



## CLIMATE CHANGE AND FOOD

Over the last hundred years we have seen the average temperature of the earth's surface **increase globally by 0.85°C.**

The period from 1995 to 2006 was the hottest registered since records began in 1850. We are also witnessing an increase in the temperature and level of the sea, rapid warming in the Arctic, the acidification of the oceans, **an increase in the number of extreme climatic events and the transformation of the life cycles of plant and animal species.**

Judging by the climate scenarios predicted for the future and the Paris Agreement, if nothing is done to reduce global emissions the earth's temperature could rise by as much as 4°C by 2100, thus seriously compromising food production. Rainfall will tend to be increasingly intense but less frequent with a conspicuous rise in extreme events.

A billion people will find themselves without water and two billion will suffer from hunger, while corn, rice and grain production will drop by 2% every ten years. Furthermore, about 187 million people will be forced to abandon their homes to flee from water encroachment and 9% of global GDP will be sucked up by the rising ocean.

The Fifth Assessment Report of the United Nations Intergovernmental Panel on Climate Change shows that climate change will have a worse impact on matters of food security, nutrition and means of subsistence than previously estimated and that its consequences will be felt much sooner, within the next **20-30 years** no less.

Scholars agree that measures should be taken to stabilize the increase in global warming at a limit of **2°C**. The resulting scenario would not be without negative effects but, according to scientists, would be 'acceptable' for us and for future generations.

## FOOD PRODUCTION REPRESENTS ONE OF THE MAIN VICTIMS OF GLOBAL WARMING

Food is closely related to environmental conditions: as a consequence, production, storage, distribution and markets are sensitive to extreme meteorological conditions and climate fluctuations. Food production and quality are also sensitive to the health of the soil and water, to parasites and diseases and to other biophysical conditions.

Between 1980 and 2008 corn yields fell by 3.6% and grain yields by 5.5%, while those of soybeans also fell but to a lesser extent.

An average 1°C temperature increase would mean shifting crops **150 kilometers further north and 150 meters higher.** New vineyards in Great Britain are already producing grapes

for Champagne, something that would have been unthinkable just a few years ago. The point to be noted today, though, is that the negative effects of climate change on agriculture are being felt all over the world, not only in the places with the greatest emissions (namely the most industrialized countries, where techniques that have strong impacts on the environment are used to increase yields), but also in the poorest.

The increase in CO<sub>2</sub> concentrations and in temperatures might theoretically favor agricultural production at high and medium latitudes (Siberia, Scandinavia, Greenland and Canada) that could see an increase in their productive capacities. Other positive effects, like the expansion of arable areas (especially in the Russian Federation and Central Asia) and the lengthening of the growth period of plants, will not compensate for the serious losses in agricultural productivity that will be sustained elsewhere, particularly in subtropical countries.

Higher temperatures and the increased concentration of CO<sub>2</sub> in the atmosphere are also expected not only to accelerate the proliferation of **weeds and pests**, but also to stimulate the appearance of **new diseases**.

Climate change will cause a 2% drop in global harvest yields against a demand for food that will grow by 14% each decade. The yield of the three most grown crops (rice, maize and wheat), which provide 60% of the calories consumed globally, will suffer a further drop. In the case of rice, the increase in yields in non-tropical areas will be offset by a decrease in tropical areas.

The variation in yields will cause an increase in prices of essential goods, creating social tension and strife, above all in the poorest countries, where the diet is based on just a few foodstuffs (the sudden rise in cereal prices, and therefore of bread, was one of the principle causes of the Arab Spring in 2010-2011).

A report by Oxfam estimates that, unless things change substantially, by 2030 the prices of **foodstuffs** could increase by **70-90%**, while the potential effect of climate change could cause the price of corn, wheat and rice to rise by **120-180%**. This thesis is confirmed by the three global food price spikes— in 2008, in 2010 and in 2012—each of which linked to extreme weather hitting supply (Oxfam, 2014).

Today the most fragile food-growing regions—Africa and Southern Asia—will be the hardest hit by the effects of climate change on agriculture.

IPCC estimates suggest, for example, that an increase of 3 -5°C in globally averaged temperatures might force developing countries to increase their cereal imports by **10-40%**.

The effect of climate change on production alone could cause the number of people suffering from hunger worldwide to increase by **20% by 2050**, with alarming spikes (65%) in sub-Saharan Africa. As a result of climate change, the fight against hunger will go back decades.

A further grave implication of unstable food supplies is the **migration** of individuals and whole communities. The terms 'environmental refugees' and 'climate refugees' are used to refer to people who leave their homelands to live in greater safety in more hospitable areas less prone to drought and less exposed to extreme climate conditions (Ghimire et al., 2015).

**Millions of people are migrating from increasingly arid zones to more fertile ones.** The International Organization of Migration estimates that over the next 40 years between 25 million and a billion people could be driven to migrate on account of climate change.

But aside from the impact on agricultural production, the same destiny awaits food provisions from the sea and the oceans. The catch from some tropical seas will suffer a drop of **50%**, with serious repercussions for the subsistence of populations whose diet is based on protein from seafood. Fishing is

a crucial sector for millions of people. About **520 million**, in fact, **depend on fishing** and aquaculture as their primary source of subsistence. For 400 million of them, among the world's poorest, fish provides more than half of their animal and mineral protein (FAO, 2009). The ensuing scarcity of resources will intensify conflict dramatically.

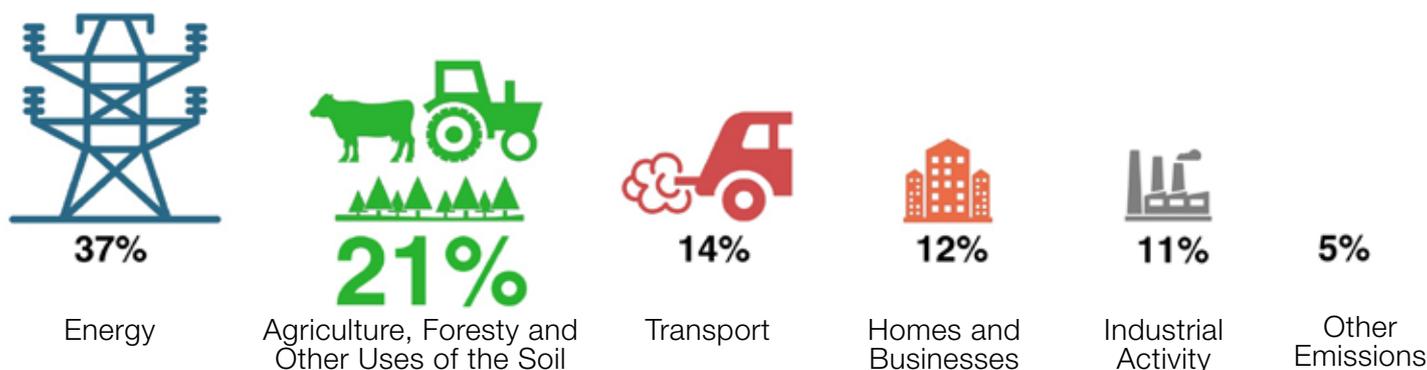
**The present productive model of industrialized agriculture, adopted over the last 70 years not only in western countries but also elsewhere, is a major cause of climate change.**

**Of all human activity, agriculture uses by far the most land on the planet.**

Excluding Greenland and Antarctica, **we currently cultivate 38% of the earth's land mass**, the rest consisting of deserts, mountains, tundra, ice, towns and cities, natural parks and other areas unsuitable for cultivation. The area occupied by agriculture is equivalent to 60 times that occupied by roads and buildings.

Global food production is responsible for **a fifth** of greenhouse gas emissions (**21%**)

Global Greenhouse Gas Emissions



It is having an impact on the environment not only through crop and livestock farming, but also with its pre- and post-production activities (animal feed and structures in the first case, packaging, transport and processing in the second). The sector also makes wide use of **fossil energy and synthetic chemicals**. Agriculture uses more than 70% of the world's water from rivers, lakes and underground aquifers (fossil aquifers included), a fact that makes the reduction of the water footprint of productive systems all the more urgent and indispensable.

Soil contains more carbon than the atmosphere and all terrestrial vegetation combined. Relatively small changes to the amount of organic matter in the soil can have significant effects on the atmosphere and global warming.

Deep plowing arable land, for instance, accelerates the release of carbon dioxide in the atmosphere. Applying nitrogen fertilizers can generate emissions of nitrous oxide, a gas with which has been calculated to have 300 times the global warming potential of CO<sub>2</sub> over a 100 year period. According to the FAO, emissions generated during the application of synthetic fertilizers accounted for 14% of agricultural emissions in 2012. This is the fastest growing emissions source in agriculture, having increased by 45% since 2001. It has been estimated that over the last 150 years, 476 billion metric tons of carbon have been emitted from farmland soils due to bad farming and grazing practices, compared with 270 billion tons emitted from the burning of fossil fuels.

The livestock farming sector is the most terrain-hungry. **Livestock breeding (through grazing land and land given over to the cultivation of corn, soybeans and forage for animals) takes up 70% of all the world's farming land and 30% of its total surface.**

The livestock sector also emits 37 percent of anthropogenic methane (with 23 times the global warming potential (GWP) of CO<sub>2</sub>) most of that from enteric fermentation by ruminants. Cattle breeding accounts for 83% of methane emissions (63% of which are from meat production and 19% from the production of milk and its by-products) against 0.6% for the poultry sector, 5.1% for pig farming and 11.7% for sheep farming.

Animal farming is responsible for 14,5% of global greenhouse gas emissions.

Another reason for the huge impact on the environment of livestock—especially herbivores—is that they are inefficient ‘protein factories’ (which is how they are regarded in modern animal husbandry) insofar as they consume many more calories, which they obtain from vegetable feed, than they produce in the form of meat, milk and eggs. Albeit variable from species to species, the vegetable feed/meat conversion ratio is always extremely disadvantageous. To make a calf gain 1 kg in weight, for example, it takes **13 kg** of feed, while for a chicken it takes only three.

Feed production accounts for **40%** of world agricultural production (FAO, 2012). According to the FAO, an average of 36% of world cereal production is used to feed meat and dairy livestock, but this figure varies widely from country to country: in the United States 65% of cereals are used to feed animals, while in India the figure is just 4%.

The creation of new pastures for meat production is one of the principal causes of deforestation, especially in Latin America. Between 1990-2005, 71% of deforestation in Argentina, Colombia, Bolivia, Brazil, Paraguay, Peru and Venezuela was due to increased demand for pasture.

At the same time, herds and flocks cause large-scale land degradation: today about 20% of pastures are considered degraded as a result of over-exploitation, soil compaction and erosion. The figures are even more alarming in arid areas, where inappropriate animal husbandry policies contribute to the advance of desertification (FAO, 2012).

**Food waste also has a negative impact on the climate. 1.3 billion tons of food are wasted every year: a third of all the food produced.**

Every year the amount of food produced but not eaten is the equivalent of the annual flow of the River Volga. It pointlessly uses 1.4 billion hectares of land—almost 30% of all the farming land in the world—and is responsible for the production of 3.3 billion tons of greenhouse gases (FAO, 2015).

According to the FAO, 54% of food waste occurs upstream at the production, harvest and storage stages, whereas 46% occurs downstream at the processing, distribution and consumption stages. In general, in developing countries food is lost mostly at the production stage, while it tends to be wasted more at the retail and consumption stage in medium-high income countries.

A further and not insignificant factor that contributes to greenhouse gas emissions is the transport of food from production sites to distributors, shops and our homes. The average distance traveled by our food has doubled in the last 30 years.

## **SO WHAT CAN OUR MOVEMENT DO ABOUT ALL THIS?**

### **A NEW MODEL OF AGRICULTURE**

At the base of all Slow Food projects there is the promotion of agroecology, a fundamental resource in confronting climate change. Unlike conventional agriculture, which concentrates on the practice of uniform technologies, independently of the contexts in which they're applied, and which aims to maximize yields

thanks to the use of chemical inputs, mechanization, selected seeds and monocultures, agroecology is based on respect for biodiversity, the recycling of nutrients and the synergy of plant and animal farming. It recycles biomass through the production of compost (instead of synthetic fertilizers) and makes use of green manure, thereby increasing the fertility of the soil and its capacity to increase yields without chemical inputs. It works to maintain the populations of useful insect species in equilibrium, reducing the use of pesticides as much as possible. It uses renewable energy to reduce the consumption of water and fossil fuels. It protects animal, vegetable and microbial biodiversity, preserving an indispensable genetic heritage that is well adapted to different climates and territories, as well as being a resource for fighting new diseases and adapting to new environmental conditions created by climate change. It gives value to traditional agriculture knowledge, promotes participatory networks of solidarity among farmers, stimulates social cohesion between producers and their sense of belonging, reducing the likelihood that the next generation will abandon farming. Soil cultivated according to agroecological principles is fertile, rich in organic material, less susceptible to erosion and desertification, and maintains vital ecosystemic services.

## **COMMUNICATION, AWARENESS RAISING AND PROJECTS**

**Slow Food promotes a new model of food production and consumption across the world. How? Through communication, taste education and projects.**

Through online communication both on websites and via social media, as well as through our network of journalists, Slow Food illustrates the problems with our food system, highlights their consequences and proposes solution. In particular, it organizes and coordinates **international campaigns** to raise public awareness, inviting everyone to change their lifestyle and consumption habits. **Menu for Change** is a campaign to explain the deep links between climate change and our food. There are several other Slow Food campaigns, of course: **against GMOs, against food waste, against land grabbing, and in favor of more sustainable meat consumption and responsible management of the seas (Slow Fish)**. Such campaigns have given Slow Food a double nature: they're aimed at the general public (involving them and encouraging them to get active, informing them and inviting them to discover what they can do in their daily lives to make a difference) and involve the Slow Food network and its projects as concrete examples of good, clean and fair food.

The **Slow Meat** campaign proposes that we reduce our consumption of meat, substituting it with pulses and other vegetables in our diet. It invites us to buy meat of better quality when we do eat it, raised sustainably by small-scale producers who practice extensive (rather than intensive) farming and are respectful of animal welfare, who feed their animals with a natural diet of grass, hay and, albeit as little as possible, cereals. It asks us to support the conservation of native animal breeds, to protect biodiversity and the best possible adaptation to local environmental contexts.

Slow Food **educational activities** (be it for children or adults) in schools, at events and through visits to producers, raise awareness on all of these issues in order to equip people to make more conscious food choices.

But our association has been active in the field for over 20 years, in which time it has started numerous projects that involve tens of thousands of producers.

The **Ark of Taste** project documents food biodiversity at risk of extinction across the world: there are over 4500 products already on board the Ark, from 148 different countries, all of which can be viewed online. From this ongoing research project, Slow Food developed the Presidia project. The Presidia support communities of producers who conserve traditional methods of food production at risk of disappearing, value their local territories, recover ancient crafts and techniques, and save native plant varieties and animal breeds from extinction. The Presidia are founded on the practice of agroecology. There are more than 500, involving 14,000 producers in over 60 countries.

Through the **Earth Markets Slow Food** brings producers and the public closer together, promoting

the consumption of local products. The average distance that food travels from where it is produced to where it is eaten has doubled in the last 30 years, and this has caused an enormous increase in atmospheric pollution. Buying local food means reducing greenhouse gas emissions but also having food that is fresher, more nutritious and tastier. Establishing direct relationships with food producers means raising awareness of the true value of food, and the dynamics behind its production, which is essential for consistently making conscious choices.

The Slow Food network cultivates **school and community gardens** in Europe and around the world. Slow Food gardens are based on the valuing and awareness of local resources, starting from the soil, seed, vegetable biodiversity, and promote agroecological practices. In Africa over 1200 community gardens nourish thousands of people putting local, healthy and nutritious food on the table.

Find all the Menu for Change materials here:

<https://drive.google.com/drive/folders/0B0AGohh9ejWDSVdRUktCTEczWjA>

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