeast to Humans", *Science*, 2010.

76 Fontana L., "Obesità viscerale, restrizione calorica ed invecchiamento", *Giornale di Gerontologia*, 2006; 54:131-133; Weindruch R., R. S. Sohal, "Caloric intake and aging", *The New England Journal of Medicine*, 337:986-94, 1997; Masoro E. J., "Overview of caloric restriction and ageing", *Mechanisms of Ageing and Development*, 126:913-22, 2005.

77 Albanes D., *Cancer Research*, 1987.

78 Shimokawa I., *et al.,* "Diet and the suitability of the male Fischer 344 rat as a model for aging research", *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 48: B27-32, 1993.

tion is not conclusive. There are important differences between studies done on cells and on animals, and studies done on human beings, and it is premature to extend the results of the former to the latter. This research, for now, remains at the current threshold of scientific medicine.

4.12 RECOMMENDATIONS

This in-depth exploration of food and longevity captures current scientific knowledge about the linkage between proper diet and life expectancy in good health conditions. The objective is not just to live longer, but rather to live better, longer.

The first piece of important information to emerge from the project is the fact that aging processes affect each of us, once we emerge from the age of growth, paradoxically from the day of our birth. Inside our bodies, the processes of cell regeneration are constantly active. The fact that mechanisms of cell repair are maintained in good functioning condition throughout our entire lifespan has a great deal to do with our overall life expectancy and quality of life.

In turn, it has become increasingly clear that those mechanisms are heavily influenced by diet and lifestyle. Diet has an influence on the multiple processes that underlie aging and the processes of cellular inflammation, as well as on the prevention of the diseases mentioned above, which are a crucial factor in the acceleration of the aging process.

So if we were looking for a slogan to capture this wisdom, it might be "Eat well today to live better today." But that's not all; we should also add "Eat well today to live better *and longer* tomorrow too."

POINTS ON DIET, NUTRITION AND LONGEVITY

- Encourage the further exploration of available scientific knowledge on the relationship between diet and health. This includes the mechanisms of aging and cell repair; the relationships between genes and nutrients and diseases; the topic of caloric restriction; and further studies on those dietary models that are already providing us with significant findings in the prevention of chronic diseases and prolonging healthy lives.
- Encourage the spread of proper information and dietary education in order to promote the adoption of adequate dietary habits and lifestyles. Governments, scientific societies, the medical industry, and private companies must make an intense effort to communicate effectively. There are lifestyles that constitute a form of insurance for an adulthood and advanced old age in good health conditions: it is necessary that people be able to access an adequate level of information on the subject.
- Structure social and health care policies and interventions so as to promote the spread of healthy dietary behaviors, with a view to the best international practices in the field. It is necessary to find—with the coordinated contributions of all the subjects involved, according to a systematic logic—new approaches for the transmission of the scientific knowledge available in the field of diet and health, in order to allow that knowledge to be translated into concrete interventions capable of having a real impact on the behaviors of individuals.

SARA FARNETTI is specialist in Internal Medicine, Ph.D. in Physiopathology of Nutrition and Metabolism, expert in Functional Nutrition, assistant Professor of Surgery, Division of Cellular Transplantation, Nutrition and Diabetes Programs, Diabetes Research Institute. University of Miami Miller School of Medicine. DRI (Diabetes Research Institute) Federation, Wellness and Nutrition Program.

CAMILLO RICORDI, professor of Surgery, Medicine, Biomedical Engineering, Microbiology and Immunology, University of Miami; member of the Advisory Board, BCFN. Known in the sector as one of the best scientists at a global level in the field of cell transplants, he is a member of the most important bodies at a global level in his field of expertise. During his career, he received numerous worldwide awards and honors. In addition, he was an editor for various scientific publications and the author of over 500 publications. As an inventor he obtained seven patents.

CONTRIBUTIONS

Health and disease in the higly processed food era

Sara Farnetti and Camillo Ricordi

Modern agricultural and food processing technologies have been important to provide large scale, cost effective and easy accessible food products. However, industrialization of the food chains has also paralleled the appearance of an epidemic of chronic disease conditions, now spreading around the world from North America, to Europe, Australia, the Middle East and even South America and Asian countries that, like Japan, traditionally enjoyed one of the longest healthy lifespans of the planet. While longevity has improved over the decades, this did not necessarily parallel an improvement of healthy lifespan. In fact, it is estimates that now 1/3 of the US population is affected by a chronic or incurable disease condition, while the obesity and metabolic syndrome epidemics have resulted in a dramatic increase in the incidence of diabetes, now affecting over 392 million subjects on the planet. The association between chronic degenerative diseases and the widespread adoption of a Western diets with high consumption of industrially processed meat, dairy, and high consumption of refined wheat products has been reported.[1,2]

The negative impact of consuming processed food are due to higher caloric content, their metabolic effect and are also related to the increased portion size that cheaper and more accessible food products have allowed. Specific triggers of the obesity and chronic disease epidemics have been the increased intake of agriculture refined dairy products, rich in pro-inflammatory long-chain fatty acids, and refined, high glycemic index (GI) carbohydrates, such as potatoes, refined rice and bakery products (bread, pizza, biscuits) produced with refined or fractionated vegetable oils rich in linoleic acid, the precursor of the pro-inflammatory arachidonic acid (omega-6 series). These food products, and especially selected combinations, can trigger the cell walls to secrete prostaglandins which cause a pro-inflammatory reaction in the surrounding area. High glycemic load (GL) and high GI food products should be consumed in moderate portions and frequency, depending also on age and physical activity/life style considerations, but in general they should be restricted and severely limited/avoided in overweight subjects and in those with metabolic syndrome, irritable bowel disease, gallbladder dys-

function and other chronic degenerative disease conditions. In this direction appropriate educational program should start very early in life, even before grade school and with the mothers during pregnancy. These products can result in impaired insulin secretion, glucose and lipid metabolism and a chronic exposure to a microscopic, subclinical and dietary induced inflammation results in long-term damage to the vessels' endothelium and calcifications, with dysfunction of several organ systems including the liver.

Not only refined starches and glucose, but also the use of the high fructose corn syrup and sugar rich in fructose could act as an inflammatory trigger, inducing lipogenesis with hepatic storage of triglycerides and an increase of LDL cholesterol.[3] In addition, the increased insulin secretion associated with these high GI products activates enzymes (i.e., desaturases) that promote the conversion of linoleic acid into the pro-inflammatory arachidonic acid.[4]

Inappropriate postprandial metabolism can be of great burden to the body, generating elevated endotoxin blood levels, increased inflammatory and oxidative stress, release of tumor necrosis factor-α and other pro-inflammatory cytokines, as well as an increased number of activated leukocytes. This state of the highest degree of silent inflammation can be measured by a blood marker: the ratio between arachidonic acid (AA) and eicosapentaenoic acid (EPA). An elevation of the AA/EPA ratio is observed in virtually all inflammatory disease conditions. Normally this ratio should be less than 2 and in the Japan population which enjoys one of the longest, healthy lifespan on the planet is approximately 1.5.[5]

All food manufacturers should be encouraged to produce low GI and low GL products, but also to avoid using some particular types of protein, sugar, flour and unhealthy fats. These facts could have a double vantage: they could be used as new health claims on the products with the associated commercial value, and also to meet the new trend of healthy food habits and disease prevention.

Besides overconsumption of highly processed food products, the epidemic of Western chronic diseases and their worldwide spread is strongly associated also with other lifestyle factors, like stress and physical inactivity, resulting in increased incidence of metabolic syndrome, the mother of the widespread "big killers," such as cardiovascular disease, diabetes mellitus type 2 with pregnancy complications (gestational diabetes and preeclampsia), cancers such as breast, prostatic and colorectal, Alzheimer and neurodegenerative disease conditions. In addition, poor dietary habits have been associated with fertility problems such as polycystic ovarian syndrome, osteo-articular diseases, allergies, skin problems, autoimmune disorders and accelerated aging.

The diagnostic indicators of metabolic syndrome are high blood pressure, elevated blood sugar, elevated triglycerides and decreased levels of the protective high density lipoprotein (HDL) cholesterol. In addition, abdominal obesity causes an inflammatory state due to excess of the pro-inflammatory visceral fat, an essential component of metabolic syndrome.[6] The presence of moderate adipose tissue is not necessarily bad, as it represents a complex organ with numerous endocrine, metabolic and immunological functions. However, visceral fat should normally be only few millimeters, but it increases in conditions of hyperinsulinemia and insulin resistance, releasing about three

times the levels of fatty acids and pro-inflammatory molecules, such as Interleukin 6 (IL-6) and Plasminogen Activator Inhibitor 1 (PAI-1), compared to subcutaneous fat on a per gram basis. Non-alcoholic fatty liver disease (NAFLD) is a well-known signs of the increase of visceral fat, strongly associated with a high waist circumference and obesity, and it is the most common chronic liver disease condition in adults, with increasing prevalence observed also in childhood.[7]

Metabolic syndrome is today increasingly common also in children and childhood NAFLD has become a recognized liver disease condition in recent years.

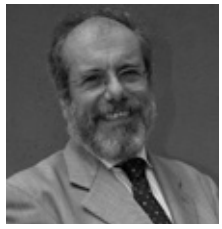
In addition, modern diets lead to modifications of the gastrointestinal microbiome, with dysbiosis responsible for the induction of a chronic, low grade systemic inflammation with endotoxemia and impairment of the immune system. In fact, overeating of fast-food and highly processed foods alter the gut microbioma, and even dietary components that per se do not appear could be associated with a negative health impact, could become associated with altered health conditions. For example, artificial sweeteners with zero caloric impact can still be associated with negative health impacts because of the alterations in the gut microbiome that is associated with their chronic use.[8] Another example is represented by preservatives added to preserve the red color of processed meat products that can generate nitrosamine compounds when they transit through the acid gastric microenvironment.[9] Nevertheless, several other factors can be associated with alterations of the gut microbiome and we have to consider also other aspects of Western lifestyles and environmental factors that could be responsible for a decline of the protective microbiota diversity. These include sanitation and other environmental factors, treatments of drinking waters and clinical practices, such as the inappropriate and/or excessive use of antibiotics, that together with dietary habits can contribute to altered gut microbiome conditions, with decreased diversity of protective bacterial species.[10]

Alterations of the microbiome cause minor, but serious symptoms as they are all manifestations of continuing low-grade inflammation, whose chronic effect can result in the disease conditions, including constipation or diarrhea, abdominal pain, impaired digestive functions, osteoporosis, overweight, infections, depression, unexplained fatigue, sleep problems, headache, hair loss, frail nails, skin rashes, acne, reduced sex functions, irregular menstruations. The patients that refer these symptoms, often, look for or receive symptomatic treatments instead of right advice to make radical changes in their lifestyle and diets. Working knowledge of how nutrients, especially dietary fatty acids, GI, GL, polyphenols and other anti-inflammatory anti-oxidant micronutrients, as well as theirs functional combination in meals, can make it possible to develop a general guideline for anti-inflammatory diets and offers a unique, non pharmacological approach for prevention and treatment of metabolic syndrome, obesity and other chronic disease conditions.[11]

---

1 Bengmark S., "Obesity, the deadly quartet and the contribution of the neglected daily organ rest – a new dimension of un-health and its prevention", *Hepatobiliary Surgery and Nutrition*, 4(4):278-88, 2015.

2 Cordain L., *et al.*, "Origins and evolution of the Western diet: health implications for the 21st century", *The American Journal of Clinical Nutrition*, 81(2):341-354, 2005.
3 Adult Obesity Facts (www.cdc.gov/obesity/data/adult.html).
4 Sears B., C. Ricordi, "Anti-Inflammatory Nutrition as a Pharmacological Approach to Treat Obesity", *Journal of Obesity*, 14, 2011.
5 Sears B., C. Ricordi, "Role of fatty acids and polyphenols in inflammatory gene transcription and their impact on obesity, metabolic syndrome and diabetes", *European Review for Medical and Pharmacological Sciences*, 16 (9): 1137-1154, 2012.
6 World Health Organization, "Nutrition health topics – The Global burden of chronic".
7 Bray G. A., P. B. Popkin, "Dietary sugar and body weight: have we reached a crisis in the epidemic of obesity and diabetes? Health be damned! Pour on the sugar", *Diabetes Care*, 37:950-6, 2014.
8 Suez J., *et al.*, "Artificial sweeteners induce glucose intolerance by altering the gut microbiota", *Nature*, 9 (514):181-6, 2014.
9 Inoue-Choi M., *et al.*, "Red and processed meat, nitrite, and heme iron intakes and postmenopausal breast cancer risk in the NIH-AARP", *International Journal of Cancer*, 27, 2015.
10 Bengmark S., "Gut microbiota, immune development and function", *Pharmacological Research*, 69:87-113, 2013.
11 Ricordi C., M. Garcia-Contrera, S. Farnetti, "Diet and Inflammation: Possible Effects on Immunity, Chronic Diseases, and Life Span", *Journal of the American College of Nutrition*, 34(1):10-3, 2015.



CONTRIBUTIONS

The obesogenic environment and its impact on society and health. Causes and remedies

Gabriele Riccardi

GABRIELE RICCARDI is professor in Endocrinology and Metabolic Diseases at the University of Naples Federico II, where he has also been head of the Human Nutrition department since 2008. He is a member of the Advisory Board Barilla Center for Food & Nutrition. During his career, he has cooperated with some prestigious European and American research groups and worked for many scientific journals. The findings of his studies have been published in the main international scientific journals of Nutrition and Diabetology and Metabolism.

The obesity epidemic is here for all to see. In all the OECD countries almost half the population is overweight, while developing countries are witnessing a paradoxical coexistence of malnutrition and obesity. Like all epidemics, the blame cannot be laid on single individuals but is to be sought in society as a whole. The simultaneous increase in obesity numbers all over the world can be attributed not only to the reduction in physical activity caused by the mechanization of production processes in industry and agriculture and widespread use of the car, but also to radical changes in global food production and distribution. These changes have brought low cost food in far greater quantities to much of the world population. For the first time in history the threat of hunger and famine that beleaguered entire populations for centuries has almost vanished from the life of modern man (although this is unfortunately not true for many regions in Africa). However, as is often the case, progress brings both benefits and new problems. Increased food production worldwide means this food has to be eaten and in the absence of a well-ordered system of food distribution, this has led to over-consumption. Food cannot be likened to any other goods and the urge to consume means that we necessarily eat more. For this reason the World Health Organization has defined our environment as obesogenic, considering obesity the normal response to the constant stimulus to overeat to which we are subjected.

Everything revolves around food: television, magazines and the social media are filled with talk about food and eating, from recommendations for trendy restaurants and food advertising to tips from so-called experts suggesting diets that allow you to lose weight even if you stuff yourself. Even social life is heavily conditioned by food. In the past in Italy, people went to the bar or social club for a game of cards; nowadays they meet for dinner or an "aperitivo" (often higher in calories than a real meal). Going for a walk in town (which might be something of an ordeal, what with cars double parked, narrow or inexistent sidewalks and pollution), every other shop sells foodstuff: homemade ice cream, French fries, Sicilian sweets, pizza to go, beer, spirits or fine wines. At the supermarket the richest and least nourishing food is displayed to catch the eye rather than fill the stomach. An article in a well-known American medical journal asks how any mother can be expected to do the shopping with her child and resist its pleading for the packet of candies or chips sitting on the shelf next to the check out.

To counteract the obesogenic environment we inhabit and which has reached worldwide proportions, there needs to be a solid and long lasting alliance between institutions, consumers and food producers and it needs to happen soon. The effects on people's health of the obesity epidemic have already started to show, especially amongst the young. An obese child has almost a 70% likelihood of becoming an obese adult. A person with weight problems from an early age will most likely be faced with hypertension, increased fat levels in the blood, diabetes and other diseases related to overweight, with a significant impact not only on longevity but also on quality of life.

Obviously, the health system will have to do its part to fight this widespread obesity through health education targeted mainly to the more vulnerable groups (children and teenagers as well as the economically disadvantaged and poorly educated), creating an effective network of local structures capable of offering qualified advice on nutrition for those who are overweight. This cannot, of course, be delegated to the general practitioner and requires qualified staff such as nutritionists and dietitians, who can recommend a healthy diet.

Addressing health matters alone, however, is not sufficient to contain problems of overweight; it is necessary to act on the obesogenic factors of our society. This requires a widespread strategy that focuses on consensus and a shared approach rather than purely on draconian policies of deterrence. Efforts need to be made to provide a greater diversification of food (over three-quarters of packaged snacks are high in calories) and better information for consumers about food sold in shops as well as that available in company cafeterias and fast food restaurants. One solution would be for the low calories dishes to be highlighted on the menu. Unfortunately, eating out often has been identified in authoritative studies as a risk factor for diabetes. As more and more people who for reasons of study or work are forced to eat at least one meal a day away from home, it is now a top priority to improve the nutritional quality of food in canteens and restaurants. It might also be very useful to set up working groups comprising representatives of institutions, the food industry, food distributors and consumers who, with the advice of nutrition experts, would draw a road map limiting the overly aggressive marketing of food products aimed at children and press for certain products to be reformulated to improve their nutritional qualities, as has already been done successfully to limit salt consumption. As part of this strategy importance should also be given to initiatives promoting physical exercise, opening school gyms in the afternoon, creating cycle paths and pedestrian areas in urban centers, investing in evening lighting and safety and security in public parks and, finally, offering discounted prices for gyms and swimming pools to poorer members of society who are overweight.

It is not easy to change our lifestyle. It takes intelligence, energy and financial resources, something that is not popular in times of crisis and that requires courage and far-sightedness. However, it is a fact that not investing in prevention today will necessarily involve greater expenditure in the years to come. Public spending on health is growing annually and this trend is set to increase in the near future. Obesity plays an important part in all this: indeed, where it is a factor health care costs increase by at least 25%. Economists (from the OECD first of all), therefore, share the view that to contain spiraling health costs, it is essential to invest in obesity prevention.

Finally, in addition to the economic and health aspects we must consider the ethics. I consider it appropriate to conclude these brief considerations with what President Obama said in a recent speech to the American people: "The world's childhood obesity has now reached epidemic proportions, and this means that for the first time in human history children today have a lower life expectancy than their parents; our goal needs to be to solve this problem within a generation in order to allow children born today to reach adulthood at a normal weight."

INTERVIEWS

Companies must behave responsibly

Marion Nestle

MARION NESTLE is one of the most respected nutritionists in the world. She is a writer and a university professor, she specializes in the issues of food policy and dietary choices. She is the author of *Food Politics* (2002), *Safe Food* (2003), and *What to Eat* (2003). *Food Politics* received many awards. She is the Paulette Goddard Professor in the Department of Nutrition, Food Studies, and Public Health (the department she chaired from 1988-2003) and Professor of Sociology at New York University. She is also a visiting professor at the Division of Nutritional Sciences at Cornell University.

Recent authoritative studies have clearly shown the importance of prevention within health policies. Despite this, topics linked to prevention tend to remain on the theoretical plane more than on the practical one, and don't seem to be able to reach us in our daily life. How can we overcome these problems? And what are the most adequate prevention policies and best practices in this area?

It is no trouble to think of many examples of prevention policies that are highly effective in public life. These aim to prevent illness or harm in one of two ways: changing the environment or changing personal behavior. The classic, prototypical public health measure—turning off the Broad Street pump to prevent the spread of cholera—was an environmental change. It did not depend on personal behavior. Water chlorination, and fluoridation to prevent tooth decay are other such measures.

But I'm guessing that you are more interested in policies that change personal behavior. Laws that require automobile drivers and riders to wear seat belts and cyclists to wear helmets are obvious examples. To these must be added anti-smoking policies that raise taxes, put warning labels on cigarette packages, and forbid smoking in schools, offices, buses, and airplanes have made it so expensive or inconvenient to smoke that many people have stopped. And many countries have food safety laws, some more effective than others. But in all of these cases, it took aggressive action on the part of government to implement such policies.

That brings us to food and obesity. Foods are not cigarettes, and policies to change the food environment or personal eating behavior are necessarily more complicated. With cigarette smoking, it's just one product. The message is simple: stop. And the ultimate goal of anti-smoking advocates is to put cigarette companies out of business.

But people have to eat. The message has to be "eat less" or "eat this instead of that." And nobody wants to put the food industry out of business. We just want companies to behave better, make healthier products, and stop marketing junk food as healthy or targeting children.

Therefore, regulating the food environment or personal choice presents different kinds of challenges. The big one is how to influence what people eat and how much they eat. This is a new area of regulation and in the United States we are now experimenting with such measures as calorie labeling, soda taxes, and incentive programs for choosing more fruits and vegetables. Large food portions are a major influence on calorie intake (larger portions have more calories!) and much attention is now

focused on ways to encourage restaurants to reduce serving sizes. Government agencies are exploring ways to regulate food advertising directed at children and front-of-package logos that indicate nutritional quality. I wish they would also improve regulation of health claims on food labels. Measures like these are strongly opposed by the food industry and it has been difficult for regulatory agencies to make much progress. And we do not yet know whether these kinds of actions will help reverse obesity. Given rising rates of obesity, especially among children, environmental interventions seem well worth trying.

The patrimony of scientific knowledge regarding nutrition is already very extensive and continues to grow. Nonetheless, the concrete possibility does exist to make a noteworthy improvement in our level of understanding of the dynamics between food and health. Among the following subjects of study / frontiers of knowledge, which in your opinion are the most significant in the food-health equation, also in the future?

Education, as any student of health education will tell you, is only the first step in helping to improve behavior. Environmental interventions tend to be far more effective, as they do not depend on personal choice. But if we do try to make education be effective, it must begin in early childhood.

In the United States, much of today's food movement focuses on reforming school meals. These, over the years, came more and more to resemble fast food. The goals of the movement are to introduce healthier food into school meals. The more forward-thinking programs are making efforts to source the food locally, cook it well, and introduce children to a wide range of food tastes and flavors. Some schools have introduced gardens to teach children to plant, grow, harvest, prepare, and eat food, as a means of teaching them where food comes from. Early evidence from such experiments suggests that children exposed to these kinds of programs do indeed eat better and exhibit greater interest in a variety of foods, just as expected.

For both adults and children, education programs must counter the effects of food marketing. Food companies spend billions of dollars a year to encourage sales of their products, much of it on television but increasingly on electronic media. People of every age are exposed to food advertisements all day long, so much so that food marketing has become part of the daily environment and is not consciously noticed. Food marketing is not supposed to be noticed. As an advertising executive once explained to me, "marketing is supposed to slip below the radar of critical thinking." If so, the objective of nutrition education clearly must be to teach critical thinking about food marketing in all its dimensions: advertisements, product placements in supermarkets, vending machines in schools, candy at the checkout counters of business supply and clothing stores, and cafes in bookstores. Noticing how food is marketed is the first step to learning how to resist it.

What is currently known about nutrition is already sufficient to create a massive, pervasive and scientifically unassailable communication campaign on a global scale that could lead to saving a very high number of human lives and improve the quality of life on our planet. What actions do you think should be undertaken to improve communication processes and

encourage people to adopt lifestyles and dietary behavior in line with available scientific knowledge?

Communication? I don't see that as fixing the problem. Environmental changes are much more likely to be effective, because education is aimed at changing personal behavior which is too hard for most people to do. What you really want is to change the food environment to make it easier for people to make healthier food choices.

With that said, the basic message for preventing obesity is quite simple: eat less (and move more, of course), but also eat better. I like to add one more precept: get political. We know that communication alone is not going to make much of a difference unless its messages come with substantial changes to the food environment. Telling people not to smoke cigarettes did nothing to change smoking patterns. Getting people to stop smoking required policies that made cigarettes expensive, difficult to use, and socially unacceptable.

If people throughout the world are to eat less and eat better, we have to help create a food environment that supports healthier food choices. Given that obesity is now a global problem, messages and policy changes will have to be tailored to the particular food culture of each country, but the basic "eat less" message is essential.

But before getting to that message, it is essential to ensure that everyone in the population has enough food to support life, growth, and health. This requires serious attention to inequalities in income and the widening gap between the incomes of rich and poor. Income inequality underlies most health problems.

But let's get back to "eat less" as essential for preventing obesity. Eating less, alas, is very bad for business. "Eat better" also confronts a food industry determined to sell highly profitable processed foods and drinks, regardless of their effects on health. That is why worldwide efforts to prevent obesity must focus on regulation of food marketing, especially to children. Governments should do all they can to discourage frequent consumption of snack foods and sugared drinks. They should ensure that every child is fed adequately and healthfully in school. They should establish agricultural policies that encourage production and consumption of vegetables and other plant foods and variety in food intake, but discourage consumption of highly processed food products. Improving food environments to promote health will benefit individuals and populations and will help reduce the financial and societal burdens of obesity-related chronic diseases on governments that can ill afford them.

INTERVIEWS

The responsibility for children must be shared

Aviva Must

AVIVA MUST is a professor of Public Health and Community Medicine at Tufts University School of Medicine, where she is also the department chair. She is also the director of the Clinical and Community Research Core at the Boston Obesity Nutrition Research Center. Her chief area of research has to do with the epidemiology of obesity, with a special focus on the effects of obesity in critical periods of life, such as adolescence and pregnancy.

Guaranteeing correct eating habits for children and adolescents would seem necessarily to involve a joint effort with the contribution of a number of players (school, family, pediatricians, sports groups, etc.) involved in caring for children at different times of the day. For different reasons, family and school would appear to be the main players in an effective effort of teaching correct eating habits, alongside the pediatricians. What actions are necessary to promote cooperation among the various players involved in different ways in child nutrition?

I certainly agree that instilling healthful eating habits in children and adolescents is a shared responsibility. In addition to these important players, one must also consider the impact of culture, community values, and regional or national policies. With respect to family, school personnel, and health care providers, those who are closest to the child, coordination throughout the different settings children find themselves in is essential. Parents are definitely key given that they determine what food comes into the home, family rules around what, when, and where food may be eaten, and how treats are handled. It is useful to think about child feeding as a shared responsibility, with parents responsible for serving food that is healthy and appetizing and children responsible for how much of it is eaten. Parents, especially before adolescence, often arrange for and provide the necessary equipment for children to participate in organized sports. For younger children, opportunities for free play are in the domain of family life.

Schools are important reinforcing environments and school policies can directly influence child food intake. Children may eat breakfast, lunch, and a snack at school, so that as much as half the child's intake may occur in the school setting. When schools prepare and serve food to students, high-quality nutritious balanced meals and snacks should be the only kind of meals and snacks served. In the policy arena, some schools have banned vending machines on school premises and limit the kinds of foods that are sold *à la carte* in the cafeteria. Schools should consider policies that ban use of any product names, logos, or "spokes-characters" on any curricula or other educational materials. In the US, schools no longer teach cooking skills as part of secondary school curricula—although it would take a lot to bring it back, it deserves serious consideration: the lack of cooking skills represents a important impediment to healthful eating at home, where increasingly youth prepare their own meals. Physical activity during the school day, in class or at recess may represent as much as half of the physical activity the child engages in daily. High-quality physical education instruction should

emphasize development of skills for a lifetime and insures that all students participate, regardless of their sports prowess. In afterschool settings, considerations with respect to food served and physical activity are important as well.

The pediatrician serves an important role as a trusted source of health-related information to parents. From the first well-baby visits, the pediatrician plays a central role in teaching mothers how to feed their child. By asking questions about what complementary foods are being fed, what liquids are put into the baby's bottle, and whether the toddler is permitted to walk around carrying the bottle the pediatrician learns about parental behaviors on which to counsel. As the child grows older, as part of preventive care, healthcare providers should ask about eating habits, whether the family eat meals together, physical activity patterns, screen time (time spent viewing television, playing video games, and working on the computer). Health care providers can encourage healthy family behaviors, such as eating meals together, turning the television off at meal-times, and not allowing a television in a child's bedroom. Healthcare providers also should adhere to weight screening guidelines, which in the US call for annual screening of weight using BMI (weight in kilograms/height in meters squared).

In view of the increasing number of obese and overweight children from the earliest years of life, and the potential consequences of serious health problems persisting in adults (increased risk of chronic diseases), what actions can be or have been put in the field successfully to promote the spread of correct eating habits and lifestyles from the earliest years?

The rise in numbers of obese and overweight children has occurred across all of the stages of childhood, starting in infancy. Children are born with higher weights, partially due to women entering their childbearing years at higher weights. So, one promising area for intervention is women before they become pregnant. During the early years of life some data suggest that children who are breast-fed are more open to a variety of food flavors and less likely to be overweight later in childhood. Although this latter association is not fully established, it may reflect the mother child feeding relationship where the breast-fed infant controls intake more than the bottle-fed infant. In child-care settings, policies around food served, use of the television, and opportunities for physical activity should be established. Once established, there must be a mechanism to ensure that policies are being followed. In the home setting, guidelines development and their wide promulgation would help inform parents of young children about their role in ensuring healthful eating for the very young. In the United States, the Dietary Guidelines are developed for individuals over the age of 2—guidelines for children younger than two, especially restriction of sugar-sweetened beverages, would represent a beneficial first step. Policies around limits for screen time and for physical activity for the very young would also be welcome.

In recent years we have become more and more aware that the agrifood industry has a role that is both possible and necessary in contributing actively to the development of products and offers coherent with the information we have about correct dietary habits and lifestyles for children and adolescents. What actions can be identified and coordinated, in your opin-

ion, with the food industries to promote healthy dietary habits and lifestyles from the earliest years of life?

I agree with the premise that the agrifood industry has a major role to play—and one that is both possible and necessary. Unfortunately, there are economic disincentives to many of the best ideas. One would like to see the industry make a business commitment to health—elevating the manufacture of healthful products to be a key criterion for their activities. Foods could be reformulated to be less energy dense, more nutrient-dense and of more appropriate portion size. For example, the soft drink industry might reduce the amount of sweetener in all sugar-sweetened beverages. The consumer would quickly adjust to less sweetness, just as they adjusted to greater sweetness. In terms of food processing, the addition of key nutrients to otherwise unhealthy foods is a trend that may fail to deliver expected benefits as consumers no longer can distinguish between healthy and unhealthy foods in the context of an ever-increasing number of choices and variations. The marketing of low nutrient dense foods to children is an industry practice that runs counter to health and should be restricted.

INTERVIEWS

Lifestyles influence the way we age

Alexandre Kalache

ALEXANDRE KALACHE is one of the leading world experts on issues linked to aging, with special reference to the care and treatment of the elderly and the epidemiology of aging. He was the director of the Department of Ageing and Life-Course at the World Health Organization (WHO) from 2004 to 2008. In 2002 he established the Active Ageing Policy Framework, and introduced the Global Network of Age-Friendly Cities. He is president of the International Longevity Centre (Brazil), the director of the International Centre for Policies on Ageing in Rio de Janeiro, a senior advisor to the President on Global Ageing at the New York Academy of Medicine, and a consultant to the municipal and state governments in Rio de Janeiro and Saõ Paulo, as well as for Brazil's federal government in Brasilia.

In industrialized countries, starting from the beginning of the 20th century, average life expectancy has increased sharply thanks to the constant improvement in medical care and important scientific discoveries. Nonetheless, contemporaneous with this, diseases such as diabetes, cardiovascular disease and cancer have continued to emerge, and over the last decade overweight and obesity have exploded. This caused a significant increase in medical costs, while a general change in lifestyles goes ahead. But, considering the different concepts of lifespan & health span, are we sure that living longer is living better?

We are indeed facing the serious risk of turning the greatest achievement of the 20th century—an increase of more than 30 years in life expectancy at birth worldwide, even more than that for most of the developed world—into a major problem of the 21st century. It does not make sense. Policies and interventions to ensure good health and quality of life as individuals age are urgently required. Important gains of recent decades are already clearly under threat. To illustrate this point I refer to a paper by the Canadian researcher P. C. Michaud and collaborators from both sides of the Atlantic, published in the prestigious *Journal of Social Sciences and Medicine*.

This paper shows that in the 1970s the United States led the world in terms of Life Expectancy at Birth (LEB) yet four decades later in the United States lags behind European countries of comparable socio-economic development. Americans are now living 18 months less than their European counterparts despite the fact that the United States spends more than twice as much on health-care as a percentage of GNP. The paper is based on a sophisticated study which concludes that "the difference between United States and Europe would disappear if prevalence of obesity in the United States would be the same as in Europe." The authors emphasize that inefficiency in the American health care system is not a factor. Americans are not dying earlier because their health system fails them but because of their prevailing lifestyle. The study also suggests that policies to reverse unhealthy behaviour are particularly critical among middle aged individuals, when they are around 50 years old. Although the earlier an individual is when healthy lifestyles are adopted, the better, middle age is the threshold to yield major health gains.

While living longer does not necessarily mean living better, it seems that American are not only living shorter lifes but also worse lifes. Obesity is both taking years from

their lives but also negatively impacting their quality of life. Diseases associated with obesity—such as diabetes, osteomuscular problems, cardiovascular disorders and some forms of cancer—not only lead to premature death but also to many years of suffering through morbidity and disability. In addition, they substantially add to health care costs, taking away billions of dollars from the public sector which could be otherwise used in interventions and policies (such as education, environmental, recreational) that would be translated into better quality of life for the population as a whole.

Modern-day theories indicate there could be a common source to the various non-communicable diseases: gradual cell inflammation that then manifests itself in actual pathologies. Numerous studies currently underway demonstrate that an approach which reduces caloric intake constitutes a powerful weapon in reducing inflammation, thus slowing aging in individuals. How to reduce inflammation with the adoption of a balanced diet and healthy lifestyles?
While we do not yet fully understand the process of biological ageing there is no doubt that lifestyles affect it in important ways. Over the last few decades study after study confirm the importance of our behaviour in relation to age-associated diseases. Control of four modifiable risk factors for non-communicable disease would lead to a huge decrease in their morbidity and mortality: sedentary lifestyles; tobacco smoking; unhealthy diets and excessive consumption of alcohol. Gradual cell inflammation seems to be at the core of the pathogenic mechanism. The problem is how to implement sustainable policies. Although studies using animal models suggest substantial life extension through reduction in the amount of calories ingested, they are still to be confirmed in humans. Similar results might extend human life span to 150 years or more. However, available evidence in these studies suggest that the calorie reductions might have to be at levels that would not be easily accepted by a large majority of the population. The very fact that obesity has become such a major public health problem throughout the world shows that humans are inclined to eat more than they need—and to burn less calories than they should, in the absence of major intervention to invert recent trends. Take for instance what is already happenning in developing countries as varied as Brazil, Mexico, Jamaica, India and the Phillippines. As soon as socio-economic levels reach a certain threshold this is followed by a spree of over-consuption of food in parallel to the adoption of sedentary lifestyles. Most recently available data for Brazil for example, shows that virtually half of the adult population is now overweight, some 15% of them obese. Equivalent figures in the 1970s and 1980s were at a fraction of these; showing how fast negative trends are achieved.
Changes in lifestyle that are more acceptable to the population at large should be pursued with more vigour. This would require a combination of marketing research—to ascertain what are the healthy behavioural preferences of the population as well as how to encourage them—with fiscal and legal policies that would sustain effective policies. For instance, research to find out which health food is more easily accepted by the population (marketing campaigns through the media) at affordable prices (fiscal policies decreasing taxes for fruits and vegetables) while creating barriers to discourage unhealthy items (legal policies, for instance, prohibiting trans-saturated fats or the provision of sugary drinks at school meals).

Today, it is no longer enough to merely aim at living longer without also living well: quality of life is an indispensable factor that no one wants to give up. Prevention from the earliest years of life and change in lifestyle as adults (by which is intended eating habits and physical activity) has become an approach that can no longer be put off. What are your suggestions, from a nutritional point of view, for healthy aging?

The World Health Organization defines "Active Ageing" as the process of optimizing the opportunities for health, participation and security in order to enhance quality of life as individuals age. This implies a life course approach: the earlier one starts to invest on one's own health, the higher the health capital for life. Health is the central pillar (to which "lifelong learning" should be added) through which to guarantee participation, the second of the pillars of the Active Ageing concept. Finally, security: a system that should be there in place to ensure that those who do not age in good health will receive the adequate protection and care so that they continue to have some quality of life however low is their residual level of functional capacity (independence).

From the nutritional point of view—and coherent with the active ageing approach—healthy diets should be encouraged as early as possible, and made sustainable throughout the life course. This is easier said than done; the emergence of fast and sugary food, the easy availability of cheap, high calory/low nutrient food as well as overly-aggressive marketing strategies conspire to cause children to acquire unhealthy diets early in life. In addition, in some cultures cooking styles are not healthy to begin with—for instance, a "white diet" based on refined carbohydrates, refined sugar, high in fat (fried food), salt and, often, alcohol. Compare that with the Mediterranean diet (high intakes of olive oil, unrefined cereals, fruits and vegetables; moderate intake of dairy products; moderate to high intake of fish; low consuption of meat and moderate intake of wine) or the Okinawan diet (low calories and fat; high consumption of green and yellow vegetables; high consumption of soya beans and other legumes; small to moderate consumption of fish; little meat; virtually no eggs or diary products). Inevitably, some cultures predispose one to good dietary decisions while others induce one to a bad start. Policies and interventions aimed at promoting and sustaining healthy diets should be followed from as early as possible in life—but not neglected later in middle age or dismissed in older age with the wrong assertion that "it is too late." In this respect, studies recently conduct by Professor Ng Tze Pin, from Singapore, have shown that the importance of "health eating for healthy brains"—not only through high intakes of fruits and vegetables, fibers, low fat, etc—but also demonstrating that there are other food ingedients that may well protect individuals from senile dementia later in life—such as green tea (polyphenols) or yellow curries (basic ingredients, tumeric and cumin) possess strong anti-oxidant and anti-inflamatory properties.

ACTION PLAN

ADOPT A BALANCED DIET AND AN ACTIVE LIFESTYLE

There exists an evident, direct, and intense linkage between lifestyles and health and, in the context of individual choices, diet and nutrition play a decisive role.

Specifically, the adoption of a balanced diet, such as the Mediterranean diet—with a low content of sugars, fats, salt, and a high content of fruits, vegetables, and cereal grains—significantly reduces the negative factors that cause diseases, states of infirmity in individuals and, in some cases, premature death.

In brief, the adoption of a balanced diet and an active lifestyle, from the earliest phases of our lives, can help minimize, at the same time and in parallel, the risks of overweight, obesity, tumors, cardiocirculatory diseases, diabetes, and metabolic syndrome.

ENCOURAGE GOOD BEHAVIORS AND LIFESTYLES FROM CHILDHOOD ON FOR BETTER ADULT HEALTH

The findings in favor of the exceptional importance of a proper dietary regimen from the earliest age appear to be undeniable. There is clearly a high correlation between poor behaviors and diet in the early years of life and the onset of diseases in adulthood.

It is clear that we must encourage the further exploration of scientific knowledge concerning childhood, which has been less thoroughly studied than adulthood. We must also encourage cooperation among the various subjects involved (including the food industry) in shaping the diets of young people, with a view to channeling proper dietary information and the promotion of a culture of prevention. Ensuring sound ways of eating in children and adolescents will require a concerted group effort by the numerous actors (school, family, physicians, pediatricians, and the dietary industry) who take care of children at different points throughout the day.

MAINTAIN AN ADEQUATE DIET THROUGHOUT YOUR LIFE

Over the last hundred years life expectancy at birth has almost doubled, rising from 45 years at the end of the nineteenth century to about 80 years in 2010. These results are the product of improvements in living conditions, medical and scientific discoveries, and continuous advances in medical and healthcare technologies.

Despite the prolonged average life span, health does not seem to be improving at the same rate: about 80% of elderly people (over age 65) suffer from at least one chronic disease and about 50% suffer from two or more chronic diseases.

In the face of a steady increase of life expectancy and the dramatic rise in the spread of the leading chronic diseases, it is probable that humanity will soon experience, for the first time in modern history, a widespread old age characterized by a sub-optimal average quality of life, for a significantly longer period of time.

Therefore, what is needed is not so much to find a way of living longer but actions to live better, longer. This may mean studying fields that are particularly innovative, such as the link between states of inflammation and the onset of chronic diseases, as well as the benefits that can be obtained through regimes of caloric restriction with optimal nutrition.

5. FOOD FOR CULTURE

Food for peace a call for the mobilization of goodwill

Shimon Peres

SHIMON PERES has been the President of Israel since 2007 to 2014. Politician, thinker and Zionist activist, Shimon Peres has held major positions of responsibility within the state of Israel as statesman, public administrator and parliamentarian. He was prime minister from 1984 to 1986 and from 1995 to 1996. Because of his long-term commitment to the peace process, and in particular thanks to the start of the Oslo Accords, he was awarded the Nobel Peace Prize in 1994 together with Israeli prime minister Yitzhak Rabin and Yasser Arafat.

In today's changing world, food for peace has become a crucial and burning issue that needs to be urgently addressed. I cannot help but be reminded of John F. Kennedy's words which encapsulate the very essence of the role of food in our global society: "Food is strength and food is peace and food is freedom and food is helping people around the world whose goodwill and friendship we want."

Generations ago the source of livelihood and food supply was land, and therefore the main concern was territory—enclosed by borders and based on an economy that was national. Today, science and technology have replaced land as our source of livelihood and food supply, overcoming poverty and pointing to a tomorrow of hope and prosperity. Like a new and fresh wind they are blowing away borders, breaking down barriers, erasing distances, their influence is global, like today's economy.

Science enabled us to have a longer life expectancy and reduce child-mortality, which has led to a population growth that presented new issues that call for new answers. With the growing population, food consumption increases, and in the global era, expectations also grow, and finding the right answers to meet the surging demand for food is of the essence.

But the answers are few. Water is declining, desertification is spreading and people are becoming bitter. In other words, it is easier to produce children than to produce food for them. It is easier to promise dreams than to realize them.

The Middle East lives in a state of tension. It has been subject to conflict and war. Today it needs a hopeful tomorrow. It needs peace. It needs prosperity and well-being for its people. It needs food for its children. And for this, goodwill and volunteers with this in mind have to be mobilized to work together towards a common goal.

There is no limit to human potential. Israel, a minuscule country with practically no natural resources, has proven this point. With little land, meager water supplies, and without a drop of oil, we had no choice but to give up the cultivation of land and replace it with the cultivation of hi-tech. Israel's agriculture is based more on technology

than on land and water. As a result, we have increased our yearly crops by twenty using little water. With the power of innovation, countries can overcome deserts.

So we look upon science as a provider of food and existence. Decreasing water-consumption, augmenting clean energy, developing plants that require little water, and recycling water for home consumption and agricultural use that boosts food supply, is all a matter of experience which we would be glad to share with everyone, because in our view, poverty is more dangerous than anything else.

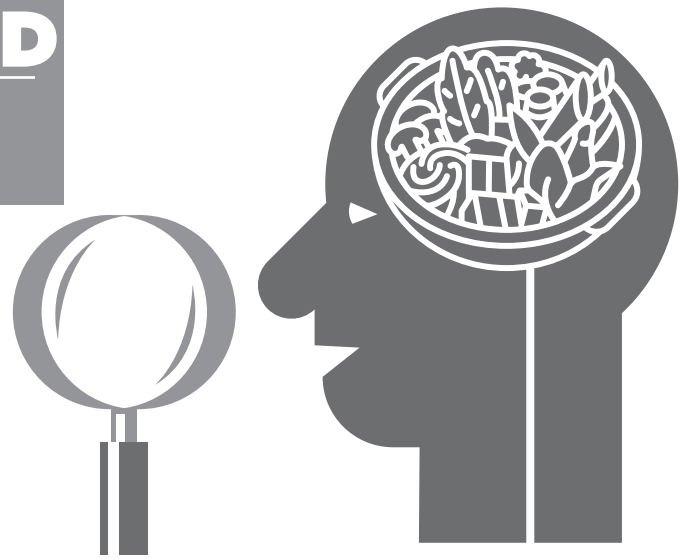
Only 23% of the surface of the globe is being cultivated agriculturally, and we can improve on this. Matching the potential of water and land with the potential of science is a promise for the future. And my greatest hope is that we shall succeed in combining both these elements to meet the need for food, placing it as a priority above borders, above nationalities, above prejudice.

By placing food above politics, we can attain a better quality of life. Let us plant the seeds of innovation into the soil of human potential and we shall feed the children of the Middle East, and of the world, with hopes and dreams.[1]

---

1 Quoted from the addresses of the former President of the State of Israel, His Excellency Shimon Peres, at the Barilla Center for Food & Nutrition Forum in December 2009 and the Villa d'Este Conference in September 2011.

5. FOOD
FOR CULTURE



CHOOSE FOODS CONSCIOUSLY

Humans have remarkable capacities for recognizing and memorizing, and these skills help people to avoid poisons and to find the most nutritious foods. Aside from their senses and memories, individuals base their food choices on culture and traditions that preserve the flavor and experience of countless “tasters” who went before them

THE OMNIVORE’S DILEMMA

Culture codifies the rules of a wise diet with a complex series of taboos, rituals, recipes, regulations, and traditions. All of this allows human beings to avoid being faced on a daily basis with “the omnivore’s dilemma”

GREATER FAIRNESS IN THE WORLD

Fairer food means that we have a responsibility for our weaker neighbors, that we value food as a means of peaceful coexistence among peoples, and that we find ways to establish socio-economic equilibriums through the phases of production

REDISCOVERING THE PLEASURE OF FOOD

The great challenge of our time is to redevelop a deeper, richer, more meaningful relationship with food, where the relationship with the things we eat is restored to the dimension of esthetics, taste, and conviviality

FIGHTING OBESITY AND FOOD-BASED PATHOLOGIES

Eating has become a banal experience, leading to the epidemic of obesity and diseases linked to obesity

THE IMPORTANCE OF CULINARY TRADITIONS

Currently, we are witnessing the progressive abandonment of the gastronomical traditions of the past, as well as the loss of knowledge about cooking and the makeup of food

THE CULTURAL DIMENSION OF FOOD

Ever since the earliest times humans, like every other species on the planet, have interacted with nature on the basis of one dominant imperative: survival. For eons, that imperative required protection from harsh climatic environments and the ability to turn to one's own advantage the perpetual contest to eat, but not be eaten. Roaming the landscape in search of food, early humans sought survival through two principal practices: hunting and the collection of any and all possible edible objects. Continually exposed to the danger of becoming food themselves, our ancestors developed increasingly sophisticated abilities to manipulate nature, long before the adoption of agriculture some 15,000 years ago. We are all familiar with that process. As early as the Paleolithic era humans had discovered and begun to use fire. In the same period, they also devised a growing number of tools and weapons—first in stone, later in metal—to hunt, fish, defend themselves, and create shelters. Whether we're talking about picking a piece of fruit or killing prey for food, the human relationship with the environment that surrounds us has always been transformative. However, our capacity to manipulate nature passed a crucial milestone with the discovery of fire. Used in a variety of ways—for heat, light, protection, signaling, and drying (food and clothing)—fire gave rise to progressive cultural developments of enormous importance, especially in the realm of diet and nutrition. In the words of Claude Lévi-Strauss,[1] cooking food with fire is "the invention that made humans human." Indeed, before we learned about cooking techniques, food and meat in particular—was eaten raw, rotten, and even putrefying. The use of fire was a decisive turning point. Cooking then symbolically marks a transition between *nature* and *culture*, and also between *nature* and *society*, given the fact that, while the raw is natural in origin, the cooked implies a transition that is at once cultural and social. From this transition onward, food becomes a point of departure for the extraordinary social and cultural developments that followed. National cuisines, as the psychologist Paul Rozin[2] puts it, embody the dietary wisdom of populations and their respective cultures. It is not far-fetched to argue that the history of man's relationship with food has been an extraordinary social and cultural saga of a quest for meaning, in which even the most problematic aspect (searching for food to nourish oneself) was transformed into an opportunity.

5.1 THE RELATIONSHIP BETWEEN FOOD AND CULTURE: THE ORIGINS

Physically ill-equipped in comparison with other animals, hunter-gatherer humans were endowed with considerable brainpower and an exploratory curiosity to match. In

1 Claude Lévi-Strauss (Brussels, 28 November 1908 – Paris, 30 October 2009) was a French anthropologist, psychologist, and philosopher. Among his contributions to scientific psychology was the application of the method of structuralist investigation to anthropological studies.

2 Psychologist at the University of Pennsylvania.

some populations of hunter-gatherers, the diet was actually largely based on game and the consumption of meat. This is also true among the modern populations of hunter-gatherers in the arctic and subarctic regions, where there is not much else to eat. In any case, many modern scholars believe that by far most of the hunter-gatherers of the past lived primarily on foods derived from plants, or else, in areas near seas and rivers, on fish and shellfish. Some populations, however, were almost exclusively vegetarian. Over the course of the Paleolithic *Homo erectus* was replaced by *Homo sapiens*, and brain size rose from about 400 cubic centimeters almost to the current size of 1,400 cubic centimeters. A large brain demands an extraordinary quantity of nutrients. Nonetheless, the American anthropologist Eugene Anderson[3] questions the theory that this specific factor explains the inclination to hunt and eat meat, given human being's pitiful lack of fangs and claws and the doubtful efficiency of primitive hunting equipment. His explanation of the link between brain development and diet is different: "In my view, the only credible theory of human dietary evolution is that the early hominids just became better and better at omnivory. They got better at finding meat, both by scavenging and by hunting, but also at finding roots, seeds, shoots, eggs, and anything else edible. [...] The only way an animal with a huge, demanding brain can survive is by using the brain to figure out how to draw on a wide range of good food to get the most nutrition with the least effort." Humankind's first "cultural" elaborations were therefore by and large focused on the challenge of how to find food and accommodate an omnivorous propensity that was decidedly out of the ordinary. Michael Pollan[4] also fully subscribes to this theory in his bestselling book *The Omnivore's Dilemma*. Other animals, Pollan notes, pursue the opposite strategy and consume a very selective diet, and correspondingly possess much smaller brains. The koala, for example, is an extreme case, since this notoriously small-brained animal eats only eucalyptus leaves. Humans, in contrast, must devote enormous mental energy to refining the cognitive and sensory knowledge needed to distinguish which foods—among the many available—are safe to eat. That effort is an essential part of humanity's cultural processes. In short, we think about food—and write about it, make art and music about it, and study it scientifically—a great deal. It is part of who we are. As noted earlier, cooking is deeply embedded in human culture, so it's no surprise that humans have developed our notions of cooking extensively. The "culinary triangle," for instance, distinguishes among three different categories of cooked food: the roasted, the boiled, and the smoked. In all societies, roasting was the first form of cooking, the one closest to the natural order. The most ancient uses of fire for cooking simply exposed food directly to the flames; food was held on sticks and simply scorched or burned. Smoking food and boiling are distinguished from roasting by the inventive use of two different elements of mediation in cooking: air and smoke in one case, and water (plus a receptacle) in the other case. The use of cooking utensils, necessary for boiling, is certainly evidence of

3 Anderson E., *Everyone Eats. Understanding Food and Culture*, New York University Press, New York 2005.

4 Michael Pollan is a writer, journalist, activist, and professor of journalism at the University of California, Berkeley Graduate School of Journalism.

cultural evolution, but the same is true of the ability to smoke food in such a way as to extend its ability to withstand deterioration far longer than with any other method of cooking. So even the simple act of cooking, probably discovered by accident, succumbs to the human drive for cultural elaboration.

5.2 HOW FOOD CONTRIBUTES TO COMMUNICATION AND CONVIVIALITY

Food took on a very important role in the development of the earliest forms of communication between individuals. As the human brain grew, so did social groups begin to expand, from the 20 or so members typical of *Homo erectus* groups to the roughly 50 to 150 members common during the period of *Homo sapiens*. The extent of the territory occupied by the group also expanded. In a larger territory the discovery of a food source had to be communicated in greater detail, in order to explain exactly where it was located and how many members of the group it could feed. This was undoubtedly one of the ways in which language developed. Furthermore, it is reasonable to presume that the evolution of language was facilitated by the need to alleviate tensions bound up with the division of foods. At the origins of what we now call conviviality were the primitive practices of sharing food around a fire by groups of human beings who sat face to face, smiling, laughing—and eventually talking. These practices are not found among other species, not only because of the fear of fire, but also because in the animal kingdom direct eye contact, opening the mouth, and showing teeth are typically hostile gestures. Moreover, as noted by Lévi-Strauss, "if we add to this the idea of placing food in the middle of a group of individuals, with different parents and children, there is a clear recipe for conflict and violence." So the ability to communicate must have played a considerable role, and been in turn rewarded, in those rituals of sharing through which our ancestors managed to reverse signals of danger and transform them into the very essence of that conviviality that characterizes human social relations. The contemporary table and the habit of mixing food and conversation in convivial circumstances of all kinds therefore derives from an experience with ancient roots very distant in time, an experience that allowed the human species to overcome natural instinctive tensions and climb a number of steps up the ladder of cultural and social development.

5.3 DELIGHT AND DISGUST: THE CULTURAL CLASSIFICATION OF THE EDIBLE

The growing mastery of language and the higher brainpower of *Homo sapien* did not automatically facilitate the development of a food system. Indeed, omnivores, unlike animals that follow a very selective diet, constantly find themselves confronting the question of whether a certain substance is edible, beneficial, or harmful. According to Michael Pollan, this might depend on the fact that on Earth "there is no nutrient source (...) that is not eaten by some human somewhere—bugs, worms, dirt, fungi, lichens, seaweed, rotten fish; the roots, shoots, stems, bark, buds, flowers, seeds, and fruits of plants; every imaginable part of every imaginable animal." This capacity for nutritional and dietary adaptation greatly assisted the evolution of the species, but

it also put humankind in constant difficulties in distinguishing the foods that were advisable to eat. In fact, when almost everything that nature offers is edible, deciding what to eat inevitably creates some apprehension. This difficulty is an intrinsic part of choosing, and from a dietary standpoint it can be expressed as "the omnivore's dilemma." As Pollan observes, "The omnivore's dilemma is replayed every time we decide whether or not to ingest a wild mushroom, but it also figures in our less primordial encounters with the putatively edible: when we're deliberating the nutritional claims on the boxes in the cereal aisle; when we're settling on a weight-loss regimen (low fat or low carb?); or deciding whether to sample McDonald's' newly reformulated chicken nugget; or weighing the costs and benefits of buying the organic strawberries over the conventional ones; or choosing to observe (or flout) kosher or halal rules; or determining whether or not it is ethically defensible to eat meat." The omnivore's dilemma was initially identified as a concept in the writings of Jean Jacques-Rousseau and Brillat-Savarin,[5] but it was officially singled out and identified as such by Paul Rozin (a professor of psychology at the University of Pennsylvania). In 1976 Rozin wrote an article titled "The Selection of Foods by Rats, Humans, and Other Animals," in which he compared the existential condition of omnivores, such as rats and human beings, with that of animals tethered to highly specialized diets. The latter animals, in fact, are untroubled by doubts about what to eat, inasmuch as their dietary preferences are written in their genes. These animals waste no thought or emotion on deciding what to eat and what not to eat. Their natural and instinctive mechanism functions perfectly because the digestive system is only capable of obtaining all that the organism needs from a few foods. However omnivores, such as human beings, have to devote quite a lot of time in an attempt to understand which of the countless foods offered by nature can be safely eaten. From the human standpoint, being able to do this has allowed us to colonize every habitat on Earth, as we have adapted to and exploited the various types of food available. When an omnivore encounters something new, and potentially edible, he is forced to deal with two clashing feelings: *neophobia*, that is, the fear of eating an unknown substance; and *neophilia,* or the desire to experience new flavors. From a dietary standpoint, these sentiments are completely unknown to animals with specialized diets. Fortunately, humans are endowed with an extraordinary memory and the ability to distinguish, that help us to avoid poisons and toxins and to seek out the most nutritious foods. From a biological point of view, human beings have also developed a genetic predisposition to prefer what is sweet; sweetness is characteristic of foods which are loaded with sugars, and are thus more energy-packed. At the same time, we naturally avoid what is bitter, which is characteristic of many poisonous alkaloids synthesized by plants. Likewise, the sense of disgust protects more evolved individuals from potentially dangerous foods, such as stale or rotten food. Being omnivores represents both an advantage and a challenge for humans. The flexibility offered by the absence of dietary specializations has allowed human beings to colonize every habitat on Earth,

5 Brillat-Savarin A., *The Physiology of Taste, or Transcendental Gastronomy*. The book was originally published in French in 1826.

as we have adapted to a variety of different foods. At the same time, humans must also spend a lot of time and energy in order to understand what to eat.
Humans have another advantage as omnivores too. Lastly, aside from being able to use our senses and memory in choosing foods, we can also rely on the culture and traditions that preserve the cumulative knowledge and experience of countless "tasters" who came before us. The culture codifies the rules of wise nutrition with a complex series of taboos, rituals, recipes, rules, and traditions. All this allows human beings to avoid having to deal each time with the omnivore's dilemma. While humans as a species are ready to gobble almost anything that comes to hand, it should be said that the various human societies tend to considerably restrict the notion of what constitutes a food as "good to eat." This concept includes a variety of nuances, which are often underscored by solid cultural boundaries. For example, as Paul Rozin pointed out, in the domain of food (but not only that), disgust is an emotion which is highly characterized according to cultural viewpoints. Some products of an organic nature are disgusting (like excrement or rotting meat), and yet many societies express rather idiosyncratic forms of disgust, which often have no meaning outside the cultural development of norms and customs. For example, in Western societies, depending on the geographic region and the social group, foods such as snails, frogs, and animal organs can be either hailed as delicious or considered repellent. This means that what we ingest—or reject—says a great deal more than a simple dietary preference. Every culture, in its own way, tends to divide everything into what can be eaten and what cannot. That subdivision often includes many elements of a symbolic nature which, beginning with the physical body, guide a certain perception of the social body, and vice versa.

5.4 FOOD: SOCIAL, GENDER, AND POWER ROLES

Access to food and nutrition—what might be called the nutritional order and hierarchy—is governed by power. The hierarchy of rank establishes the rules governing access to food, even among other animal species. For example, even though lionesses do the hunting themselves, they do not touch the prey until the lion has finished eating. Among human beings, the control of food was historically one of the principal sources of power. In the Middle Ages, the banquets of aristocratic families contrasted with endemic starvation among the peasantry, and in various parts of Europe those who were caught poaching in the royal reserves, or in the preserves of local lords, were sentenced to death. Countless battles and wars have been waged between farmers and stockbreeders in many regions of the world, not only to gain a greater number of holdings, but also to have a monopoly on the techniques and tools used for producing and preserving food. On the African continent these conflicts are, unfortunately, still under way. Food can be a signifier of power in social terms, especially regarding social prestige. But it is interesting to observe that the cultural perception of that accepted meaning is fairly complex, and in some cases contradictory. Certain foods have always been recognized in terms of prestige and exclusiveness, especially due to reasons linked to cost and insufficient availability. Foods like chocolate, which are now available to everyone, once were accessible only to the wealthiest people. In any case, as Sertorio

THE MYTH OF MEAT. CULTURAL AND SOCIAL ASPECTS OF MEAT CONSUMPTION*

History demonstrates how food has always played a fundamental role in daily life, regardless of its nutritional function. Indeed, throughout the world there is no other similar activity for which human beings have spent so much time and money.[1] Food represents scores of meanings, and can serve as a form of social interaction and as a communication tool. Food provides a foundation for conveying religious norms, but it can also support the expression of human identity and sexuality, and be the ground on which conflicts and control are played out.[2]

Of all the foods which are broadly recognized as being edible, meat seems to be the one which is most loaded with symbolism; more than other foods perhaps, meat is able to inspire many different expressions of our Self. Meat is the most appreciated food, the heart of a meal. For many people, it is synonymous with "real food," so much so that even for vegetarians, consuming soy-based or other vegetable products seems to fill the void left by a previous dietary habit with something equivalent, which imitates meat in its shape or nutritional concept. In Western countries, especially those with Anglo-Saxon origins, meat is highly esteemed from a nutritional standpoint, as it is rich in protein and other nutrients that are crucial to a proper diet. Nonetheless, meat has also been cause for fear and worry following food scandals which started at the end of the 20th century and continue today (for example, the mad cow disease outbreak, SARS, and the very recent announcement made by the WHO warning people against eating processed meat). It is paradoxical that meat seems to be both the most appreciated and the most demonized food, at the same time.[3] In any case, it is a proven historical fact that the most significant (and interesting, from an anthropological standpoint) dietary bans include entire categories of animal-based products. For example: Muslims ban pork, Hindus ban beef, and Jews have special rules about consuming milk, and ban eating various kinds of fish.[4] Likewise, many taboos linked to meat exist outside of religious frameworks. For example, even though North American cuisine includes many kinds of meat, horse meat is simply not eaten. Horses, in fact, are not just any animals, but are pets; as pets, it would be reprehensible to serve them as food. The expression "I am so hungry I could eat a horse" doesn't just mean that I am "very hungry," but that I am *so* hungry I could exceed the bounds of what is normal or allowed to be put on my plate. According to social anthropologist Nick Fiddes,[5] domestic animals cannot be eaten, since they have been "humanized." Eating meat goes back to the start of the civilization process for human beings, and therefore those who are no longer a part of the "natural" world—like other human beings and some "spiritually similar" animals—cannot be "food." From a sociological and cultural viewpoint, eating meat is also strongly linked to the concepts of power and masculinity/virility. For example in the North American tradition, meat is still considered as "men's food," and in fact many men don't consider a meatless dish as a "real" meal.[6] After all, the famous expression "meat and potatoes man" conjures the image of a man which is deeply rooted in that society: practical, solid, strong, and friendly. With this in mind, meat can be considered as something more than just a simple meal; as social anthropologist Nick Fiddes writes, "it also represents a lifestyle." In primitive societies, for example, meat is representative of meaningful social situations. As compared to fruit and vegetables, meat is used more often for encouraging and strengthening relationships between relatives, neighbors and even members of similar communities. "The Yanomami hunters [...] are convinced they will lose their hunting skills if they do not share their hunted prey. Both individuals as well as entire families rarely share bananas or their cultivated food, however they never eat wild game without cutting off portions and offering them to the most prominent people in the village, who then distribute some of the meat to women and children."[7] A preference for

* Retrieved from: Cadel E., *The Psychology Of Meat Consumption: An Investigation Of Attitudes, Identity And Norms*, PhD thesis, Università degli Studi di Milano Bicocca, 2014.

meat can also be seen in the dietary customs of more evolved societies which are characterized by the presence of complex religious doctrines and highly structured rites. Often these societies have at their core the sacrifice of domestic animals and ritualistic meals. According to Marvin Harris, "As flocks and herds became domesticated, meat, blood and milk had to be shared with one's ancestors and with the gods, just as hunters had to share the game they hunted daily with one another. The intent was to create a network of reciprocal obligation within the community one belonged to, in order to prevent jealousy and conflict, and to protect both the invisible rulers of the world as well as its earthly creatures. Ancient peoples could express their hunger for meat and for other animal-based products by making the slaughtering of animals into a form of sacred sacrifice."[8]

Even to the present day, eating meat continues to play the role of social aggregator. That said, recent food scandals and new medical discoveries regarding excessive meat consumption[9] have led people to adopt new dietary styles with low meat consumption. In Italy, for example, there has been a consistent increase in the consumption of soy and its derivatives. Soy products are familiar to four out of five Italians, and appear to be served in a good 40% of Italian households. Within this framework, the number of people who become vegetarian or vegan has increased each year. According to Eurispes data,[10] the number of people in Italy who have stopped eating meat went from 4.9% in 2013, to 6.5% in 2014, to 5.7% in 2015. A very recent study promoted by the dairy-cheese cooperative TreValli,[11] in collaboration with Eurisko, highlights how ethical and health issues have motivated more than two million Italians to reduce their meat consumption, and another million Italians to give up all animal-based products entirely, honey included. In the photograph, the three basic characteristics of people who typically embrace this type of diet are portrayed: female (between 45 and 54 years old), lives in north-western Italy, and works in a managerial position (and often is a degree-holder). There are four main reasons which lead people to choose a vegetarian diet: disgust for meat's sensorial qualities, concern for one's health, concerns for the well-being of animals, and environmental concerns.[12] [13] [14] The first reason is less common: since meat is a very tasty food, disgust for meat's organoleptic characteristics is usually developed later, after a person has been a vegetarian for some time.[15] Conversely, it is highly probable that people stop eating meat due to health or ethics issues. The latter reason, in particular, plays a fundamental role in helping people maintain this kind of diet over the long term. In conclusion, in order to best understand why people eat or avoid eating meat, it is necessary to focus on the socio-cultural and ecological perspectives of meat consumption, bearing in mind each single condition in which it is presented. Since raising animals for food, especially in industrial contexts, influences climactic changes (due to toxic gas emissions, wasting resources like water and electricity, deforestation and damages linked to waste disposal after production), it may be true that eliminating meat from one's diet can bring about some advantages from an environmental standpoint. However, from an anthropological viewpoint, it is not necessarily true that such a radical change leads to a greater awareness of the global food situation, or to adopting healthy and sustainable diets. For this reason, reanimating some of the fundamental dynamics of the greatest gastronomical cultures appears to be crucial for the near future, so that the pleasures of food can be reconciled with a focus on sustainability and the environment. This would create a world in which alleged opposites can live together without anyone having to renounce their place at the table.

---

1 Samuelson R. J., *The economist book of vital world statistics*, Random House, New York, 1990.

2 Ogden J., *The psychology of eating. From healthy to disordered behavior*, Wiley-Blackwell, Oxford, GBR, 2010.

3 Fessler D. M. T., C. D. Navarrete, "Meat is good to taboo. Dietary proscriptions as a product of the interaction of psychological mechanisms and social processes", *Journal of Cognition and Culture*, 3(1), 1-40, 2003.

4 Simoons F. J., *Eat Not This Flesh,* University of Wisconsin Press, Madison 1994.

5 Fiddes N., *Meat: A natural symbol*, Routledge, London 1990.

6 Sobal J., "Men, meat, and marriage: Models of masculinity", *Food & Foodways*, 13(1-2), 2005.
7 Marvin H., *Good to Eat*, Waveland Press, Long Grove 1990.
8 *Ibid*.
9 WCRF, World Cancer Research Fund International, Second Expert Report [Data file], 2007 Retrived from www.dietandcancerreport.org/expert_report/recommendations/index.php.
10 www.leurispes.it/vegetariani-vegani-alimentazione- futuro/.
11 www.trevalli.cooperlat.it/news-502-italiani-si-cambia-la-tavola-diventa-verde.
12 Fox N., K. Ward, "Health, ethics and environment: A qualitative study of vegetarian motivations", *Appetite*, 50(2), 422-429, 2008; Fox N., K. J. Ward, "You are what you eat? Vegetarianism, health and identity", *Social Science & Medicine*, 66(12), 2585-2595, 2008.
13 Santos M. L. S., D. A. Booth, "Influences on meat avoidance among British students", *Appetite*, 27(3), 197-205, 1996.
14 Worsley A., G. Skrzypiec, "Teenage vegetarianism: Prevalence, social and cognitive contexts", *Appetite*, 30(2), 151-170, 1998.
15 Rozin P., M. Markwith, C. Stoess, "Moralization and becoming a vegetarian: The transformation of preferences into values and the recruitment of disgust", *Psychological Science*, 8(2), 67-73, C. 1997.

and Martinengo[6] explain, the gradual spread of well-being and technology has caused a progressive tapering of the divide between bourgeois and working-class food tastes. In contemporary evolution, in fact, it is not unusual to observe that special attention is given to food even in less affluent segments of the population.
From a historical standpoint, however, the categories of Lévi-Strauss's culinary triangle allow us to understand this aspect very clearly. In his analysis, boiled food constitutes a more evolved form and therefore communicates more refined values than roasted food. But this relationship in terms of prestige and power can be overturned as well, because boiled food frequently tends to be associated with a more intimate, family-oriented style of cooking (dishes such as stews or boiled meats), foods that were generally cooked by women. Roasted foods, on the other hand, could be presented during public celebrations, often in the open air and with great ostentation, which tended to be associated with the world of males. A very significant and modern-day example of the latter form is the barbecue. These phenomena have been updated and expanded by socio-anthropological studies which aim to examine the relationship between food and gender. There can be no doubt that food practices give rise to countless varieties of hierarchy, and that in many traditional societies this tends to place women in a subordinate position. For instance, the American anthropologist Anne Allison emphasizes that Japanese mothers, in their meticulous and dutiful preparation of the *o-bentō* (please note the presence of the honorary prefix "*o*" – お – whose use is culturally recommended to females, in particular), or the lunch-box, tended to reproduce an ideology of their own role that was deeply reductionistic and strongly influenced by state institutions. At the same time, the sociologist Marjorie DeVault highlights how the female practices of preparing food in the domestic environment, however gratifying they might be for those who perform them, subtly reveal pervasive conditions of inequality and subordi-

6 Sertorio G., M. C. Martinengo, *Consumare. Lineamenti di sociologia dei consumi*, Giappichelli, Turin 2005.

nation, which thus reinforces the "naturalness" sensed in their deference to the needs of men and undermines any progress toward forms of food culture under the aegis of reciprocity. Of course, especially in the more prosperous Western societies, the role of women can also be viewed in a more positive light. The comparative specialization of women in the purchase and preparation of food can in many cases represent an area of strength in their relationship with men. Also playing a part in that context are increasingly articulated factors of market knowledge, nutritional expertise, purchasing autonomy, and self-expression. According to some, women can take pleasure from their condition of chosen preparers of homecooked food, the pleasure of an activity that is no less intelligent and imaginative than other activities that are customarily considered to have superior standing, such as music.

5.5 THE SYMBOLIC VALUE OF FOODS IN THE MAJOR RELIGIOUS FAITHS

As Eugene Anderson points out, with reference to Émile Durkheim,[7] a great many rituals, ceremonies, and religious celebrations throughout the world inevitably include a relationship with food. This is why the symbolic value of foods in the major religions must not be underestimated. For example, in Judaism a substantial number of the *mitzvot* (commandments or precepts) that guide the life of an observant Jew have to do with the dietary sphere and originate within important passages of the Old Testament. Jewish tradition tends to perceive in the act of nourishment a significance that educates people to make a constant series of choices and verifications, defining the relationship of humans with nature and with sacredness. However, there is no comparable set of rules about food in Christianity; what is missing most of all is a dogmatic distinction between foods that are permitted and foods that are prohibited. Nonetheless, people's relationship with food remains a part of the dimension of the relationship with God. The symbolic role of the wine and the host in the sacrament of Eucharist (Holy Communion), which is based on the words uttered by Jesus during the Last Supper, represents for Christians the means of communion of souls and a form of ongoing memory of the passion of Christ. Even though the relationship with food in Christianity is a relatively free one, some prescriptions require the faithful to restrict their consumption of meat and to engage in periods of abstinence and fasting. Called "religious fasting," this practice is carried out during several days of the year (called penitential days), especially during the liturgical period of Lent. In the Orthodox Church, for example, during the forty days preceding both Christmas and Easter, the faithful observe a tradition in which they must abstain from eating any animal products, such as meat, fish, eggs, milk, and cheese, but also wine, other alcoholic beverages, and olive oil. Conversely, another great monotheistic religion, Islam, rejects both the narrow strictures of Judaism and the dietary freedom of Christianity, and tends instead to preach an attitude of moderation in the consumption of food. However, the *Halal* (whose literal meaning is "licit") dietary tradition which is followed by

7 Émile Durkheim (Épinal, 15 April 1858 – Paris, 15 November 1917) was a French sociologist, anthropologist, and historian of religion.

about 70% of all Muslims on Earth, also dictates some rules about what can be eaten and what cannot. The chief limitations (less stringent than those in Judaism) also have to do with meat. For example, animals must be butchered according to the traditional guidelines found in the *Sunna* (one of Islam's sacred texts); in practice this means that the animals must be conscious at the moment they are killed (even though they are often blindfolded so they do not see the butcher's tools), and the killing must be done by severing the animal's trachea and esophagus, causing the animal to lose all of its blood. Moreover, unlike Judaism and Christianity, Islam famously forbids the consumption of alcoholic beverages. The importance of dietary practices, as defined by religious strictures, is emphasized by the fast of Ramadan, designed to educate Muslims in the practices of patience, modesty, and spirituality. Regarding the eating of meat, certain other religions, such as Hinduism, are characterized in dietetic terms by the almost absolute prohibition against eating meat, at least among the most devout followers. For example in the city of Rishikesh, located on the Ganges River in India, it is forbidden to eat meat, fish, and even eggs, and it is impossible to find these products for sale in shops and restaurants. Anderson points out that "meat is seen as involving the killing of animals, a violent and anti-spiritual thing. The religions based in India—Hinduism, Buddhism, and Jainism—share this commitment to what is called in Sanskrit *ahimsa*, 'nonviolence'." Jainism, in particular, makes the assumption that every living thing, however microscopic, possesses a soul, and that the soul is potentially divine. It therefore rejects the eating of meat as well as all useless forms of violence, such as the violence practiced by modern factory-farming of animal products. In this sense, what stands out is the narrow connection between food and destiny, between food and final significance. In conclusion, even within those extraordinary processes of cultural elaboration that are the religions, food plays a role of enormous importance, given its ability to be a catalyzer of meanings and symbolisms. In most religions, food is also an important factor in social aggregation, an element that serves the function—among others—of establishing who is a member of the congregation of the faithful and who is not. Anderson also explains this point very effectively: "Typically, aggregation and differentiation are stronger and more emotionally intense in religion than in other human activities (though political ideology and ethnicity have sometimes taken pride of place in the last century or so). Food is almost always a marker. The sharers eat together at ritual meals."

5.6 FOOD PROHIBITIONS: FOOD AND PURITY

Religious rules include, as we have mentioned, a number of prohibitions concerning food. Of course, certain foods tend to be considered inedible for reasons that may be purely cultural, and which have no specific foundation in the realm of religion. These prohibitions—and at the same time, the rules about the foods that were allowed—have been interpreted on the basis of various orders of explanations, ranging from disgust toward certain species to hygienic reasons, from symbolic motivations (for instance, strictures against eating birds of prey out of a rejection of the violence intrinsic to those animals), to educational considerations (teaching man that not all goods need to

be enjoyed directly and thoughtlessly). From an anthropological standpoint, Marvin Harris explains the motives which lie at the foundation of the majority of food choices throughout the world, with his residual utility/harmfulness theory (for example, the ban to eat pork for Muslims, or the ban to eat beef for Hinduists). The fact that some foods are considered good or bad to eat are choices which do not depend on either the food's intrinsic quality or its availability in a given territory, but instead depend on a careful evaluation which encompasses nutrition, economics, and the environment. Even if religious precepts may appear dated and lacking in logic, they do not stem from irrational impositions; instead they are "compromises" which originate from environmental conditionings and the possibilities offered by the territory. In carefully analyzing each of these aspects, Harris[8] demonstrated, for example, how the sacredness of the Indian cow is a principle which ensures that Hinduists will always have calves, milk, and cultivated fields. This belief also prevents a situation in which only a few wealthy people manage the entire meat market, which would eliminate the only source of subsistence available to the general population. Due to its inherent qualities, the zebu is the only animal in India which can still offer so many benefits to its owners, and that is why it needs to be protected at all costs. From this standpoint, the sacredness of religious prohibitions provides the best defense for this precious animal. Conversely, according to the author, the ban on eating pork for Muslims depends on the fact that raising pigs was extremely costly during ancient times in the Middle East, and therefore the benefits gained from this strategy were clearly less as compared to the losses. In fact, raising pigs not only requires special attention such as feeding them with food which is good for human beings (for example, certain types of corn), but pigs cannot be used for ploughing fields, they do not produce milk, and are useless in battle the way horses are, for example. By being banned to eat pork, these populations were offered the possibility to focus their efforts on more profitable livestock.

Conversely, remaining in the anthropological area, Diane Mary Douglas[9] traces many rituals that are intended to define the relationship between the individual body and the social body back to the more general idea of purity. This analysis broadly applies to food, which is a symbolic element of particular significance since it is a piece of reality that we literally incorporate. In the vision of this renowned anthropologist, the idea of contamination, and the fears that derive from it, are strongly present both in the primitive world and in contemporary societies. A great many rituals are therefore designed to ensure an attempt to approach some ideal of purity through practices of separation, demarcation, and punishment. The most clear-cut example is that of the Hindu caste system, in which the lower castes (which are by definition impure, or at any rate assigned to a lower rank of purity than the higher castes), habitually participate in the production of food in various roles, for instance, as farmers. For that reason, in the higher castes, food must be cooked by the family or by someone else who belongs to the same level of caste, in an act of symbolic demarcation. A similar phenomenon exists

8 Marvin H., *Good to eat*, Waveland Press Inc, Long Grove 1998.

9 Douglas D.M., B. Isherwood, *The world of goods: towards an anthropology of consumption*, Rouledge, London 1996.

in Japan.[10] During the feudal era in the Edo period (1603-1868 A.D.), the Japanese people were divided into four main castes, consisting of samurai, farmers, merchants, and artisans. Along with these, there was another category comprising all the people who conducted impure work that involved blood and death: they were called the *Eta* (穢多, literally "full of filth"). Even though these people carried out tasks which were crucial to the community's survival—such as butchering animals and tanning hides—they were not considered as part of the society, but rather as non-castes. This stigma is linked to the major religions of Japan: Shintoism and Buddhism. In Shintoism, any activity involving blood and death is considered impure; in Buddhism however, killing an animal is considered to be morally reprehensible (as previously noted), since every living creature has a soul. The caste system was abolished at the start of the Meiji epoch at the end of the 1800s; however it has not been possible to eliminate the prejudices and discriminations against the *Eta* descendants, called the *Burakumin* (部落民, literally, "village people"). Despite repeated charges made by human rights organizations, these biases have survived into present-day life, especially amongst elderly people.

5.7 FOOD AND CULTURE: AN INDISSOLUBLE BOND

In conclusion, it would certainly be possible to write entire volumes on the relationship between food and nutrition (and in fact, many books have been). What we have chosen to discuss in this brief introduction to the topic, in the preceding paragraphs, is the close, intimate nature of the link between food and culture. The act of feeding oneself, to the extent that it entails rationality, tradition, memory, symbols, and values, is a cultural thing. It is so innate to human beings to establish a relationship with foods that it is the point of departure for remarkable developments, with repercussions in social and individual terms of extreme significance. This is evident when this relationship is balanced. It becomes even more so when it loses all semblance of equilibrium.

THE GREAT CULINARY TRADITIONS AND THE REALITY OF FOOD TODAY

We showed in the previous section that there is a deep-seated link between food and culture. On the one hand, food has a significant effect on people's lives, and on the other hand, ways of eating reflect and are conditioned by the habits and the relationships which people create. In some parts of the world, the interaction between these variables has given rise over time to unique and very specific dietary approaches and gastronomical traditions.

In particular, in the next section we wish to briefly mention and describe three great culinary traditions: Mediterranean cuisine, Asian cuisine and North-American cui-

10 Caroli R., F. Gatti, *Storia del Giappone*, Laterza, Rome & Bari 2007.

sine. Though these traditions differ in terms of style, availability of certain foods and environmental needs, all three are the result of a continuous series of innovations and adjustments, which have modified and deeply shaped how these populations nourish themselves and adopt food habits.

5.8 THE GREAT CULINARY TRADITIONS

Mediterranean cuisine. Beginning in the Neolithic Age, the *Mare Nostrum*, or Mediterranean Sea, was the destination of countless migrations. The new arrivals settled in existing communities in search of better living conditions: more fertile soil for those who came from Asian or African deserts, a milder climate for those coming from Scandinavia or Germany. During the eleventh and twelfth centuries C.E., contacts between Muslim and Christian communities, based on the Iberian Peninsula, grew into intense commercial exchanges, during which a significant number of new food products were introduced into the respective gastronomical cultures. At first, during the high Middle Ages, the ancient Roman tradition—which, on the model of Greek culture, identified bread, wine, and oil as the products symbolizing the tradition of a farming and agricultural civilization, as well as the chosen symbols of the new faith—encountered the culture of the Germanic peoples. Those peoples lived in close symbiosis with the forest, from which they drew most of their nutritional resources, through hunting, herding, and harvesting. Thereafter, the new food civilization, that emerged from the marriage and fusion of the nutritional models of the Roman and Christian civilization and its Germanic counterpart, measured itself against the tradition of the Arab world, which had developed, along the southern shores of the Mediterranean Sea, its own specific nutritional culture. It was the Muslims, however, who gave rise to a significant process of agricultural renewal, in which irrigated fields played a fundamental role. The new agriculture introduced unfamiliar plant species or varieties that had only been utilized by the more prosperous social classes because of their elevated prices. Among the products introduced into Mediterranean cuisine that originally came from the Islamic world, we should mention sugar cane, rice, citrus fruit, eggplant, spinach, and spices. Moreover, the use of rose water, orange water, lemon water, almond water, and pomegranate water was introduced as well. Islamic culture, then, played a role in the change and the transformation of the cultural unity of the Mediterranean, which had been constructed by force on the Roman model, providing a decisive contribution to the new gastronomic model that was taking shape.

Another chapter of great historic impact was the discovery and the conquest of America by the Europeans. This discovery involved a "to-and-fro" of food products, such as the potato, the tomato, corn, the pepper, and the chili pepper, as well as a number of varieties of beans. The tomato, which now holds a prominent place in Italian dishes, was initially treated as no more than an exotic curiosity and an ornamental fruit. In fact, it was not thought of as edible until a later date—the first red vegetable to enrich our pantry of edible plants—but it has now become a symbol of Mediterranean cuisine and, in particular, of Italian cuisine. While the central role of vegetables is one of the most distinctive characteristics of the Mediterranean tradition, it is also important to

remember the role played by cereal grains, as the foundation of the poor man's cuisine and as a tool of day-to-day survival, given their capacity to fill stomachs, and help assuage the hunger pangs of the less well-to-do classes.

This vast geo-culinary movement, which has benefited from foods coming from the Far East and Africa, as well, emphasizes the role of the Mediterranean basin as a crucible and melting pot of civilizations, beliefs, and lifestyles. Creolization is one of the causes of its cultural diversity and peculiarity. The food model that we now call the "Mediterranean diet," then, is not only a way of nourishing oneself, but also the expression of an entire cultural system, based on healthfulness, the quality of the foodstuffs, their territorial characteristics—and conviviality and a love of food. In fact, dining with others has always played a central role in the social lives of Mediterranean peoples. In a literal sense, this term means eating at the same table: it comes from the Medieval Latin word *commensalis*, from *con-dividere* (to share) + *mensa* (table). In a broader sense, the word conveys the idea of habitually sharing food, and sometimes implies the dependency which dining companions may have on one another. The Italian term "partecipare" (to participate), for example, come from the Latin *pars capere*, which literally means receiving your own portion of a sacrificial meal; this participation implies that you belong to and have your own place in a group, an institution, or an event. Companionship at the table is not specific only to the Mediterranean area. In any case, for some of the cultures which developed around the Mediterranean basin, this custom has gained a degree of institutionalization and a political meaning which have contributed to other crucial developments. Historians have shown that, in the wake of sacrificial banquets, public banquets did indeed become a determining factor in the development of Athenian democracy. In the monotheistic religions which were established in the Mediterranean area, formal meals and their rules have taken on a high degree of ritualization and symbolic meaning (for example: the Jewish Saturday lunch, and the Christian commemoration of the Last Supper during the Eucharist).

In conclusion, despite the changes in dietary customs and lifestyles that have taken place since the second half of the twentieth century, the Mediterranean diet continues to be a point of reference, and not only in the Mediterranean region but also in regions throughout the world, given its distinctive nutritional characteristics. The Mediterranean diet also represents a very important resource in terms of sustainable development for all the countries that overlook the Mediterranean basin, because of the economic and cultural importance that food has in the entire region and for its capacity to inspire a sense of continuity and identity for the local populations.

Asian cuisine. Asian cuisine (for example, Chinese, Japanese, Thai or Vietnamese) is rich in flavors that are unexpected for the Western nations. It is the product of a historic and cultural tradition comparable in importance with the tradition that sprang up around the Mediterranean basin. Here we shall focus on the great Chinese tradition and its distinctive features, as they are emblematic of a broader approach. Rooted in a vast rural world, Chinese cuisine boasts an extraordinary variety of ingredients and excellent dietetic qualities. In China, for millennia, health has represented the focus of all nutritional behavior. In daily life, in fact, cuisine forces people to respect the dietetic

rules that have been acquired as the foundation of traditional medicine. In order to understand the Chinese culinary tradition, therefore, it is indispensable to place it in the broader context of a body of knowledge that defines the relationship between nutrition and health. This attention to diet, to the nutritional characteristics of the foods and the nutrients that were being attentively studied by physicians and by Taoists, has been at the foundation of traditional Chinese nutrition for thousands of years. In fact, the Chinese believe that a proper diet which follows the laws of harmony is one of the principle ways to improve health and seek longevity.

In this connection, we should mention another important factor of the Chinese tradition: the central role played by food in festivities and the symbolic value of certain dishes. For birthdays and at New Year's, for instance, noodles are eaten, because their thin and elongated shape symbolizes longevity. According to the philosophy of Tao, the world is a continual process of becoming, whose propulsive force derives from the dynamic opposition of *yin* and *yang* (female and male, darkness and light, cold and heat). These are far from being merely theoretical principles; they are viewed as concrete categories of life which also permeate the realm of diet. Foodstuffs are therefore divided into four categories, according to their *yin* and *yang* nature: cold and cool foods are *yin*, warm and temperate foods are *yang*. Consequently, in following the principles of harmony, Chinese cuisine must focus on seeking a constant balance between foods and the categories they belong to. Furthermore, in Chinese cuisine there is a particular technical rationality that can be found in the methods of cooking and in the cutting of the raw materials. Even the cooking method is designed to attain harmony of the flavors: from this standpoint, cooking is meant to achieve the "ideal consummation of the substance through fire." Cutting the foods very thin before cooking, however, is also one of the chief criterion of differentiation from other cuisines. This ancient practice has been released from more philosophical principles in order to draw closer to the needs of daily life, such as using *kuàizi* (chopsticks in Chinese); however its existence can be linked in particular to a lack of combustible material throughout history, which made reducing cooking time an absolute priority. From this framework, cutting ingredients properly is the first step, followed by the use of fast cooking techniques, such as sautéing ingredients in a wok over a high flame.

Regarding beverages, in comparison with the Mediterranean tradition—which was more accustomed to the consumption of wine—in China tea was the characteristic beverage. Tea was so important that it was listed among the seven products that were indispensable to life, along with fuel, oil, rice, salt, soy sauce, and vinegar. The Chinese were the first to cultivate tea, and its production and consumption were widespread throughout the territory as far back as the time of the Tang dynasty (618-907 A.D.).

Finally, in China nutrition is a social concern of enormous importance. In fact, we find in Chinese gastronomic culture (and in Asian cuisine in general) parallel traits to the conviviality typical of the Mediterranean tradition. A taste for food is translated into the taste for the consumption of food together with other people, a simultaneous vehicle for pleasure and relationships. This aspect, along with the importance attributed to food, and to the care and creativity employed in its preparation, helps to draw a parallel between the Chinese and Mediterranean cuisines.

North-American cuisine. North-American cuisine, which also includes that of Anglo-Saxon peoples, develops out of a logic, an approach, and social contexts that are very different from the ones described above. In particular, we're referring to the absence of a sufficiently long and solid history to permit the deep rooting of widespread cultural practices and values. To this is added a tendency toward hyper-mobility that prevents attachment to any given territory, the objective absence of typical products that characterize a culinary style, and lifestyles and ways of consumption based on individualism, pragmatism, and speed. All of these factors seem to have prevented North America (and, to a lesser degree, also Great Britain)[11] from developing an original gastronomic culture of quality comparable to the Mediterranean and Chinese cuisines. If we are to attempt to characterize the North-American culinary tradition, we would do well to remember the fact that, as early as the beginning of the 1960s in America, and subsequently in England and Europe as well, women in every social class began to work. Women moreover began to work outside of the home: this significantly changed the female model prevalent until then, which had been that of a woman primarily devoted to caring for home and children.
The preparation of food lost its connotation as an everyday obligation and became a moment of pure socializing, bound up primarily with the sphere of recreation. Prepared foods quickly spread amongst consumers, and the number of meals eaten outside of the house increased, often in the form of fast food. In brief, it is possible to note how the deep social changes experienced in the United States, many decades ahead of the other Western countries, along with the absence of a strong nutritional tradition, together contributed to orienting the American and Anglo-Saxon city dweller toward speed of consumption and choice, with a resulting disinterest in the nutritional characteristics of products, as well as in terms of the quality of the social interaction that accompanies the consumption of food. This is perhaps the most evident case of how the absence of a patrimony of knowledge and shared, common choices—a nutritional culture—winds up "unloading" upon the individual, who then lacks basic tools of information and culture, the capacity of choosing and selecting foods, with results that have sometimes proven to be very negative.

Lastly, despite the fact the United States is a land of transition and settlement for people of all nations and civilizations, there has not been, except on the margins, a process of creative cross-fertilization capable of leading to the birth of original approaches. To the contrary, in fact, there has been a general leveling toward a diffuse mediocrity. As we conclude this introductory overview on the principle cuisines of the world, it should be pointed out that the process of exchange between cultural traditions—the so-called crossover traditions—is generally growing to an exponential degree. In the past, changes in nutritional culture required a great deal of time before becoming established in a consistent way, also because they were for the most part the result

11 The influence that North American culture has exercised over the United Kingdom in the twentieth century makes it possible now to group the two countries together in this context. Numerous authors refer to the entire Anglo-Saxon world when they speak about the Western diet.

of migration and creolization, that process of cross-breeding between diverse cultures and ethnic groups, which are often quite distant from one another. Today, however, globalization, along with a growing mobility between countries, the desire to discover characteristic traits of other civilizations in a process of drawing closer to "others," and the strategies of industrial expansion pursued by multinationals, have quickly modified the general situation, and food habits, with a variety of outcomes. While on the one hand it is certainly a positive development to see the choice of food as a channel of knowledge that makes it possible to appreciate and get closer to experiences that are different from one's own, that often lead to creative "contamination," it is quite worrisome to envision a setting in which the responses to the social changes now under way (changes in the role played by women, less and less free time, etc.) seem to emulate those "productivist" and profit-driven solutions of the past that have already proven to be so misguided and dangerous.

5.9 FOOD TODAY: CHALLENGES AND PERSPECTIVES

If in ancient times all the major societies tended to organize their experiences with food around two poles—activity (work, specifically) and free time (celebratory moments, specifically)—the complexity of postmodern life has led to the development of new dimensions, which revolve around and intersect with the tensions which plague the body, and the situations in which food is consumed.[12]

In fact, in post-industrial countries[13]—where speed matters more than duration, and where there is a growing sense of uncertainty, lack of control, and a sense of risk—a state of anxiety has arisen which was unknown to pre-modern society. This state of anxiety and uncertainty is also mirrored in food habits which have a variety of characteristics: a demand for speed which requires practicality, due to the fact that so little time is dedicated to eating meals; a demand for foods which are raised and produced close to home, and the search for more wholesome ingredients; and an increasing move towards individualization, which introduces the risk of losing out on the pleasure of sharing meals with others. In light of this context and the conditions with which we live, it is possible to summarize and outline which elements will influence the future development of food choices within postmodern societies. Specifically, five paradigms which impact the entire socio-economic context at the global level have been identified. These paradigms represent the major tendencies which lie at the heart of the economy and society, and they contribute to defining the overall situation within which all the other forces function. These are long-term models whose effects can already be felt today; through their interactions, these models will determine the generation and evolution of forces and tendencies which will characterize future decades to come.[14] These paradigms have been identified based on the mappings of the primary mega-trends which have allowed post-industrial and postmodern societies to develop. Specifically, they involve:

---

12 Franchi M., *Il cibo flessibile. Nuovi comportamenti di consumo*, Carocci, Rome 2009.

13 BCFN, *Eating in 2030: trends and perspectives*, 2012.

14 *Ibid.*

- Demographic evolution (aging of the population, one-member family units, immigration, women's role, etc.);
- The new geopolitical equilibriums (shifts in power and cultural influence, from the West to the East, and from the Atlantic Ocean to the Pacific);
- Total connectivity (the democratic nature and spread of information, immediacy);
- A focus on environmental issues;
- GRIN technologies (Genetic, Robotic, Information and Nano processes).

Through the interaction of these paradigms, eight forces of change and/or conservation emerge; they are "motors" which lead to the transformation of social behaviors or, conversely, they serve as status quo "guardians." These elements exist together, dialectically, and illustrate both the processes of change as well as the phenomena of inertia which tend to hold those processes back.[15]

1. Globalization and financialization of the economy. Globalization[16] is meant as that phenomenon in which markets are unified at the global level, with a push towards more uniform and converging consumer and production models, thanks to the spread of technological innovations and the opening up of international commerce. The primary effect of this phenomenon is a decisive *economic and cultural convergence* between the various countries in the world. We are indeed witnessing a progressive homogeneity in terms of needs, and the consequent disappearance of the traditional differences between consumers' tastes at the national and regional levels. However, it is also true that businesses are better able to take advantage of sizable economies of scale for the production and commercialization of products, especially standardized consumer goods. One of the most significant risks globalization poses is excessive cultural homogenization, that is the loss or non-development of single cultural identities[17]. Along with globalization, financialization appears to be emerging as a force in the world; this is a phenomenon in which the role of financial activities grows significantly in the enterprises of a socio-economic[18] system. This economic development model is based less and less on the real economy's manufacturing and production processes: it is the model which led to the enormous crises which the entire world has been experiencing since 2008. As a reaction to this approach, alternative viewpoints have emerged, which propose different approaches to economic growth and to the most modest and economically sustainable forms of consumption.[19]

---

15 *Ibid.*

16 *Ibid.*

17 BCFN, *Eating in 2030: Trends and Perspectives,* 2012. On this topic, we cite as an example the many contributions by Joseph Stiglitz, Nobel Prize for economics in 2001, and Paul Krugman, Nobel Prize for economics in 2008.

18 BCFN, *Eating in 2030: Trends and Perspectives,* 2012. As for the effects due to the growing importance of financial activities in economic systems, see also the lecture given by Tremonti G., "The Causes and Political Effects of the First Global Crisis", of 19th November 2009 at the Party School of the Central Committee of the Communist Party of China in Beijing.

19 BCFN, *Eating in 2030: Trends and Perspectives,* 2012. See also Bayon D., F. Flipo, F. Schneider, *La décroissance. 10 questions pour comprendre et en débattre*, La Découverte, Paris 2012.

2. Polarization. In post-industrial countries we have been witnessing an increasingly larger divide between individuals belonging to opposite classes, based on available wealth. This has resulted in a gradual tapering of the middle class—especially amongst Western populations. This situation entails economic inequality amongst social categories with very high and very low spending powers. According to the OECD, the most important reason for this gap has been the growth of disparity in compensation and salaries. At the same time, we are also witnessing a gap which is not measured only in terms of wealth, but also regarding access to new information technologies. The so-called "digital divide" is a recent and complex phenomenon that is linked to the development of information technologies and the internet, and it is causing significant cultural and social inequalities. The digital divide is closely linked to the social divide, because not being able to access digital technologies prevents some population sectors from being able to access economic, employment, and cultural opportunities.[20]

3. Tribalism. Starting in the 70s, traditional social structures floundered and new social situations, such as the extended family or one-member family units, inspired innovative forms of grouping together. In their broadest expression, these forms found an effective conceptualization in the idea of the "tribe," which was first proposed by Maffesoli.[21] Tribes are intended as emotional communities which are based on "shared experience and feeling." In this sense, right at the time when individualism was gaining new social legitimacy, the desire to stay together in order to share environments and exchange emotions became widespread. Unique kinds of socialization emerged, which were different from more traditional forms based on belonging to a certain class, because tribalism is more of a cultural phenomenon than a political, economic, or social one.[22] The neo-tribe concept[23] developed into tribal marketing, a marketing strategy which was theorized between 2000 and 2004. Tribal marketing seeks to create consumer communities which are connected to a product or service which they aim to promote. Maffesoli and Cova are considered to be the principle exponents of tribal marketing, and they claim that this approach is an alternative whose origins are more "Mediterranean" as compared to the more classic approach found in North America.

---

20 BCFN, *Eating in 2030: Trends and Perspectives,* 2012. On this subject, in 2000, the former US Secretary of State Colin Powell said: "We hear much today about the 'digital divide'. [...] I use an even stronger term: digital apartheid. If digital apartheid persists, we all lose. The digital have-nots will be poorer, more resentful of progress than ever and will not be able to become the skilled workers or potential customers that are needed to sustain the growth of the internet economy." (*Business Week*, 18th December 2000).

21 BCFN, *Eating in 2030: Trends and Perspectives,* 2012. Michel Maffesoli, French sociologist, is considered one of the main representatives of the European post-modern thought for his theory on modern rationality's crisis and for having stressed new forms of post-modern sociability.

22 BCFN, *Eating in 2030: Trends and Perspectives,* 2012. Maffesoli M., *The time of the Tribes: The Decline of Individualism in Mass Society*, SAGE, London 1996.

23 BCFN, *Eating in 2030: Trends and Perspectives,* 2012. According to Bernard Cova, one of the leading experts on the subject, the new tribe "is a group of individuals who are not necessarily homogenous (in terms of objective social characteristics), but are inter-linked by the same subjectivity, affectivity or ethics, and capable of taking micro-social collective actions, short-lived but intense, in a strongly ritualized manner."

While the latter approach usually involves requests for consumer individualization and personalization, in tribalism a business does not aim to create personal connections with its clients. Instead, it seeks to nourish and support the connections between clients, by helping them share their passions and feel that they belong to a group. In other words, these ways of responding to the need for conviviality and belonging have emerged in a society that, having surpassed traditional forms of belonging, has embarked on a process to discover new approaches and methods for social interaction.

4. Sustainable happiness. According to many sociologists, the societies of the post-modern age identify happiness with wealth, consumption, pleasure, as well as the immoderate attention to material goods. In these contexts, where values marked by hedonism and individualism are prevailing, attention to the needs of the community and to the impacts of lifestyle on society, economy and the environment decreases. However, little by little, a current of thought and action that aims to support and promote a lifestyle focused on best practices and sustainability is spreading.[24] The goal is to ensure widespread and sustainable prosperity, through the preservation of the environmental, social and cultural heritage of all. This asset has to be delivered to future generations, namely promoting the pursuit of *happiness*, considered as the satisfaction of needs (primary or not), in a way that can be sustainable over time.

5. Lack of confidence. The last few years have been characterized by the exponential growth of problems related to anxiety and emotional stress, especially among workers, also worsened by the situation of generalized crisis and by the overall weakening of traditional references, which for years have been a source of guarantee and of social, psychological and spiritual assurance. A sense of impatience and frenzies characterizes the lives of many people: if we compare today's lifestyle and work rate with that of a decade ago, we realize how much more stressed and under pressure due to economic issues we are now and forced to a much more hectic pace of life. This has led, in time, to a greater development of diseases related to stress and anxiety. In Europe, for example, according to a report published by the European Agency for Safety and Health at Work,[25] work stress is on the second place among work-related health problems, with an annual cost estimated at approximately 20 thousand billion euros, affecting as much as one-fifth of the workers. Depression is on the rise too. According to the World Health Organization, globally, it affects 350 million people, of all ages.[26]

6. Convergence around the media. Nowadays, we are witnessing an intensification of the use of multiple digital devices to enjoy social life, commercial communication

---

24 BCFN, *Eating in 2030: Trends and Perspectives,* 2012. In this regard, reference is made to the movements related to the concept of contraction, theorized by Nicholas Georgescu-Roegen, founder of the bio-economy, and in line with the thinking of Serge Latouche, one of the main proponents of decline, according to which the term is to indicate the need and urgency of a "paradigm shift", of a reversal of the dominant model of unlimited growth and accumulation (Latouche S., *Le pari de la décroissance*, Fayard, Paris 2006).

25 European risk observatory report n. 9, "OSH in figures: stress at work – facts and figures"; Gigantesco A., I. Lega, *Stress lavorativo e salute mentale* (www.epicentro.iss.it/focus/lavoro/Gigantesco-Lega2014.asp).

26 WHO, *Depression*, *Fact sheets 369*, 2015 (www.who.int/mediacentre/factsheets/fs369/en/).

and entertainment. Which means that people use multiple screens to access different contents, whose degree of authenticity is not always accurate. The risk is to have problems in assessing the quality of the proposals without an adequate level of information and expertise. This risk, when it comes to nutrition, is particularly high, which is why today's consumer education on these issues is one of the top priorities for governments and businesses. The new media have in fact attained an extremely high level of influence: the capacity of disconfirmation (meaning the power to alter or completely change the opinion of individuals on products and services already known) especially of blogs and forums seem to be very high. Interactions between consumers on socials are growing, to the point that some movements and consumption styles come from and flourish on the web itself. Consider, for example, the freegan movement (the term comes from combination of the words "free" and "vegan"), that groups those who live of what others throw away, or even locavorism, people who would promote agriculture proximity and the so-called "local-food" as opposed to comparative advantage and long-distance trade of agricultural products.

7. Customizing consumption. The difference between individuals or groups consumption habits has always brought with it a set of meanings that go beyond the simple purchase of goods. However, after the oil crises and the compression of consumption due to the international recession in the Eighties, the needs that drove consumption started to change, going in the direction of individualism and strong attention paid to the product. Currently some segments of consumers are moving away also from this model, in favour of the search of experiences, rather than of products, of emotions and sensations rather than of usage value, generating little linear or predictable patterns of consumption. This type of consumer is attracted by tailored and custom-made products, which are somehow "unique" in their kind. This tendency has generated a new conceptualization of consumption, considered as the creation of products and services tailored to the tastes and preferences of the individual rather than on the mass. Consumers, who are more and more mature, demanding and selective, take functional features and benefits, product quality and positive brand image[27] for granted. They want products, communications and marketing campaigns with which to relate and to incorporate into their lifestyle, touching their senses and their hearts, stimulating their mind and providing, therefore, an experience.[28] In this context, we find Experiential Marketing, which supports the need for companies to offer experiences and emotions to satisfy and move the consumer, thus promoting the purchase and consumption of the product/good or product/service that is felt, lived, "experienced."

8. Lifestyles of singles. In today's society the family, understood as a married couple with children, is losing its centrality, even from a statistical point of view, in favour of new emerging households: lonely couples, single-parent families and singles. If current

---

27 BCFN, *Eating in 2030: trends and perspectives,* 2012. Fabris G., *The new consumer: towards post modern*, FrancoAngeli, Milan 2003.

28 BCFN, *Eating in 2030: trends and perspectives,* 2012. Schimtt B. H., *Experiential marketing view consumer as rational and emotional human beings who are concerned whit achieving pleasurable experience*, Free Press, New York 1999.

trends will remain stable, soon in Italy there will be more singles without children than couples with children. In ten years the single households have increased by 39% and, in parallel, couples with children are on the wane by more than 7%.[29] The downsizing of the average household and the growth of single-component families have contributed to the spread of lifestyles and consumption habits based on singularity and not plurality. For example, the 7 million Italians living alone spend on food 71% more than the average of families.[30] In the absence of single-serve products, now offered by a market attentive to this phenomenon, people living alone often purchase greater quantities of food due to the lack of proper sizes, not only ending by spending more but also running the risk of wasting more. This is generally a source of complaint that, regardless of its ethical dimension, is also the expression of new consumption patterns, characterized by a strong individualization in choices and from irritation with market proposals that are not usually studied to satisfy their needs.

It is important to underline that paradigms and the forces of change and/or conservation do not necessarily directly affect food habits. They help to define the context in which food trends may develop. As a matter of fact, the interaction between the paradigms and the forces of change and/or conservation helps us drawing current food scenario and allows us to make assumptions about future. Such a scenario is characterized by thirteen evolving trends, here considered only for their impact on food habits, which are, in many cases, related one to another. They have been identified analysing existing literature on the subject[31] but also, most of all, directly involving luminaries able to fully understand the interactions between food and social behaviour, to the extent of independently formulate predictions about future trends.[32] More specifically, these trends are:

- Taste understood as pleasure, aiming at achieving a sense of indulgence and satisfaction through the dining experience;
- Attention to health, in terms of improving the overall well being of people;
- Orientation to the past, which implies the memory and preservation of traditions;
- Orientation to the future, which results in emphasising and enhancing progress;
- Technology, that is the innovative effort urged by an increasingly critical and demanding consumer;
- Naturalness, meaning simplicity, understood as minimizing (not avoiding completely) interventions and manipulations;
- Globalization of tastes, understood as an exchange between food cultures;
- Local and regional food, which emphasizes the relationship between food and territory;

---

29 BCFN, *Eating in 2030: trends and perspectives,* 2012. Censis, *45th Report on the social situation of the country, 2011*, FrancoAngeli, Milan 2011.

30 BCFN, *Eating in 2030: trends and perspectives,* 2012. Italian "family type" means an average household size of 2.5 persons (Coldiretti, 2011).

31 BCFN, *Eating in 2030: trends and perspectives,* 2012. Ambrosetti Club, *The new mega trends that impact on business and on our lives*, 2011.

32 BCFN, *Eating in 2030: trends and perspectives,* 2012. The bibliography contains the whole list of the sources used to define the conceptual framework.

- Food as a "luxury" product, in terms of increased quality and difficulty to find certain foods;
- Food as a "low cost" product, or accessibility in the sense of wide availability;
- Speed, due to the shortage of time available for eating and preparing meals;
- Individualization, from a relationship perspective;
- Sustainability, which refers to an "aware" consumer involved in environmental and product quality protection.

In general, these trends are characterized by some distinctive elements, which sometimes place them in conditions of apparent antithesis. In many cases, however, trends that are at first sight opposed to each other coexist. Given the starting situation, characterized by this contrast—in some respects alleged and theoretical—between the main characteristics of the various trends, we hope that in the next twenty years a gradual transition to a new equilibrium, characterized by a balanced and positive approach, will take place: a future food scenario that is realistic, constructive and durable.

5.10 TOWARD A NEW NUTRITION VISION

As per the relationship between food and culture, the balance achieved between the different dimensions related to nourishment (pleasure, comfort, health, conviviality), within the great culinary traditions, is today more and more precarious. As described in the previous paragraphs, lifestyles are changing, there is no longer the ability to transfer gastronomic know-how and skills, there is a growing demand for functionality and health-related concerns are increasing.
It seems evident that, today, we are called to witness a turning point in nourishment. However, we are given the possibility to think anew, with new interpretations, the relationship with food. To start, the emerging features of this new approach could be located, according to the analysis of the sociologist Zygmunt Bauman, at the intersection of the pleasure for the sensory experience and the demand for situational convenience allowing for the complete enjoyment of tasted food, without it being the cause for health-related concerns. As a matter of fact, the idea that pleasure is healthy—meaning that what we like is good for us—is, indeed, one of the ideas behind the ancient dietary approach.[33] The relationship between nourishment and gratification of senses produces a rather complex plot, in which need, desire and pleasure are concepts overlapping each other.[34] What is needed is a renewed education to taste, that helps promoting more diverse and articulated dietary habits, putting in the proper perspective the role that different foods play in our daily diet, without deprivation but with higher "abstemiousness" and the demonstration that even the food which is not identified as a "source of pleasure" can actually be prepared with satisfaction and shared with pleasure. It is a question of rediscovering the tastes and characteristics of food, to enjoy it thoroughly—as already partially happened over the past twenty years in the world of

33 *Ibid.*
34 Montanari M., *Il cibo come cultura*, Laterza, Rome & Bari 2004.

wine. Therefore, we shall have to propagate the "strong" idea that it is possible to eat properly, maintaining a dietary style able to protect health, without sacrificing taste and pleasure in nourishing. The same message will have to be endorsed by consistent food proposals from the industry, by the various forms of public catering and the popularisation of proper dietary information by the institutions, in a gradual process of active education to taste and health. In particular, in this context, it will be necessary to promote the broader concept of lifestyle, as opposed to the more restrictive concept of diet, as a healthy lifestyle based on a balanced diet and regular physical activity seems to be the answer for ensuring wellness in longevity.[35]

Conversely, as per the orientation to the past and to the future, it seems reasonable that each of us is pushed to experience a new sense of "proportion" between conservation and innovation, exploiting new foods and cooking styles, without neglecting traditions, being aware that these are historical products that change over time. We shall have, therefore, to incorporate foods and innovations to overcome the sort of suspicion that characterises the current consumer, thus enlarging the boundaries of the identity of a community. In a way, it will be necessary to put aside the concerns related to the progress and the static vision that are purely connected with the nostalgia for the past, to accommodate innovation, understood not as a loss of tradition, but rather as the affirmation of new ideas helpful to meet the changing social needs.
Furthermore, in the near future, people should choose carefully considering the interaction between technology and naturalness: technological breakthroughs cannot and must never be sacrificed in the name of naturalness that presupposes the lack of manipulation. On the other hand, as mentioned before, human manipulation and technology always existed in the preparation of food. "Cooking is the human activity for excellence, it is the act that transforms the product of nature into something totally different: the chemical alterations induced by cooking and the combination of ingredients, allow us to bring to the mouth a food which, if not totally artificial, is definitely artefact."[36] In this regard, it is important to pinpoint that there are some "myths to be debunked" as, for example, the concept of raw food (a dietary pattern that consists mainly in consuming raw and alive foods and that has become very common in recent years) seen by some as the ultimate expression of naturalness. In some cases, just to meet the needs of "rawness" the use of advanced technologies is necessary (just think of the raw fish and the need to use the blast chiller to ensure the level of safety required). Moreover, "local" often is paired with "natural" but is not always correct to think that what is indigenous is genuine, authentic, and what comes from the outside is sophisticated and artificial. For the food industry and for all the active traders working in the world of food, the challenge is to offer solutions and innovations able to make products, belonging to the different food categories, richer from a nutritional point of view and alluring from the point of view of taste.

---

35 BCFN, *Diet and Well-being for a Healthy Life*, 2012.

36 Montanari M., *Il cibo come cultura*, Laterza, Rome & Bari 2004.

As expected, the globalization of tastes is undermining the nourishment cultural identity. It would be desirable that in the future, in contrast with the current situation leading to the homogenization of food patterns, interest and curiosity about the exotic will go hand in hand with the recovery of roots, flavours and tastes (which often leads to the discovery of exchanges and relations between ones' culture and other cultures, as was the case in the past) and the discovery of the territory and of the authenticity of local and seasonal food. Popularise, raise the awareness and share local cultures, will be in the future one of the appropriate responses to deal with the effects resulting from cultural and gastronomic homologation. In practice, we will have to exchange in the global markets not only goods, but also food and eating patterns. Getting to know the food cultures of a group can be a way to promote integration in an increasingly multi-ethnic context, protection of dietary and gastronomic biodiversity and a way to widespread the idea of sustainable and indulgent food, "a pleasure considered legitimate, almost necessary."[37]

Considering now the contrast between food understood as a "luxury" or "low cost" product, it is clear that in the future the entire food supply will have to meet increasing minimum quality standards, understood in the broadest sense of the concept ranging from food safety to organoleptic perception, from nutritional level to the sustainability of all preparation processes, from accessibility and ease of use to the facilitation of waste reduction. Against low cost consumption, there is the desire to experience great and acknowledged quality food. In particular, today as in the past, with the increase in the level of availability of products, thanks to the enlargement of commercial boundaries, "the object of desire is no longer plentiful food, but the rare one."[38] As a matter of fact, social, economic and cultural differentiation has always been considered a synonym for exclusivity.
In this situation where dietary patterns are controlled by trends that too often have little or nothing to do with the proper food choices, it would be desirable to create a situation in which the price (and in general, the value) of food is put, to some extent, in relation with the optimal frequencies of consumption, according to the indications given by nutritionists,[39] in order to concretely promote the adoption of "good" dietary patterns. In this context we may find also the issue of the costs associated with some low-calorie diets: in fact, the most common dietetic styles seem to be characterized by high cost, precisely because they require the intake of particular and not always common foodstuffs, whereas most of the time you do not need to spend a lot of money to follow a dietary pattern that goes in the direction of healthy eating and good health.

With reference to the relational aspects of food, the values of conviviality and sharing of the dining, in the future these aspects should become increasingly important.

---

37 Fischler C. (interview), "With food for free we cancel our identity", *Corriere della Sera – Sette*, 19 october 2012.

38 Montanari M., *Il cibo come cultura*, Laterza, Rome & Bari 2004.

39 BCFN, *Diet and health*, 2009.

Sharing food is, in fact, universally recognized as one of the fundamental ways to promote, establish and maintain interpersonal relationships. On the contrary, the lack of sharing, typical of those aspects related to individualization, conveys a sense of social detachment, distance and exclusion. In future, however, values such as conviviality and "eating together" will not be faithfully replicated, because the speed of the pace of life, the hustle and the chronic lack of time to devote to meals will generate new models and moments of conviviality. The awareness that the pace of our lives is bound to change in a structural way, together with the recognition of the importance of the concept of conviviality, may offer a useful starting point for redesigning the offer system and, in parallel, that of customers' choice, adapted to the new context. The recovery of conviviality, in fact, does not come just by changing the offer, but also through a real change in the technological paradigm, where until now (except for a few cases of companies that have been able to adopt a profoundly "human" vision of technology, which may however be considered as exceptions) increased connectivity has not been translated into increased time and/or improved quality of the same, but in an overexposure of the working activity.[40]

Lastly, the focus on the *environment* will become one of the fundamental factors at the base of the feeding behaviour of the future: man will have to become conscious of the fact that it will be necessary to behave responsibly to ensure that the planet uses efficiently and doesn't waste all available resources. A culture change will be needed that will modify the deeply held beliefs, individual life styles and production and consumption patterns. To meet the food and nutritional needs of a richer, more urbanized and with a growing population world, it will, in fact, be essential to spread sustainable eating habits, passing awareness also about the cost related to the environmental impacts of the different dietary patterns.[41]

In conclusion, it is worth remembering that food consumption is, by its nature, a specific cultural experience and that our age represents the best time to modify, positively, this value. Its social relevance and the urgency of a vast operation to reconsideration of this relation, make it no longer possible to postpone it, as it is necessary to respond, to the root, to people's needs and aspirations.

Food culture is the most effective lever for redefining in concrete terms the relationship between man and food. Only by adopting a food culture more attentive to the values of naturalness and sustainability in all its forms, we will be able to address successfully even the major food crises of our century, ranging from those related to food accessibility, to the prevention of a wide range of pathologies, to respecting the environment. Culture has always been a multiplier of achieved results, thanks to its ability to activate and direct people's energies collectively. Just identifying technical solutions to the emerging issues, neglecting the circulation of a cultural and awareness approach, is

---

40 BCFN, *Eating in 2030: trends and perspectives*, 2012. For further information please refer to the article by Tom Chatfield, "Is the Web Driving Us Mad?", in *Newsweek Magazine*, July 9, 2012.

41 BCFN, *Eating in 2030: trends and perspectives*, 2012. For further discussion of this matter, see also BCFN, *Double Pyramid 2012: enabling sustainable food choices*, 2012.

like planning short-term interventions, renouncing to affect the root causes of current difficulties.
Therefore, it is hoped that in the future the focus will be shifted more and more from "what" to "how" we will eat: it is the choice of the "how," the value that is bestowed to food, its weight in personal and social life, to represent the possible turning point for adopting healthy eating habits and creating good quality and affordable offer systems.

THE CULTURAL VALUE OF THE MAN-FOOD RELATIONSHIP FOR THE FUTURE

- **Make the best possible use of the bountiful reservoir of conviviality.** The times we live in are impoverished in terms of relationships. The proliferation of opportunities for contact (through new technologies, among other things) often correlates with superficiality in human relations. Food, on the other hand, is still a vehicle for opportunities for interaction and relations. It is necessary to recover this natural inclination intrinsic to food and restore to a more appropriate social dimension the moments in which it is consumed.
- **Protect forms of local territorial variety and work to expand them.** Food is an expression of the identity of a community and a territory. It thereby preserves a quality of unique individuality that makes it, on the one hand, an opportunity to rediscover one's own cultural roots and, at the same time, an opportunity to establish relations with other traditions. For this to happen, however, it is necessary to preserve the wealth of food and cuisine identities, without giving up the taste for "contaminations" and cross-fertilizations, thus reinforcing the emotional capital linked to roots, distinctive traits, and territorial localization while capitalizing on their universally human aspects.
- **Transfer knowledge and know-how.** These are extraordinary deposits of cultural wealth. The preparation of food is by its nature an artisanal experience; the consumer is summoned to contribute by joining into forms of co-production with the people who make foodstuffs available. Such participation demands major skills and expertise, which must be preserved and handed down over time.
- **Restore healthy relationships with territory and the context of the raw material, with a view to the excellence of the ingredients.** In the case of nutrition, the relationship between the physical and material quality of the food and the quality of the cultural experience is very strong. Poor quality food does not produce culture. It is therefore necessary to work carefully on the excellence of the ingredients, establishing a direct and respectful link with the soils and lands where the raw materials are created.
- **Recover the value of food as a fertile link between generations.** The table at which breakfast and the evening meal are served seems to remain, in many families, one of the few privileged places where they share the experience of their lives, a place for cultivating mutual bonds of affection. This should be recovered as a means of constructing (and reconstructing) a social fabric that modern life is steadily weakening.
- **Recover the ancient flavors that can be renewed in the context of contemporary taste.** We should strive to preserve the best of gastronomic traditions by reinterpreting them creatively. This, in all fields, is the principal mechanism for the transmitting culture across generations.
- **Finally, spread the culture of taste and enjoyment of life through authentic food.** If we can revitalize the magic and the astonishment of food in its rituals and its carefree pleasures—as an existential and cultural "fuel"—we can restore people, their feelings and human relations to the center of the human experience. Future luxury and health will consist to a very great degree in the art of living and conceiving of food in a cultural context.

Fischler, in the introduction of the value of the Mediterranean Culture,[42] highlighted that the social dimension of commensality plays a key role in putting people in the right perspective in relation to food, promoting a balanced approach to nutrition. The "how" (values, culture) prevails on the "what" (products). In other words: Tell me how you eat and I'll tell you who you are.

THE MEDITERRANEAN CULTURE: LIFESTYLE, CULINARY TRADITION AND PRESENT TIMES DIFFICULTIES

There is a strong cultural bond that has united and continues to unite the diverse peoples of the Mediterranean basin. As mentioned in the previous paragraphs the Mediterranean Sea has long been a special theatre of encounters between diverse cultures continually exchanging material goods, ideas, and values. This created a geographic and cultural context made up of significant differences but also of numerous points of convergence. One of these is the attitude toward food: as a matter of fact, the Mediterranean peoples share a view of reality that identifies food as one of the essential components of their identity. This does not depends only on sharing food products; to the contrary, they are rather diversified. It is instead the approach to food that is unique; an approach that attributes a central role in people's lives to food and the moments of conviviality linked to food. This is, in other words, a combination of foods and types of relationships with food that is the basis of a durable cultural identity. Together with other factors (but no less a degree than the other factors), this identity helps to constitute the foundation of a rich and articulated system of sociability. As Claude Fischler, the French sociologist, recently pointed out, the Mediterranean approach to food—the so-called Mediterranean diet, understood here in the broader sense as an overall lifestyle and foodway—now displays an unexpected degree of fragility. It is unexpected, because in the past it was the Mediterranean diet more than any other that had proved capable of successfully assimilating elements of extraordinary novelty (think of the various New World foods, first and foremost the tomato) without losing its distinctive personality—indeed, being enriched by them. Secure in a clear and strong identity, the Mediterranean diet assimilated elements of innovation in a complementary manner, encouraging an even more complete structuring of the way of eating. Today, however, within the same Mediterranean countries the lifestyles and foodways of recent history tend to be lost very easily, giving way to nutritional habits, foodways, and approaches to eating that come from other traditions. Those traditions are often much less rich in terms of nutritional content as well as elements of sociability and significance. This seems to be happening to a much greater degree within regions that, more than others, once represented the select territories of the Mediterranean identity, Italy for instance. What seems to be blocked is a strong mechanism for transmitting tradition. This ex-

42 BCFN, *Double Pyramid 2011: healthy diet for all and environmentally sustainability*, 2011.

poses the people of the Mediterranean to the risk of losing a trove of knowledge and nutritional behaviors that are unrivalled on Earth.

5.11 THE SALIENT CHARACTERISTICS OF THE MEDITERRANEAN DIET

As discussed above, there are three principal culinary traditions in the world, each of them characterized by specific traits: the Mediterranean model, the North American model, and the Asian model (which contains a number of very important traditions and cultures, such as the Japanese, the Vietnamese and the Chinese). We can describe the Mediterranean diet as the nutritional model inspired by the traditional dietary models of the European countries of the Mediterranean basin, in particular, Italy, Greece, southern France, Spain, and Portugal. This diet has spread widely outside of the borders of these countries and has been broadly adopted in South America (Argentina and Uruguay, in particular) and in certain areas of the United States of America and Canada. Many scientific studies have concluded that the Mediterranean diet is one of the best diets for promoting physical well-being and preventing chronic diseases, in particular cardiovascular diseases.

The first intuition of the Mediterranean diet. The concept of the Mediterranean diet was first "developed" in 1939 by Lorenzo Piroddi, an Italian nutritionist, who sensed the connection between diet and certain diseases. During the war, he had the opportunity to observe the dietary pattern of Germans, Americans and Italians, perceiving, even in the absence of scientific evidence, that the nutritional habits of the Italians led to an improved life expectancy. These observations led him to open a centre for the treatment of nutritional disorders, which he cured through herbal teas and with what would become years later the Mediterranean diet,[43] a diet based mainly on grains, vegetables and fruits and limiting eggs, dairy products and meat. Later, in the 1950s, Ancel Keys,[44] a doctor and scientist at the University of Minnesota's Department of Food Science and Nutrition, who later wrote the bestselling book *Eat Well and Stay Well, the Mediterranean Way,* spent time in Italy and noted a fact that at the time struck him as distinctly odd: the less well-to-do people (the so-called poor) of the small villages of southern Italy ate a diet mainly of bread, onions, and tomatoes—yet appeared to be much healthier than city-dwellers in New York, and even than their own relatives who had emigrated to the United States in previous years.
In later studies, Keys observed a very low incidence of coronary disease among the inhabitants of the Cilento and the island of Crete and theorized that this situation was a result of the diet adopted in those areas. These early observations led to the re-

43 Lucchin L., "Criticità nella gestione della dieta mediterranea", *Adi, Rivista scientifica. Associazione Italiana Dietetica e Nutrizione Clinica*, 4, 2011; Piroddi L., *Sapore di sole. Dieta Mediterranea: principi base, ingredienti e ricette per una corretta alimentazione*, Mursia, Milan 2008.

44 Ancel Benjamin Keys (1904-2004) an American doctor and physiologist was known as one of the first proponents of the benefits of the Mediterranean diet as a way of combatting many pathologies common in the West, in particular cardiovascular diseases.

nowned Seven Countries Study,[45] based on a comparison of the diets of over 12,000 people, ranging in age from 40 to 59, in Finland, Japan, Greece, Italy, the Netherlands, the United States, and the former Yugoslavia. From the findings of the Seven Countries Study, numerous associations were discovered between the kind of diet consumed and the risk of onset of chronic diseases.[46] As seen in the findings, levels of saturated fatty acids and cholesterol in the blood largely explain the differences in mortality rates of the populations analyzed, as well as predicting the future their rates of coronary disease.[47]

Mortality due to heart attack is still lower among the Mediterranean populations than in countries, like Finland, where diets are rich in saturated fats (butter, lard, milk and milk products, and red meats). The final results of the Seven Countries Study indicated that the best dietary regimen was that followed by the inhabitants of Nicotera, in Calabria, and that they had adopted a Mediterranean way of eating. The population of Nicotera, Montegiorgio (Marche), and the inhabitants of the Campania region presented very low levels of blood cholesterol and a minimal percentage of coronary disease. These rates were due to a dietary regimen based on olive oil, bread and pasta, garlic, red onions, aromatic herbs, vegetables, and not much meat.[48]

The latest studies. From the first "Seven Countries Study" to today, many other studies have analysed the characteristics and the connections between adopted dietary pattern and the onset of different kinds of diseases.[49] For example, according to the study carried out by the American Heart Association, the Mediterranean diet decreases the mortality rate caused by coronary heart diseases by 50%. In general, starting from the mid-nineties of the last century, a branch of study has arisen investigating the association between diets and longevity. What emerged was a posi-

---

45 Keys A., *et al.*, S*even Countries. A Multivariate Analysis of Death and Coronary Heart Disease*, Harvard University Press, Cambridge, MA and London, 1-381, 1980; Toshima H., Y. Koga, H. Blackburn, *Lessons for Science from the Seven Countries Study, Springer Verlag*, Tokyo,1995.

46 Keys A., *et al.*, "Epidemiologic studies related to coronary heart disease: characteristics of men aged 40-59 in seven countries", *Acta Medica Scandinavica*, (Suppl to vol. 460), 1-392, 1967.

47 Keys A., "Coronary heart disease in seven countries", *Circulation*, (Suppl to vol. 41), 1-211, 1970. Kromhout D., A. Menotti, *The Seven Countries Study: A Scientific Adventure in Cardiovascular Disease Epidemiology*, Brouwer, Utrecht 1994.

48 In the years that followed, Ancel Keys and the other scientists that contributed to the Seven Countries Study pursued their research in Pioppi, in the Cilento. Forty years after the publication of the findings of the Seven Countries Study, the Association for the Mediterranean Diet, Nutrition, and Lifestyle was founded in Pioppi. It held a conference on the Mediterranean diet at Pioppi from 24 to 27 September 2009, with the participation of illustrious scientists and personalities from all over the world. The association was honored by the President of the Italian Republic Giorgio Napolitano for the cultural and social values embodied by the association and the conference, as an important source of popularization of a proper lifestyle.

49 World Cancer Research Fund, *Food, nutrition and the prevention of cancer: a global perspective*, Washington, D.C.: American Institute for Cancer Prevention, 1997; Willett W. C., "Diet and coronaryheart disease", Willett W. C., (ed.), *Nutritional epidemiology*, 2nd ed., New York, Oxford University Press, 1998.

tive correlation between the adoption of a Mediterranean dietary pattern and the reduction of chronic diseases. Furthermore, a high degree of compliance with the Mediterranean diet seems to allow people to live better and longer, while more recent studies have shown that those who follow this type of diet are less likely to experience premature cognitive decline and have fewer possibility of developing (or delay) neurodegenerative diseases such as Alzheimer's.[50] For example, a recent study by Gu Yuan,[51] a researcher at the department of neurology at the Columbia University in New York, suggests that the Mediterranean diet would lead to diminished brain atrophy over the years. In numerical terms, the study examined 674 octogenarians, who lived in northern Manhattan, who were not suffering from dementia. Looking at the total volume of their brains, Yian Gu and her colleagues found that those whose nutrition was in line with the principles of the Mediterranean diet (especially more fish and less meat) had an average cerebral mass greater by 13.11 millilitres compared to that of those who followed another dietary pattern. Although this number may seem exiguous, researchers argue that this difference amounts up to 5 years of cerebral aging (less).

As mentioned earlier, the source of such well-being result from a high consumption of vegetables, fruits, legumes, nuts, olive oil, and cereal grains (which in the past were mainly unrefined); moderate consumption of fish and dairy products (especially cheese and yogurt) and wine; and low consumption of red meat, white meat, and saturated fatty acids. The model is largely based upon an apparent paradox: The peoples that adopt the Mediterranean diet consume relatively high quantities of fats (levels similar to those consumed by people in the United States), but they have lower rates of cardiovascular disease than do other populations in North America. The explanation is that the large quantity of olive oil used in Mediterranean cuisine substitutes for animal fats, at least in part. In fact, olive oil seems to help to maintain lower levels of cholesterols. Aside from olive oil, cereal grains occupy a special place in the Mediterranean diet, mainly unrefined grains (rich in dietary fibre and other important components, such as minerals, vitamins and antioxidants), and it is not just about bread and pasta; we are also talking about barley, spelt, oats, rice, and corn. The food customs that have spread over recent years have gradually excluded legumes from diets. In the Mediterranean diet, on the other hand, their presence is fundamental. Legumes contain slow-absorption carbohydrates (low glycaemic index) and substantial amounts of proteins mineral salts, certain vitamins, and food fibre. In short, the Mediterranean diet's stress on fruits and vegetables is now well accepted in the international scientific community; the standard recommendation is to consume at least five portions, i.e. at least 400 grams[52] of fruits and vegetables every day. These foods contain essential vitamins (such as vi-

---

50 Lourida I., *et al.*, "Mediterranean diet, cognitive function, and dementia: a systematic review", *Epidemiology*, 24(4), 479-489, 2013.

51 Gu Y., *et al.*, "Mediterranean diet and brain structure in a multiethnic elderly cohort", *Neurology*, 10-1212, 2015.

52 World Cancer Research Fund International, Continous Update Project (www.dietandcancerreport.org); WHO, *Healthy Diet, Factsheets 394*, 2015 (www.who.int/mediacentre/factsheets/fs394/en/).

tamin C) and contribute to a sense of fullness without adding many calories. This is mainly due to the presence of high quantities of fibre and water, which increase the volume of the food but not its caloric content.

5.12 THE MEDITERRANEAN STYLE TODAY: THE DECLINE OF A MODEL

From the 1950s to the present day, that is, since Keys's first study, we have witnessed all over the Mediterranean region, Italy included, a gradual abandonment of the Mediterranean approach to food in favour of less-healthy ways of eating. The results of the studies by Flaminio Fidanza (one of the pioneers in food and nutrition research, who thoroughly investigated the state of affairs in Italy beginning in the Sixties)[53] have shown that the index of Mediterranean diet adequacy in two Italian cities that have been symbolic in this context had dropped drastically, starting in the 90s: in Nicotera that index was 7.2 in 1960 but dropped to 2.2 in 1991. In Montegiorgio, where the index had been 5.6 in 1965, it fell to 3.9 in 1991. The abandonment of the Mediterranean diet appears to be unmistakable in the larger Italian cities,[54] and a following study carried out by the Italian Association of Dietetics and Clinical Nutrition and by the Grana Padano Nutritional Observatory in 2009, confirmed this trend. In Italy, in fact, the Mediterranean adequacy ratio has further dropped to 1.44, a value well below the 7.2 in Nicotera or the 5.6 in Montegiorgio. In this regard, an important value is represented by the steady decline in the consumption of fish, a valuable source of protein and essential fatty acids, which, from the beginning of the new millennium has experienced a contraction in the expenditure for this item by 12.4% (Censis-CIA 2014 data).[55] However, it seems that also vegetables, olive oil and pasta are going down.
Food desires are changing also in the new generations which, according to a study carried out in Spain and Italy, seem to phase out the Mediterranean diet, in favour of new food trends characterized by foods with a high fat content. The change in dietary pattern, associated with a reduction of physical activity, is at the base of the sudden rise in the levels of obesity in our country. According to the updated data of the Okkio alla Salute project[56] (the national surveillance system sponsored and funded by the CCM – Ministry of Health and coordinated by the National Institute of Health since

---

53 Fidanza A., F. Fidanza, "Mediterranean Adequacy Index of Italian Diets", *Public Health Nutrition*, 2004.

54 The index of Mediterranean adequacy, thus calculated, establishes a relationship between the calories introduced from typical foods of the Mediterranean diet and those not belonging to the Mediterranean diet, through division. An index equaling 2 means that for every calorie ingested from foods not belonging to the Mediterranean diet two calories are ingested from foods belonging to the Mediterranean diet.

55 Censis, "Gli italiani tagliano i consumi alimentari, ma qualità ed eccellenza resistono a tavola" (www.censis.it/7?shadow_comunicato_stampa=120949); SlowFood.it, "Effetto crisi: crolla il consumo di olio di oliva nel Mediterraneo" (www.slowfood.it/effetto-crisi-crolla-ilconsumo-dolio-doliva-nel-mediterraneo/).

56 Ministero della salute, Okkio alla salute (www.salute.gov.it/portale/temi/p2_6.jsp?lingua=italiano&id=2952&area=stiliVita&menu=sorveglianza).

2007, every two years, and aiming at collecting information concerning the weight, dietary habits and physical activity in children), Italians children have high levels of excess weight, which places Italy among the firsts in Europe as per childhood overweight and obesity. In detail, the data for the year 2014 show that overweight children of the third class of primary schools are 20.9%, while 9.8% of them are obese, with percentages growing in regions of the South and Centre of Italy. The situation does not improve when considering the adult population and the elderly,[57] because, according to data collected in 2010 by the "Passi" monitoring system, in our country, 32% of adults are overweight, while 11% are obese, for a total of four adults out of ten (42%) with excess weight. Furthermore, according to "Passi d'argento," the experimental system (launched in 7 Italian regions) surveillance of the health state in elderly population, 60% of the population between 65 and 75 years of age are overweight/obese, while between 75 and 84 people overweight/obesity reaches 53% and among those over 85 or older 42%.

In general, according to ISTAT, for several years in our country there is a tendency to abandon the traditional Mediterranean diet in favour of different eating patterns.
In recent years European society, and specifically Italian society, have changed from a number of points of view. Every day in Italy about 105 million meals are consumed, of which 76% are eaten at home and 24% are eaten away from home.[58] On an aggregate level lunches (53%) outnumber dinners (47%) while 71% of the meals are consumed with one's family, 16% with friends and colleagues, and 16% are eaten alone; 67% of the 25.5 million meals consumed daily away from home are lunches, and only in 30% of all cases are those lunches eaten between one and two o'clock in the afternoon (figure 5.1). Observing the breakdown by method of the meals eaten every day in Italy (aside from the prevalence of the "normal" lunches and dinners) we see, among the meals consumed away from home, that 11% are "lunch on the run" and 5% are the "catch-up lunch." Lunches eaten in less than 10 minutes account for 9% of the total number of lunches eaten away from home.
Moreover, 14% of the meals eaten away from home were eaten standing up, while 15% of those meals were eaten sitting down, but not at a table. As for the meals eaten away from home, they are predominantly "primi piatti," or pasta or soup dishes (41%) and main entrees (42%), with one million "primi piatti" consumed away from home every day (for the most part in bars and cafeterias). The composition of the meals eaten at home, on the other hand, shows a greater degree of variety, as can be seen in figure 5.2.
The picture drawn by these data seems to be fairly clear: the pace of Italian life is accelerating and the way of eating is progressively following this trend. This trend is confirmed by more recent studies, which show that eight Italians out of ten go more or less regularly to bars and restaurants for lunch, dinner or just for a break,[59] despite of

57 Epicentro, "La sorveglianza Passi d'Argento" (www.epicentro.iss.it/passi-argento/).

58 Nielsen-Barilla, 2009.

59 FIPE, *Cresce la voglia di mangiare fuori casa – Rapporto ristorazione 2015* (www.fipe.it/component/k2/item/4086-fipe-cresce-la-voglia-di-mangiare-fuori-casa.html).

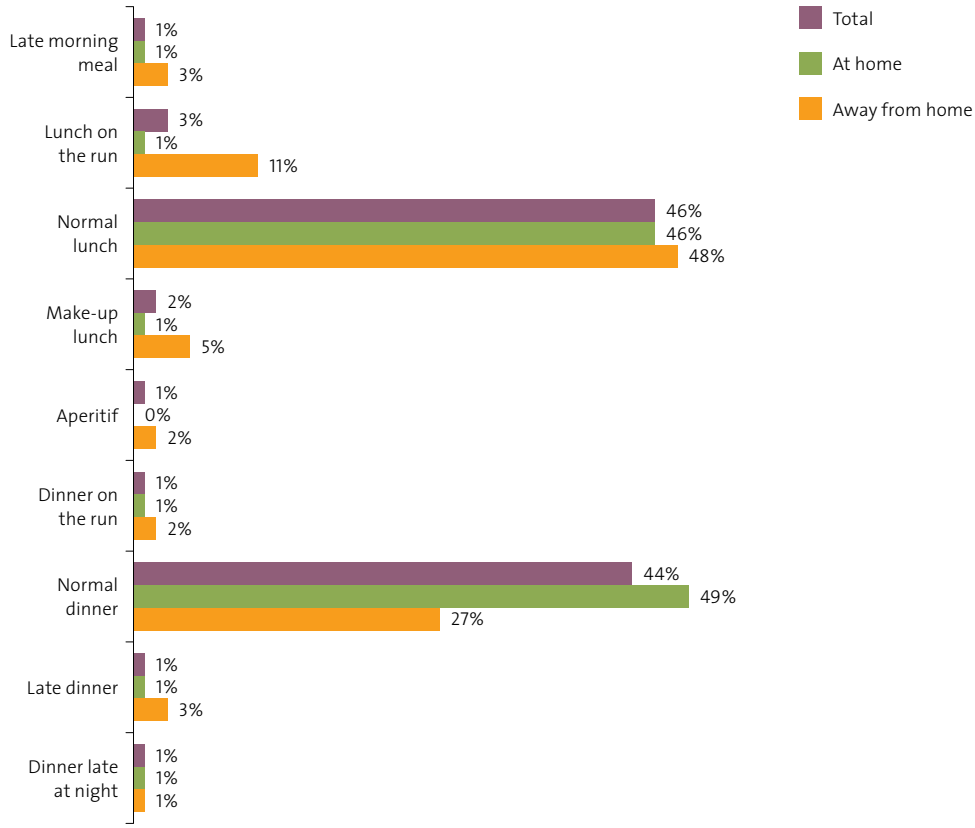


FIGURE 5.1

Breakdown of the 105 million meals consumed daily in Italy by mode of consumption
Note: Data expressed in%. Base: 99,000 meals analyzed; 105 million meals daily.
Source: BCFN on Nielsen-Barilla data, 2009.

the years of "crisis." Specifically, the recent *Rapporto Ristorazione 2015* by FIPE (Italian Association of Catering Businesses), taking into consideration adult Italians (a sample of about 39 million people) shows that during the working week, every day, almost 5 million people go out for breakfast, preferring the traditional coffee, cappuccino or pastries. 12 million people go out for lunch, mainly to bars, three to four times a week, to eat above all: paninis, pizza and main courses. Last but not least, 9 million Italians go out for dinner (above all to pizzerias) three times a week. While in the weekend, 6.6 million Italians have dinner in pizzerias at least three times a month and 7.3 million choose to have dinner in restaurants and trattorias.

The result is that the time and the quality of the space devoted to nutrition over the course of the day is more and more squeezed in among the other daily commitments of individuals who increasingly find themselves obliged to sacrifice the quality of their own nutrition.

The distinctive features and traits of Mediterraneity, especially the tendency to assign

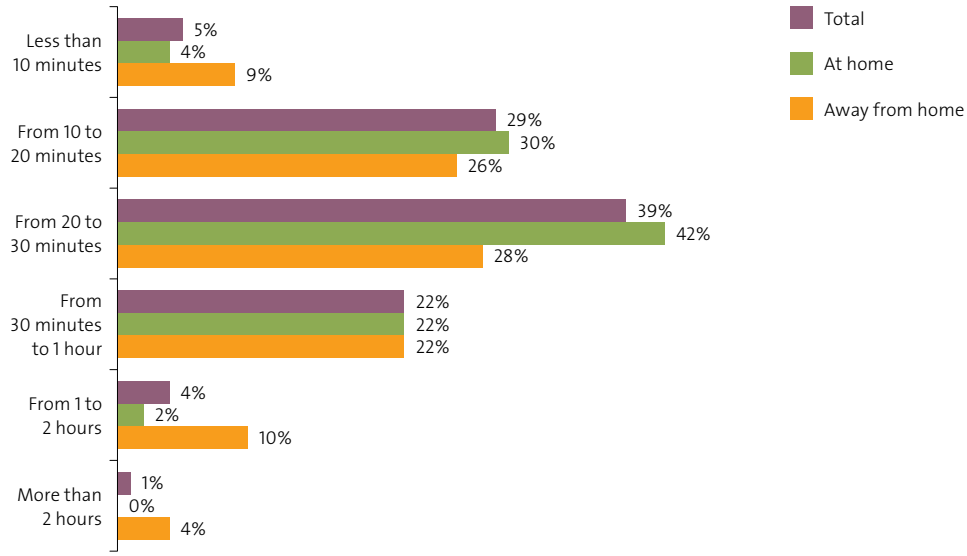


FIGURE 5.2

Distribution of preparation time for meals at home and away from home
Note: Data expressed in%. Base: 80 million meals at home daily.
Source: BCFN on Nielsen-Barilla data, 2009.

meaning and significance to eating that rise above the merely nutritional or functional aspects, represent a cultural patrimony that still endures in Italian society despite the pressure to which individual lifestyles are subject. But it is increasingly difficult to reconcile Mediterraneity with a reality that makes its practice more and more challenging. The statistics shown have to do with Italy, but they correspond to the figures for Europe as well. In fact, if we broaden our view to include sociopolitical context of the entire European Union—which, although it only partly shares the larger cultural tradition mentioned here, is undergoing social changes parallel to those seen in Italy—we observe the same tendency toward a fluidity and a social movement that are structurally modifying the customs established over time. While, on the one hand, it tends to affirm itself over time, and this is the most worrisome datum, the same productivist paradigm that is now sweeping other areas of Earth (this is demonstrated, among other things, by the growing number of people afflicted with diseases directly linked to overweight and all obesity),[60] on the other hand it is clear that certain values typical of Mediterraneity have by now permeated the entire continent. What appears most significant, however, is the emergence of a meaningful fracture between ideal dietary choices and actual everyday practice. While awareness of the importance of good nutrition to overall well-being is rising, actually practicing those values is becoming increasingly difficult.

60 Barilla Center for Food & Nutrition, *Position Paper Alimentazione e salute*, 2009.

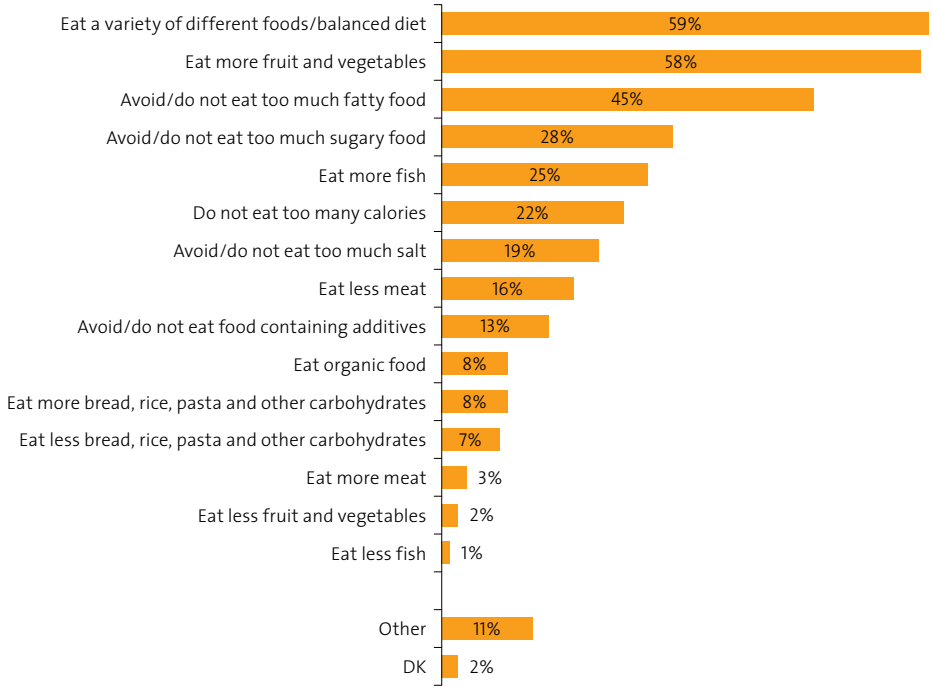


FIGURE 5.3

What does it mean to follow a healthy diet?
Source: The European House-Ambrosetti on Eurobarometro data, 2006.

The challenges of adopting a balanced diet. A survey undertaken by Eurobarometer for the European Commission in 2006 of the nutritional habits of the citizens residing in the twenty-five European countries[61] revealed that the majority of European citizens believe that eating in a healthy way means adopting a balanced diet made up of a variety of foods. Specifically, 59% of European citizens believe that a diet composed of a wide variety of foods and including significant consumption of fruit and vegetables meets the needs of healthy nutrition. Some European citizens (about one out of four) are also aware that excessive consumption of fats and sugars is not healthy and should therefore be avoided (figure 5.3).

Well aware of the importance of the makeup of diet, the vast majority of European citizens (83% of the total) say they are conscious of the crucial significance of what they eat for their own physical well-being.

However, despite the fact that most European citizens say they follow a healthy diet, the number of people who have difficulty eating in a healthy manner is pretty high in countries such as Hungary (54%), Slovakia (52%), and Poland (49%). On the other

61 Eurobarometro, *Health and Food*, november 2006.

hand, people report it seems fairly easy to adopt a healthy diet in countries such as the Netherlands (79%), Sweden (77%), and Malta (77%). Italy is below the European average, with 57% of respondents who believe that it is easy to eat in a healthy manner as against the 66% of the EU25 average.

The lifestyle of European citizens seems to be the chief obstacle to their eating in a healthy and nutritious manner. According to the survey, two principal factors hinder that possibility: the excessive amount of time required for the selection and preparation of a meal (31% of respondents), and the inability to supervise the foods consumed because they were purchased or prepared by someone else (27%). A third significant reason expressed is the idea that healthy food isn't particularly tasty (23%); 12% also report a lack of information concerning what constitutes a healthy diet and 15% complain about the confusing and contradictory information accompanying foodstuffs.

In conclusion, the Eurobarometer survey seems to indicate an increasingly widespread awareness of the importance of diet and nutrition in terms of a healthy, full life. But it also confirms the difficulty of translating that awareness into concrete forms of behavior.

In general, recent research in psychology,[62] underline that individuals tend to have a very personal vision of what healthy eating is, which reflects their personal, social and cultural experiences, as well as the interaction with the environment around them. It is a more complex notion that goes beyond the real nutritional composition of foods and the tips from experts. In recent years a lot of money was spent to carry out information campaigns on a large scale, in order to increase public awareness and to generate a better understanding of what it means to have a healthy diet. However, there is solid evidence that emphasize how information alone is not enough to encourage long-term changes (especially in those areas where people do not want to hear), unless some evident form of attraction does not accompany the messages. Not only that, communication campaigns seem to be effective only on those people who are already active into food, as this kind of individuals are most likely to search autonomously for this kind of information.

What seems to be missing is some form of cultural mediation that makes it possible to translate in a natural way what is already known and acknowledged by scientific nutrition about sound dietary practices into proper behaviour. (Just consider, in this connection, the Food Pyramid—universally known for the past 30 years, but never so seldom applied in the world as it is today.)

What emerges from these observations is a clear indication of the challenge facing us. The battle for good nutrition depends upon and can only be won on the field of behavior, even before it is fought in the realm of the choice of foods. It will be decided on the good practices that will make it possible to attribute a value and a meaning to food. We are not suggesting that food become an obsession or a tedious task but, quite to

62 Bisogni C. A., *et al.*, "How people interpret healthy eating: contributionsof qualitative research", *Journal of nutrition education and behavior*, 44(4), 282-301, 2012.

the contrary, a path toward the rediscovery of oneself and others, within the context of time devoted to caring for oneself as a person. This original theme has always constituted the heart of the Mediterranean approach to diet and nutrition.

5.13 HOW TO RECOVER THE SIGNIFICANCE OF MEDITERRANEITY

Aside from the loss of nutritional value, what seems to be progressively vanishing in many countries is a balanced relationship with food. The objective, then, should be to make the time we spend eating less predictable and banal, and therefore more immediate and intense, more beautiful, and more attractive—attractive because it will become the vehicle of a conviviality, a measured use of time, of an aesthetic taste that we sometimes have a hard time expressing in a daily life that is punctuated by frenetic rhythms, anxiety, and superficiality.

If this belief is well-founded—that culture is the primary tool in the attempt to win back a portion of daily reality from merely economic and productive concerns—then the problem arises of how to redirect concrete terms—the future of nutrition. What should the most significant dimensions of this movement be? The topic is complex and deserves to be explored at much great length than we have here. We shall therefore limit ourselves to suggesting two ideas that, in our opinion, are decisive.

The first has to do with the capacity of the agro-alimentary industry to put itself at the service of some fundamental dynamics of Mediterraneity (explored in greater depth in the insert "The cultural value of the man-food relationship for future"):

- make the best possible use of the rich and diverse resource of conviviality, in this era of ours that is so impoverished in terms of relationships;
- protect local territorial variety by preserving the wealth of identities (while still encouraging cross-fertilizations), thus reinforcing the emotional capital invested in roots, distinctive qualities, and territorial localization, while at the same time emphasizing the aspects that are humanly universal;
- transfer the knowledge and know-how linked to the preparation of foods; they are extraordinary deposits of cultural wealth;
- return to a healthy relationship with the territory and the context of the raw food materials that go into a cuisine, aiming at the excellence of the ingredients, establishing a direct and respectful link with the context in which the raw materials develop;
- restore the value of food as a medium for a fertile relationship between the generations, in the simplicity and clarity of its benefits, to promote the construction (and reconstruction) of a social fabric that is steadily weakening under the pressure of modernity;
- recover the flavors of bygone times to preserve the best of gastronomic traditions and seek to renew and reinterpret them creatively in the context of contemporary tastes;
- last of all, spread the culture of taste and the enjoyment of life through authentic food. Revitalizing the magic and astonishment of food in its rituals and its carefree pleasure—as the fuel of life and culture—allows a renewed centrality to the role played by people and their feelings.

The second significant element is bound up with the method of activating the process of change. It is necessary, to this end, to forge a great pact among all the actors of the world of nutrition and food, including the public institutions—nowadays increasingly concerned about the devastating consequences of the improper dietary choices being carried out by their citizens—in order to reorient lifestyles and ways of eating toward modes of consumption that are more sustainable in terms of health, the environment, and an intact social structure.

The scale of the challenge—to educate the populace to a new dietary ecology—is so great that it demands an ability to intervene that is well beyond the power of the individual actors. A concerted effort will be required, an alliance, which while it preserves the typical character of competition in the relationships between the various players in a single sector, makes it possible to undertake cooperative games intended to promote a new dietary paradigm.

CONTRIBUTIONS

The importance of children's food education

Jamie Oliver

JAMIE OLIVER is a phenomenon in the world of food. He is one of the world's best-loved television personalities and one of Britain's most famous exports. Jamie has inspired people to spend more time enjoying cooking delicious food from fresh ingredients—and even start growing their own food. His Jamie Oliver Food Foundation campaigns globally for better food education for all.

Back in 2010 I was lucky enough to win the TED prize and, while a lot has happened since then, ultimately my wish is still the same. I wish for every child, in whatever way is relevant in their circumstances, to be taught about food, where it comes from, how it affects their bodies, and how to cook it, allowing them to be confident in the kitchen and to enjoy good, nourishing, delicious food with their future families. That's my only wish, and what I believe to be our biggest global challenge.

Food is one of the biggest joys in life—it is cultural and symbolic, it brings families together around the dinner table and, without doubt, wherever we are in the world, it connects people from all walks of life. Yet in the fast food-filled world we now live, some of this beauty has been lost. We need to get back to basics.

We've got an escalating obesity epidemic on our hands, and this is putting immense pressure on our health systems and increasingly is becoming a problem in even the very poorest of countries. Along with this epidemic comes a whole host of largely preventable diet-related diseases. We simply cannot afford it, neither from a health nor economic perspective. Recent reports have put the global cost of obesity at $2 trillion annually. This is an absolutely terrifying statistic, and I defy anyone reading this not to want to take action. We must act now.

At the same time, there are millions of people around the world suffering from hunger and malnutrition. Simply too many people have too little of the right food, and too many others have too much of the wrong food. Currently, 45% of all countries are facing the double burden of malnutrition, according to the latest *Global Nutrition Report*. How did we get to this point? In 2016, this should absolutely not be happening.

Combine all this with other major flaws in our food system, including the phenomenal amount of perfectly edible food wasted every day, and the unsustainable and often unethical farming and agricultural practices impacting our planet, and the outlook is pretty dire. Our global food system has become a serious challenge for both mankind and the planet. This is a crucial moment in time, and it's up to us to make it better.

While all of these issues are very complex, I believe that there are some pretty simple solutions we can all support. And for me, food education is key.

I believe that it's every child's human right to be fed properly and to be educated about food and how to cook it. There is no doubt in my mind that every child should be getting compulsory, hands-on food education at school, and from a very young age.

We know from experience that children who are educated about food are healthier,

happier and better able to concentrate in the classroom. Research shows that kids who grow, prepare and cook their own food are more likely to eat it. They're also likely to share their learnings with their parents and grandparents, who themselves may have never been taught to cook—looked at it this way, the passing of this knowledge from child to parent is important and really very special. Research from my food education projects at our Ministry of Food centres in Australia, has also shown that if you teach people to cook from scratch, their health improves, their confidence improves and naturally this is passed onto their families, too.

By teaching people about good, real food, we're also helping to build connections not only between our food choices and the impact on our bodies, but also our choices and the impact on our planet. Given today's statistics, this is vital. It's our duty to ensure that the next generation grow up armed with the knowledge and skills they need to make good lifestyle choices for *both* their health and for the preservation of the planet. At the end of the day, they'll become the next politicians, policy-makers, doctors, teachers and parents. It's our responsibility to ensure they put good health, fair food standards and ethical farming first.

Education extends beyond the classroom, too. Is it right that most of today's food education comes from the incredibly powerful marketing campaigns of major junk food corporations? I believe we need to introduce regulations banning the advertising of unhealthy foods on children's TV channels; and on non-children's channels before, during, and after programmes aimed at children and families, while increasing the promotion of good, nutritious food in a way that appeals to our kids. Furthermore, government authorities need to provide educational programmes to parents, and more support to healthcare professionals so they can deliver quality education and offer practical support. Imagine a world where good, nutritious food and physical activity are prescribed as medicine?

Individuals, communities, businesses and governments need to come together in one united front so that we can challenge the status quo, demand compulsory food education for every child, as well as more ethical and sustainable practices in the food industry, in order to secure a better future for our children. By uniting as one global voice with one common goal, we can ensure positive, lasting change.

Food education will give future generations the life skills they so urgently need in order to lead healthier, happier, more productive lives. I passionately believe this is every child's human right, and I hope you agree.

CONTRIBUTIONS

Consumers and sustainability: our plate is the answer

Ellen Gustafson

ELLEN GUSTAFSON is Co-Founder of Food Tank: the Food Think Tank; Founder and Executive Director, 30 Project; member of the Advisory Board, BCFN. The 30 Project, a new way to connect global hunger and obesity and crowd-source long-term food system change. Ellen Gustafson is also the Co-founder of FEED Projects, and Co-founder and former Executive Director of FEED's non-profit partner, the FEED Foundation. Under Ellen Gustafson's leadership FEED provided over 65 million school meals to children around the world.

Every single day, people everywhere do one thing—they eat. Usually, if we are not in a devastating famine or crisis, we eat at least three times a day. And every time we eat, we make choices about what will be in our grocery cart, on our plate and in our stomach. If you think about how each of us decide what to eat at least 1,095 times in a year, that gives us many opportunities to vote with our dollars on the food that we want. That's a powerful thing to be able to do, while also satisfying our hunger and our taste buds.

But the global food system itself is also a powerful thing. The system produces enough calories to feed every person on the planet more than we need and many of us have more diverse food options than our grandparents could ever have imagined. But, despite the fact that we enjoy cheap coffee, burgers and bananas almost everywhere and that a well known soft drink is available in more countries than are recognized by the UN—there are still almost 800 million people struggling with hunger and over 2 billion people globally who are overweight or obese. Our interconnected food system can do amazing things, but we still have not figured out how to ensure that people are fed well, in almost every corner of the globe.

Back to the individual consumer many western world eaters, and those who eat most like us, struggle every day to figure out how to navigate a food system where most food seems to make us fat and unhealthy. We try diets and cleanses and spend more and more money on foods that claim they will help us weigh less and less. Since the proliferation of no-fat, gluten-free, paleo and fake sugar "food," we the eaters have gotten fatter, are built less like our "ancestors" and have more processed junk and sugar-induced health problems. To add to all of this, many of us don't know this fundamental irony—in America, our farmers are some of the most overweight among us, and in the developing world, farmers tend to be among the hungriest.

Adding to the challenges that our modern diets have created in our human health—the ingredients that go into junk food often come from agricultural systems that lead to degradation of our environmental health. Vast monocultures of the ubiquitous corn and soybean fields—which become vast monotonies of corn syrup-sweetened soda, corn-fed cheap beef, soybean oil-fried snacks and endless configurations of sweet and fat confectionary—are no better for our soil or our waterways than they are for us. Stripped topsoil from farming the same crop year after year, mixed with the chemical

fertilizers and pesticides that make lifeless dirt grow things, eventually flows into our rivers and creates sediment build-up or, worse, dead zones. The continued demand for cheap and easy meat has led to a devastation of the Amazon for grazing and corn feed-growing fields and the hidden cost of increased palm oil in snacks means Pacific rainforests are burned for palm plantations.

Back to human impacts, although its easy to say that the overweight and hungry around the world are just too lazy or are somehow else at fault for their food-related woes, it actually seems clear that what really needs to change is our food system itself. We need to demand a food system where the most available and easiest food options are also the healthiest. Where farmers and farm-workers are paid fairly and have the least food-related health issues. We need to support farmers and companies that use practices that promote healthy ecosystems and demand food that is grown in ways that protect the soil and our waterways.

The answers to some of the world's most pressing problems real are actually on our plates. As we the eaters increase demand for fresh and sustainably grown fruits and vegetables, farmers increase production and those foods become easier to access for everyone. As we choose restaurants not just for how cheap or "happy" their meals are, but for how nutritious their food is and how fairly they pay their workers, we push the system toward the options that allow us, and our neighbors, to be healthier. As we understand better who grows our coffee, burgers and bananas and demand more fair trade and socially conscious sourcing, we help prevent hunger among farmers in the developing world thousands of miles away.

Of course, many of these changes mean that we need to change how we spend our money on food. Today, Americans spend the least on food (less than 9% of household spending) than any other country and yet we complain about skyrocketing healthcare costs. We buy two-for-one deals since they're a good bargain, but more than half of all Americans say they are trying to lose weight and almost 70% of Americans are overweight. We want to save money by racing to the drive-thru, but then we spend more on weight loss groups and gyms than ever before. We don't want to admit that a homemade sandwich and a long walk at lunch would be cheaper and healthier.

To change how we eat, we need to rethink how we shop for food. By learning more about the environmental impacts of our food (through tools like the Barilla Center for Food and Nutrition Double Pyramid), we will make small changes like eating less, but more sustainably-produced meat and discovering the delicious proteins in many plant foods. We will buy fruits and vegetables that are more local, more in season and grown by farmers who want to keep the soil and water healthy in our communities. We will push stores and restaurants to waste less food and we will become more conscious of food waste in our own homes. By choosing food brands that are transparent in their sourcing and are committed to improve the nutrition profile of their products according to healthy eating habits we will indirectly put ourselves on a different kind of diet.

The diet of more conscious consumerism means limiting our food choices by how fairly and sustainably they are produced—what's better for the planet, tends to be better

for our health and if more sustainable food costs a little bit more, that might just help us to eat a little bit less. This diet will help push the whole food system in a better direction, so that eventually the healthiest choice will be the easiest choice. The solution to our health and our planet's health is right under our noses—it's the power of what we put on our plates.

CONTRIBUTIONS

The consumer culture war and the food system: what does this mean for the mediterranean model?

Michael Heasman

MICHAEL HEASMAN is Lecturer in Health and Well-Being, Faculty of Health Studies, University of Bradford, UK and a Visiting Research Fellow at the Centre for Food Policy, City University, London. He specializes in food and health, the global food industry and food policies. He has written or co-authored more than 90 publications or presentations, including: *Food Wars: The Global Battle for Mouths, Minds and Markets* (2nd edition, 2015, with Professor Tim Lang), *The Functional Foods Revolution: Healthy People, Healthy Profits?* (2001) and *Consumption in the Age of Affluence: The World of Food* (1996).

The traditional Mediterranean model to eating could be a potential roadmap towards a different diet and food system, not least through creating a model for constructing a "sustainable diet"—that is, one that enables an ecologically integrated food system from production through to consumption. But the current food system is rooted in the industrial food model and its resulting consumer food culture. This "food system" continues to shape and influence food consumption patterns and hence consumer food "cultures."[1] The impact of the Mediterranean model has to be situated within this broader context which sees today's food culture war framed as a conflict within the future of food consumerism itself.

The on-going industrial food system dynamic is driven by consumerism—that is, creating the desire to purchase goods and services in even greater amounts and the mechanisms to activate this. In this respect the industrial production model and its accompanying, hugely sophisticated, consumer marketing industries, are designed to push this consumption agenda forward, so that this model appears to be the only option available.[2] But the consumer culture food war is not simply between the mainstream and alternatives. Within the mainstream a struggle is also underway to shape consumer culture towards particular interests. So food processors work to sell their branded product dreams, foodservice operators lure consumers to their food offerings through strategies that owe more to the entertainment industries than food—a trend termed "eatertainment" in the United States—and the supermarkets try to outdo both. A late entry into this food cultural melee are farmers who are attempting to inject their imagery into this consumer cultural mix with an appeal to the "natural." Increasingly all of these players attempt to convince consumers of their sustainability and environmental credentials. The Mediterranean model is competing with all these consumer and societal influences.

While food consumer culture is important it is rarely mentioned in nutrition and food policy documents.[3] Instead much modern food and nutrition policy (and business language) is all about framing consumers through a market-led "consumer choice" lens—in this sense "choice" defines consumer culture. So an important task is for societies to reclaim their narratives relevant to their food cultures. For example, the Mediterranean "model" might be regarded as both under threat and, at the same time, as posing a threat to the industrial food system. It is a diet, as is well known,[4] established

on plant-based foods with little meat and dairy—almost the opposite to the modernizing trends in global food markets which are seeing increasing promotion of meat and dairy product consumption. But in other ways the modern global consumer culture offers possibilities for the Mediterranean model. In a globalizing world, cuisines have opened up or created new consumer markets and introduced new eating possibilities for people that were unheard of for earlier generations. In this manner the modern globalizing food system relies as much on breaking down and reinventing food cultures as it does on breaking down the chemical and nutrient components of foodstuffs and ingredients and reassembling them into branded consumer food products with new marketing stories about their "naturalness" and "healthiness" and "provenance."

And the Mediterranean diet itself has not been immune from this process. In some instances the Mediterranean diet has itself become "medicalised"—stripped of its cultural heritage, gastronomy, and ecological framing—and instead been turned into a package of nutrients which in the right combinations will prevent individual heart attacks and other diet-related ill-health. Food traditions and heritage need careful nurturing to remain authentic in the brutally competitive consumer culture war around food, diet, our bodies and health.

As importantly the Mediterranean consumer culture itself has started to succumb to globalizing and industrializing dietary tendencies. As a result the diet of Mediterranean countries today relies more on both sugars and saturated fat and childhood obesity rates are now higher in some Mediterranean countries than compared to northern Europe. Consumers in European Mediterranean countries have also moved away from traditional Mediterranean diets and foodstuffs in recent decades.[5]

Some of these societal and cultural trends can be identified through following the olive oil food system in recent years. In a study of the olive oil systems between 1972-2003 by Armin Scheidel and Fridolin Krausmann[6] they demonstrate how olive oil developed from a niche product that could hardly be found in food stores outside of the producing regions towards an integrated component in the diets of industrial countries. While global olive oil production is still concentrated in the Mediterranean region just three countries are dominant: Greece, Italy and Spain. Until relatively recently olive oil markets were predominantly for local consumption. But promotional campaigns for the "healthy Mediterranean diet" especially from the 1980s onwards and devised and promoted by production interests, saw increased demand in non-traditional markets—such as northern European countries—with a more than 10 food increase.

But Scheidel and Krausmann also document some of the consequences of these production-consumption changes. First, is the impact on local and traditional Mediterranean olive groves. Many of these were abandoned and modern, intensive, mono-cultural production plantations were set up which rely upon irrigation systems, agro-chemicals and mechanization. This has enabled much higher productivity and modernization of industrial processes, but has also meant major structural changes in land use. This intensification has been especially pronounced in Andalusia, Spain. As Scheidel and Krausmann write: "While traditionally rain fed olive trees were grown mainly on marginal soils, industrial olive groves expanded primarily into agricultural land with high quality soils." The growth in olive oil consumption has therefore had

profound ecological impacts leading to a structural transformation of Mediterranean landscapes. The case of olive oil also serves as a lesson in how it is often difficult for consumers in a globalized food system to connect to the environmental consequences of their consumption patterns.

The Mediterranean diet when set in the context of the industrial food consumer culture war raises many questions about its implementation as a potential new "model" for a healthier and sustainable diet. From such a perspective we have to ask (and provide answers if we are serious) about what would be the impact of its large-scale adaptation on agricultural practices, food economies, consumption patterns, in addition to public health and nutrition. As noted from the olive oil case study, some of the downstream production implications may be unexpected and not necessarily desirable over the longer-term and the consumption impact in relation to public health objectives might be minimal. This then raises the question of how to internationalize the Mediterranean model in a culturally appropriate way, for local food systems and global consumers.

In the food policy world there has been a reluctance to confront the true scope of consumer culture—all too often consumer culture is reduced to "choice," and even choice is limited to macro-issues such as price and convenience, whereas consumer choice itself embraces a much more complex set of demands and aspirations.[7] Increasingly, in food, both health and ecological principles together are key consumer concerns and a repositioning of an authentic Mediterranean diet seems well placed to reconnect with these concerns and aspirations.

---

1 Lang T., M. Heasman, *Food Wars: the Global Battles for Mouths, Minds and Markets*, Earthscan, London 2015.

2 Aldridge A., *Consumption*, Polity Press, Cambridge 2003; Lien M. E., B. Nerlich, (eds.), *The Politics of Food*, Oxford, Berg, 2004.

3 Fitzpatrick I., *et al.*, *Understanding food culture in Scotland*, NHS Health Scotland, Edinburgh 2010.

4 Nestle M., "Mediterranean diets: historical and research overview", *American Journal of Clinical Nutrition*, 61 (Suppl), pp. 1313S-1320S, 1995.

5 Drewnowski A., P. Eichelsdoerfer, "The Mediterranean diet: does it have to cost more?", *Public Health Nutrition*, 12 (9A), pp. 1621-1628, 2009; Da Silva R., *et al.*, "Worldwide variation of adherence to the Mediterranean diet in 1961-1965 and 2000-2003", *Public Health Nutrition*, 12 (9A), pp. 1676-1684, 2009.

6 Scheidel A., F. Krausmann, "Diet, trade and land use: a socio-ecological analysis of the transformation of the olive oil system", *Land Use Policy*, 28, pp. 47-56, 2011.

7 Kneafsey M., *et al.*, *Reconnecting producers, consumers and food: exploring alternatives*, Oxford, Berg, 2008.

INTERVIEWS

Whoever controls food controls democracy

Vandana Shiva

VANDANA SHIVA is the founder of Navdanya, a movement for the conservation of biodiversity and to protect the rights of farmers. She is the founder and director of the Research Foundation for Science, Technology and Natural Resource Policy, whose mission is to solve the most serious social and economic problems in collaboration with local communities and social movements. She has also served as an adviser to the Indian government and for foreign governments, as well as for such NGOs as the International Forum on Globalization, Women's Environment and Development Organization, and Third World Network.

The 800 million people starving and the more than 2 billion people sick, and the planet sick—water disappearing, bio-diversity disappearing, the climate damaged—soil losing fertility—are all interconnected. And they are interconnected in a model of farming that forgets the nutrition of the soil, it forgets the nutrition of people and puts at the center profits from extraction. That means small farmers can't feed themselves because they are now part of the new dispossessed. Or if they are farming they're indebted and they are selling what they grow. So of the 800 million people who are hungry, 500 million are producers of food. And a system that forgets that food is about nourishment then produces non-food. And non-food becomes junk food and junk food creates all kinds of diseases. That's also the same system that is able to exploit water because it doesn't have to bear the cost. They can push species to extinction. They can put 40% of the greenhouse gases into the atmosphere that gives us climate change. So profits lead to destroying food, destroying the Earth, destroying our farmers, destroying our health. Obsession with profits.

Given this, what approach should developing countries take towards agriculture, to prevent the problem getting worse?

Well, I think the most important point is that so-called developing countries are called developing because we weren't industrialized in the first industrial revolution. And the large majority of people in our countries, even China and India, are small farmers. Africa for sure, Latin America, for sure. And we need to treat our small farmers as our social capital, because small farms produce more. If we start imitating the large scale industrial corporate farming of the West, we will not only destroy our farmers, we will destroy our food security. The second thing we need to do because developing countries happen to lie in the part of the world that has higher bio-diversity, we need to recognize that nature's capital of bio-diversity is real capital. Not financial loans from banks that are going to take away your land down the line. Not technologies that are already failing us like genetic engineering. We need to have respect for the land, for our farmers, and for the knowledge that has been older and more time-tested in agriculture. That is what the IAASTD report has pointed out. The International Assessment of Agricultural Knowledge, Science and Technology for Development. That neither the Green Revolution, nor genetic engineering are food security solutions. Ecological farming very often

linked and growing out of indigenous knowledge systems is the place to increase your production while conserving your resources.

Do you think that in this process women have a specific role?
Women have a specific role for two reasons. First, when we talk about the long history of agriculture which did not starve people, which did not create obesity, which did not give us diabetes epidemics, that long history was an agriculture and food in which women had the knowledge and control. So we need to turn to women to say how do we feed people with nourishment? That's why in Navdanya we run a Grandmothers' university, so that we learn once again how to give respect to food. The second thing is that the agriculture that is creating all these problems for a 800 million hungry people, more than 2 billion obese, is an agriculture that has its roots in war. It came out of war. Agri-chemicals came out of war. And it has its roots in what I call the patriarchal mindset of man as dominator. Man as a violent conqueror of the Earth and people. That model has become too heavy for the food system. We need the non-violence, the diversity, the multifunctionality that women bring to agriculture.

You once said that whoever controls our food system will control our democracy as well. What do you mean, can you explain better?
Well, at one level it is what Kissinger said when he talked about food as a weapon. He said when you control weapons, you control governments and armies. When you control the food you control people. In today's context, food is being controlled through control of seeds. Monsanto has emerged as the single biggest player on the seed front. And sadly the US government which has made itself extremely impoverished by outsourcing all its production, is now only collecting royalties from patented seed, taking away the democracy of the third world farmer to have their own seed, taking away the democracy of people worldwide to choose the food they grow and to know what's in the food. Food democracy in our times means having seed sovereignty and seed freedom. Therefore no patents on seed. Having the ability to grow your own food, therefore the defense of the small farm and therefore stopping the perverse subsidies of 400 billion dollars that give industrial farming an unfair benefit to prosper. And third, it means being much more aware of what you're eating and how it is grown. That means democracy begins with food.

ACTION PLAN

CULTURE, TASTE, AND JOY OF LIVING BOUND UP WITH FOOD

We need to bring back to life a number of fundamental dynamics typical of the gastronomic cultures that are most keenly aware of the link between food and person, such as the Mediterranean gastronomic culture. What's involved is the revitalization of the aspects of conviviality, the protection of local territorial variety by preserving the wealth of identities, the transfer of knowledge and know-how tied up in the preparation of foods, the return to a healthy relationship with the territory and with the context of the raw material by focusing on the excellence of the ingredients, and the recovery of traditional flavors capable of being renewed in the context of contemporary tastes, through a critical operation that allows us to preserve the best of the gastronomic tradition.

TEACH A NEW ECOLOGY OF FOOD

We must establish a grand overriding pact among all the actors of the world of food, including the public institutions—now increasingly worried about the devastating consequences of the mistaken nutritional choices being made by their own citizens—to redirect the lifestyles and ways of eating toward forms of consumption that are more sustainable in terms of health, the environment, and an intact social structure.

The scale of the challenge is such that it demands a capacity for intervention that rises above the power of the individual operators. What is needed is a concerted effort, an alliance among diverse subjects, such that, while still preserving the distinctive characteristic of competition in the relationship among players in a single sector, it becomes capable of implementing cooperative games aimed at the promotion of a new nutritional and dietary paradigms.

Barilla Center FOR FOOD & NUTRITION

THE MILAN PROTOCOL ON FOOD AND NUTRITION

Update 31 December 2015[1]

1 The first edition of the Milan Protocol on Food and Nutrition was issued on 12 May 2014.

Introduction

The way in which resources are used and the speed at which renewable resources are being exploited rapidly erodes the planet's capacity to regenerate the resources and environmental services on which the wellbeing of all people depends. According to the recent Millennium Ecosystem Assessment report,[2] *humans have changed ecosystems more rapidly and extensively over the past 50 years than in any comparable period of time in human history, largely in an effort to meet rapidly growing demands for food, fresh water, timber, fibre, and fuel.*

The great challenge faced by societies today is to integrate socioeconomic and environmental sustainability within socioeconomic development and welfare by decoupling environmental degradation from economic development and doing more with less, to improve or preserve the present level of welfare with fewer resources. Now is the time to move towards an energy and resource efficient economy, whereby social inequalities are addressed. This is the only way to improve and safeguard the quality of life and well-being for present and future generations.

We, drawn by the theme "Feeding the Planet, Energy for Life" of the World EXPO 2015 in Milan, have come to realise that the links between people, the planet, and food need to be at the centre of our considerations, as they are the critical foundation of the sustainability of the earth and of humanity alike.

Climate change, agricultural productivity, water management, dietary habits, urbanisation, and population growth. The causes and consequences of these critical issues for our planet will ultimately depend on management of food systems in socioeconomic and environmental frameworks, currently afflicted by three major global paradoxes.

> *First paradox – FOOD WASTE: Every year, 1.3 billion tons of edible food are wasted, an amount that represents one third of global food production, or four times the amount needed to feed the 795 million*[3] *people suffering from undernutrition worldwide.*
>
> *Second paradox – SUSTAINABLE AGRICULTURE: A large portion of crop and food production is funnelled into animal feed or biofuels despite widespread hunger and undernutrition. Predictions foresee global demand for biofuels reaching 172 billion litres in 2020, up from 81 billion litres in 2008, coinciding with an additional 40 million hectares of land converted for biofuel crops. A third of the global food production is used to feed livestock. Of the some 7 billion people on earth, 1 billion are without access to drinking water, which causes the death of 4,000 children each day.*

---

2 Millennium Ecosystem Assessment, *Ecosystems and Human Well-being: Synthesis,* Island Press, Washington DC, 2005, 1-6 (www.millenniumassessment.org/documents/document.356.aspx.pdf).

3 FAO, IFAD, WFP. *The State of Food Insecurity in the World 2014 strengthening the enabling environment for food security and nutrition,* FAO, Rome 2014, 4, 8, 11-12, 18, 40 (www.fao.org/3/a-i4030e.pdf).

In contrast, 15,000 litres of water are needed for the production of a single kilo of beef. Excessive and harmful financial speculations on commodities further exacerbates the problem, leading to market volatility and increase in food prices.

Third paradox – COEXISTENCE OF HUNGER AND OBESITY: Today, for every person suffering from undernutrition, two are obese or overweight (overnutrition): 795 million people suffer from undernutrition globally,[4] *while over 2.1 billion people*[5] *are obese or overweight. Worldwide, obesity has nearly doubled since 1980 and continues to rise in epidemic proportions: the proportion of adults with a BMI of over 25kg/m²*[6] *is over 30%. While 36 million people perish annually due to undernutrition and famine,*[7] *3,4 million people die each year as a result of being overweight or obese. In addition, 44% of diabetes, 23% of ischaemic heart disease and up to 41% of cancer are attributable to an excess of food.*[8] *The root of this problem is a global imbalance of wealth and resources that results in some populations eating themselves sick while others barely or do not survive.*

Global and complex interventions are required to establish sustainable consumption and production patterns to reconcile the respect for the planet and the well-being of its people. Governments and Institutions have a strong responsibility to address the three paradoxes, bearing on the truth that the hunger of people should take precedence to the hunger for unbridled growth. These are political, systemic problems and need political solutions. These paradoxes all threaten the unalienable human right to food creating serious social and environmental damages.

Preamble

The Parties to this Milan Protocol *gathered at the International Exposition Milan Italy 2015, hereafter "EXPO" under the auspices of the Bureau International des Expositions, hereafter "BIE";*

Submit *the full text, issued this on this DAY of MONTH two thousand fifteen.*

---

4 Recent data from the World Food Programme contends that 795 million people in the world do not have neough food. That is about one in nine people on Earth (www.wfp.org/hunger).

5 Ng M., *et al.*, "Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: a systematic analysis for the Global Burden of Disease Study 2013", *The Lancet*, 766-781, 384, 9945, August 2014 (www.thelancet.com/journals/lancet/article/PIIS0140-6736(14)60460-8/abstract).

6 The measurement is based on BMI (Body Mass Index) calculation. A BMI of 25 – 29.9 is considered overweight, a BMI over 30 is obese.

7 www.theworldcounts.com/counters/global_hunger_statistics/how_many_people_die_from_hunger_each_year.

8 World Health Organisation. *Fact sheet N°311.* WHO, August 2014. Online: www.who.int/mediacentre/factsheets/fs311/en/.

Respecting *the objectives embodied in the International Exposition theme, "Feeding the Planet, Energy for Life";*

Recognizing *the Expo as a platform to confront and discuss the challenges and re-examine the relationship between humans, our planet and its resources;*

Confirming *that the "right to safe and nutritious food" as a human right and therefore implies a strong legal and policy narrative using a Right to Food Framework as supported by the United Nations;*

Emphasizing *that our situation is plagued and perpetuated by the aforementioned three global paradoxes;*

Highlighting *that the vast majority of hungry people (651 million) live in developing countries*[9] *where 13.5% of the population suffers from undernutrition;*[10]

Mindful *of the pressure and threats on resources and humanity in each of these areas;*

Understanding *that such problems have global impact and are not confined to a single country or region, and that collaborative international efforts are required to dismantle the paradoxes and return balance to the relationship between humans and our planet;*

Conscious *that global efforts for increased awareness raising and education have the capacity to solve the bulk of these problems;*

Recalling and noting *the relevant provisions in international, regional, and national legislation to protect and conserve resources and adopt actions in pursuit of sustainable development in the EU Water Framework Directive, the Roadmap to a Resource Efficient Europe, Millennium Development Goals to Eradicate Extreme Poverty and Hunger, Vienna Declaration on Nutrition and Non-communicable Diseases in the Context of Health 2020, Declaration by European Health Ministers with WHO against Non-Communicable Diseases;*

Having *discussed the unique capacity of humans to reject and rectify these injustices that prevent all persons from having freedom from hunger and ready access to food that is healthy, safe, and sufficient;*

---

9 According to the FAO, 651 million or 80% of those suffering from hunger and undernutrition worldwide live in Southern Asia (276 million), Sub-Saharan Africa (214 million) and Eastern Asia (161 million) (www.fao.org/3/a-i4037e.pdf).

10 FAO, IFAD, WFP. *The State of Food Insecurity in the World 2014 Strengthening the enabling environment for food security and nutrition,* "Key messages", FAO, Rome 2014 (www.fao.org/3/a-i4030e.pdf).

*We **declare and propose** the following Milan Protocol to move toward a civilization oriented towards creating a sustainable future for planet and people where both exist and persist in harmony.*

Article 1: Scope

Each Party, in striving to adopt, promote and establish more sustainable consumption and production patterns, shall implement and/or further elaborate policies and measures in accordance to its national circumstances.

Parties will provide regular reports and estimates of current progress in a transparent and verifiable manner.

The undersigned commit to review and attend to the current and emerging societal needs on the most important issues linked to food and nutrition.

Foreseen actions include:

a) Commitments

1. First commitment: Food Waste

Parties commit to a 50% reduction by 2020 of the over 1.3 billion tons of edible food wasted by implementing the following actions:

a) Agree on a **common definition** of food loss and food waste;

b) Give priority to policies that aim to reduce food waste by addressing the **causes** of the phenomenon and follow a **hierarchy for the use of food**, since keeping track of the nature of food loss and waste is essential to eliminating hunger globally;

c) Recognize the positive contribution of **cooperation and long-term food chain agreements** (between farmers, producers, and distributors) to allow for better planning and projections of consumer demand;

d) Provide support to generate **awareness raising initiatives**, including from professionals in the food sector.

2. Second commitment: Sustainable Agriculture

Parties commit **to promote sustainable forms of agriculture and food production** in light of climate change and respect of natural resources, paying particular attention to environmental, agricultural and socioeconomic issues:

a) Biodiversity and agrobiodiversity;
b) Management of land, water and energy resources;
c) Climate mitigation and adaption;
d) Agricultural subsidies;
e) Welfare of farm animals;
f) Environmental impact;
g) Promotion of sustainable practices.

Parties commit to assign appropriate monetary and non-monetary values to ecosystem services and raw inputs into the system (such as water and energy) that are imbedded in food and used in food production.

Parties commit to limit global land conversion for biofuels, bioplastics or animal feed, while preserving the climate benefits of second generation biofuels.[11] To this end parties will explore techniques to use land both for food and non-food crops, for example with crop rotation, while limiting the use of food-based biofuels to 5% within national renewable energy targets.[12]
Parties commit to identify and propose legislation to regulate international financial speculation on commodities as well as land speculation and protect vulnerable communities from "land grabbing" by public and private entities, while reinforcing the right of local communities and native populations to access land.

a) Encourage **equal access to agriculture, production and markets** for indigenous, minority groups and women;

b) Set out a framework for **financial speculation** on commodities and the related price fluctuations in food markets to create conditions for better food security;

c) Establish rules **to guarantee land property rights globally** and end land grabbing.

---

11 European Union, European Commission, *Communication from the Commission to the European Parliament, the Council, The European Economic and Social Committee and the Committee of the Regions: A policy framework for climate and energy in the period from 2020-2030,* 22 January 2014, COM (2014) 15 final (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014DC0015&-from=EN). The assessment of how to minimize indirect land-use change emissions made clear that first generation biofuels have a limited role in decarbonization. The European Commission opted to focus on improving second and third generation biofuels and other alternative sustainable biofuels.

12 This target is consistent with the Commission proposal on Biofuels from October 2012, currently under discussion. European Union, European Commission, *Directive of the European Parliament and of the Council amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources.* 17 October 2014, COM (2012) 595 final (http://ec.europa.eu/clima/policies/transport/fuel/docs/com_2012_595_en.pdf).

3. Third commitment: Eradicate Hunger and Fight Obesity

Parties commit to eliminate hunger and undernutrition by implementing the following actions:

a) Following the new global paradigm for development, the Sustainable Development Goals,[13] to:

   I. Provide all populations with all-year access to adequate, safe and nutritious food;

   II. End undernutrition;

   III. Make food production systems more productive, efficient, sustainable and resilient;

   IV. Secure access for small food producers and youth.

b) Endeavour to **make equity intrinsic to economic** development;

c) **End cyclical and chronic undernutrition** through direct and indirect actions;

d) **Make undernutrition visible** as a preventable crisis.

Parties commit to halt the rise in obesity, ensuring that there is no increase in childhood overweight and no increase in adolescent and adult obesity by 2025[14] by implementing the following actions:

a) Promote a **culture of prevention** on the role of nutrition for health including amongst vulnerable populations and encourage responsible and healthy diets and lifestyles;

b) Encourage **physical activity** as a crucial component to a healthy lifestyle;

c) **Improve** food system governance.

---

13 The Sustainable Development Goals have replaced the Millennium Development Goals from 2015.

14 World Health Assembly Target from 2012. The target implies that the global prevalence of 7% among children should not rise to 9.1% in 2020 as per current trends, and that the number of overweight children under 5 years of age should not increase from the estimated 44 million in 2012 to approximately 60 million as forecast. WHO, *Global Nutrition Targets 2025, Childhood Overweight Policy Brief,* 2014 (www.who.int/nutrition/globaltargets_overweight_policybrief.pdf).

b) Exchange of information, research, and best practices

1. Each Party will cooperate with other parties to enhance the individual and combined effectiveness of policies and implications with regard to three central paradoxes;

2. Parties shall take steps to share experience and exchange information on best practices policies, measures, and campaigns;

3. Parties will pursue improvement of transparency and communication to enable comparison between policies;

4. Together in intent and separate in country, Parties will consider ways to facilitate global and regional cooperation.

Article 2: Preparatory phase

Each Party shall design and implement no later than one year after the initial preparatory phase a national system capable of addressing the three commitments identified in Article 1.

During a preparatory phase that shall last no longer than 12 months, the Parties shall develop practices and policies that do not, individually or jointly, aggravate or perpetuate the current crises and shall contribute constructively to their abolishment, namely by

1. Collecting and analysing knowledge and expertise to share pertinent and valuable information to other parties regarding but not limited to diet and food intake and purchasing habits, agricultural practices, and food waste;

2. Making available major opinions and national policy initiatives in food and nutrition, as well as prevailing recommendations, to improve life and overall wellbeing;

3. Identifying the fundamental actions and policies in several sectors including the environment, science, and the economy;

4. Defining a common methodology to measure results and progress.

Article 3: Guidelines for the commitments of Parties

For each commitment, Parties shall take the following guidelines into consideration:

1. First commitment: Food Waste

Parties will endeavour to reduce current food waste by 50% by 2020.[15] United in this goal, Parties will seek a common definition and methodology to quantify food waste to help harmonise food waste monitoring and practices. With regard to specific commitments:

a) **Parties shall build on the definitions of food loss and waste** provided by the Food and Agricultural Organisation (FAO) and improve them as appropriate;[16]

b) **Parties shall cooperate to develop international guidelines and standards for measuring food loss and waste**, in the context of ongoing efforts such as the Food Loss & Waste Protocol;[17]

c) **Parties shall give priority to avoiding food losses and waste by addressing their root causes,**[18] before directing focus to how best to dispose of waste.

---

15 This is the target indicated by the Food and Agricultural Organisation (FAO) and World Food Programme (WFP) for the revised global development paradigm of Sustainable Development Goals (SDGs) to succeed the Millennium Development Goals (MDGs) from 2015. FAO, IFAD, WFP. *Post 2015 Development Agenda: Targets and Indicators.* Rome: FAO, March 2014. P. 5. (www.fao.org/fileadmin/user_upload/post- 2015/Targets_and_indicators_RBA_joint_proposal.pdf). The European Parliament set this goal for the EU (with a different deadline of 2025) in their communication on food waste in 2012, which would be a reduction of 44.5 million tonnes (in 2012 89 million tonnes were wasted in the EU27). European Union, European Parliament, *European Parliament Resolution of 19 January 2012 on how to avoid food wastage: strategies for a more efficient food chain in the EU.* 19 January 2012. 2011/2175 (INI) (www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P7-TA-2012- 0014+0+DOC+XML+V0//EN).

16 FAO defines food loss as "a decrease in edible food mass throughout the part of the supply chain that specifically leads to edible food for human consumption". Food waste is defined as "food losses occurring at the end of the food chain appropriate for human consumption". All food originally meant for human consumption but which leaves the human food chain is considered food loss or waste, even if it is directed to a non-food use (feed or bioenergy).van Otterdijk, Robert and Alexandre Meybeck. *Global Food Losses and Food Waste.* Rome: FAO, 2011. P.2 (www.fao.org/fileadmin/user_upload/suistainability/pdf/Global_Food_Losses_and_Food_Waste.pdf).

17 The Food Loss and Waste Protocol of the World Resources Institute (WRI) is a multistakeholder effort to develop the global standard for measuring food loss and waste to enable countries, companies and other organisations to estimate in a credible, practical and consistent manner how much food is lost and wasted and identify where this occurs. Its development is coordinated by WRI in conjunction with Consumer Goods Forum, FAO, FUSIONS, UNEP, World Business Council for Sustainable Development, WRAP (www.wri.org/our-work/project/food-loss-waste-protocol).

18 One possibility to determining the causes of food losses and waste: the FAO has developed three

Waste reduction initiatives should respect a **hierarchy**, namely:

I. Prevention;

II. Reuse for human food intake;

III. Animal food intake;

IV. Energy production and composting.

Parties shall develop appropriate and targeted interventions to reduce food waste, taking into account the different role and responsibilities of the actors at each stage of the food supply chain:

I. Farmers and producers;

II. Post-harvest handling and storage companies;

III. Processing companies;

IV. Distribution: retailers, groceries, restaurants;

V. Consumers.

d) Parties shall endeavour to address the issue at every stage in the food chain, from producers to consumers to create a fully **informed chain** of actors wherein all have a responsibility in helping to reduce food waste:

I. Analysis to address the gap in knowledge regarding the shortcomings of the food supply chain from a resource efficiency perspective, with particular regard to production and distribution stages;

II. Cooperation between farmers as well as long-term vertical food chain agreements to allow for a better planning of consumer demand, both quantitatively and qualitatively;

III. Trainings for professionals in the food sector and for packaging designers, to incentivize the processing industry to market products that encourage households to reduce food waste;

---

different levels of the causes of food losses and waste: micro, meso, and macro as well as the solutions (such as investments, behavioural change, or valorization of food) most appropriate for each cause. High Level Panel of Experts on Food Security and Nutrition (HLPE), *Report 8: Food losses and waste in the context of sustainable food systems*, FAO, Rome 2014, 39-83 (www.fao.org/3/a-i3901e.pdf).

IV. Information-sharing among packaging designers to reduce food waste through the use of retail ready packaging and display pallets size and capacity to protect products and improve stock turnover for greater recoverability, reduced damage and less expiration before sale;

V. Education of consumers to show their role and insist on their accountability in the food waste problem. Explanation of the use-by and best-by dates of food products which have proved to be confusing, teach food planning, storage and preservation, and preparation of food leftovers.

e) Parties shall engage in immediate awareness raising measures to reduce food waste, including:

I. Analysis of the perceived value of food at the household stage and of the socio- economic impact associated with wasted food;

II. Development of reporting mechanisms and platforms to deliver data on food waste and assessment of progress made, including the pooling of best experiences and practices to encourage smart usage of the resources involved and nurture initiatives which prove effective;

III. Assessment of the impact of food and farm subsidies that lower prices and decrease consumer perception of food's value and increase food waste;

IV. Consider alternative economic models evaluated on their impact on human and environmental wellbeing rather than giving priority to traditional growth measures such as GDP;[19]

V. Incentive-based approaches given the emergency of the situation, including targets for food waste prevention and collection at local or national levels;

VI. Promotion of food education explaining how to preserve, cook, and dispose of foods, in order to address cultural causes of food waste.

---

19 The Urban Institute's "State of Society" shows how to measure economic success and human wellbeing, showing the drawbacks to considering only GDP. De Leon E., E. T. Boris, *The State of Society: Measuring Economic Success and Human Wellbeing,* The Urban Institute: 2014 (www.urban.org/uploadedpdf/412101-state-of-society.pdf).
The Sustainable Society Foundation (www.ssfindex.com/ssi/) talks about a Sustainable Society Index (SSI) that measures human and environmental wellbeing as integrated concepts and explains the limitations of GDP. The SSI measures human, environmental, and economic wellbeing for a holistic picture of societal health beyond economics.

2. Second commitment: Sustainable Agriculture

a) Parties shall engage in the promotion of **sustainable agriculture**, understood as the efficient production of safe, healthy and high quality agricultural products, in a way that is environmentally, economically and socially sustainable. Parties will do this by protecting the natural environment and its resources and mitigating climate change, by improving the social and economic conditions of farmers, employees and local communities, and by safeguarding animal welfare for all farm species. Parties shall advocate for productive and resource-efficient farming that is adapting to climate change and able to mitigate its most negative impacts, taking into account the specificities of different farming systems in terms of size, models, inputs, technology and sustainable longevity.

Parties shall agree on global sustainability targets in the following environmental, agricultural and socioeconomic areas:

I. Biodiversity and Agro-biodiversity
Parties will make biodiversity a priority in in accordance with renewed international focus on biodiversity enshrined in the Gangwon Declaration on Biodiversity,[20] defined as[21] all components of biological diversity relevant to production (variety and variability of plants, animals, and microorganisms at genetic species and ecosystem levels) that contributes to stability and resilience. In this regard, Parties will consider diverse ownership of the germplasm to prevent the monopolization of international corporations, traditional and appropriate crop choice, traditional agricultural knowledge, and the importance of genetic biodiversity and associated biodiversity that support agricultural production through nutrient cycling, pest control and pollination. Special attention will be given to diversity within and between habitats and at the landscape level for its contribution in providing alternative food sources for beneficial insects and natural enemies of crop pests.

II. Management of land, water and energy resources
Parties will use Green Accounting and Virtual Water and other effective multicriteria tools to estimate the monetary and non-monetary value of ecosystem services under different scenarios and in light of the precautionary principle to maximise system resilience. Parties will modify current subsidy systems to account for these values and scenarios and promote food and water security accordingly.

---

20 Gangwon Declaration on Biodiversity for Sustainable Development, 2014 (www.cbd.int/hls-cop/gangwon-declaration-hls-cop12-en.pdf).

21 CBD (Convention on Biological Diversity), *Programme of Work on Agricultural Biodiversity,* Decision V/5 of the Conference of the Parties to the Convention on Biological Diversity, May 2000, Nairobi: Convention on Biological Diversity (www.cbd.int/decision/cop/default.shtml?id=7147).

III. Climate mitigation and adaptation
Parties will implement agricultural practices to benefit decarbonisation and adapt to the constraints of climate change, such as carbon sequestration.

IV. Agricultural subsidies
Parties shall work to reform agricultural subsidies to consider not only farmers' production capacity but also the degree to which their agricultural methods and local materials are sustainable to preserve and enhance the multiple services provided by agriculture. 150 million of the hungry people live in developed countries. Subsidies to support GMO products or convert 30% of US-American corn to the biofuel ethanol only exacerbate problems of insufficient food.

V. Welfare of farm animals
Parties will strive to take into account the five freedoms[22] with farm animals and consider other husbandry methods which are more sustainable (such as land-based extensive systems coupled with rotational crop farms, in terms of resource depletion (water, grain-based feed, energy) and protect against climate change, biodiversity loss, disease and food insecurity, while helping to avoid needless farm animal suffering.[23]

VI. Environmental impact
Parties will encourage the development of global indicators measuring the economic, environmental and social performance of different farming systems (for example, with or without pesticides or fertilizers or with or without crop rotation, irrigation methods) and their impact on global sustainability targets. This includes an assessment of new technologies on their impacts and long-term sustainability.

VII. Education
Parties shall invest in the human capital of farmers as stewards of the land, educating them about the economic and environmental benefits of sustainable agriculture.

---

22 The Farm Animal Welfare Committee (FAWC) established the 'five freedoms' (www.gov.uk/government/groups/farm-animal-welfare-committee-fawc#assessment-of-farm-animal-welfare-five-freedoms) in 1979, recognized worldwide by animal welfare organisations. The five freedoms are:
1. Freedom from Hunger and Thirst
2. Freedom from Discomfort
3. Freedom from Pain, Injury or Disease
4. Freedom to Express Normal Behaviour
5. Freedom from Fear and Distress

23 Compassion in World Farming evidence shows that factory farming is not "just bad for farm animals" but has harmful impacts: climate change, biodiversity loss, disease, food insecurity (www.ciwf.org.uk/factory- farming/).

b) Parties shall revise their use of **biofuels and industrial uses such as bioplastics** in congruence with sustainability as an essential condition for their long-term viability, given the potential adverse effects of biofuels on food prices, the global food supply and access to food particularly for poor families and climate change mitigation.

Parties commit to:

I. Limit the portion of first generation biofuels from food crops in national renewable energy targets to 5%;

II. Investigate the merits of relaxing or suspending biofuel mandates especially at times of agricultural price pressures.

c) Parties shall **endeavour to review the allocation of the supply of food for animal feed** by considering other ways for feeding animals, considering security and access to food as primary concerns.

Parties commit to:

I. Consider more sustainable ways to feed animals such as pasture, grazing crops, agro-byproducts (even from biofuel crops) or food waste;

II. Reduce the use of antibiotics to a minimum to avoid resistance to antibiotics and/or threats to human health.

d) Parties shall encourage equitable and sustainable access to and sharing of natural resources (including animal and plant genetic resources) and their management. To do so, access must be secured for small food producers, especially women, to adequate and diverse planting materials, education, inputs, knowledge, productive resources, markets, infrastructure, revenues and services. These producers are central to new partnerships for a hunger free world.

e) Parties shall endeavour to end land grabbing and ensure land property rights, especially in middle and low income countries where between 50 and 80 million hectares of land have been acquired by international investors.[24] To this end, Parties shall strive to identify and record ownership and use of land.

f) Parties shall endeavour to increase transparency on the food market and work on a regulatory framework for **financial speculation** on food commodities in the food market.

---

24 High Level Panel of Experts on Food Security and Nutrition (HLPE), *Report 2: Land tenure and international investments in agriculture.* FAO, Rome 2011 (www.fao.org/fileadmin/user_upload/hlpe/hlpe_documents/HLPE-Land-tenure-and-international- investments-in-agriculture-2011.pdf).

Parties shall pressure regulators to introduce caps on the number and size of bets speculators can make, in order to curb excessive speculation as well as to improve transparency by ensuring that all future contracts are cleared through regulated and transparent exchanges.

Parties shall endeavour to limit the amount of food commodities that can be traded. This involves familiarising banks, pension funds and insurers with the issue, so that they might phase-out and refrain from financial speculation on staple foods. Such speculation threatens the human right to food.

3. Third commitment: Eradicate Hunger and Fight Obesity

a) Parties commit **to end hunger and undernutrition and the associated fatalities** as per the SDGs**,** the new global development paradigm and successor to the MDGs. Despite the approaching MDG deadline of 2015, 1 in 8 people worldwide remain hungry and progress has been uneven within and across countries. The SDGs are in development, but the Food and Agriculture Organisation (FAO) and World Food Programme (WFP) have revealed targets for food security and nutrition that will influence the set of SDGs. Parties to the Protocol will strive to:

I. **Observe the Human Right to Food and provide access to adequate food** all year round for all people;

II. **End undernutrition in all its forms** with particular attention to stunting;

III. **Make food production systems more productive, efficient, sustainable and resilient** beyond simply increasing production. More food does not mean better nutrition.

b) One of the many causes of hunger and undernutrition is poverty,[25] alongside political instability, perennial conflicts, lack of infrastructure and the impossibility many poor countries face to properly and fairly profit from trade or natural resources. Eliminating hunger is one way to unlock the potential of people, communities and nations, Parties will endeavour to **make equity intrinsic to economic growth and protect families from poverty.**

---

25 According to the World Bank, the poorest children in the poorest countries are two times more likely to suffer from chronic undernutrition than their richest counterparts, and 2-3% of national income can be lost to undernutrition. Measures to combat undernutrition will therefore pay for themselves (http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTHEALTHNUTRITIONANDPOPULATION/EXTNUTRITION/0,,contentMDK:20187633~menuPK:282580~pagePK:148956~piPK:216618~theSitePK:282575,00.html).

c) With regard to cyclical undernutrition, parties commit to end **seasonal hunger—**a predictable gap wherein food stocks are exhausted before new harvests become available—which causes life-threatening undernutrition. Seasonal food insecurity is invisible to poverty economics based on annual data. This can be mitigated through technology, seasonal employment programmes, agricultural diversification or investments in infrastructure.

d) With regards to undernutrition, Parties will engage in direct and indirect interventions, such as micronutrient supplements, water sanitation, recruitment to fill a shortage of at least 3.5 million health professionals, or fortification of staple foods. Parties will use the market influence on production and diet choices to address undernutrition and offer social protection for populations suffering from hunger or undernutrition not because there is no nutritious food available but because they cannot afford to buy it.

e) Parties **will make undernutrition visible** as a preventable crisis**.** Building up the profile of the crisis will lead to political momentum to galvanize change. To date it is a hidden killer that does not appear on death certificates and releases governments from the responsibility of preventing these deaths.

f) Parties **commit to halt the rise in obesity and overweight by facilitating scientific research** on nutrition topics in reference to eating patterns and their impact on health and to disseminate their findings, including on the linkages between people's diets and environment, health and nutrition outcomes. This includes levels of physical activity, micro biome of the gut, socioeconomic status and the onset of chronic diseases and/or overnutrition and the metabolic and endocrine effects related to international guidelines for a healthy and sustainable diet,[26] such as the Mediterranean model.

g) Parties commit to address gaps in the **food system governance** in different national contexts:

I. Promote healthy choices through consumer-friendly nutrition information;

II. Increase food and health literacy among population, including through long-term awareness campaigns;

---

26 The FAO defines sustainable diets as "those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources." FAO: *International Scientific Symposium Biodiversity and Sustainable Diets United Against Hunger,* FAO, Rome 2010 (www.fao.org/ag/humannutrition/23781-0e8d8dc364ee46865d5841c48976e9980.pdf).

III. Provide evidence that healthy and sustainable diets are affordable diets;

IV. Account for socioeconomic inequality in homes, schools, hospitals, workplaces and schemes to encourage healthy eating in these settings;

V. Limit advertising and aggressive marketing to children for high energy, saturated fats, trans fatty acids, free sugars or salty foods;

VI. Support surveillance, monitoring, evaluation and research of the population's nutritional status and behaviours

h) Parties shall develop a **physical activity** strategy for different age groups at local and community level in conjunction with high risk diet information. Programmes shall be formulated with a long-term horizon to allow interventions to have the necessary impact on targeted populations. They could include awareness raising activities, increasing mandatory physical education in schools, and financial incentives on sports equipment or fitness programmes, as appropriate.

Parties shall encourage the creation of public-private initiatives to bridge the knowledge gap on the relationship between diet and health, especially with regard to the years of childhood and adolescence.

Article 4: Establishment of a Governing Body and Secretariat for the Protocol

The governance of the Protocol is overseen by a Governing Body elected and nominated by the fellow signatories to the Protocol. The duties of this body include:

a) Acting as depositary of the Protocol

b) Transmittance of any draft amendments to all Parties six months prior to prospective adoption

c) Gathering of information regarding the methods for implementing Party commitments regarding particular success, failure, and progress. This includes overall effects of the measures taken as well as the estimated cumulative impact on the three paradoxes

d) Routine distribution of information on measures adopted by the Parties, taking into account the differing circumstances, responsibilities and capabilities of the Parties.

1. Promote and guide the development and refinement of comparable methodologies to determine best practices for the most effective implementation of this Protocol.

2. Seek to utilize and reincorporate external information and services from cooperative competent international organizations, nongovernmental and intergovernmental bodies.

The Governing Body and Secretariat is elected for a term of two years. The body shall be replaced in case of need to cede duties or if resignation is demanded by a majority of the Parties. The Governing Body and Secretariat shall be replaced by an additional member elected by and from amongst the remaining Parties of the Protocol.

Article 5: Provisions for Joint Action with Parties External to Protocol

The Protocol Parties acknowledge that external parties including non-governmental organisations, civil society and industry bodies may be helpful cooperative partners for joint action. The Protocol encourages these projects, as these partners are stakeholders and advocates for the common goal. Only by addressing the paradoxes together and from several angles can Parties effectively fight the crisis. Therefore Parties acting in the framework of and together with regional or international organizations are free to continue to fulfil commitments established in those partnerships independent from the Milan Protocol.

Parties maintain however an obligation to inform: Parties must inform other Parties as to the terms of the agreement (duration, participants, and goals) and update routinely, especially to discuss fruitful or failed practices so that other Parties may benefit from knowledge and experience acquired. This ensures that positive developments and methods can be shared across the Protocol Parties and identifies potential partners for the common goal.

Article 6: Amendments

Any individual Party or group of Parties may propose amendments to the Protocol text.

Proposed amendments shall be communicated to Governing Body and Secretariat of the Protocol which will transmit the proposed change to the Parties. Amendments are tabled for a minimum six months before being eligible for adoption.

Amendments are adopted by consensus. If efforts at consensus are exhausted, amendments can be adopted by three-fourths majority vote by the Parties. Each Party disposes of one vote.

Amendments enter into force 90 days after adoption via consensus or vote.

Article 7: Withdrawal Clause

At any time in the three year from the date of entry into force of this Protocol, any Party may withdraw from this Protocol via provision of written notification Secretariat and Governing body of the Protocol.

Article 8: Protocol Entry into Force

The Protocol shall be open for signature and therefore acceptance or approval by participating states at EXPO Milano 2015 under the auspices of BIE. It shall be open for signature throughout the course of the Exposition from DAY of MONTH two thousand and fifteen to DAY of MONTH two thousand and fifteen in Milan.

The Protocol is open for accession beginning with the day following this signature period, DAY of MONTH two thousand fifteen.

ANNEX I – GLOSSARY OF TERMS

Biodiversity or Biological Diversity: the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part, including diversity within species, between species and of ecosystems.[27]

Body Mass Index: is a measure of body fat based on height and weight that applies to adult men and women. Body mass index (BMI) = kg/m^2. It is commonly used to classify obesity (BMI greater than or equal to 30) or overweight (BMI 25 – 29.9).[28]

Carbon sequestration: describes both natural and deliberate processes by which Carbon Dioxide (CO_2) that would otherwise be emitted or remain in the atmosphere is removed from the atmosphere or diverted from emission sources and captured and stored long term in the ocean, terrestrial environments, and geologic formations.[29]

Chronic undernutrition: or **stunting** is a form of growth failure occurring over time. Individuals who are stunted or suffer from chronic undernutrition often appear normally proportioned but are actually shorter or weigh less than is normal for his/her age. Stunting starts before birth and is caused by poor maternal nutrition, poor feeding practices, poor quality as well as frequent infections which can slow growth.[30]

Climate adaptation: anticipating the adverse effects of climate change and taking appropriate action to prevent or minimise the damage they can cause, or taking advantage of opportunities that may arise. Well planned, early adaptation saves money and lives.[31]

Climate mitigation: refers to efforts to reduce or prevent greenhouse gas emissions. Mitigation can mean using new technologies and renewable energies, making older equipment more energy efficient, or changing management practices or consumer behaviour.[32]

---

27 United Nations. *Convention on Biological Diversity: Article 2 – Use of Terms,* United Nations, 1992 (www.cbd.int/doc/legal/cbd-en.pdf).

28 The World Health Organisation, *Fact Sheet N° 311.* WHO, August 2014 (www.who.int/mediacentre/factsheets/fs311/en/).

29 US Department of the Interior Geological Survey, *Carbon Sequestration to Mitigate Climate Change: Fact Sheet 2008-3097.* USGS, 2008 (http://pubs.usgs.gov/fs/2008/3097/pdf/CarbonFS.pdf).

30 UNICEF. *Harmonized Training Package: Resource Material for Training on Nutrition in Emergencies, Lesson 2.3* UNICEF, 2011 (www.unicef.org/nutrition/training/2.3/20.html).

31 European Commission, DG Climate Action. *Adaptation to Climate Change.* European Commission, 2014 (http://ec.europa.eu/clima/policies/adaptation/index_en.htm).

32 United Nations Environment Programme. *Climate Change Mitigation,* UNEP (www.unep.org/climatechange/mitigation/Home/tabid/104335/Default.aspx).

Consumption: the term consumption is not synonymous with "food intake" but refers to all forms of use, i.e. food, feed, seed and industrial use as well as losses and waste.[33]

Cyclical undernutrition: or **seasonal food security** falls between chronic and transitory food insecurity. It is usually predictable and occurs when there is a cyclical pattern of inadequate availability and access to food associated with seasonal fluctuations in the climate, cropping patterns, work opportunities (labour demand) and disease. It is often not captured in statistics.[34]

Decarbonisation: the transition to a low carbon economy to meet targets in limiting emissions or climate change. Decarbonisation requires a transformation of mid-century energy systems through declines in carbon intensity in all sectors of the economy, for example through development and diffusion of low carbon technologies.[35]

Ecosystem services: are the benefits people obtain from ecosystems, including provisioning services such as food and water, regulating services such as flood and disease control, cultural services such as spiritual, recreational and cultural benefits, and supporting services such as nutrient cycling that maintain the conditions for life on earth.[36]

EU Water Framework Directive: a directive of the European Union that established a framework for EU action in the field of water policy, committing EU Member States to achieve good qualitative and quantitative status (inter alia biological quality, chemical quality, physical- chemical quality) of all water bodies by 2015.[37]

Financial speculation of commodities: banks, hedge funds and pension funds betting on food prices in financial markets can create instability and push up global food prices in staple foods such as wheat, maize and soy. Deregulation of market enables speculators free reign which can lead to dramatic spikes and crashes.[38]

---

33 Alexandratos, Niko and Jelle Bruinsma. *World Agriculture Towards 2030/2050.* FAO, 2012, P. 3 (www.fao.org/fileadmin/templates/esa/Global_persepctives/world_ag_2030_50_2012_rev.pdf).

34 Food and Agriculture Organisation of the United Nations. *An Introduction to the Basic Concepts of Food Security,* EC – FAO Food Security Programme, 2008 (www.fao.org/docrep/013/al936e/al936e00.pdf).

35 Institute for Sustainable Development and International Relations. *Pathways to deep decarbonization.* Sustainable Development Solutions Network (SDSN), Sept. 2014 (http://unsdsn.org/wp-content/uploads/2014/09/DDPP_Digit_updated.pdf)

36 United Nationals Environment Programme. *Ecosystems and Human Wellbeing, Chapter 2: Ecosystems and their Services,* UNEP, 2005 Pp. 49-70 (www.unep.org/maweb/documents/document.300.aspx.pdf).

37 European Union, European Commission, *Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy.* European Commission, 23 October 2000 (http://eur-lex.europa.eu/resource.html?uri=cellar:5c835afb-2ec6-4577-bdf8-756d3d694eeb.0004.02/DOC_1&format=PDF).

38 World Development Movement. *Food Speculation: What is the Problem?* (www.wdm.org.uk/stop-bankers-betting-food/what-problem).

First-generation biofuels: refer to fuels that have been derived from sources like starch, sugar, animal fats, and vegetable oil. First-generation fuels are produced directly from food crops. The structure of the fuel does not change between generations, rather the source from which the fuel is derived. Corn, wheat and sugar cane are the most commonly used first generation biofuel feedstock.[39]

Food Loss: refers to edible parts of plants and animals that are produced or harvested for human intake but are not ultimately eaten by people. In particular, food loss refers to food that spills, spoils, incurs and abnormal reduction in quality such as bruising or wilting, or otherwise gets lost before it reaches the consumer.[40] Food Loss requires technical interventions to improve *inter alia* harvesting, storage and transport.

Food Security: the World Food Summit of 1996 defined food security as existing when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life. The concept of food security includes both physical and economic access to food that meets people's dietary needs as well as their food preferences.[41]

Food Waste: refers to edible parts of plants and animals that are produced or harvested for human intake but are not ultimately eaten by people. In particular, food waste refers to food that is of good quality and fit for human intake but that does not get eaten because it is discarded—either before or after it spoils. Food waste is the result of negligence or the conscious decision to throw food away.[42] Food waste mitigation requires behaviour and policy interventions.

Green accounting: or **environmental accounting** is a tool to understand the role played by the natural environment in the economy, a set of aggregate data linking the environment to the economy. Environmental accounts provide data to highlight the contribution of natural resources to economic well-being and the costs imposed by pollution or resource degradation.[43]

---

39 Biofuel.org.uk. *First-generation Biofuels.* Biofuel.org.uk, 2010 (http://biofuel.org.uk/first-generation- biofuel.html).

40 Lipinski B., C. Hansen, J. Lomax, L. Kitinoja, R. Waite, T. Searchinger, *Installment 2 of "Creating a Sustainable Food Future": Reducing Food Loss and Waste,* World Resources Institute, June 2013. P. 1 (www.wri.org/sites/default/files/reducing_food_loss_and_waste.pdf).

41 World Health Organisation. *Glossary: Food Security.* WHO, 2014 (www.who.int/trade/glossary/story028/en/).

42 Lipinski B., C. Hansen, J. Lomax, L. Kitinoja, R. Waite, T. Searchinger, *Installment 2 of "Creating a Sustainable Food Future": Reducing Food Loss and Waste,* World Resources Institute, June 2013. P. 1 (www.wri.org/sites/default/files/reducing_food_loss_and_waste.pdf).

43 Hecht J., *Environmental Accounting: What's it all about?*, The World Conservation Union (IUCN), Washington DC, 1997 (www.unpei.org/sites/default/files/PDF/budgetingfinancing/Environmental-accounting.pdf).

Gross Domestic Product (GDP): GDP measures the monetary value of final goods and services produced in a country in a given period of time. It has become widely used as a reference point for the health of national and global economies.[44]

Hunger: A state, lasting for at least one year, of inability to acquire enough food, defined as a level of food intake insufficient to meet dietary energy requirements.[45]

International Exposition 2015: International event sanctioned by the Bureau of International Expositions referring to the largest class of exhibitions of 3 to 6 months' duration. The International Exposition 2015 ("EXPO 2015") will take place in Milan, Italy from May – October 2015 and will host over 140 national and regional pavilions and expositions. The theme of EXPO 2015 is "*Feeding the Planet, Energy for Life.*"[46]

Land-grabbing: large scale land acquisitions (purchases, leases or other), legal or illegal, international or national (although there is a dominance of private sector, foreign investment land acquisitions). Recent years have seen an increase in the size of single acquisitions. Important to monitor as land is so important to identity, livelihoods and food security. The growing scrutiny of land deals creates pressure for a more measured and multifaceted approach on the part of investors and governments.[47]

Millennium Development Goals (MDGs) to Eradicate Extreme Poverty and Hunger: the eight MDGs range from halving extreme poverty rates to halting the spread of HIV/AIDS to ending hunger or ensuring environmental sustainability form a blueprint agreed to by nations and leading development institutions.[48]

Obesity: defined as abnormal or excessive fat accumulation that may impair health. Body mass index (BMI) is a simple index of weight-for-height (BMI = kg/m^2) that is commonly used to classify obesity in adults. The World Health Organisation classifies individuals with a BMI greater than or equal to 30 as obese.[49]

Overweight: defined as abnormal or excessive fat accumulation that may impair health. Body mass index (BMI) is a simple index of weight-for-height (BMI = kg/m^2) that is

---

44 Callen T., *Gross Domestic Product: An Economy's All.* IMF, March 2012 (www.imf.org/external/pubs/ft/fandd/basics/gdp.htm).

45 Food and Agriculture Organisation of the United Nations. *The FAO Hunger Map 2014.* FAO, 2014 (www.fao.org/hunger/en/?fb_locale=ja_JP).

46 EXPO 2015 (www.expo2015.org/it).

47 Cotula L., S. Vermeulen, R. Leonard, J. Keeley, *Land grab or development opportunity? Agricultural investment and international land deals in Africa,* FAO, IIED, IFAD, Rome 2009 (www.fao.org/3/a-ak241e.pdf).

48 United Nations. *United Nations Millennium Declaration.* UN, 18 Sept 2000 (www.un.org/millennium/declaration/ares552e.pdf).

49 The World Health Organisation, *Fact Sheet N° 311,* WHO, August 2014 (www.who.int/mediacentre/factsheets/fs311/en/).

commonly used to classify obesity in adults. The World Health Organisation classifies individuals with a BMI greater than or equal to 25 as overweight.[50]

Second-generation biofuels: also known as advanced biofuels, the feedstock used to produce second generation biofuels are generally not food crops. The only time food crops can act as second generation biofuels is when they have already fulfilled their food purpose.[51]

Sustainable Development Goals (SDGs): the proposed framework for sustainable development succeed the Millennium Development Goals (MDGs) beyond the 2015 MDG target date. At the Rio+20 Conference, States agreed that the SDGs must inter alia build on commitments already made, be action oriented, easy to communicate, global in nature, aspirational, and universally applicable to all countries.[52]

Sustainable Diet: The FAO defines sustainable diets as those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources.[53]

Undernutrition: Proportion of the population whose dietary energy intake is less than a pre-determined threshold. This threshold is country specific and is measured in terms of the number of kilocalories required to conduct sedentary or light activities. Those with undernutrition are also referred to as suffering from food deprivation. Undernutrition is the outcome of poor absorption and/or poor biological use of nutrients eaten as the result of repeated infectious disease. It includes stunting, wasting, and micronutrient malnutrition (deficiencies in vitamins and minerals).[54]

Vienna Declaration on Nutrition and Non-communicable Diseases in the Context of Health 2020: Signed in 2013, the Declaration contains 18 commitments signed by Health Ministers seeking to face the challenges posed by the burden and threat of

---

50 The World Health Organisation. *Fact Sheet N° 311,* WHO, August 2014 (www.who.int/mediacentre/factsheets/fs311/en/).

51 Biofuel.org.uk, *First-generation Biofuels.* Biofuel.org.uk, 2010. (http://biofuel.org.uk/first-generation-biofuel.html).

52 United Nations Sustainable Development Knowledge Platform, *Sustainable Development Goals: Open Working Group Proposal for Sustainable Development Goals* (http://sustainabledevelopment.un-.org/index.html).

53 FAO, *International Scientific Symposium Biodiversity and Sustainable Diets United Against Hunger,* FAO, Rome 2010, P. 1 (www.fao.org/ag/humannutrition/23781-0e8d8dc364ee46865d5841c48976e9980.pdf).

54 Food and Agriculture Organisation of the United Nations, *An Introduction to the Basic Concepts of Food Security.* FAO Food Security Programme, 2008 (www.fao.org/docrep/013/al936e/al936e00.pdf).

noncommunicable diseases (NCDs) and reaffirm commitment to existing European and global frameworks to address risk factors, notably unhealthy diet and physical inactivity.[55]

Virtual Water: is the amount of water that is embedded in food or other products needed for its production. For example, the production of one kilogram of wheat requires 1.000 litres of water. For meat, we need 5 to 10 times more.

55 World Health Organisation Europe. *Vienna Declaration on Nutrition and Noncommunicable Diseases in the Context of Health 2020.* WHO, July 2013 (www.euro.who.int/ data/assets/pdf_ file/0003/234381/Vienna-Declaration-on-Nutrition-and- Noncommunicable-Diseases-in-the-Context-of-Health-2020-Eng.pdf?ua=1).

ANNEX II – SIGNATORIES

Organizations and Institutions

ACCADEMIA NAZIONALE DI AGRICOLTURA
ACRI – Associazione di Fondazioni e di Casse di Risparmio SpA
AGGIORNAMENTI SOCIALI
AIDEPI
ALLEVAMENTO ETICO
ALMA La Scuola Internazionale di Cucina Italiana
ANBI Associazione Nazionale Consorzi di Tutela Gestione Territorio e Acque Irrigue
ANGEM Ass. Naz. Ristoraz. Collettiva
ARTE DA MANGIARE MANGIARE L'ARTE (AMMA)
AVRDC – The World Vegetable Center
BANCO ALIMENTARE
BARILLA
BIOVERSITY INTERNATIONAL
CENTRO CULTURALE SAN BENEDETTO – MONASTERO DI SILOE
CEREALIA – Il festival dei cereali
CESVI
CHEP Italia
CiBi
CIC – Consorzio Irrigazioni Cremonesi
CIWF – Compassion in World Farming
CNAPPC – Consiglio Nazionale Architetti, Pianificatori, Paesaggisti e Conservatori
COLDIRETTI
COMIECO
COMUNE DI FORMIGINE
COMUNE DI PARMA
COMUNE DI ROSIGNANO MARITTIMO
CONFAGRICOLTURA
CONFCONSUMATORI
CONSIGLIO NAZIONALE DEL NOTARIATO
COOP
COSTA CROCIERE
EATALY
EAT RESPONSIBLE
EDENRED Italia
ENEA
EPODE International Network (EIN)
FCRN – FOOD CLIMATE RESEARCH NETWORK
FINDUS
FISPMED ONLUS
FONDAZIONE AIUTARE I BAMBINI

FONDAZIONE BARILLA CENTER FOR FOOD & NUTRITION
FONDAZIONE CASSA DI RISPARMIO DI FOSSANO
FONDAZIONE MONTE DEI PASCHI DI SIENA
FONDAZIONE SANTA CHIARA Onlus
FONDAZIONE UNIVERDE
FOODTANK
GIOCAMPUS
GIUNTI EDITORE
GLOBAL WATER FUND
GREEN INNOVATION
GRUPPO GABRIELLI
GLI – GUSTOLAB INTERNATIONAL INSTITUTE FOR FOOD STUDIES
iFREEZE
INTERNATIONAL UNION OF NOTARIES
JAMIE OLIVER FOOD FOUNDATION
JEREMY COLLER FOUNDATION
LEGAMBIENTE
LIMES
LINK 2007 Cooperazione in Rete
MADEGUS – Maestri del Gusto
MOIGE
NATIONAL GEOGRAPHIC ITALIA
NUTRAID
ORICON Osserv. Ristoraz. Collettiva
ORTICULTURA
TA – ordine dei tecnologi alimentari Lombardia e Liguria
OSPEDALE LUIGI SACCO MILANO
QUI FOUNDATION
REGGIO CHILDREN
RURALIA – Associazione Italiana per il Recupero Unitario delle Realtà Agricole e dei Luoghi
SATISFEITO
SAVE THE CHILDREN
SLOW FOOD
STOP HUNGER NOW
STOP WASTING FOOD
TONIC NETWORK BENESSERE
TULLI Cereal Culture
TRUE FOOD ALLIANCE
UNAFPA
UN'ALTRA IDEA DI MONDO – Associazione
UNIMPRESA
UNIVERSITÀ DEGLI STUDI DI PARMA
UPI – Unione Parmense degli Industriali

WASTED FOOD
WISE SOCIETY
WWF

Experts and Opinion Makers

Miguel Altieri – Professor, University of California
Molly D. Anderson – Partridge Chair in Food & Sustainable Agriculture Systems, College of the Atlantic
Paolo Bartolozzi – Former Member, European Parliament
Jonathan Bloom – Journalist
Renata Briano – Member and Vice-Chair of the Fisheries Committee, European Parliament
Daniel Chamovitz – Director, Manna Center for Plant Biosciences
Paolo De Castro – Member and Coordinator of the Progressive Alliance of Socialists and Democrats in the Agriculture Committee, European Parliament
Herbert Dorfmann – Member, European Parliament
Adam Drewnowski – Director, Center for Public Health Nutrition and Professor of Epidemiology, School of Public Health, University of Washington
Carlo Fadda – Senior Scientist, Biodiversity University
Charles Feldman – Associate Professor, Montclair State University
Kim M. Gans – Director, Community Health Promotion
Tara Garnett – Environmental Change Institute, University of Oxford
Mario Giampietro – Research Professor, ICREA
Tiziano Gomiero – Institute of Environmental Science and Technology (ICTA), Universitat Autonoma de Barcelona
Selina Juul – Founder, Stop Spild Af Mad
Patrizia La Trecchia – Professor, University of South Florida
Jan Lundqvist – Professor, Stockholm International Water Institute (SIWI)
Ruth Oniang'o – Professor, Rural Outreach Africa
Massimo Paolucci – Member, European Parliament
Aldo Patriciello – Member, European Parliament
Barry M. Popkin – Distinguished Professor of Nutrition, University of North Carolina
Steven Satterfield – Chef and co-owner, Miller Union
Mauro Serafini – Head of the Functional Foods and Metabolic Stress Prevention Laboratory, CRA
Stella Thomas – Founder and Managing Director, Global Water Fund
Duncan Williamson – Food Policy Manager, WWF UK

YOUTH MANIFESTO ON FOOD, PEOPLE AND PLANET

These words are for you. For you, and anyone who calls planet Earth home. For you, policymaker. You, farmer. You, educator. You, businessperson, journalist, activist, or researcher. They are for you, citizen.

"I appeal to all people, everywhere, to raise their voice.
Speak out on behalf of this planet, our only home.
Let us care for Mother Earth so she can continue to care for us,
as she has done for millennia."[1]

The planet-people-food relationship is broken.

People go to bed hungry, but still we waste food. People are starving, but obesity levels are rising. Meanwhile, unsustainable farming pushes the environment to the limit.

We all must take responsibility for the wellbeing of our common home and shared future.

We come today from all over the world, willing to propose concrete recommendations for the global challenges facing planet, people and food.

We are the future policymakers, farmers and educators. We are the future journalists, activists, businesspeople and researchers.

When world leaders talk about the consequences of hunger, food waste, poor nutrition, and unsustainable agriculture for future generations, they are talking about us. They are deciding for us. As future leaders, we want to be part of that conversation and we want to be part of the solution.

This Youth Manifesto is our contribution to the Milan Charter, cultural legacy of EXPO 2015, inspired by civil society's Milan Protocol. It proposes a new approach to food sustainability for a healthier planet and healthier people.

The Manifesto represents our commitment to work for a more sustainable tomorrow beyond EXPO 2015. It's not too late to create the world we imagine.

---

1 Ban Ki-Moon, United Nations Secretary General.

We call on policymakers, farmers, educators, businesspeople, journalists, activists and researchers of every nation to raise their voices with us. We will need each one of you to join forces and act to solve this crisis together.

TODAY WE ARE THE YOUNG GENERATION, TOMORROW, WHEN WE BECOME...

Policymakers, *we will:*

Move away from a purely economic cost-benefit analysis by considering carefully the environmental, social, health and cultural impacts of policies when designing and adopting legislation.

Farmers, *we will:*

Bring young people back to farming, this profession that feeds us all. Work with governments for better access to land and urban spaces, to financing, and to appropriate methods to empower a new generation of farmers.

Educators, *we will:*

Commit to teaching all children about the relationship that connects food, people, health and the planet by making food, nutrition and agriculture education mandatory in school curricula around the world.

Food industry businesspeople, *we will:*

Lead by example by creating sustainable supply chains, supporting farmers and making available healthy products that inspire consumers to adopt sustainable living.

Journalists, *we will:*

Bring recognition to the importance of fact-based media coverage of hunger, food, obesity, nutrition, and agriculture with the "Foodlitzer," an international award for excellence in independent reporting on sustainability issues.

Activists, *we will:*

Advocate that food and agriculture corporations provide a seat on their boards to include our perspectives. This will create new spaces for activist-business cooperation, for example in sustainable agriculture, food waste reduction and healthier product composition.

Researchers, *we will:*

Deliver unbiased open data in a way that connects multiple disciplines to make complicated concepts about food, agriculture and nutrition understandable, accessible, and exploitable.

HELP US MAKE THIS HAPPEN

This book is printed on FSC forest friendly paper.
The FSC logo identifies products which contain paper from forests
managed according to strict environmental,
economic, social standards defined by the Forest Stewardship Council.

EATING PLANET

FOOD AND SUSTAINABILITY: BUILDING OUR FUTURE

Global food system's sustainability is a worldwide challenge. To reach it means dealing with an extremely complex system, where traditional cultures interact with profound changes of food and consumption models. Impacts on health go hand in hand with those on ecosystems and inequalities of access to food risk being exacerbated by the effects of climate change.

This new edition of *Eating Planet* is a collection of the most recent developments of the debate and research on the four large areas characterizing **Barilla Center for Food & Nutrition's** approach: "Food for All", "Food for Sustainable Growth", "Food for Health", "Food for Culture", with the contribution of a network of prestigious experts and opinion leaders: **Pavan Sukhdev, Gianfranco Bologna, Barbara Buchner, Paolo De Castro, Danielle Nierenberg, Paul Roberts, Carlo Petrini, Riccardo Valentini, Hans R. Herren, Tony Allan, Ricardo Uauy, Sara Farnetti** and **Camillo Ricordi, Gabriele Riccardi, Marion Nestle, Aviva Must, Alexandre Kalache, Shimon Peres, Jamie Oliver, Ellen Gustafson, Michael Heasman, Vandana Shiva**.

Eating Planet also suggests the priority initiatives that decision makers, economic players and citizens should implement in the various fields involved. It furthermore contains the *Milan Protocol* and *Youth Manifesto's* action platforms, elaborated within BCFN's action plans and to turn Expo 2015's ideas into action.