FROM AGROPOLIS TO ECOPOLIS, WHAT CHANGED? GEOGRAPHICAL APPROACHES TO FOOD ISSUES

Ana Firmino

Abstract

In this paper the issue of food production will be tackled from a geographical perspective, which intends to analyze the changes occurred in the life's pattern of the so-called most developed societies, that has driven to an unbearable pressure on the natural resources and is affecting the health of the planet and of ourselves. Moreover it will be discussed how efforts to undertake transition into creating a more sustainable model, can also contribute to mitigate and eventually eradicate hunger in the world.

1. Introduction

Food is essential to life. Therefore harvesting and hunting were vital to the survival of the populations since the beginning of human life on Earth and in some societies they still are. About 10 000 years ago agriculture started being implemented and since then a large array of technical improvements has allowed that today, in an ever more urbanized world, farmers may feed an increasing population of 7 billion people, which is expected to reach between 9 and 10 billion people in 2050.

Agropolis represents an agrarian society, as displayed in von Thünen's model, published in the 19th century, where the lack of easy access to the markets and the rudimentary technical tools available at that time dictated a local production, with the most perishable items located near the market. Although this was not contrary to the import of products from abroad (namely spices and cereals) exchanges with foreign countries were restricted due to the long and dangerous transportation by land or sea and because the consumers had no purchase capacity.

The advent of industrialization brought mechanization and with it the generalized use of petroleum, which rendered transportation easier and allowed the reversal of the insofar dominant rationalities, from an economic point of view. In some cases it would be more advantageous to import food from countries where favorable production costs such as labor were cheaper. In the Western countries, mainly after Second World War, changes in society and higher levels of wealth supported dietarian shifts towards a higher intake of calories and demand for a larger diversity of products over the year. Petropolis, a model based on intensive agriculture (mechanization, specialization and imports) is representative of this stage which sooner or later has affected every society and is responsible for much pollution and heavy consumption of oil.

In a more recent era of our History, societies started increasing their awareness of the impact that this model has on the environment and our health. The anticipated

exhaustion of oil, predicted around 2050, calls our attention to the need for a transition from a society dependent on oil to a resilient one, as defended by Rob Hopkins (2008).

Girardet (2011) suggests Ecopolis, a model distinguished by resilience and endeavor in creating a sustainable society, which retains the best from preceding models, namely some similarity to von Thünen's one, and the local production of food, together with a generalized use of sustainable energies, energy efficiency and zero waste.

2. From Agropolis to Ecopolis, what changed?

2.1 Agropolis

Agropolis corresponds to an agrarian model presented by Girardet (2011) in which due to the absence of efficient transport and conservation methods, cities depend on nearby markets, gardens, orchards, forests, arable and grazing land, according to this sequence.

It is a simplified interpretation of the classic model of agricultural land use in Geography developed by von Thünen, a German farmer and economist (1783-1850). Von Thünen's model shows the relationship between distance to the city (symbolizing the market) and how farming gets organized spatially.

The model assumes that:

- The city is located centrally within an "Isolated State" which is self-sufficient and has no external contacts;
- The land of the State is completely flat and has no rivers or mountains;
- The soil quality and climate are the same throughout the State;
- Farmers use the same technology and resources;
- Farmers in the Isolated State transport their own goods directly to market in the central city;
- Farmers act to maximize profits.

The model created by von Thünen develops in a pattern of rings around the city in which dairying and intensive farming are located in the ring closest to the city. As perishable goods such as vegetables, fruits, milk and other dairy products must get faster to market they would be produced close to the city.

Forest would come next, since wood is heavy to carry and was an important material at the time for fuel and building, for heating and cooking.

The third ring was occupied by extensive field crops such as grains for bread. They can be stored longer than dairy products and they are easy to carry, thus they can be located further from the city.

In the fourth and last ring we find ranching, since animals can walk to the city for sale and slaughter.

Beyond the fourth ring lies wilderness, too far away from the city to produce

anything except ecological services!

In a homogeneous idealized situation the rings would be concentric but these get distorted if rivers, hills or other cities occur in the area, as shown in the lower half of the image (Figure 1).

As Johnston (2005) states, von Thünen derived a model for the location of agricultural production "suggesting a zonal patterning of different activities consistent with the costs of transporting the output to markets". We should take into consideration that modeling was also based on principles of least effort.

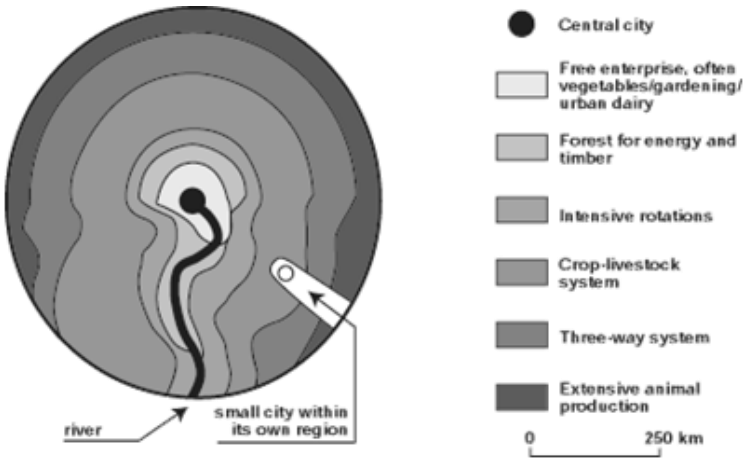

Figure 1: von Thünen's model showing distortions if the area is not homogeneous

Source: Adapted from Bieleman (1992) (http://www.fao.org/docrep/004/y0500e/y0500e03.htm)

He concluded that the farmers in an Isolated State take into consideration the costs of land, transportation and profit and produce the most cost-effective goods for market, i.e. the farms closest to the consumption market have a higher income if compared to the most distant ones. The location has, thus, in terms of profit, an inverse relationship to the distance. Of course, in the real world, this is not always true, since many other factors contribute to the final profit.

If we take a look at the crops grown today in Metropolitan areas we realize that up to a certain degree von Thünen's model is still valid. Perishable vegetables and fruits are grown in the closest areas to the market, while less perishable goods like grains are produced in more distant areas.

However, nowadays goods also travel long distances to reach the markets abroad and can be cheaper than those produced locally, especially if we do not internalize the cost of pollution in transporting them, and disregard labor legislation and animals' rights as applied in Western countries, or dump them into the market (although this is a forbidden practice) among other factors that will be discussed next.

2.2 What happened in the last 150 years?

Changes in food systems were particular important after the Second World War especially in the Western countries. In spite of all the progress that had been achieved with the super phosphates NPK (created by Liebig, 1803-1873) and increased efficiency in mechanization, some other drivers of change gained importance through the decades.

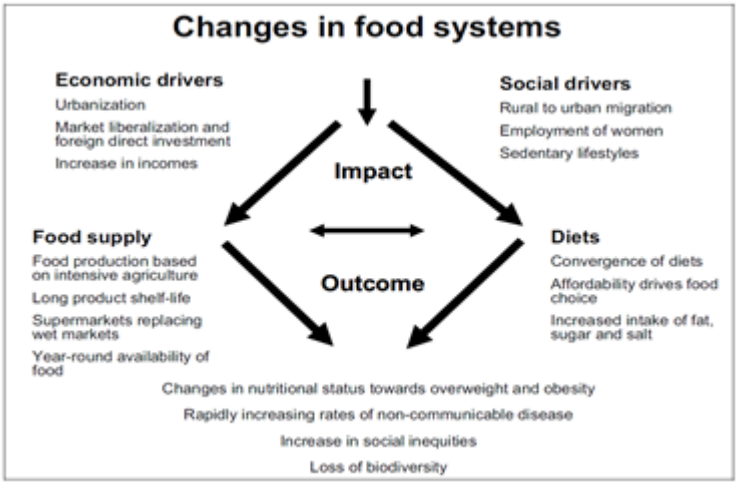

Figure 2: Changes in Food Systems

Source: Kennedy, G. et al (2006, 1-26)

Some of the drivers of change, which deeply influence the food systems, are presented in a study by Kennedy (2006, 1-26) organized in 4 groups: economic, social, dietarian and food supply. These are mainly influenced by globalization which has had a particular impact on the growing spread of the western diet and way of life in general among less developed countries. These four groups are as follows:

(1) Economic drivers such as urbanization, which has consumed part of the agricultural land and introduces different life styles; market liberalization and foreign direct investment, that introduces new products, often contrasting with the cultural and societal characteristics of the country; and increase in incomes, which supports a different consumption pattern.

(2) Social drivers induced by the flow of people from rural to urban areas looking for new job opportunities; employment of women, who work outside their homes, and have no time to prepare meals for the family as their ancestors used to do (with fresh products, cooked every day). The food industry responded to this reality with products long shelf-life, such as lyophilized products (powder soups) pre-cooked frozen meals and an array of products, some of them with added preservatives to extend their shelf period; sedentary lifestyles and increased intake of fat, animal protein, sugar and salt, that contribute to an increase in overweight and obesity among other "diseases of civilization", such as cardiovascular disease, diabetes, cancer, affecting these populations. Capon defines modern civilization "as societies with the characteristics of ecological phase 4 - the high-consumption phase of human civilization. Some people in every country on Earth (whether living in the East, West, North or South) currently live in this way". According to Global Burden of Disease (GBD), an Independent American Research Organism, 34000 people die per year from cancer in the world due to a diet too rich in transformed meat (sausages, etc.) and 50 000 die per year due to an excess of red meat (Science et Avenir, 2016, 36). Animal Liberation - a new ethics for our treatment of animals, a book by Peter Singer (1975) seduced many to become vegetarian, mainly in the protestant countries (Switzerland, United Kingdom and Germany) where about 10% of the population are vegetarian (Science et Avenir, 2016, 35-36). However a single day in the week, as it is the case in countries such as Belgium with the Vegetarian Thursday (Jeudi Vegetarian) would be a good contribution to health

and environment, as it will be argued further. Indeed with the same amount of cereals necessary to feed one person with meat, we can feed seven with bread and more than 20 people with germinated seeds (www.mapn.ca).

(3) Dietarian Changes: even in countries acknowledged by UNESCO as representatives of a Mediterranean Diet, which is presented as an intangible cultural heritage of Humanity, these changes have been visible, as shown below in the energetic profile of the Portuguese Agri-Nutritional Model between 1961 and 2002, having for bases the Western Model (100%). Compared to 1961, it is clear in 2002 there is increase in the consumption of starchy roots, animal fats, meat and eggs, milk and dairy products. The high proportion of fish and seafood (although slightly less than in 1961) are a characteristic of the Mediterranean diet, the Portuguese being one of those in the world with a higher consumption of these items, some of which are also endangered and thus, fish catches, such as sardines, have been from time to time temporarily suspended to allow the fish stocks to recover.

The amount of grain needed to feed one person per year on a meat-based diet is 930 Kgs but only 180 Kgs on a grain-based diet (Millstone et al, 2003, 34) and the reduction in consumption of meat does not render the diet poorer. Gordon Ramsay, for instance, a distinguished chef with several Michelin stars and well-known for his TV programs, praises Vietnamese dietarian pattern as being healthy, since they use a large diversity of fresh salads and fruits and reduced consumption of meat, poultry and fish.

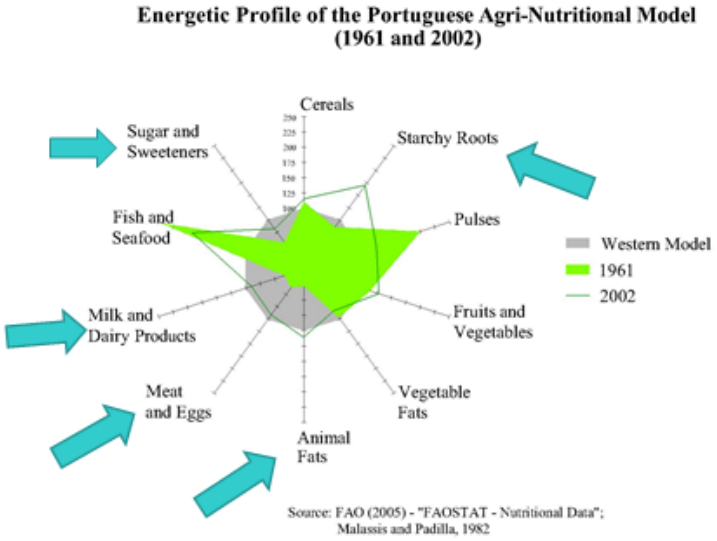

Figure 3: Energetic Profile of the Portuguese Agri-Nutritional Model

Source: FAO (2005) and Malassis et al (1982)

A reduction in the consumption of meat would represent a saving in water and fossil fuel, as illustrated in Table 1.

	Water (Liters)	Fossil Fuel (Calories)
100 grams beef	25,000	33,3
100 grams wheat	25	0,46

Table 1: Amount of water and energy used to produce beef and wheat

Source: Adapted from Millstone et al (2003, 35)

According to FAO, a global demand for livestock products will increase by 70% by 2050 and the livestock sector contributes to human-induced GHG emissions for 14.5% and is a large user of natural resources (accessed the 28th April 2016 at http://www.fao.org/livestock-environment/en/) which constitutes a collateral threat to the survival of human life on Earth.

Chakravorty (2016, 12-13) gives China as an example of a nation where a cereals-based diet is moving towards being more dependent on animal protein, namely meat and dairy products. China consumes today half of the world's pork and its consumption of this meat has been growing at a rate of 150% a year since 2007. This author writes that "on average, eight kilograms of cereals (as feed) produce one kilogram of beef, and three kilograms of cereals produce one kilogram of pork. As more people start consuming animal products, they exert pressure on limited arable land resources, and food prices rise over time".

Figures 4 and 5: Slow and Fast Food

Wet Market in Hanoi, Vietnam and Macdonald's in Nanjing, China (Author: Ana Firmino)

The figures above explain why the predicted increase in the consumption of meat is foreseen with much concern and drive some authors to question the meat consumption. In the European Union 75% of agricultural land is used for growing animal feed (Millstone et al, 2003). The growing demand for biofuels renders the competition for land to produce cereals for this purpose more fierce.

(3) The Food Supply: In the last decades the food supply has been constantly challenged to produce based on intensive agriculture, develop long product shelf-life, offer year-round availability of food and where supermarkets have replaced the wet markets.

In practice the changes in diets together with the fast growth of population put pressure on farm efficiency, i. e. the farmer has to produce more (intensification often without taking into consideration the carrying capacity of the different ecosystems and thus creating environmental problems typical of the chemical-industrial food systems, as described by Weis (2007) driving to a drastic reduction in the area necessary to feed one human being, which in 1960 accounted for 0,45ha, in 2000 was only 0,25 ha and in 2050 shall be achieved in only 0,15 ha (1500m2) increasing the yield per area of arable land, calculated today in 1400 million hectares. This is due to the fact that the

enlargement of the area for future cropping is conditioned by either policies aiming at protecting tropical forests or by the reduction in the agricultural area (estimated in 8 or 9 million ha/year) due to erosion, salinization of irrigated soils (between 15 and 20% of these soils) and exhaustion of land due to loss of fertility. Urban sprawl and climate change tend to render this situation still worse in the years to come (Data selected from Charvet, 2012, 18-19).

Concomitantly the number of farmers has been decreasing. Kirschenmann (2000) quoting the United States Department of Agriculture, says that in the 1930s one American farmer produced enough agricultural product to feed only himself and three other eaters.

The report "A Briefing on the Status of Rural America", published by the U.S. Department of Agriculture in 2010, shows that the number of people fed annually by one American farmer steadily increased over the years (Figure 3).

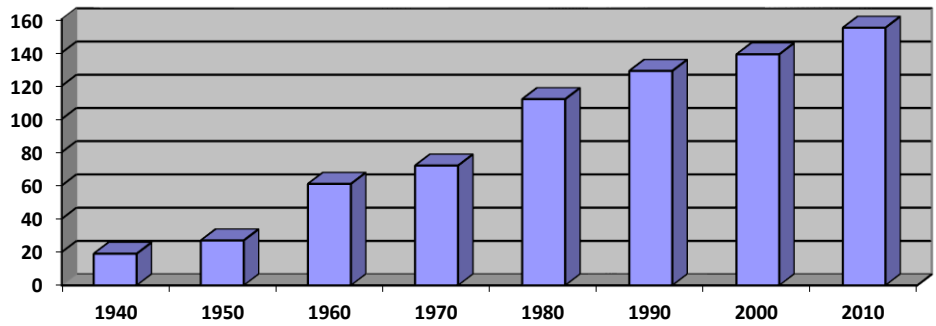

Figure 6: Number of People fed by one American Farmer (1940 – 2010)

Data Source: USDA (2010)

However, the calculations do not take into consideration the changes that occurred over the years in the dietarian habits that include more diversity of products (some of which imported) the increase in the consumption of meat that demands more cereal for animal feed, and produce used for other purposes such as biofuels. According to David Swenson, an Iowa State University economist, about 40 percent of the USA's corn crop is used to produce ethanol. He admitted that "the statistic isn't perfect, but it provides a consistent look at the effect of farm production and reliance on farmers over the past several decades" (accessed the 20th January 2016, http://www.thegazette.com/subject/news/government/fact-check/fact-check-reynolds-says-one-iowa-farmer-feeds-155-people-worldwide-20140524).

Chakravorty (2016, 13) predicts that "out of the approximately 200 million hectares of new land devoted to agriculture by 2022, 80 million can be attributed to the biofuel mandates". Moreover he adds that cellulosic biofuels may be crucial to the viability of biofuels in the United States, "since they are less land-intensive than corn ethanol".

2.3 Petropolis

"Petropolis" emerges with the generalization of cheap transportation and intense trade exchanges in the framework of globalization, being responsible for the fast growing emissions of greenhouse gas and rendering traceability of the products often difficult. As Millstone et al (2003, 66) write "the price of sending food by sea fell by over 70 percent between 1980 and 2000, while air freight prices are falling by 3 to 4 percent every year". This is only possible because emissions resulting from international air freight and sea freight are not taken into consideration in national inventories and the Kyoto Protocol does not include them in its targets. Besides the damage caused to the environment and to human health by pollution are not taken into account, nor are reflected in the price of food, as well as other externalities resulting from food production intensification, loss of food sovereignty, changes in food patterns and degradation of food landscapes.

Millstone et al (2003, 67) give examples of vegetables that travel long distances to reach the market. Lettuces, for instance, travelling from California to London, are responsible for the production of 5 kg of CO2 per kilo of product. Besides this makes it quite inefficient in terms of energy since 1 unit of lettuce energy takes 127 units of fuel energy just for transportation. For those concerned with their ecological footprint, food miles are for sure a matter of concern!

Insofar as the agricultural sector has been able to produce enough food to nourish the world population, as many authors have asserted in their publications (Parmentier, 2007; Tudge, 2007, for instance). However hunger prevails and food safety is questioned (Bodin-Rodier, D. et al, 1997; Boyens, I., 1999; Dowler, E. et al, 2003; Madeley, J., 2002; Rémésy, C., 2005; Petit, M., 2011; Weis, T., 2007, to mention only a few).

Modern agriculture has definitely been able to produce enough food for a growing world population but it has not been able to fight back hunger because this "is not a consequence of overall scarcity, but of unequal access to land, technology, education and employment opportunities, coupled with a whole range of socio-economic and environmental factors" (Millstone et al, 2008, 20). Great achievements were possible with the Green Revolution, but also in this case social inequalities were generated that increased the number of poor. Besides the success in increasing productions has been possible mainly due to the heavy use of fertilizers, pesticides, and herbicides, responsible for the pollution of air, soil and water, as well as the depletion of natural resources, decrease in biodiversity, wasted water and eroded soil with the consequent disturbance of ecosystems visible also in the impact on landscapes.

David Pimentel has published important information during his career about the energy expenditure to produce, process, distribute and prepare food. He estimates that food production in the USA needs 17% of the total energy used in that country. He argues that with supplies of fossil fuel declining and becoming more expensive, alternative technologies and diets should be adopted in order to produce ecological and social benefits (Pimentel, 1984, 3-9). He concludes that "all through the food production system, currently used methods of preservation and packaging as well as transportation must be studied and re-evaluated in order to determine the most energy-efficient methods that produce high quality and nutritious foods" (idem, 9).

2.4 Ecopolis

It is under this scenario that the concept of "Ecopolis - an ecologically as well as economically restorative city - becomes relevant. It proposes a new integration of the human habitat within its local environment. A new emphasis on regional food needs to be augmented with local, renewable, modern energy supplies" (https://www.boell.de/sites/default/files/assets/boell.de/images/download_de/Girardet_regenerative_citys.pdf, accessed on the 24th April 2016).

Girardet (2011) responsible for the concept of Ecopolis, has worked in Adelaide (Australia), an example of how it is possible to implement resilience and environmental regeneration**,** creating at the same time jobs in the framework of a green economy.

The Ecologist presents Adelaide (1,251 Million inhabitants) as an emergent regenerative city where the production of 180,000 tons of compost a year, made from the city's organic waste, is used to increase the fertility and soil structure of 20,000 hectares of land in the outskirts of the city, where most of the fruit and vegetables, consumed by the local population are produced and irrigated with reclaimed waste-water (accessed on the 24th April, 2016) http://www.theecologist.org/News/news_analysis/2000416/ecopolis_the_emergence_of_regenerative_cities.html

The example of Cuba is a classic, particularly as to what concerns the urban food production with "organoponico" gardens in the city of Havana. In this country over 117,000 people produce food in over 35,000 hectares of urban land, providing enough production to guarantee a minimum of 300 grams of fresh vegetables per day, which is considered by FAO as adequate for optimum health (idem).

3. Challenges to food systems: some prevailing myths and threats

Malthus (1766-1834) in his Essay on the Principle of Population (1798) expressed his concern that the population growth would lead to a global epidemic famine due to the collapse of food systems, unable to feed so many mouths. His premonition fortunately has not come true so far, since today enough food is produced to feed every human being, although population growth continues to be a challenge to the food production.

FAO, for instance, estimates that agricultural production must increase by about 60% by 2050 in order to feed a larger population. (accessed the 24th April 2016 at http://www.fao.org/world-food-day/2016/theme/en/).

But not only food matters. According to IFPRI's estimations (2006), a growing interest in the expansion of biofuels up to 2050, can increase the number of malnourished pre-school children, that could be 3 million higher in sub-Saharan Africa and 1.7 million higher in South Asia than would otherwise be the case.

The same study also estimated that investment in research for productivity growth could significantly reduce the negative effect of biofuel production on food availability.

However other threats should not be minimized as it will be presented next.

3.1 Bioengineering: hope and risk

Agricultural/biological engineering and bioengineering are presented as "fields that integrate the principles of biological and physical sciences and use them to solve agricultural and environmental problems. Engineers in these fields design systems and equipment that increase agricultural productivity and food safety. They also manage and conserve soil, water, air, energy, and other agricultural resources" (http://www.princetonreview.com/college-majors/417/agricultural-biological-engineering-bioengineering, accessed the 18th May 2016).

However the attempt to produce more quantity more quickly puts research under a great constraint, since investments in their projects are huge and investors wish to see returns in the short term. Thus often bioengineered products are launched in the market before there is sufficient period of trial to evaluate their potential effects on people's health and environment. In spite of the precautionary principle, put in force in the European Environmental Bases Law, which determines that in case of doubt about the security of a product, this should not be used, even if there is not yet enough evidence of being harmful, food products have been traded making all of us guinea pigs of these developments.

Canotilho, a renowned Portuguese jurist and State's counsellor, refers to the production of genetic modified maize as follows: "It is feared that genetically modified maize may be harmful to one's health. It is too soon and there is not yet enough research which allows us to be sure that no harm will come to people and animals. Any measure taken, namely banning production and importing genetically modified maize, is based on the precautionary principle ..." (Canotilho, 1998, 49, translated in Firmino, 2009, 171-172).

Even authors like Comstock, who defends the right of people to adopt biotechnology, concludes: "assuming that we will act with responsibility and appropriate precaution" (Comstock, 2004, 231). Definitely this is not what often happens!

Co-existence measures are, of course, possible, but according to Silva (2003, 97), costs to avoid contamination would increase up to 41% for the farmers involved, since these would have to install hedges, adopt different periods of planting to avoid crossbreeding, use certified seeds and rent certified machinery. In the meanwhile biodiversity keeps being threatened!

Besides GMO's, some other innovations can be a risk to our health, such as the variant Creutzfeldt-Jakob disease (vCJD), a rare and fatal human neurodegenerative condition, that has been strongly linked to the consumption of food of bovine origin contaminated with the agent of Bovine Spongiform Encephalopathy (BSE), a disease of cattle which is thought to be caused by a prion, i.e. a protein**,** that was incorporated into cattle feed due to meat and bone meal being produced from animal carcasses.

To protect human health, WHO has recommended that "no tissue that is likely to contain the BSE agent, nor part or product of any animal which has shown signs of a TSE should enter the (human or animal) food chain. All countries should ban the use of ruminant tissues in ruminant feed" (accessed on the 18th May 2016, http://www.who.int/mediacentre/factsheets/fs180/en/).

Although sometimes these problems are hardly perceived in advance, curiously,

during a conference in 1923, Rudolf Steiner, mentor of the Bio-Dynamic Agriculture, described what would happen to a bull, if it were to be fed with meat: this would produce harmful substances which once introduced in its brain would render it mad (in Wolff, 2000, 21; Steiner, R. 1983). Thus, at that time it was already predictable, at least by Steiner!

Finally, although increase in production is often argued as being the main requirement for feeding a growing population, and bioengineering represents the hope to contradict Malthus' theory that agriculture would not be able to achieve this goal, hunger remains, not for lack of food at the world level but due to a bad wealth distribution and access to food, that are responsible for the 1 billion hungry people today (IAAKSTD, 2009).

3.2 Climate Change

Climate change is an important factor, representing a real threat to food security due to its adverse effects. Baas writes that "over the last 30 years the occurrence of natural disaster has constantly risen … particularly climate-, weather- and water related hazards, such as floods and droughts" affecting annually about 230 million people (Baas, 2015, 100). This is in line with some of the preoccupations expressed by the UN Climate Change Conference, COP 22, which will take place from 7-18 November 2016 in Marrakech, Morocco. As shown in Figure 7, the losses projected by 2080 in rainfed cereal production will affect mainly and dramatically the poorest countries in the world.

FAO launched the slogan "Climate is changing. Food and Agriculture must too"! to raise the awareness of people that agriculture and food systems must become more resilient, productive and sustainable, as the only way to ensure wellbeing of ecosystems and rural populations and reduce emissions.

They recommend the adoption of practices that produce more with less in the same area of land and use natural resources wisely (http://www.fao.org/world-food-day/2016/home/en/).

FAO also exhorts countries to include food and agriculture in their climate action plans and invest more in rural development.

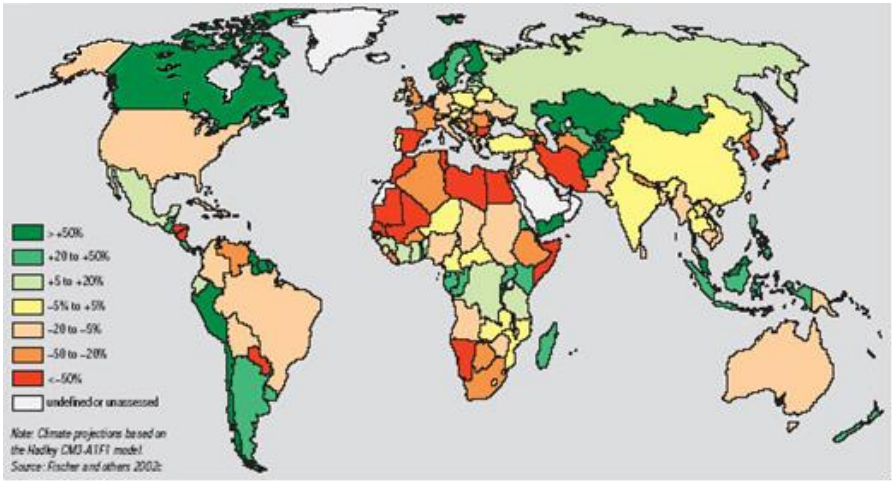

Figure 7: Projected percentage gain and losses in rainfed cereal production potential by 2080
Source: UNEP (2006, 30)

The resilience of smallholder farmers is particularly important in order to guarantee food security for the planet's increasingly hungry global population and reduce emissions, as recognized by Pimentel (1984).

3.3 Food Waste

Food losses represent a waste of resources used in production such as land, water, energy and inputs, increasing the green gas emissions in vain (FAO, http://www.fao.org/food-loss-and-food-waste/en/).

According to FAO one-third of all food produced worldwide for human consumption is lost or wasted globally, which amounts to about 1.3 billion tons per year. Food is lost or wasted throughout the supply chain, from initial agricultural production down to final household consumption. In developing countries food is primarily lost due to inadequate infrastructure, while in more developed countries food waste is the main problem in the marketing and consumption.

This amount of lost or wasted food each year is worth around US$1 trillion and it could feed about 870 million people who are going hungry each day (accessed on the 20th May, http://www.thinkeatsave.org/docs/TES_FoodKit%20ToolKit_WEB.pdf). Is it acceptable that 1.4 billion hectares of land - 28 per cent of the world's agricultural area - is used annually to produce food that is never eaten? Thus the pertinence of the Campaign "Zero Hunger Challenge", launched by the UN Secretary-General, Ban Ki-moon, at the Rio+20 Conference, in which zeroing food loss and waste is one of the main goals.

In line with the previous recommendations FAO appeals to the reduction of "food losses before the final product or retail stage through a number of initiatives including better harvesting, storage, packing, transport, infrastructure, market mechanisms, as well as institutional and legal frameworks" (http://www.fao.org/food-loss-and-food-waste/en/, accessed on the 20th May 2016).

In Europe, Italy has led a movement called "Milan Urban Food Policy Pact", a protocol that was signed in October 2015, during the World Food Day ceremony at Expo Milan and was presented to the UN Secretary-General, by mayors committed to develop "sustainable food systems that grant healthy and accessible food to all, protect biodiversity and reduce food waste" (accessed on the 20th May 2016, http://www.fao.org/world-food-day/2016/events-2016/en/). Next October, mayors from about 100 cities all over the world will meet at FAO in Rome, to discuss their experiences in developing sustainable food systems in cities worldwide, and share best practices.

FAO will establish indicators that will measure the impact of the Pact, and by exchanging best practices among cities (accessed on the 20th May 2016 at http://www.fao.org/world-food-day/2016/theme/en/).

4. Societies in transition

Movements such as Slow Food, Agroecology, Permaculture, Community Supported Agriculture (CSA) and other initiatives, they all contribute to a transition that is happening almost imperceptibly in several parts of the world, and can be illustrated with the example of Totnes, in UK, founded in 2006. It was the first transition town and became known through its mentor Rob Hopkins (2008). Today it is part of a network involving thousands of communities around the world. They present themselves as communities that "have started up projects in areas of food, transport, energy, education, housing, waste, arts, etc. as small-scale local responses to the global challenges of climate change, economic hardship and shrinking supplies of cheap energy. Together, these small-scale responses make up something much bigger, and help show the way forward for governments, business and the rest of us" (https://transitionnetwork.org/, accessed on the 20th May 2016).

Rob Hopkins (2008) has contributed positively to the shift of paradigm with "The Transition Handbook: from oil dependence to local resilience", that enhanced a silent and resilient revolution. The book gives guidelines as how to prepare a shift from a society based on oil to a more sustainable one: "We live in an oil-dependent world, and have got to this level of dependency in a very short space of time, using vast reserves of oil in the process - without planning for when the supply is not so plentiful. Most of us avoid thinking about what happens when oil runs out (or becomes prohibitively expensive), but The Transition Handbook shows how the inevitable and profound changes ahead can have a positive outcome. These changes can lead to the rebirth of local communities, which will grow more of their own food, generate their own power, and build their own houses using local materials. They can also encourage the development of local currencies, to keep money in the local area" (available at: https://transitionnetwork.org/support/publications/transition-handbook).

This shift in paradigm is also represented in the concept of regenerative cities or Ecopolis, as defended by Girardet (2011) i.e. a city, which integrates habitat in its local environment, satisfies the regional food needs based on local, renewable energies and creates positive externalities at the ecological, economic and social level, such as Adelaide, in Australia, whose Metropolitan Area has over a million inhabitants and is an example of regenerative urban development, as mentioned before. How is this achieved? In short, by making an efficient use of energy, supporting a "solar-city" development, water efficiency, zero waste, local food, sustainable transport, Nature in the city, green business and a culture of restorative urbanization (adapted from Girardet, 2011).

According to Girardet "the challenge today is no longer just to create sustainable cities but truly regenerative cities: to ensure that they do not just become resource-efficient and low carbon emitting, but that they positively enhance rather than undermine the ecosystem services they receive from beyond their boundaries" (Girardet, 2011, 3). Creating regenerative cities thus primarily means one thing: Initiating comprehensive political, financial and technological strategies for an environmentally enhancing, restorative relationship between cities and the ecosystems from which they draw resources for their sustenance (ibid, 4).

Former traditional societies in the developing countries are opening up to "globalization", transforming their production system, market supply and consumption

pattern. Thus the impact in these countries will also be felt sooner or later but, as Rostow (1990) explained, due to the knowledge proportioned by the "pioneers", their evolution into the next stage will be quicker. On the other hand, also in these countries, some consumers already value the quality products and are concerned with their health and the environment, because in a globalized world they are influenced by what is going on elsewhere.

Recently, April, 2015, in Milan, the Global Alliance Conference compiled several materials for discussion in their sessions, which give much information about what is being done to support agroecological movements and food systems all over the world (http://www.newfieldfound.org/pdfs/PathwaysResources-April192015.pdf).

Miguel Altieri, in a study dating from December 2011, about the impacts of organic farming in the Third World, stated that 85% of the peasants are practicing this mode of production in less than 2 ha. The study shows that by using traditional methods and their own seeds, without any chemical fertilizers, and pesticides, African peasants were able to reduce irrigation and multiply by two the average agricultural incomes (in Wirz, 2012, 15).

His findings are in line with the studies that David Pimentel at Cornell University has published, using a calorie formula to determine overall food system efficiency.

Pimentel found that when calculating all the energy necessary to produce food, from the field to the table, industrial agriculture is not very efficient, since it requires about 10 calories of energy to produce every calorie of food that we will eat. He concludes that local food systems, using less processing and packaging, are much more efficient.

Also Tudge (2007, 136) praises local produce, as well as self-reliance and fair trade. He writes that "the only way out for poor countries is autonomy: not to be beholden to rich countries that basically are not on their side, and deep down prefer them to be relatively poor".

Besides, as Breimyer writes (1978, 310-311): "in a grand contradiction of all that has been taught about carrying modern technology to agriculture everywhere, it is possible that as fossil-fuel energy becomes scarcer and more costly, those nations that have not converted to heavy reliance on it may be relatively better able to adjust. The western industrial nations - the "developed" ones - may find themselves losing status economically and politically. They will face the greater problems of accommodating higher costs of fossil-energy, for they have relied on that energy source so heavily in the past".

Miguel Altieri has long worked with traditional communities and is responsible for projects based on agroecology, which he presents as the solution to hunger and food security, due to its ecological, small scale, local and urban farming (see, for instance, https://www.youtube.com/watch?v=2yFvD8wuLmU).

He is not the only one believing in this. FAO Director-General José Graziano da Silva, in the opening of the 24th session of the Committee on Agriculture (COAG) on the 29th September 2014, called the attention of policy makers, acknowledging that "we cannot rely on an input intensive model to increase production and that the solutions of the past have shown their limits". He calls for a "paradigm shift" that ensures an "overhauling global food system, making them healthier and more sustainable", i. e. that

are able to "lower the use of inputs, especially water and chemicals, in order to put agriculture, forestry and fisheries on a more sustainable and productive long-term path". He recommends that "options such as agro-ecology and climate-smart agriculture should be explored, and so should biotechnology and the use of genetically modified organisms", noting that food production needs to grow by 60% by 2050 to meet the expected demand from an anticipated population of 9 billion people (adapted from http://www.fao.org/news/story/en/item/250148/icode, accessed on the 20th April 2016).

This co-existence between agroecology and genetically modified organisms (GMO's) defended by Mr. da Silva seems difficult and controversial, since contamination is undermining biodiversity and restraining other modes of production such as organic farming and bio-dynamic agriculture, as Johannes Wirz denounces (Wirz, 2012, p. 14-15). This dispute about GMO's shows how, even among Northern countries, the values and decisions about food production can diverge. Recently (3.10.2015) a European Commission rule allowed its members to request the opt-out option, full or partially, i. e. the possibility to abstain from growing GMO crops, such as Monsanto´s GM maize MON 810, even though this had been allowed by the European Food Safety Authority (EFSA) for use and cultivation in the EU.

5. Conclusions

After travelling from Agropolis up to Ecopolis it is clear that the food issue cannot be uprooted from a more complex and broader context. Physical, social, economic and political factors affect the production, distribution and access to food, but we as consumers and conscious citizens can make the difference.

As stated in the Milano Charter of Food (http://carta.milano.it/en/) "only our collective action as citizens, together with civil society, businesses and local, national and international institutions, will make it possible to overcome the major challenges related to food: combating undernutrition, malnutrition and waste, promoting equitable access to natural resources and ensuring sustainable management of production processes".

It is thus our duty as "consum'actors" (active consumers, as defined by Rimsky-Korsakov, 2003) to play a role to mitigate the effects of climate change, by making choices that can contribute to decreasing the "food miles" and support the local production (proximity economy).

Furthermore, "by being conscientious or ethical consumers and changing simple day-to-day decisions, for example, by wasting less food, or eating less meat and more nutritious pulses, we can reduce our environmental footprint and make a difference" as FAO argues (http://www.fao.org/world-food-day/2016/theme/en/, accessed on the 18th May 2016).

In a previous work entitled "Food and Consumption: how a meal can change the world" (Firmino, 2014) it was also argued that as a consequence of this new pattern of consumption, not only the hygienic and nutritional characteristics of the products and prices are important factors in the moment of choice but also the mode of production (organic farming), the distance to the market, the direct sale in a short cycle, the

traceability, the history and edapho-climatic characteristics (le terroir according to the French!), the respect for the human and animals rights, the solidarity towards poor farmers in developing countries (Fair Trade) and the respect for those who produce what we eat.

Last but not the least, several cities around the world are engaged in building food systems anchored to sustainability and social justice, as it is the case of the Milan Urban Food Policy Pact signed by 75 cities. FAO and RUAF foundation, support these initiatives offering a "Food for cities Programme: building food secure and resilient city regions", and "City Food Tools" (FAO and RUAF, n/d). This will contribute to build sustainable and resilient city regions, lowering the pressure on the farmers in the rural areas and fighting back the dichotomy between urban and rural, that has supported the established model of development in favor of an "urban rural continuum in all regions, with mutually reinforcing and reciprocal relationships, and flows of resources, people and information" as defended by Forster and Escudero (2014, 7).

As Pierce wrote (1990, 313) "Sustainable development over the long term is not a choice but an imperative for society. If we fail to make the conscious transition, the choice will be made for us - for sustainable development is a self-enforcing process capable of achieving its own equilibrium".

The transition is on its way and we should try to make part of it as soon as possible on behalf of the Planet Earth and all its inhabitants, i.e. of ourselves!

6. References

Andrews G. (2008), The Slow Food Story: Politics and Pleasure, London, Pluto.

Bauman Z. (2001), The Individualized Society, Cambridge, Polity Press.

Beck U. (1998), Word Risk Society, Cambridge, Polity Press.

Bennett T., Gayo-Cal M.,.LeRoux B., Rouanet H., Savage M., Silva E., Warde A., Wright D. (2013), *Distinction Revisited: Mapping British lifestyles in 2003*, in. Coulangeon P., Duval J. (eds.), *Trente ans après la Distinction de Pierre Bourdieu*, Paris, La Découverte. 179-205.

Bourdieu P. (1979), La distinction: critique sociale du jugement, Paris, Minuit.

Dahlgren P.(1995), Television and Public Sphere, London, Sage.

Douglas M. (1996), Thought styles: Critical essays on good taste, London, Sage.

Fischler C. (1988), Food, Self and Identity, in *Social Science Information*, 27, 275-293.

Fischler C. (1990), L'Homnivore. Le gout, la cuisine et le corps, Paris, Odile Jacob.

Habermas J. (1989), The Structural Transformation of Public Sphere, Cambridge, MIT Press.

Kluckhon C (1952), Culture: A Critical Review of Concepts and Definitions, New York, Vintage Press.

Lipovetsky G. (2006), Le Bonheur Paradoxal. Essai sur la société d'hyperconsommation, Paris, Gallimard.

Low J., Malacrida C. (2008), Sociology of the body: a reader, Oxford, Oxford University Press.

Malinowski B. (1944), A Scientific Theory of Culture and Others Essays, Chapel Hill, University of North Carolina Press.

Martinengo M.C. (2015), Lo spreco alimentare domestico nella società della post-crescita: valori ed interessi individuali, in E. Varese (ed.), *Sprechi alimentari: una prospettiva multidisciplinare*, Torino, Giappichelli, 156-175,

Montanari M. (2007), Il cibo come cultura, Bari, Laterza.

Baas, S. (2015), Disaster Risk and Crisis: challenges for food and nutrition security, in Kraas, F. et al (Eds.), IGC Cologne 2012: Down to Earth, 95-103, Kölner Geographische Arbeiten, 95, Köln/Cologne, Germany.

Bieleman, J. (1992), Geschiedenis van de landbouw in Nederland 1500 - 1950 (Dutch agricultural history 1500 - 1950), Boom, Meppel, The Netherlands.

Bodin-Rodier, D.; Blanchet, J. (1997), La Stratégie agro-alimentaire mondiale, les enjeux du XXIe siècle, Armand Colin, Masson, Paris, France.

Boyens, I. (1999), Unnatural Harvest – how corporate science is secretely altering our food, Doubleday Canada Limited, Toronto, Ontario, Canada.

Breimyer, H. (1978), The Food-Energy Balance, in Ensminger, D. (Ed.) (1978) *Food enough or starvation for millions*, p. 303 – 311, Tata McGraw Hill Publishing Company Limited, New Delhi, India.

Canotilho, J. J. (Coord.), (1998), Introdução ao Direito do Ambiente, Universidade Aberta, Lisbon, Portugal.

Capon, Anthony G. (n/d), Diseases of modern civilization, Contemporary human health issues, http://www.natsoc.org.au/our-projects/biosensitivefutures/part-4-facts-and-principles/human-health-issues/diseases-of-modern-civilisation (accessed May, 18, 2016).

Chakravorty, U. (2016), The Impacts of Biofuel Mandates on Food Prices and Emissions, in *Resources*, nº 191, winter 2016, 12–13, Resources for the Future, Washington, USA.

Charvet, J.-P. (2012), Atlas de l'Agriculture, Comment nourrir le monde en 2010, Éditions Autrement, Collection Atlas/Monde, nouvelle édition augmentée, Paris, France.

Comstock, G. (2004), A Ética e os Alimentos Geneticamente Modificados, in Rosa, H. (Coord.) (2004) *Bioética para as Ciências Naturais*, p. 203-233, Fundação Luso-Americana, Lisboa, Portugal.

Dowler, E. ; Finer, C. J. (2003), The Welfare of Food, Blackwell Publishing, Oxford, UK.

Ensminger, D. (Ed.) (1978), Food enough or starvation for millions, Tata McGraw Hill Publishing Company Limited, New Delhi, India.

FAO and RUAF (n/d), A Vision for City Region Food Systems, building sustainable and

resilient city regions, with the support of German Federal Ministry of Food and Agriculture and Fondation Daniel & Nina Carasso.

FAO (2005), FAOSTAT – National Data,

http://webcitation.org/getfile?fileid=11ba36ce290516f412772223b0692c3cbfefd697

Firmino, A. (2014), Food and Consumption: How a Meal can Change the World, in Editors: Mary Cawley, Ana Maria Bicalho, Lucette Laurens, *The Sustainability of Rural Systems: global and local challenges and opportunities*, Publisher: Whitaker Institute, NUI Galway and CSRS of the International Geographical Union, Ireland.

Firmino, A. (2009), GMO's: Genetics Maculating Organics?, in Frutos, L; Climent, E., Ruiz, E., Bicalho, A.; Laurens, L. (Editors), *New Ruralities and Sustainable Use of Territory*, Prensas Universitarias de Zaragoza, Zaragoza, Spain, p. 167-175.

Forster, T.; Escudero, A. (2014), City Regions as Landscapes for People, Food and Nature, Landscape for People, Food and Nature Initiative, Washington, D.C. USA.

Girardet, H. (2011), Creating Regenerative Cities, Heinrich Böll Stiftung, Berlin, Germany.

Hopkins, R. (2008), The Transition Handbook. From Oil Dependency to Local Resilience, Green Books, Cambridge, UK.

IAAKSTD (2009), Agriculture at a Crossroads, International Assessment of Agriculture Knowledge, Science and Technology for Development, http://www.unep.org/dewa/agassessment/reports/IAASTD/EN/Agriculture%20at%20a%20Crossroads_Synthesis%20Report%20(English).pdf

IFPRI (2006), How to Feed the World in 2050, accessed on 25th May, 2016 at http://www.fao.org/fileadmin/templates/wsfs/docs/expert_paper/How_to_Feed_the_World_in_2050.pdf

Johnston, R. (2005), Geography and the Social Science Tradition, chapter 3 in Holloway, S. et al (Editors) (2005) Key Concepts in Geography, SAGE Publications, London, pp. 50-71, UK.

Kennedy, G. et al (2006) Globalization of Food Systems in developing countries: impact on food security and nutrition, FAO, Rome, Italy.

Kirschenmann, F. (2000), How many Farms will we need?, Winter 2000 issue of the Leopold Letter, a quarterly publication of the Leopold Center for Sustainable Agriculture at Iowa State University, USA.

Madeley, J. (2002), Food for All – the need for a new agriculture, Zed Books, London, UK.

Malassis, L. and Padilla, M. (1982), Typologie mondiale des modèles de consommation alimentaire, ENSA-INRA-IAM, Montpellier, France.

Malthus, T. (1998), Essay on the Principle of Population, Electronic Scholarly Publishing Project, http://www.esp.org

Millstone, E.; Lang, T. (2003), The Atlas of Food, Earthscan Publications Ltd, London, UK.

Parmentier, B. (2007), Nourrir l'Humanité – les grands problèmes de l'agriculture

mondiale au XXIe siècle, La Découverte, Paris, France.

Petit, M. (2011), Pour une agriculture mondiale productive et durable, Éditions Quae, Versailles, France.

Pierce, J. (1990), The Food Resource, Longman Scientific and Technical, Essex, England.

Pimentel, D. (1984), Energy alternatives in the Food System: Ecological and Social Aspects, in Knorr, Dietrich and Watkins, Tom (Editors), Alterations in Food Production, p. 3 - 10, Van Nostrand Reinhold Company Inc., New York, USA.

Rémésy, C. (2005), Que mangerons-nous demain? Odile Jacob, Paris, France.

Rimsky-Korsakoff, J.-P. (2003), Au-delà du bio: la consom'action, Éditions Yves Michel, Barret-sur-Méouge, France.

Rostow, W. W. (1990), The Stages of Economic Growth: a Non-Communist Manifesto, Cambridge University Press, 3rd Ed., UK.

Silva, M. (2003), Alimentos Transgénicos – um guia para consumidores cautelosos, Campus do Saber, Universidade Católica Editora, Lisboa, Portugal.

Singer, P. (1975), Animal Liberation – a new ethics for our treatment of animals, Pimlico, London, UK.

Steiner, R. (1983), Über Gesundheit und Krankheit, GA 348, Rudolf Stiener Verlag, Dornach, Switzerland.

Tudge, C. (2007), Feeding People is Easy, Pari Publishing, Pari, Italy.

UNEP (2006), How to Feed the World in 2050, accessed on 25th May, 2016 at http://www.fao.org/fileadmin/templates/wsfs/docs/expert_paper/How_to_Feed_the_World_in_2050.pdf

USDA. (2010), A Briefing on the Status of Rural America," U.S. Department of Agriculture, USA, available at:

http://www.usda.gov/documents/Briefing_on_the_Status_of_Rural_America_Low_Res_Cover_update_map.pdf

Weis, T. (2007), The Global Food Economy: The Battle for the Future of Farming, Zed Books, London, UK.

Wirz, J. (2012), Les événements de l'époque, une source de forces, in Das Goetheanum nº 17, 28 avril 2012, p. 14-16, Dornach, Switzerland.

Wolff, O. (2000), O que comemos afinal? Editora Antroposófica, Limitada, São Paulo, Brazil.

Other Publications

Science et Avenir, nr. 832, June, 2016

Web

Altieri, Miguel: https://www.youtube.com/watch?v=2yFvD8wuLmU .

Bioengineering: http://www.princetonreview.com/college-majors/417/agricultural-biological-engineering-bioengineering, accessed the 18th May 2016.

Cities in Transition: https://transitionnetwork.org/, accessed on the 20th May 2016.

David Swenson: http://www.thegazette.com/subject/news/government/fact-check/fact-check-reynolds-says-one-iowa-farmer-feeds-155-people-worldwide-20140524, accessed on the 20th January 2016.

Ecopolis: https://www.boell.de/sites/default/files/assets/boell.de/images/download_de/Girardet_regenerative_citys.pdf, accessed on the 24th April 2016.

FAO: World Agriculture 2030, main findings,

http://www.fao.org/english/newsroom/news/2002/7833-en.html

FAO: http://www.fao.org/food-loss-and-food-waste/en/, accessed on the 20th May 2016).

FAO: http://www.fao.org/livestock-environment/en/, accessed on the 28th April 2016.

FAO: http://www.fao.org/world-food-day/2016/theme/en/, accessed on the 24th April 2016.

Food Loss: http://www.thinkeatsave.org/docs/TES_FoodKit%20ToolKit_WEB.pdf, accessed on the 20th May.

Global Alliance Conference: http://www.newfieldfound.org/pdfs/PathwaysResources-April192015.pdf

Graziano da Silva: http://www.fao.org/news/story/en/item/250148/icode, accessed on the 20th April 2016.

Iowa Farm Bureau: http://www.iowafarmbureau.com/public/113/ag-in-your-life/fooditicisms involving it.

Médecins aux Pieds Nus, Canada: www.mapn.ca

Milano Charter of Food: http://carta.milano.it/en/

Secretary of Agriculture Tom Vilsack's 2010 Briefing on the Status of Rural America: http://www.usda.gov/documents/Briefing_on_the_Status_of_Rural_America_Low_Res_Cover_update_map.pdf

The Ecologist: (accessed on the 24th April, 2016) http://www.theecologist.org/News/news_analysis/2000416/ecopolis_the_emergence_of_regenerative_cities.html

U.S. Farms and Farmers 2012 Census of Agriculture report highlights: http://www.agcensus.usda.gov/Publications/2012/Preliminary_Report/Highlights.pdf

USDA 2012 Census of Agriculture Farm Demographics: http://www.agcensus.usda.gov/Publications/2012/Online_Resources/Highlights/Farm_Demographics/

USDA: National Directory of Farmers Markets, https://www.ams.usda.gov/local-food-directories/farmersmarkets

WHO: http://www.who.int/mediacentre/factsheets/fs180/en/, accessed on the 18th May 2016.